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Case Study Report
on
AN INTEGRATED PRODUCTION AND MARKETING SYSTEM
FOR THE ANTIGUA AGRICULTURAL SECTOR

Commissioned by:
The Executive Committee
of
THE CARIBBEAN AGRO-ECONOMIC SOCIETY

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FOREWORD

This Conference is the second in an experiment to focus on real problems and to attempt to recommend solutions for immediate implementation.

The Executive of the Society, having accepted the invitation of the Government of Antigua to host the Twelfth Annual Conference, set about the task of identifying the subject for the case study. After we had pursued this exercise from several points of view, a common feature emerged. It was clear that one of the main constraints to increased agricultural production was the lack of an integrated approach to food production and marketing at the territorial level.

There were several agencies in the agricultural sector which were operating independently, but the organization of the cohesive forces necessary to co-ordinate all their activities was non-existent. On further examination, it was mooted that the absence of efficient management systems was perhaps the major constraint to agricultural development in the region. A team of case study consultants was then engaged by the Executive to study the problem, and this working document, for discussion at the Conference, is a result of their efforts.

Because Antigua has a developing tourism sector, the impact of this sector on agriculture was also considered in the study. However, the problem which has been identified, the analysis and recommendations of the working document and the subsequent recommendations by the Conference, we expect, will be of great interest to many developing countries of the Caribbean and elsewhere.

This document is a testimony to the fact that, as Dr. J. Bernard Yankey, Past President of the Society put it, "if we only give our people a reasonable chance to succeed professionally they can team up to produce the goods that are part of our own expectations."

The Executive, recognizing the weakness of not having initiated a follow-up programme to the Dominica Conference recommendations in 1976, has taken steps to remedy the situation on this occasion.

The Society is very grateful to the Government of Antigua for extending unlimited courtesy and co-operation to the case study consultants during their visits to Antigua.

We deeply appreciate the financial and moral support from Ford Foundation and CADEC for a novel case study such as this. We sincerely hope that their forward thinking will be rewarded by the successful implication of the recommendations arising out of the study.

The Society extends best wishes and many thanks.

*Basil G.F. Springer
President.*

SECTION I: BACKGROUND

The Economy

The structure of Antigua's economy has undergone a number of important changes over the past two decades. Up until the late fifties the economy was predominantly agricultural with two export crops, sugar and cotton, accounting for the greater share of the Gross Domestic Product and providing the main source of employment. In the sixties, the tourist sector assumed the dominant role in the country's development, accounting for an increase in GDP from \$8 million in 1950 to \$25 million in 1964 - accurately described as a "remarkable rate" of growth.¹ As impressive as the rate of growth was in this period, it was far exceeded in the subsequent period to the early seventies, as shown in the table below.

Table 1. Gross Domestic Product (at current factor cost) by Industrial Sector

	Average 1961-65	Average 1969-73	% Increase/ Decrease
	(EC\$ million)		
Agriculture, Forestry, Fishing	3.9	3.5	-10.3
Mining, Quarrying, Manufacturing	0.7	5.5	685.7
Construction	4.6	8.9	93.5
Transport & Distribution	5.6	24.6	339.3
Government	4.7	11.4	142.5
All others	5.7	26.4	363.2
	25.2	80.3	

Source: Based on data provided in: UN/ECLA, Agricultural Statistics of the Caribbean Countries, August 1976.

The highest growth sector, in relative terms, reflected above for this period was mining, quarrying and manufacturing, which includes the refining of petroleum. The only sector to show a decline was agriculture. The growth in the transport and "other" sectors reflects primarily the increased impact of tourism on the economy.

Owing to "increasing inefficiencies" in the sugar industry, the Government of Antigua initiated a study in 1971 to determine the industry's continuing viability.² Purchase of the sugar estates from the former

¹ Campbell, L.G. & Edwards, D.T. Agriculture in Antigua's Economy: Possibilities & Problems of Adjustment. Agricultural Series No.1, U.W.I., I.S.E.R.(E.C.), July 1965.

² Conducted by Peat, Marwick, Mitchell & Co., 1972.

owners had been finalized by Government in 1966, and sugar cultivation continued under the management of the Antigua Sugar Estates Development Board. Despite recognition of the socio-economic implications of the collapse of the sugar industry, particularly the problem of a lack of alternative employment for displaced sugar estate workers, the decision was taken to terminate sugar production on the island in 1972.¹ With the collapse of the sugar industry, most of the sugar estate lands became idle, although a start was made with a programme of diversification.

The collapse of the industry coincided with a decline in the tourist industry, in the late sixties and early seventies, resulting in an increase in unemployment and a sharp decline in the rate of growth. Although the main impetus in Antigua is still on development of tourism, a new thrust is being given to agriculture and the manufacturing industry.

Physical Characteristics

Climate

The island lies between 17°N latitude and 61° 45'W longitude. It has a tropical climate which is modified by oceanic influences. Steady winds and marked seasonal rainfall are the important features.

Uniformly high temperatures are experienced. Mean minimum and maximum are 73°F and 83°F respectively. The range is relatively small - 62°F to 97°F.

Relative humidity ranges from 60 to 80 per cent throughout the year, with highest values at the end of the year. The constant north-east Trade Winds not only ensure low humidity, but greatly assist in removal of moisture from the soil, especially during the drier months.

Annual rainfall over a long period averages 45 inches. There are great variations in annual rainfall (70" to 24"), and recurrent droughts are a serious problem. The wet season is usually from August to November, during which period 50 per cent of total precipitation may be experienced. A marked dry season usually occurs from February to April. Heavy showers are sometimes experienced in May, when there is little vegetative cover, and this sometimes results in serious erosion problems.

Soils

The soils of Antigua have been developed from different parent material. The three major soil groups coincide with the principal geological areas of the island. The island is divided into three regions running north-west to south-east:

¹Vide. "Proposals to Develop the Agricultural Industry in Antigua." Government of Antigua, (unpublished).

- (i) Soils of the north-eastern area. These are essentially soils developed from hard white limestone or compacted marl.
- (ii) Soils of the central region are characterized by heavy clays. They consist of water deposited tuffs, short shales and conglomerates containing pebbles and andesites. Deposits of lime occur irregularly in strata.
- (iii) Soils of the volcanic area are comprised of igneous rocks, ash-beds and agglomerates. Some alluvial valleys of this area contain soils of relatively good drainage.

Relief and Drainage

The relief of the island is low, flat in parts, but generally hilly. Again, the island can be divided into three regions, corresponding to the geological areas:

- (i) the limestone region of the north and east consisting of a number of steep hills, 300 to 400 feet, separated by small valleys and gently undulating areas. The area is generally a low rainfall region, runoff is relatively low, and there is little surface water in the area. The coastline is very irregular in shape, with many inlets and bays.
- (ii) The central plain lying between the limestone region of the north, and the volcanic region in the south. Most of the land is below 100 feet, but several ridges are in the area. The area is poorly drained, and some areas are flooded or waterlogged during the wet periods. There is a large number of ponds and pools in this area.
- (iii) The hilly south-western area with the highest peak, Boggy Peak, rising to 1,319 feet. Many hills are around 1,000 feet. The area is intersected by a number of valleys, and there is a radial drainage pattern. A number of mangrove swamps occur in the area.

Population

The population of Antigua, at the 1970 Census, was 64,794 of which 30,589 were males and 34,205 females. This is estimated to have increased in 1975 to 66,750, adjusting for net migration. The heaviest concentration of population is in the capital city, St. John's, where there were 21,814 residents, or 30 per cent of the total population, in 1970.

Antigua has a relatively young population, with 64 per cent below the age of 24. The heaviest age concentration is in the group 5 to 24, which numbers 31,415. The population over 50 years represents 15.4 per cent of this total. However, projections based on the trend between the censuses of 1946, 1960 and 1970 indicate a very slow rate of growth, with a decrease of the population below 15 years, and a continued expansion of the potential work force, i.e. those above 15.

The unpublished figures of the Ministry of Development show the distribution of the labour force by industrial employment and the changes over the period 1960 to 1970.¹ The figures in Table 2 below, show an overall increase in the labour force over the ten-year period of 27 per cent, with increases in all sectors, with the exception of manufacturing and agriculture. Employment in agriculture declined from 33 per cent in 1960 to 10 per cent in 1970. In comparison, employment in the service sectors almost doubled, reflecting the economy's shift to tourism.

Table 2. Distribution of Labour Force by Industry, 1960 and 1970.

	1960	1970	% Increase/ Decrease
Community, Social & Personal Services	3,574	6,608	85
Financing, Business	319	1,249	292
Transport	1,044	1,947	86
Hotels, Restaurants	414	1,247	201
Construction	2,164	2,872	33
Electricity, Gas, Water	200	415	108
Manufacturing	2,131	1,680	-21
Agriculture, Forestry, Fishing	5,987	2,449	-59
Total	18,154	23,067	

The decline in the importance of agriculture in both relative and absolute terms, as a source of employment over the period 1960 to 1970, indicates a trend which is unlikely to be checked or reversed, unless far-reaching improvements are made in the incentives offered to young people to attract them to farming. Two basic facts would seem to validate this. In the first place, most of the existing farmers who work their own holdings are above 50 years and, secondly, agriculture in Antigua has, traditionally, been related to the sugar industry, and has not been developed as a "way of life", as has been the case in some other countries. The decline of the sugar industry would have caused a shift of the "farm population" to other sectors, if for no other reason than the lack of development of alternative agricultural activities.

Concerning the rural-urban shift of population, data presented by the UN/ECLA report already cited indicate that, whereas in 1960 60 per cent of the population was rural and 40 per cent urban, in 1970 the situation was almost reversed with 45 per cent of the population rural and 55 per cent urban.

¹ It is to be noted that the ECCM Annual Digest of Statistics, which employs a somewhat different industrial classification, estimates the working population in 1970 at 18,575.

Tourism

Tourism in Antigua, as in the rest of the Eastern Caribbean, saw its most rapid advances during the late fifties to the late sixties. As can be expected, during this period there was a boom in hotel construction, as the economy became more tourism oriented. However, the inducement to build more rooms resulted in a situation of excess capacity, with the slackening off of tourist arrivals during the seventies. This is perhaps due both to the competitive attraction of other Caribbean destinations, and to some degree of economic recession in the tourist generating countries of North America and Europe. Tables 3 and 4 give the arrivals of visitors by air and cruise ship for the period 1970 to 1976. Corresponding to this are the number of hotel rooms and beds for the same time frame. A significant pattern of this development trend is that the supply has increased by 18 per cent during the time period, while arrivals ranged from 63,595 (1970) to a high of 71,065 (1971), to an estimated 56,398 in 1976, suggesting that supply has expanded too fast, thereby compounding the situation of excess capacity in the industry.

Table 3. Antigua: Annual Arrival of Visitors by Sea and Air, 1970-76

Year	By Sea	By Air
1970	18,705	63,595
1971	37,658	66,067
1972	63,784	70,140
1973	52,174	71,065
1974	27,062	68,897
1975	23,237	62,114
1976	32,385	56,398

Source: Dept. of Tourism, Antigua.

Table 4. Antigua: Number of Cruise Ships and Cruise Passengers, 1970-76

Year	No. of Cruise Ships	No. of Cruise Passengers
1970	71	18,705
1971	101	37,658
1972	137	63,784
1973	113	52,174
1974	61	27,062
1975	41	23,237
1976	n.a.	32,385

Source: Dept. of Tourism, Antigua.

Table 5. Antigua: Number of Hotels, Hotel Rooms and Beds, 1970-75

Year	No. of Hotels	No. of Rooms	No. of Beds
1970	33	1,051	2,102
1971	34	1,031	2,062
1972	32	1,124	2,248
1973	31	1,109	2,218
1974	32	1,194	2,388
1975	34	1,248	2,496

Source: Dept. of Tourism, Antigua.

Table 6. Antigua: Monthly Arrival of Visitors by Air Only, 1970-76

Month	1970	1971	1972	1973	1974	1975	1976
January	6,231	6,158	5,970	6,891	6,370	6,158	5,299
February	8,315	8,105	7,954	8,588	8,410	8,252	7,120
March	7,649	6,770	7,203	7,930	7,658	7,273	6,106
April	5,084	6,093	5,678	6,284	5,683	5,320	5,118
May	3,391	4,075	4,264	4,298	5,303	3,892	3,568
June	3,085	3,621	4,101	3,867	4,089	3,277	2,952
July	5,733	7,025	6,761	5,470	6,276	5,718	6,264
August	5,764	6,040	6,958	6,715	6,381	5,491	4,770
September	3,151	3,115	3,718	3,207	2,890	2,636	2,271
October	3,631	3,384	4,012	4,172	3,362	2,992	2,885
November	5,170	4,847	5,636	6,309	5,833	5,077	4,100
December	6,391	6,834	7,886	7,334	6,642	6,028	5,955
Total	63,595	66,067	70,140	71,065	68,897	62,114	56,398

Source: Dept. of Tourism, Antigua.

In spite of this situation, tourism has for Antigua the potential of being a catalyst for economic development in terms of:

- (i) the contribution which the industry can make to the balance of payments situation in the country;
- (ii) creation of jobs, both in and outside the industry, along with the development and improvement of artistic skills;
- (iii) economic linkage with other sectors, especially agriculture; and, to a lesser extent,
- (iv) the shifting of development to the non-developed areas of the country, thereby giving way to infrastructural development for the benefit of nearby communities as well.¹

¹ However, one caution must be given. Because tourism is an industry in which the product is consumed at the place of production, it has got to be constantly monitored, to ascertain and reduce the negative effects which it can have on the social and environmental fabric of the country.

Table 7. Antigua: Gross Domestic Product at Current Factor Cost

	1967	1969 ^P	1970 ^P	1971 ^P	1972 ^P	1973 ^P
	(EC\$ million)					
Agriculture	0.9	3.5	3.2	4.1	3.0	3.5
Mining & Manufacturing	1.2	3.6	5.0	5.5	6.4	7.2
Construction	9.0	9.5	10.2	9.5	7.2	8.0
Distribution	4.4	17.0	18.0	20.0	22.0	23.5
Government	7.3	10.0	10.5	11.0	12.5	13.0
Others	11.4	26.0	28.2	30.4	33.1	36.9
	34.2	69.6	75.1	80.5	84.2	92.1
Hotels' share of GDP	4.5	7.5	8.0	8.7	9.5	10.5
Tourist Receipts	18.1	25.3	30.5	n.a.	30.0	44.8

Sources: 1967 Economic Survey and Projections, July 1969, British Development Division in the Caribbean.

1969-73: Statistics Division, Ministry of Planning, Development and External Affairs, Antigua.

Employee/Room Ratio: In Season - 1.43 Employees/room
Out of Season - 0.94 Employees/room.

Note: P = Provisional.

According to statistics compiled by the Government of Antigua, the total tourism revenue grew from EC\$18.1 million in 1966, to EC\$44.8 million in 1973. However, there does not appear to be any recent information on the composition of the tourist dollar. The lack of such information is unfortunate because, in an economy intent on achieving greater linkage between tourism and agriculture (and to benefit generally from developmental tourism), such information as the amount spent on food purchases is essential. This would, therefore, suggest that a comprehensive study has to be carried out, on a continuous basis, to generate this information. Simultaneous with this exercise would be a survey of food utilization in the hotel industry by commodity, grade/quality and quantity within a given time frame. By having, on the demand side, an indication of how much the tourists are spending on food and, on the supply side, a profile of the agricultural produce utilized by hotels, etc., local agricultural supply can be better geared to the needs of the tourist sector, as part of the overall programme of food production. Such an approach could also be used for the country on a whole.

According to statistics prepared by the Ministry of Planning, Development and External Affairs, Antigua's GDP ranged from EC\$69.6 million in 1969, to EC\$92.1 million in 1973. Of this, the hotel sector share of GDP ranged from EC\$7.5 million in 1969, to EC\$10.5 million in 1973, approximately 11 per cent of GDP.

In 1970, the total working population in Antigua was estimated at 35,000. The economic survey and projections prepared by the British Development Division in the Caribbean (1969) estimated that, during the high season, the employee per room ratio for 1967-68 was 1.43 and 0.94 in the low season (it is assumed that this ratio still holds). Applying this statistic to the number of rooms available in 1975 would suggest that direct employment in the hotel industry ranges from 1,785 in the high season, to 1,173 in the low season, or approximately 5 per cent of the work force in the high season. From an employment point of view, it should be noted that as the tourism high season coincides with the crop season (November-February/March), while, on the one hand, a good market is created for agricultural produce during peak production periods, agriculture cannot be expected to absorb excess labour from the tourism sector during the low season (April to October). Therefore, in economic terms, while a strong linkage may be developed between agricultural supply and tourism, other sectors (in the absence of an extended tourism season) will have to be depended upon, to act as the main thrust for the absorption of the labour supply during the slack periods in the industry.

Conclusion

Our review of the tourism sector suggests that several deficiencies exist in the Antiguan situation.¹

- (i) More up-to-date and meaningful economic analysis needs to be undertaken, especially to estimate the relative amounts being spent by tourists on various activities.
- (ii) A study needs to be done, on a regular basis, to determine the consumption patterns for food, especially in the tourist sector.² This perhaps should be extended to the food service industry, in general, and the country as a whole.
- (iii) An integrated methodology has to be applied for the channelling of agricultural supply from the farmer to the hotel. Preferably, all marketing activities involved therein should be closely monitored by a central government agency. Fragmented approaches to the provision and delivery of agricultural produce should be discouraged. The emphasis in supplying the food service (agricultural) needs of the hotel sector should be on a well-organized system, with the main functions being provided by either public or private sector institutions capable of establishing rapport with the hotel industry, in an effort to ensure that the requirements of the industry are met.

¹ See also Appendix "Note on Forecasting the Demand for Agricultural Products in the Tourism Sector".

² See also Section III of this report.

Description of the Agricultural Sector

Pattern of Land Tenure and Land Use

The pattern of land use in Antigua is shown in the Table below.

Table 8. Antigua: Land Use, 1971

	Estimated Acreage	Per cent
Permanent crops*	22,371	33.9
Other crops	3,356	5.1
Uncultivated land, permanent pasture	20,084	30.4
Woodlands, forests	12,890	19.5
Other	7,299	11.1
Total Farm Land	66,000	100.0
Total Land Area	108,800	

Source: ECCM Annual Digest of Statistics, 1974.

Note: *Including sugar lands.

Campbell and Edwards have observed that both the total area of land in farms and the distribution of land between small farmers changed appreciably between 1946 and 1961.¹ The changing fortunes of agriculture in Antigua have, in fact, given rise to this characteristic of change in the pattern of both land use and land tenure. Descriptions of these patterns must, therefore, be cautious and must recognize the possibility, particularly in relation to land use, that the acreages specified in a given category may be more apparent than real. With reference to the above acreages, it must be noted that the amount of land shown as being under "Permanent crops" is probably greatly overstated, since it includes the former sugar lands, much of which is not under production. On the other hand, the acreage under "other crops" might be understated, in relation to the present, in view of the Government's programme of stimulating diversification and production of food crops for the domestic market.

Some 60 per cent of all agricultural land in Antigua is claimed to be now owned by the Government. In addition, an additional 10 per cent is leased by Government for sub-letting to small farmers, or to be used for Government estate production.

A large segment of the government holdings, an estimated 12,000 acres, is part of the former sugar estates bought over by Government in 1965, when the former owners decided that sugar cultivation was uneconomical. These lands were largely those of the Syndicate Estates who were the island's

¹ Campbell & Edwards. Op. cit., 1965.

largest sugar producers.

The former sugar estates acquired by Government were initially under the control of the Antigua Sugar Estates Development Board. On taking over the estates, the Board passed some of the land to the Agricultural Extension Division, which in turn sub-divided it for use by small farmers. In the majority of cases, allocation of land was to farmers who previously held land in areas that were regarded as less fertile. Another part of the land taken over by Government, variously estimated as between 6,000 and 10,000 acres, was leased from the Board by the Antigua Agricultural Industries Company. The remaining portion of land, which has not been allocated to the Agricultural Extension Division, The Antigua Agricultural Industries Company or, for specific projects, to the Housing Authority, the Division of Agriculture and the Livestock Development Authority, remains under the control of the (now inoperative) Antigua Sugar Estates Development Board.

The majority of small farmers in Antigua do not own the land they cultivate, and they are expected to pay an annual rental to the Agricultural Extension Division, in respect of land owned by Government. In addition to Government, a number of private landowners rent or lease agricultural lands to farmers at a rate of about \$20 per acre per annum. Reasonable security of tenure is assured to the tenants for short-term cropping under the provisions of the Agricultural Small Holdings Act of 1938, although most of the farmers now holding lands have not signed the required agreement. Adequate provision is usually paid to farmers in the event that the land is repossessed, and this usually includes relocating the tenant.

It is useful to draw attention here to the Agricultural Small Holdings Act, which is a potential mechanism of control in the agricultural sector. The law provides for the registration of small holdings and, under Section (5) 2, requires that contracts between landowners and tenants be registered. These contracts must show the acreage and the crops being produced. The Act has, unfortunately, fallen into disuse, and its provisions are neither upheld nor enforced.

The pattern of land tenure in Antigua has important implications for the development of the agricultural sector. Antigua does not have the pattern of peasant proprietorship which is a feature of agriculture in some Caribbean islands and, added to the lack of tradition in production of food crops for the domestic market, this land tenure pattern could lead to a serious drift from the land at short notice, if conditions become too adverse, for instance in a period of extended drought. Prior to 1950, a number of Land Settlement Schemes were developed on a freehold basis, and farmers were allowed to purchase their holdings by annual instalment payments. All land settlements since then have been on a leasehold basis, and even then the leases have been entered on an informal basis. The rental paid by farmers is low - \$7.20 per acre per annum on government lands, and cultivation services are highly subsidized, and given on credit. These may not always be incentives and, in fact, there are cases where the cultivation services are taken advantage of by farmers who make no further use of the land.

Pattern of Agricultural Production

In the agricultural sector in Antigua today, two principal production sectors are identifiable:

- (i) the small farm sector; and
- (ii) the governmental sector.

Large scale private farming is almost non-existent since the collapse of the sugar industry, which is dominated by metropolitan-owned estates. There are a few private estates engaged chiefly in livestock (cattle and sheep) production and pineapples, but the main plantation type farm which remains is operated by Antigua Agricultural Industries, a private American company, engaged in corn and soyabean production on lands leased from Government. It is estimated that of the total amount held by the company, only about 1,500 acres have been cleared and planted over the past two seasons. The company has been producing both sweet and grain corn. Most of the sweet corn and some grain corn are consumed locally. A substantial quantity of last year's crop of grain corn was exported, although some was used for local animal feeds.

There is an ongoing Caribbean Development Bank-financed project, under which 100-acre farms are being established for livestock development. The immediate target is 20 such farms. To date, seven of these farms have been allocated, and partially developed, and four more are in progress. The intention is to allocate the farms to private farmers having a basic stock of cattle. Some of these farms will be established on a portion of the former sugar lands taken over by Government.

It needs to be pointed out here that estimates of the total number of farm units, as well as of the different sizes, vary considerably in Antigua. The latest published available statistics give the following number and size distribution of farms:

Table 9. Antigua: Distribution Pattern of Landholdings, 1961.

Size Group (acres)	No. of Farms	% of Total Number	Total Area of Holdings	% of Total Agric. Acreage
0 - 4.9	5,233	91.0	9,600	26.9
5 - 99.9	476	8.3	4,800	14.0
100+	38	0.7	20,200	59.1
Overall Total	5,747	100.0	34,600	100.0

Source: Based on UN/ECLA. Op. cit. 1976.

The figures indicate that around 1961 the agricultural sector of Antigua consisted of a large number of very small farms and a much smaller number of large farms. While farms 100 acres and over comprised only 0.7 per cent of the total number of farms, they occupied 59.1 per cent of the total agricultural landholdings. Since 1961, the distribution of farms in Antigua has changed substantially. The large farms were associated with the sugar industry on the island. The demise of the sugar industry led to abandonment of agricultural production by large farmers, so that currently few large farms over 100 acres exist.

The Small Farm Sector

Small farmers engage in subsistence agriculture, mainly under government-supervised land settlement schemes, but a number of these farmers occupy their own land, or lease land from the Government or private landowners. According to one estimate, there are 1,700 small farmers operating units of between one-half and 10 acres, but the average size is about two acres. The Central Marketing Corporation claims that the number of small farmers served by that agency is in the region of 1,500. The ECLA figures above would, therefore, appear to be somewhat exaggerated, and the number of small farms (between one and 10 acres) is more likely to be about 2,500 at the outside. (This is supported by the unpublished report of an interim agricultural census recently undertaken by the Division of Agriculture which puts the total of all holdings at 3,138.

Among those described as small farmers, there is a high percentage of part-time farmers, some of whose incomes are derived mainly from non-farming activities. Small farmer production is in the main unorganized and unplanned, as regards choice of crops, time of planting and marketing. These small farmers are influenced by the unreliability of rainfall, the need for quick cash in the early planting season (August-September) and their confidence that they can handle some familiar crops (sweet potatoes, cucumbers, tomatoes, pumpkins and egg plants) and not others.¹

Short Term Annual Crop Production

Production in the small farm sector is restricted to short-term annual crop (vegetable) production.² For the most part, vegetable production is dependent on the rainfall, so that production is dictated by the weather pattern on the island. The water situation in Antigua has been thoroughly described by Campbell and Edwards in their study of agriculture in the economy of Antigua.³ They state:

"Compared with the other islands in the Eastern Caribbean, Antigua is poorly supplied with water. The average annual rainfall is less than 45 inches. The highest average rainfall of over 50

¹ See Appendix VI for estimates of small farmer vegetable and food crop production.

² See Appendix V for a sample description of the system of production on a small farm.

³ Campbell & Edwards. Op. cit. 1965, p.16.

inches is recorded in the south-west section of the island, while much of the north-eastern region gets, on average, less than 30 inches. Although the rainfall is fairly low, the water problem arises primarily because a significant portion of the rainfall does not become available for use. Much of the rain water runs to the sea. The supply of water available for the growing of crops is insufficient for proper plant growth."

Although the last statement is probably too sweeping a generalization, the substance of their arguments is still valid.

The rainy season extends from August to January, and this is the normal production period. Vegetables are chosen since they are high return crops, and they can be produced within the short production period. Vegetable production requires a fairly high labour input in planting, weeding and harvesting operations, as well as a high level of managerial expertise in the control of pests, disease and weeds, at critical periods of plant development. In the absence of mechanized cultural operations and irrigation, production of vegetables is usually carried out on small acreages, as is the case in Antigua.

Advantages of Short-Term Annual Crop Production Pattern

As stated before, Antigua is generally a semi-arid island. However, most of the rain falls in the period August to January. This five-month period sets a limit to the period of unirrigated production. Thus, the type of farming systems suited to Antigua would be dictated by the need to have a production cycle of less than six months. Suitable types of enterprises include sugarcane, cotton, root crops, vegetables and pineapples.

During the period from November to April, night temperatures in Antigua average below 75°F with daytime temperatures around 84°F. Such a temperature range is considered quite suitable for the production of vegetable crops, especially tomatoes.

The total size of agricultural landholdings in the island of Antigua is around 34,600 acres (Table 9). This represents a fairly scarce resource on the island. Intensive use of this resource is thus desirable. Vegetable production allows for intensive use of the land.

As mentioned earlier, vegetable production requires a high labour input, especially if cultural practices are done manually (transplanting, weeding, spraying, etc.). The official unemployment figure in Antigua is about 20 per cent, with unofficial estimates going even higher. Enterprises which utilize a high labour input could, therefore, be desirable to meet full employment objectives.

Disadvantages of Short-Term Annual Production Pattern

There would appear to be two major deficiencies to vegetable production in Antigua: (i) managerial limitations, and (ii) lack of irrigation.

- (i) Managerial limitations: The production of vegetables extensively

in Antigua is a rather recent phenomenon. The farmers seem, generally, to have adopted patterns of production on a trial and error basis. Hence, little factual information is available on appropriate varieties and cultural practices for vegetable production in the Antigua situation.

One result of this unsystematic adoption of technology seems to be that, once farmers have hit upon a partially successful method of producing a particular crop, they continue producing that crop, in spite of prevailing or expected market conditions. The uncertainty associated with growing different crops, without appropriate technological know-how, is considered too great by the farmers. This factor helps to explain the apparent inelasticity of supply of some commodities. The farmers know how to obtain a reasonably good crop of cucumbers so they will always grow cucumbers. Crops like onions and carrots, while they may promise greater returns than cucumbers, are not grown because the farmers lack the technology for producing these crops.

- (ii) Lack of Irrigation: The availability of irrigation is generally considered essential for the successful production of vegetables under semi-arid conditions. The presence of irrigation greatly reduces the risk associated with vegetable production. Also, a sufficient water supply, at critical periods, is very important, if the quality of produce is to be maintained for specialized markets like the tourist trade. Campbell and Edwards have provided an interesting discussion on the possibilities for irrigated farm production in Antigua.¹

The Government Production Sector

A number of projects have been organized and are operated by Government to achieve goals such as:

- (i) Production of vegetables under irrigation using surface, trapped water in dams and sub-surface water from wells.
- (ii) Demonstration of efficient husbandry techniques to the farming sector.
- (iii) Upgrading small farming by allocating more and better land under new land settlement schemes.
- (iv) Increased and improved livestock production.
- (v) Provision of suitable and cheap planting materials for crop production.

Some of the government projects are related to the normal service functions undertaken by the Division of Agriculture, while others, more specifically, relate to putting the land acquired by Government to productive use. Among the former group could be included the following:

¹Campbell & Edwards. Op.cit. Part III: Production of Crops Under Antigua's Dry Conditions. 1965.

- (i) Pond Clearing: There is a pond-clearing programme financed by British Aid. To date, 50 ponds have been dug or cleared, thereby increasing the water catchment area by an additional 70 million gallons for use by livestock and food crop farmers.
- (ii) The Cades Bay Station: This is a pineapple production and multiplication unit where some 35 acres of pineapples have been established. Planting material is supplied to farmers from the station. Antigua is well known for the good quality of its pineapples, and it is expected that pineapple production will be increased significantly in the future.
- (iii) Christian Valley Plant Propagation Station: The Christian Valley Horticultural Scheme was established to create a base for the development and expansion of fruit crops. Fruit and tree crop production is at a rudimentary stage in Antigua, and this project is seen as the beginning of the tree crop industry. It is expected that suitable varieties of mangoes, avocados, citrus and cashew, etc., will be produced for distribution to farmers, and for establishment of commercial orchards for large-scale government farms. About 20 acres have already been planted at the station, and the Division is just beginning propagation for commercial sale. Provision is made for housing, offices, preparation units and irrigation facilities, and the project is being managed by the Government Horticulturist. A Commonwealth Fund for Technical Cooperation Horticultural Adviser is also associated with this project.

The other groups of government projects relate mainly to small farmer settlement schemes, some of which involve the simultaneous development of irrigation projects. The principal ones are:

- (i) Bethesda Irrigation Project: This project was developed to expose a number of small farmers to production of vegetables, using irrigation. The project covers 50 acres of land and is divided into 12 farms, occupying 1.4 to 4.5 acres. There is a demonstration plot of 6.2 acres which is under the supervision of the project manager. Water is supplied by a dam of 100 million gallons capacity. This project officially opened about one year ago is funded by the Caribbean Development Bank and engineering services are provided by the Director of Agriculture and a horticulturist adviser on the project. The project, it is claimed, has suffered a number of setbacks caused by breakdown in equipment and tractor services and farmers have also experienced difficulty in marketing.
- (ii) Table Hill Gordon: Table Hill Gordon is a recent land settlement project covering some 300 acres which was introduced to develop viable farming systems based on full-time farming and to relocate farmers on better lands with larger farm units. Plot sizes vary from 3 to 8 acres.

It was expected to increase production in food crops, livestock and diversification into commercial production of fruit crops. Sugarcane was contemplated as one of the crops to be grown. Crops grown so far have been traditional food crops and vegetables,

and an attempt has been made to establish peanuts. One portion of the land is being reserved for a communal pasture. There is no irrigation on this project.

The British Development Division provided the technicians for setting up the project and the funds for the initial stages. The project is supervised by the Small Farms Development Manager. There is a committee which is made up of technicians from the Ministry of Agriculture, including the Director of Agriculture, who has the ultimate responsibility for the project.

The project, as planned, indicated that farmers had a free choice of crops and could utilize the Antigua and Barbada Development Bank's credit facilities. Observations on the project are that performance of farmers on the project has not improved when compared to other small farmers elsewhere on settlements. These lots are held by the older farmers, unfamiliar with the modern techniques and systems of production. All the holdings have been allocated to about 50 farmers and it is interesting to note that most of the farmers do not wish to operate more than 5 acres since they depend on manual labour.

- (iii) Orange Valley Pineapple Expansion: This project will establish 170 acres of pineapples, first under government control, but eventually to become a small cooperative enterprise. Initially, the farmers are to learn the skills of pineapple production by working on the project as labourers. It is contemplated that tree crops will be included in the scheme.

This project is phased over three years and will be financed by the British Development Division. It has a production target of one million pounds of pineapples annually. The Division is at the first stage of clearing and fencing the land and interviewing farmers for settlement.

- (iv) Diamonds Project: This is a government commercial unit with about 30 acres under vegetable production, some of which are served by irrigation. The project is operated by the Antigua Sugar Estates Development Board and there are plans for its expansion.
- (v) Claremont Irrigation Project: Claremont comprises 10 acres under vegetable production, and an additional 5.7 acres is expected to be put under pineapple production. The irrigation project at Claremont was established in 1962, mainly as a demonstration unit and for developing techniques for irrigated vegetable production.

Imports

Like most small, developing countries, Antigua is heavily dependent on imports. According to statistics published by the East Caribbean Common Market Secretariat, imports in Antigua registered a 97.9 per cent increase over the years 1970 to 1974. For this same period, the average annual change (increase) was 24.5 per cent. The increase in

imports over the period 1973-74 was 52.2 per cent.

Table 10. Antigua: Imports, 1970, 1973 and 1974

Year	Value (\$m)
1970	72.6
1973	94.5
1974	143.8

Source: ECCM Secretariat. Digest of External Trade Statistics, 1976.

Thus, Antigua's imports almost doubled with an increase of about 98 per cent during the period 1970-1974.

Of the total imports of the ECCM states, Antigua also registered, by a significant margin, the highest changes in its relative contribution to the total imports of the region.

Table 11. Antigua: Percentage Increase in Imports Relative to Contribution to ECCM Imports

Year	Per cent
1970	27.3
1973	28.7
1974	34.3

On the other hand, the lowest rate of growth of exports of all the ECCM States for the period 1973 to 1974, was registered by Antigua.

Table 12. Antigua: Value of Exports, 1970, 1973 and 1974

Year	Value (\$m)
1970	27.3
1973	59.4
1974	66.5

Source: ECCM Secretariat. Op. cit.

This pattern does not indicate Antigua's position in absolute terms. Based on an analysis of the relative contribution of total exports of the region, Antigua shows the highest figure, representing 36.9 per cent of ECCM exports in 1974.

Table 13. Antigua: Percentage Contribution
to ECCM Exports, 1970, 1973 and 1974

Year	Per cent
1970	36.1
1973	43.3
1974	36.9

Source: ECCM Secretariat. Op. cit.

It is significant also that Antigua enjoys a favourable balance on visible trade with all the ECCM countries combined. Imports of the rest of the ECCM from Antigua in 1974 amounted to \$2.5 million, while Antigua's imports from the rest of the ECCM were \$0.7 million. This has been the pattern for the four years to 1974.

On the other hand, in 1970, the highest proportion of food imports from the rest of the world into the ECCM was registered by Antigua: 13.7 per cent, and Antigua was in 1974, the state with the highest level of adverse balance of trade - almost \$77.3 million.

Table 14. Antigua: Balance of Visible Trade,
1970, 1973 and 1974

Year	Value (\$m)
1970	-45.4
1973	-35.1
1974	-77.3

Source: ECCM Secretariat. Op. cit.

Food Imports

Table 15 shows the total imports of food into Antigua as a percentage of total imports over the years 1969 to 1974.

Table 15. Antigua: Food Imports as a Percentage of Total Imports

Year	Total Imports	Food Imports	% Annual Increase	Food as a % of Total
1969	57,183,930	10,243,152	-	17.91
1970	72,649,112	13,164,220	28.52	18.12
1971	86,767,465	14,645,655	11.25	16.88
1972	90,976,175	16,419,630	12.11	18.05
1973	94,503,903	14,876,976	-9.40	15.74
1974	143,749,504	21,852,217	46.89	15.20

Source: ECCM Secretariat. Op. cit.

No adjustment has been made in the figures for price increases, so they do not necessarily reflect the real growth of imports. However, the annual increases are very high and suggest the need for reduction of the dependence on imported foods, which now utilize a significant proportion of the foreign exchange earnings from tourism and export agriculture.

As shown in Table 16, relatively few items or food groups account for most of the food imports with dairy and fish products predominating.

Table 16. Antigua: Imports of Principal Food Groups (\$)

Item	1971	1972	1973	1974
Rice	n.a.	n.a.	508,600	1,117,900
Beverages	2,628,200	2,968,900	3,026,100	2,852,800
Butter	n.a.	n.a.	571,000	771,800
Fish	924,200	1,053,900	1,630,300	1,627,000
Meat & meat preparations	3,735,200	4,041,900	3,350,800	4,137,600
Wheat flour	n.a.	n.a.	1,297,700	2,333,500
Total	7,287,600	8,064,700	10,384,500	12,840,600
Total food imports	14,645,655	16,419,630	14,876,976	21,852,217

Source: ECCM Secretariat. Op. cit.

Food Imports and Import Substitution

Since import substitution is seen as a major instrument in the programme of agricultural development and diversification, it is necessary to define its implications in the circumstances of Antigua. As can be seen from Table 17, structuring imports of food by the main classifications, the imports of food cover a range of products - fresh and processed - many of which do not lend themselves to production in Antigua. The attempts to meet local requirements from domestic production, in some areas, must, therefore, be preceded by considerable technological and other advancement, and must necessarily involve fundamental changes in eating habits, in the direction of the limited range of foodstuffs that Antigua can produce. Efforts, so far, have been concentrated on fruits and vegetables.

References to the high level of food imports and reduction of dependence on these imports tend to ignore this basic reality, and use of the global import figures in analysis of import substitution can be grossly misleading. In fact, the number of items which can potentially be replaced by local production of direct substitutes is extremely small.

It is interesting to note that one of the largest single items on the import bill which has long been in production in Antigua, i.e. sugar, has been cut out of production, as a policy decision, because of

Table 17. Antigua: Imports and Value of Food by Selected Classification, 1974

Item	Value (EC\$)
Live animals	20,092
Meat (all kinds: fresh, frozen, salted)	3,220,993
Meat (prepared: ham, sausages, canned, etc.)	952,596
Dairy products (milk, butter, cheese)	1,911,825
Eggs	553,318
Dairy products and honey	71,773
Fish (all kinds: fresh & processed)	1,626,963
Rice (flour, biscuits, etc., all kinds)	5,276,178
Fresh fruits	91,434
Nuts (all kinds: including coconuts, fresh, processed)	223,125
Dried & canned fruits, jams & jellies	204,924
Tomato paste	145,936
Fruit juices (canned)	356,489
Fresh vegetables (all kinds: including potatoes)	935,160
Canned vegetables, soups, etc.	361,709
Sugar & sugar products (including confectionery)	2,675,503
Coffee, cocoa and products	687,859
Spices	83,582
Animal feeding stuffs	900,123
Margarine, shortening & food preparations	808,771
Tomato ketchup	62,920
Sauces, condiments & other food preparations	679,929
Food - Grand Total	21,853,217
Total Imports	143,749,504
Food as a Per cent of Total	15.20

the low level of efficiency of the sugar industry. The conclusion to be drawn from this is not that import substitution, in relation to agricultural products, should not remain an important aim of policy. While these facts draw attention to the limitations of such a policy, they should not affect the country's determination to take every action which the economic and physical conditions permit for the development of local agriculture and the reduction of agricultural imports.

Exports

Table 18 shows the principal domestic exports of Antigua for the years 1970-73. Mineral fuels and lubricants have been Antigua's major export since 1967, but in the past two years the operations of the refinery have been considerably reduced. Agricultural exports are marginal.

Table 18. Antigua: Main Items of Domestic Exports and Their Relationship to Total Domestic Exports, 1970-73

Item	1970		1971		1972		1973	
	(\$'000)	(%)	(\$'000)	(%)	(\$'000)	(%)	(\$'000)	(%)
Clothing	388.4	1.8	n.a.	n.a.	n.a.	n.a.	977.5	1.9
Cotton lint	160.9	0.7	180.6	0.6	190.8	0.6	471.6	0.9
Gas (manufactured)	63.9	0.3	n.a.	n.a.	n.a.	n.a.	16.5	0.03
Lobsters	216.9	1.0	n.a.	n.a.	n.a.	n.a.	145.2	0.3
Mineral fuels & lubricants	20,551.2	94.1	27,643.5*	85.8	30,350.9*	87.6	48,113.5	95.5
Rum	121.7	0.6	n.a.	n.a.	n.a.	n.a.	425.2	0.8
Wine	74.5	0.3	n.a.	n.a.	n.a.	n.a.	48.3	0.1

* Manufactured gas included

Source: ECCM Secretariat, Digest of External Trade Statistics 1976, Antigua.

Export Development

A programme of agricultural diversification and expansion in Antigua must take account of the requirements of the export markets and the real opportunities for exploiting the export markets which exist. The domestic market is small, relative to the total production capabilities of the sector, and in relation to the items that can be developed. Surpluses can easily be generated, as they have been persistently in the past, in response mainly to price incentives.

The official marketing agency in Antigua - the Central Marketing Corporation - recognizes, even in its early stages of operation, the need to investigate and exploit market opportunities. A mission to the U.S. Virgin Islands was mounted by the Corporation in 1976. The report of this mission identifies the prospects and the conditions affecting the trade with St. Martin, St. Thomas, St. Croix and Tortola, and in each case the general conclusion is arrived at that the prospects for Antigua's produce are favourable, subject to (i) continuity of supply, (ii) sound quality, and (iii) competitive prices. Positive action in exploiting these opportunities is recommended by the mission.¹

It must be noted that export marketing can be very demanding, in terms of the three elements indicated above, and it is particularly difficult to penetrate a market for agricultural produce which has been built up and held by competitive supplying countries. Established trade arrangements are hard to break. The efficient organization of production and marketing, to meet the export demand, would have to be even more rigorously pursued than in the case of domestic marketing, and there are other factors like

¹ Central Marketing Corporation. "Market Conditions and Export Prospects for Antiguan Agricultural Products in St. Martin, St. Thomas, St. Croix and Tortola."

packaging and transportation which complicate penetration of the export market. At present, the market identified by the Central Marketing Corporation is dominated by competition from Puerto Rico and the Dominican Republic which is bolstered by linkages at the top official level. In addition, a number of West Indian territories are also looking towards the U.S. Virgin Islands market as potential outlets for their production.

On the other hand, Antigua enjoys certain locational advantages, as well as air transport facilities, which favour development of exports of some products to countries such as the U.S.A. and Canada.

Government's Policy

Analysis of the Antigua Government's policy suggests official emphasis on the development of the tourist industry as the first priority. Tourism, indeed, has played a major role in Antigua's development up to the present time and this trend is likely to continue because of the nature of the country's resource endowments. While placing emphasis on tourism, Government is not unmindful of the potential contribution to development of the other sectors, notably agriculture. Government's policy, for instance, recognizes that the massive food import bill is an important source of leakage of foreign exchange earned from tourism.¹ To counteract this, Government proposes to establish a closer working relationship between the Ministry of Economic Development and Tourism, and the Ministry of Agriculture and Supplies, so that production of meat, fish and fresh fruits and vegetables, as well as processed products, will be better geared to meet the demands of the tourist sector.

Government also recognizes the importance of efficient use of land in the country's development, and proposes to "control the use of land to ensure that (it) is put to its proper use bearing in mind the value of land in the development of agriculture". At present, physical planning is the responsibility of the Development Control Authority established under the Development Control Act. It is proposed to strengthen the law "to restrict indiscriminate use" of the land.

The need to stimulate interest in farming is recognised by the Ministry of Agriculture. It is intended in the current year to hold a number of seminars and conferences related to agriculture in Antigua. A weekly agricultural programme is being broadcast over the local radio station, and there are plans to start agricultural courses in the schools intended to inculcate the proper attitude to farming in the youth. In addition, a number of slogans are to be publicised, focusing attention on agriculture and on the role it can play in Antigua's development, and there are also plans for agricultural exhibitions.

Of importance, too, is the policy in relation to processing of agricultural products. An Industrial Development Board is to be set up shortly, which will be charged with responsibility for developing

¹The analysis in this section is based on the Throne Speech of 1977 and discussions with the Minister of Agriculture.

agro-based industries. In particular, the IDB will study the feasibility of expanding the present edible oil processing plant, based on locally produced soyabeans. If this is positive, farmers are to be encouraged to produce that crop "with the assurance of a steady market". The IDB will also be required to resuscitate the corn mill to allow for processing of local corn production. It should be noted that the policy in regard to these two processing enterprises, soyabean oil and corn meal, have important implications for the rest of the agricultural sector programmes, particularly in relation to the allocation of limited land resources.

In relation to agriculture in general, Government's policy is to pursue "self sufficiency in food". The principal instruments which it is proposed to use in this are import substitution, crop diversification, planned production and marketing, and the stimulation of local consumption of what is produced. In pursuing this policy, the real constraints are not ignored. It is accepted that "persuasion" will have to be exercised on producers, distributors and consumers to enlist their co-operation in achieving this self-sufficiency.

As a means of stimulating agricultural production and of encouraging small farmers, Government proposes to undertake certain incentive measures. These include subsidy of cultivation activities (ploughing, banking and harrowing), reduction in the rate of interest payable on agricultural loans, and improvement in the quality of the advisory service of the Extension Division. A number of incentives are already in effect. Land for farming is available to small farmers at low rental rates (\$7 per acre per annum), all equipment used on the farm is available duty free, as well as all agricultural chemicals and supplies. Planting material is supplied on credit, and a system of guaranteed prices is in effect.

On the marketing side, the basic aim of policy is to co-ordinate production and marketing. In this, the need to monitor production and marketing information and to regulate production to the real requirements of the market is recognized.

Government's express policy in relation to agricultural development, as outlined in this section, underscores overall acceptance of the vital role that agriculture must play and indicates appreciation of some of the fundamental measures which are a prerequisite to its realization. It is useful to attempt some examination of the relationship between policy aims and Government financial measures for realizing these aims.

Sector Shares of Budgetary Allocations

The degree of priority given by Government to the Agricultural Sector can be defined by analysis of the relative shares received by the various sectors in Government's annual budgetary allocations.

The Estimates for Antigua, 1975, provided for a recurrent expenditure of \$35,754,211, and capital expenditure of \$3,667,170, a total expenditure of \$39,421,381. Recurrent revenue for that year was estimated at \$30,063,541, and capital revenue at \$9,357,840, a total of \$39,421,381. A shortfall in domestic revenue of \$4,800,000 was projected, which was expected to be met from overseas development aid. The 1977 provision

for recurrent expenditure was \$41,254,775, an increase over 1975 of \$5,500,564 or 15.38 per cent. Recurrent revenue for 1977 was estimated at \$31,667,813, a deficit of \$9,586,962. There was, thus, a marginal increase in revenue projected in 1977 over 1975 of \$1,604,272, or 5.34 per cent.¹

Of the total expenditure budgeted, the amount allocated to the Ministry of Agriculture was \$2,166,821, or 5.5 per cent. In turn, the amount allocated was distributed over the nine departments of the Ministry: Headquarters, Agriculture, Veterinary and Animal Husbandry, Fisheries, Cotton, Lands and Surveys, Agricultural Extension, the Chemistry Laboratory and the Price Control Division. It is to be noted that no provision was made for subsidies to agricultural agencies such as the Central Marketing Corporation. Of total expenditure budgeted in 1977, the amount allocated to the Ministry of Agriculture was \$2,615,411 or \$448,590 higher than 1975, representing an increase of 20.7 per cent. This amount was allocated over the same number of divisions, and again no subsidies were provided for statutory bodies.

The Division of Agriculture proper received an allocation of \$492,181 or 22.7 per cent of the Ministry vote, and of this amount \$135,081 was accounted for by recurrent administrative costs. The provision for what could be described as "development" under agriculture was, therefore, \$363,100. Agricultural Extension, which is not included under Agriculture, received an allocation of \$399,329. The allocation to the Division of Agriculture in 1977 was \$749,831 or 28.67 per cent of the Ministry's vote. The total personal emoluments account for \$176,881, an increase of 30.9 per cent over 1975. The provision for "development" was, therefore, \$572,930, representing 57.79 per cent increase over 1975. The overall increase to the Division of Agriculture in 1977, over 1975 was 76.72 per cent. The allocation to the Extension Division in 1977 was \$402,253, representing an increase over 1975 of 0.73 per cent.

Related to the statement of policy in the Throne Speech, the allocation does not suggest a very heavy emphasis on agriculture, relative to other sectors. In addition, much of the "development" funds was budgeted for ongoing projects, e.g. maintenance of the Botanic Gardens, plant propagation, road maintenance, etc. However, it needs to be observed that some proportion of the funds allocated to other ministries and divisions can have either a direct or an indirect impact on the agricultural sector.

¹ Antigua Estimates for 1975 and 1977.

SECTION II: DESCRIPTION OF AGENCIES SERVING THE AGRICULTURAL SECTOR

Introduction

The organizational structure of the agricultural sector in Antigua, at present, places the agricultural sector and related agencies under the direction of two ministries:

1. The Ministry of Agriculture and Supplies
2. The Ministry of Economic Development and Tourism.

The Ministry of Agriculture and Supplies, with headquarters at the capital, St. John's, is responsible for six main divisions:

- (i) The Division of Agriculture
- (ii) The Agricultural Extension Division
- (iii) Veterinary and Livestock
- (iv) Lands and Surveys
- (v) Fisheries
- (vi) Prices and Consumer Affairs.

In addition, the Ministry runs a central cotton station and a chemistry and food technology laboratory.

The Division of Agriculture

The Division of Agriculture, which is headed by the Chief Agricultural Officer, is located at Dunbars and is the principal arm in the execution of agricultural development programmes. The Director of Agriculture is officially recognised as the Chief Technical Officer of the Ministry, and he is thus directly responsible for all agricultural programmes and projects. Before the Ministerial System of Government, and during the period of British Colonial rule, the Director of Agriculture was the chief adviser to the Legislature on all agricultural matters except for the sugar plantations. This official controlled all the divisions which serviced the agricultural sector: Veterinary and Livestock Research, Chemistry, Botanic Gardens, Propagation, and Forestry. At present, the Director of Agriculture is, theoretically, the Chief Technical Officer, but virtually all divisions have separate heads who report to the Ministry headquarters, i.e., to the Permanent Secretary. The areas directly under the Division of Agriculture are: Research, Forestry, Horticulture, and Soil and Water Conservation.

Research

The research function of the Division covers principally crop husbandry methods, insecticides, plant varieties, seed selection and fertilizers. Most of the research work is undertaken at Dunbars, but work is also done at another station, Cades Bay. The Research Unit has its own vote, its own labour force, and has a post for a Research Officer who must be a professional, trained in Agricultural Science. This officer reports to the Director of Agriculture.

Forestry

The senior officer in the Forestry section of the Division is the Forestry Officer who reports directly to the Director of Agriculture. He is assisted by field officers, called Rangers, who patrol the hillsides and wooded areas to prevent the wanton destruction of trees and land.

Horticulture

Horticulture is the responsibility of the Government Horticulturist. This section undertakes plant propagation and crop expansion, in ornamentals, root crops, vegetables and tropical fruit crops at three agricultural stations: Cades Bay, Green Castle and Christian Valley.

Soil and Water Conservation

This section, under the direction of an Agricultural Engineer, is responsible for dams, ponds, irrigation systems, land drainage and soil conservation. The section attends to the construction, maintenance and supervision of these facilities.

The Agricultural Extension Division

The Agricultural Extension Division is a separate Division of the Ministry of Agriculture and Supplies. The Division is the successor to the former Peasant Development Organization (PDO), which previously provided advisory and other services, mainly to small farmers. It is interesting to note that, of all the divisions under the Ministry of Agriculture, Extension accounts for the highest share of the budgetary provisions for personal emoluments which also reflects the highest divisional staff for which provision is made - 37. In comparison, the Division of Agriculture itself has a staff of 26.

There is, however, a considerable discrepancy between the the number of staff provided for and the number in post. At present, the Division carries a staff of eight, headed by the Extension Officer who is supported by two senior field officers. The other members of staff are three agricultural assistants (Grade III), and two junior agricultural instructors. Below the level of the Agricultural Instructors are Rangers, three of whom are performing the functions of Agricultural Instructors. The Ranger is expected to be a key farmer in the district he serves and to spend time on his own holding. He is thus a non-established worker.

The Agricultural Extension Division grew out of the PDO. The name was changed in 1969. The PDO itself was an offshoot of the Small Farmers' Land Settlement Scheme, a project of the Division of Agriculture at the time. During its operation, the PDO was considered the Division of Agriculture's link with the farming community, and its responsibilities included provision of cultivation and haulage services for small farmers, maintenance and supervision of Government Land Settlement Schemes, maintenance of demonstration plots, provision of loans and advisory services to farmers, and the provision of marketing services, mainly in respect of sugarcane and cotton produced by small farmers. A small marketing depot which handled the sale of seeds and other farm supplies, as well as the

purchase of food crops, was also maintained.

The establishment of the Agricultural Extension Division (AED), as the successor to the PDO, was intended to bring about a shift of emphasis from the type of services indicated above to an advisory function. The Division, therefore, no longer provides most of these services and some, like the marketing services, have been reduced. The AED is still engaged in providing tractor services to the small farmers. While it does not itself operate a tractor pool, as was previously done by the PDO, it assumes responsibility for contracting with the Antigua Sugar Estates Development Board (ASEDB) for tractors, to perform cultivation services for small farmers. It is also responsible for providing credit to meet payment for such services, and for this an annual vote (which currently stands at \$50,000) is made to the AED by the Government. The provision of cultivation services is regarded as a major activity of some agricultural instructors. In relation to marketing, the activity of the AED is restricted to the cotton crop with all the other marketing operations previously handled by the PDO now being the responsibility of the CMC.

One important activity in which the PDO engaged, and which is not now performed by the Extension Services, was the organization of Annual Land Settlement Committee Conferences which brought farmers and their advisers together, and provided a forum at which farmers could air their views on the services provided by the PDO, as well as other agencies. There is no formal arrangement, at present, for sounding out and assimilating the views of the farming community in the design and implementation of agricultural sector programmes. Nor is there a farmer's union or association uniting farmers towards common goals.

Veterinary and Livestock

The Division is headed by a Veterinary Officer who is supported by a Livestock Extension Officer and a Livestock Officer. The Extension Officer is responsible for education and is also the Project Officer for the Caribbean Development Bank (CDB) - financed livestock project. The Livestock Officer is responsible for the development of livestock farms and pastures. There is also a Farm Manager who supervises the government livestock multiplication units at Olivers and Paynters. The Division has its own vote, supporting field staff, labour and clerical services, and is assisted by a British Development Adviser.

The Veterinary and Livestock Division which reports to the Ministry of Agriculture offers services in three main areas: veterinary services - surgical, medical and preventative; improvement of stock; and information and demonstration. Both government livestock stations are engaged in the development of the national herd which is expected to provide breeding animals to farmers. Recently, however, it has been proposed that the Paynters Station, which is now less than six years old, may be operated by the proposed Agricultural Development Corporation (ADC), on its formation.¹

¹ See pp. 71-72.

Lands and Surveys

The Lands and Surveys Division deals with the management of land. It falls directly under the Ministry of Agriculture and Supplies and is headed by a Chief Surveyor who is the Senior Technical Officer responsible for supervising the Drawing Office and the field staff. A Land Officer in the Ministry's headquarters works under the Permanent Secretary and handles the administrative work involved in land management.

Fisheries

The Fisheries Division reports directly to the Ministry and is headed by a Fisheries Officer. There is also a Fisheries Adviser who assists the Fisheries Officer and collaborates with the Ministry. The Fisheries Division offers assistance to the fishing industry by way of repair facilities, small loans, limited equipment and materials, such as nets and wire and training. The Division is somewhat limited in scope. The services it offers to the fishing industry are minimal, and facilities for building and repairing of boats are leased to private individuals. The loan funds operated by the Division are small, and provide for loans of less than \$500 to any one fisherman. Although the Division operates a workshop, most marine repairs are undertaken by private arrangements. Commercial firms in the country are the main source of engines and building materials. The Antigua and Barbuda Development Bank provides credit for large-scale investment in fishing for which the fishing industry is not geared.

Prices and Consumer Affairs

This is a recent addition to the portfolio of the Ministry. The Division carries three sections: (i) price control, (ii) consumer affairs, and (iii) supplies.

At present, the affairs of the Division are managed by an Adviser on Supplies, who reports directly to the Minister. It is, however, proposed to establish the post of Director of Prices and Consumer Affairs. The Price Control section is to be supervised by the Senior Price Control Officer. A Committee for Consumer Affairs and a Price Control Commission and Bureau of Standards will co-ordinate their efforts to set guidelines for the establishment and monitoring of all prices on goods and on some services. The Supplies Officer will control the procurement, pricing and distribution of all food produced locally and imported. The Commission and the Bureau of Standards are two semi-autonomous institutions which are, however, part of the organizational structure of the agricultural sector and are agencies of the Ministry of Agriculture and Supplies with responsibility to the Minister.

The Central Cotton Station

Cotton is Antigua's most important export crop at the present time and, without dwelling too much on it, it needs to be mentioned. The Central Cotton Station is responsible for the multiplication of Sea Island Cotton in Antigua. The Station, which is headed by a Senior Technical Officer, works in close collaboration with the West Indian Sea

Island Cotton Association. Research work for seed multiplication for each year's crop is the chief responsibility of the Cotton Station. The Cotton Officer reports to the Ministry of Agriculture and Supplies. With the assistance of British Development funds, a Cotton Assistance Scheme will be introduced for the 1977 planting. Under supervision, farmers will be assisted by being provided with sprayers, insecticides, fertilizers etc.

Chemistry Laboratory and Food Technology

The Chemistry Laboratory performs analytical work on water, milk, plant substances, etc. In the area of food technology, the research and development activities cover cotton seed products, animal feed, jams and jellies, pickles, pepper sauce, etc. The Chemistry and Food Technology Unit is headed by a Food Technologist, designated Government Chemist, who is supported by an Assistant Chemist, a Government Analyst and a Laboratory Assistant. The Government Chemist reports to the Ministry of Agriculture through the Permanent Secretary, but the Unit itself is functionally and physically related to the Central Marketing Corporation.

The Government Chemistry Laboratory is a potentially very important agency in the agricultural development of Antigua. At present, however, the Laboratory operates on a very marginal scale and is geared mainly to utilizing the surpluses of agricultural commodities handled by the Central Marketing Corporation for processing. The Laboratory is limited in the volume and range of products it can handle because it has very rudimentary equipment, and is not really geared to commercial production. Up to the present time, the Laboratory has been processing onions, peppers, cucumbers, pineapples and tomatoes and, on a more limited scale, ochroes (fresh, blanched and heatsealed) and lime juice. The Laboratory processes these for retail sale on the same premises. It is intended to use this outlet when the retail section of the Central Marketing Corporation is in operation. Plans are in progress for the establishment of a pilot processing unit at another site and some equipment has already been ordered.

Central Marketing Corporation

This is a statutory board established by Government in 1973. The Board comprises, at present, 11 members, three of whom are government representatives, with the rest drawn from business and the farming community. The Corporation employs a staff of 46 including a General Manager, Secretary/Accountant, a Manager of Local Marketing and Distribution, Personnel and Office Manager, a Manager of Imports and Exports and a number of depot attendants, sorters and sales clerks.

The Corporation was set up under the Central Marketing Corporation (CMC) Act No. 14 of 1973, to carry out the following principal functions:-

- (i) to stimulate, facilitate and improve the production, marketing and processing of produce in the State, particularly for the benefit of the producer;
- (ii) to develop and carry out a co-ordinated programme with the view of securing the most favourable arrangements for the purchase, handling, distribution, transportation, storage,

processing, exportation, shipping, marketing and sale of produce whether in the State or out of the State and to operate and maintain services necessary or incidental thereto;

- (iii) upon being required so to do by the Minister, to make recommendations on any matter directly or indirectly relating to the production and marketing of produce;
- (iv) to collect, analyse and disseminate statistical data on agricultural production, particularly horticultural crops and livestock numbers by obtaining basic data on acreage, yield, production and livestock numbers, and to do so initially in collaboration with the Ministry responsible for agriculture with the assistance whenever possible of samples;
- (v) to assist and advise producers in the selection of commodities and their delivery to the market in order to regulate market supplies and to avoid marketing gluts with a consequent sudden drop in prices;
- (vi) to give, when necessary, in collaboration with the Ministry responsible for agriculture, practical demonstrations to producers in the timing of harvesting fruits and vegetables and in the preparation and packing of fruits and vegetables for the market;
- (vii) to supply to producers necessary means of production such as seeds, fertilizers and insecticides.

The Corporation is also empowered to make regulations in the discharge of its responsibilities, including:

- (i) regulations on the establishment of agricultural marketing schemes;
- (ii) fixing wholesale and retail prices;
- (iii) licensing and registration of producers and wholesale buyers of products;
- (iv) prescription of standards and grades;
- (v) prohibiting or restricting sales or export of produce; and
- (vi) issuing of licences to export products and providing further regulations of the import and sale of produce cultivated in Antigua.

In general, the Corporation has very wide-ranging powers and responsibilities, impinging both on the production and the marketing of crops.

Facilities Provided by the Corporation

The Corporation has one central "facility" at the present time in the capital, St. John's, from which most of its operations are conducted. So far, there are no depots in any other area of the country although there are plans to establish at least two others.

Cold storage capacity is now being installed for perishable fruits and vegetables and a supermarket outlet is soon to be opened. There is a retail produce outlet already in operation, serving the individual consumer. In addition, the Corporation wholesales to hotels, supermarkets, etc. There is little export at present, with exports accounting for some 15 per cent of its sales.

All purchasing by the CMC is done in their main depot in St. John's. There are no purchasing depots or points in the country areas and an itinerant system of buying is not operated. Farmers are, therefore, responsible for getting produce to the CMC by their own means. Minimum guaranteed prices are established for a large number of products and the Corporation is responsible for purchasing the total quantity of these commodities brought in by the farmers. The commodities for which minimum guaranteed prices have been established are listed in Appendix IV.

The CMC also sells agricultural supplies and implements to farmers. These include knapsack sprayers, the recommended chemicals, animal feed, and seeds and fertilizers. Farmers do not, however, depend entirely on the CMC for their supplies, and this has important implications for the integration of production and marketing of agricultural produce as will be shown later.

The Chairman of the CMC is the head of this agency, with responsibility to the Minister of Agriculture and Supplies. The General Manager is the officer in charge of the day-to-day operations of the agency.

Special Committee on Production and Marketing

Although not an agency serving agriculture directly, it is appropriate, at this stage, to refer to a special committee set up by Government to advise on the co-ordination of agricultural production and marketing in Antigua. The Committee was established on the recommendation of an earlier committee, appointed by the Minister of Agriculture and Supplies, to discuss recommendations for local agricultural production in April 1976. Among the earlier committee's terms of reference were:

- (i) to examine the question of standardization of the flow of information in regard to local production of agricultural produce and recommend a system by which the estimated advance production is made available to the CMC and other relevant division within the Ministry either monthly, quarterly, or annually;
- (ii) to assess the needs of home consumption at export marketing and relate them to production patterns on government estates and, as far as possible, to the small farmers;
- (iii) to assess the cost of the production of items by using relevant norms with a view to fixing minimum prices for the producer quoting periods of glut and scarcity;
- (iv) to examine and make recommendations on standard grades of crops especially those handled by the CMC to facilitate the

exchange of goods between the producer and purchaser, minimising risk and improving returns to producers whilst satisfying the buyers;

- (v) to examine ways and means of having a greater degree of planning, co-ordination and communicating between the different branches involved in agricultural produce and also a closer link and dialogue with farmers and producers so that objectives envisaged are achieved; and
- (vi) to examine ways and means of improving and expanding the present processing unit, with a view to using citrus production for processing and bottling and other containers.

The Committee, thus established, recommended the establishment of a Planning Committee comprising the Extension Officer, the Government Horticulturist, the General Manager of the CMC, the General Manager of the Antigua Estate Development Board and other members which the Committee might find necessary to co-opt.

The first stage of this Committee's operation was to implement the other recommendations of the initial Committee. To date, the following action has been taken by the Planning Committee.

1. The Committee has established a Forecasting System under which information is to be supplied by small farmers and the Government Estates, with a view to obtaining accurate data on production. While this provides forecasts of production, after farmers have planted their crops, it does not provide a solution to gluts and shortages. The Forecasting System is recognized to be deficient and does not provide very accurate reporting. However, the system established is being monitored by the Committee and improved.
2. The Committee recently issued new, revised, guaranteed minimum prices for the agricultural produce handled by the CMC. The initial report had contained recommendations in this regard, and the new prices established by the Committee show only slight modification from those in the report.
3. The Committee has also prepared and issued a booklet containing descriptions of the acceptable grades for crops handled by the CMC. Grades have been established for beets, cabbage, carrots, beans, ochroes, onions, peanuts, pineapples, pumpkins, string beans, sweet corn, sweet peppers, sweet potatoes, tomatoes and yams.¹

The grades established have taken into account special circumstances of agriculture in Antigua and are not a straightforward duplication of grades established in other countries. The Committee intends to obtain photographs of the grades established with a view to having these posted at strategic points, for the benefit of farmers.

¹Acceptable Grades for Crops, Central Marketing Corporation, 1976.

4. The Committee has also held discussions with the Statistical Unit of the Ministry of Finance with which it has agreed to give monthly reports of trade in a specified number of crops, 56 in all. At the moment, global annual statistics are available and are of little practical use in planning and programming of agricultural production and marketing.
5. The Committee is concerned with the problem of gluts and shortages and with the need for the rationalization of production and marketing and has, accordingly, commissioned the East Caribbean Common Market Secretariat to undertake a market survey in Antigua which will be used for determining the precise requirements of the market. The results of such a survey are expected to allow proper co-ordination of seasonal production for the tourist industry.

The Planning Committee has, in addition to the steps indicated above, been considering the question of registration of farmers, contract farming, and guaranteed prices. The Committee recognizes the need for implementing a scheme for registration of farmers, as a priority, in view of the necessity for obtaining regular scientific information on farm planning, etc. Contract farming is seen as one way of ensuring production of the items that are, in fact, required by the market in controlled quantities. With regard to guaranteed prices, the problems posed by them and which are the subjects of consideration by the Committee, will be discussed in detail later. The Committee is also giving consideration to the problems in regard to agricultural credit.

The Antigua Sugar Estates Development Board

The Antigua Sugar Estates Development Board is no longer an established organization serving the agricultural sector. However, some of the functions which it was established to perform are still being undertaken by a Commission, set up on its dissolution and, to place all the activities of the agricultural sector of Antigua in perspective, the Antigua Sugar Estates Development Board (ASEDB) must be mentioned here.

The ASEDB was established in 1963 to take over and operate the estates acquired by Government from private owners, when they decided to discontinue sugar production. Following a report to the Antigua Government on the feasibility of continuing development of the sugar industry, a decision was taken to dissolve the Antigua Sugar Estates Development Board. The Board was accordingly dissolved in 1974 through the Antigua Sugar Estates Development Board (Dissolution) Act, and the Commission appointed to wind up its affairs. However, the Commission still engages a General Manager, but his functions are restricted to the cultivation services, the Diamond Estate Irrigation Project, and the cultivation of cotton. With no active board, the General Manager is directly responsible to the Minister of Agriculture and Supplies. The ASEDB is responsible for the "tractor pool" which has been taken over from the Peasant Development Organization.

The Antigua Agricultural Development Corporation

Although it is not yet in operation, reference must be made to the Agricultural Development Corporation (ADC) which Government proposes to

establish as a replacement to the ASEDDB. A Bill to establish the ADC has already been discussed by the Antigua Government. The ADC is intended to undertake the following functions:-

- (i) basically, to stimulate, facilitate and undertake the development of agriculture, and to carry out, operate and participate in agricultural projects, as approved by the Minister;
- (ii) develop and manage, on a commercial basis, Government lands, along the lines of government agricultural policy, so as to
- (iii) stimulate and encourage the private sector;
- (iv) to prepare and administer agricultural schemes of a commercial nature approved by the Minister; and
- (v) matters incidental and connected to the above.

Agriculture, in the context of this agency's functions, will include fisheries, forestry, horticulture and the use of land for any purpose of husbandry, inclusive of the keeping of livestock, the cultivation of fruit, vegetables and the like, and the establishment of grasslands, etc.

The Ministry of Economic Development and Tourism

The Ministry of Economic Development and Tourism is a new ministry in Antigua and is still engaged in working out its functional relationships with other ministries. By definition, Ministries of Economic Development must always perform some overall co-ordinating function in relation to other ministries and agencies operating in the country. But, while it is possible to define the functions of Ministries of Economic Development, it is seldom clear where the precise point of departure is from other ministries responsible for specific sectors of the economy and their development. Indeed, it is very easy for the situation to develop in which, not only do the functions of the Ministries of Agriculture and of Economic Development overlap, but where there is outright conflict, particularly in small economies such as Antigua. A sharp distinction between economic development and agricultural development is hardly likely since agriculture is such an important part of the economy. Both economic and physical planning in Antigua are under the portfolio of the Ministry of Economic Development and these play a major role in relation to agricultural development as well.

The Ministry has, under its control, the sectoral areas of tourism, trade and customs, industry, development, banking, physical planning, and development planning. It contemplates having a central planning unit, as an instrument for overall development planning. Three areas which significantly affect agriculture are agro-industry, tourism and trade, and they necessitate close collaboration with the Ministry of Agriculture.

Agro-Industry

Agro-industry is not yet developed in Antigua. There are plans for development of soyabean production to be used as a basis for a feed plant, as well as to reactivate a corn processing plant which has been out of operation for several years. Corn production is being undertaken in Antigua by a foreign-owned company - Antigua Agricultural Enterprises - on lands leased from the Government. The output from this and other government

projects will form the basis for the new project of cornmeal production. The processing of other agricultural projects is only at the pilot stage and this, as has been indicated, is under the control of the Ministry of Agriculture. However, if the processing enterprise develops, it would seem logical that it would have to be passed over to the Industrial Development Board which has been set up to manage government agro-industrial projects.

Tourism

Plans for food production to meet the requirements of the tourist industry would be the responsibility of the Ministry of Agriculture. However, as tourism development is the responsibility of the Ministry of Economic Development, there will need to be close co-ordination of the plans of the two ministries in relation to tourism.

Trade

The greatest linkage between the two ministries would seem, however, to be in the area of trade, both import and export. The trade programmes and policies adopted for implementation by the Ministry of Economic Development would affect the exports of agricultural produce, as well as the opportunities for local production to replace imports of agricultural products. If the policies of the two ministries do not converge, all the problems of over-production, etc., in relation to agricultural produce could manifest themselves. The Ministry of Economic Development expresses much concern about the tremendous leakages in the tourist sector. One important source of leakage is that created by food imports. Considerable sums are spent on imports of food for the tourist industry and the Ministry is intent on reducing these. It is, however, recognized that there are products required by the industry which the country cannot produce, and the Ministry intends to adopt a realistic attitude in respect of controls in the tourist industry which is, at this stage, more important than the agricultural sector.

The Antigua and Barbuda Development Bank

The Antigua and Barbuda Development Bank (ABDB) was established under an Act of 1971 by that title. The Bank is responsible for:-

- (i) assisting persons in establishing, carrying on or expanding development enterprises by participating in share capital, granting loans and providing other forms of financial assistance to such persons; and
- (ii) fostering development of money and capital markets in the State.

The ABDB is thus not specifically an agricultural credit institution. However, it does make agricultural loans for projects which meet the criteria established under the Ordinance.

The Bank is mandated to consider applications for loans on the basis of the financial and economic viability of the project and must

insure that the financial assistance given to the enterprise is utilized for the purpose for which it is given. Its authorized capital is EC\$5 million, and the Government of Antigua may subscribe the full share capital.

Apart from the specific provisions of the Bank's Act, the Bank also recognizes the possibility that action may be taken by the Bank on occasion, which does not necessarily relate directly to the banking function but which advances the Bank's overall purpose. Section 5 (1), therefore, allows that the Bank may:

"for the purpose of performing any of its functions ... do anything and enter into any transaction which, in the opinion of the Bank, is necessary to ensure the proper performance of its functions."

This, among other things, allows the Bank to relate functionally with other agencies if this is considered advantageous.

As in the case of other agencies, there is the provision for ministerial policy directives to the Bank. Section 8(1) of the Act provides that the Minister may, after consultation with the Chairman, give the Board such directions of a general character as to the policy to be followed by the Bank in the exercise of the performance of its function, as appears to the Minister to be necessary in the public interests.

The four main areas in which the Bank must deal are: industry and tourist development, housing, agricultural development, and other development projects. While the emphasis of the Bank has been on financing industrial projects, it is now making an impact on agriculture, through a scheme of loans for small farmers. The Caribbean Development Bank (CDB) which is one source of funding for the ABDB, has now approved a loan called "The Agricultural Production Credit Loan", which is to be used to give loans to small farmers of \$2,000 and upwards. The ABDB is generally said by farmers and other sectors to be sometimes slow in granting loans to agriculture. Some of the reasons for this will be analysed in a later section. It must be observed here, that because of the difficulties of obtaining the right security from farmers and of ensuring that loans are used for the purposes for which they are given, the Bank has been trying to introduce a system of agricultural credit loans in kind.

The operations and some of the problems facing the agricultural sector agencies will be analysed in the following section. No attempt will be made to indicate how the internal structures and the procedures for day-to-day operation within each agency should be altered to enable them more efficiently to discharge their function. However, it is recognized that such an analysis could be of crucial importance since co-ordination between agencies could be effectively impeded if the internal operating procedures of the agencies are inadequate. In bringing about fuller co-ordination of the agencies, it will be one of the responsibilities of the co-ordinating agent to recommend the structural and operational adjustments within the agencies, which suggest

themselves as being necessary for the proper or more efficient discharge of their functions.

Analysis of the Problems and Operation of the Agricultural Sector Agencies

The Agricultural Division

The performance of the Antigua Agricultural Division must be assessed with reference to the traditional goal which it was intended to play in a plantation-type economy, and the way it has adapted itself to meet the needs of a modern agricultural sector, based on a changing concept of the role agriculture must play in the future development of the society. Up until quite recently, the role of the Division was necessarily confined to the needs of the sugar industry, of cotton production and of livestock.

Since the technology and methods of production and processing of sugarcane had been well established for decades, and since that industry was under the control of foreign-owned companies, it is easy to see that the Agricultural Division would not have been called upon to play a very vital role in relation to sugar cultivation. Cotton, as secondary crop, would be more or less in the same position, excepting that cotton production was predominantly a small farmer activity.

Today, the emphasis is on diversification of agricultural production, the introduction of new crops with which the farming community is not familiar, the organization and management of small farm units and land settlement schemes, the development of tree-crops and provision for irrigation, and a host of other infrastructural facilities necessary to the scientific expansion of agricultural production and productivity. This new trend in the agricultural economy of Antigua is perhaps too recent to justify judgement of the performance of the Agricultural Division in relation to it. But it will appear from the activities described in the previous section that the Division recognizes its role and responsibility in developing a new agricultural sector.

The ambient factors affecting agriculture in Antigua such as climate and, particularly, rainfall, would necessarily serve to impede plans and programmes of the Agricultural Division, particularly bearing in mind the level of funding within which the Division is constrained to operate. For instance, recognition of the need for continuous irrigation in the development and production of certain crops would not automatically lead to the provision of irrigation facilities for any of these crops to be produced. In addition, the Division would have either to recruit from other countries, or to have trained, a new cadre of staff, particularly in the areas of extension, capable of directing and assisting the farming community in the development of new crops. Even with the requisite trained staff, the Division would still be confronted with the problem of reluctance to change and adaptation which is always posed by a farming community.

The problem is not so serious in respect of short-term crops, which are easily produced from the point of view of climatic conditions and support facilities, including fertilizer, chemicals and so on. But, with more difficult crops, even short-term crops, the department would have a

tremendous task in persuading the farming community to adopt methods and techniques which it considers desirable for successful cultivation of such crops.

Having said this, it is necessary to record what appear to be important inhibiting factors in the programme of agricultural diversification and development from the point of view of the Agricultural Division:

1. The role of the Head of the Division and his qualifications for discharging his functions must be clearly defined. Much of the success of the work of the Agricultural Division and, thus, of the development of agriculture in Antigua, would depend on the knowledge, dynamism and authority of the Head of the Division.
2. The effective work of the Division depends on marketing and other information fed into it from the other agencies. It would seem to be necessary to give priority to a census of the farm population and the land available to be used in conjunction with a land-use survey indicating the type of soils available and the crops which could most effectively be cultivated in Antigua. Without this information, the work of the Division would seem to be much more difficult.
3. In the circumstances of Antigua, there is much advantage in the co-operative use and development of infrastructure, for instance, in farm settlement schemes. However, the idea of the co-operative has not caught on very well in Antigua and there is no effective co-operative in existence, although legislation is provided. By all reports, the co-operative principle is not accepted among farmers in Antigua, and each individual farmer prefers to operate on his own. This poses a difficulty for the Division of Agriculture in organizing production to meet specific market requirements and in rationalizing the distribution of the services.
4. Since the Agricultural Division is not itself responsible for providing agricultural supplies, there must be some guarantee that those supplies recommended by the Division will be available in the proper quantities, at the appropriate times, to support the production recommendations and advisory services of the Division.

The Extension Service

In an earlier section, the work of the Agricultural Extension Service was described, and it was indicated that its functions and influence had been reduced with the formation of the Central Marketing Corporation so that, at present, the office functions mainly as an advisory service. It is clear, however, that the advisory services offered by an agricultural extension office must be based on the real plans and programmes of the production and marketing services which are linked to the farming community by the Agricultural Extension Office. It is more normal to find an Agricultural Extension Service as an integrated part of the overall agricultural services, and particularly a Division of Agriculture. In the case of Antigua,

the Extension Division has developed somewhat independently, and has come to be viewed as a service in its own right. While, theoretically, the Chief Extension Officer is answerable to the Director of Agriculture, the human tendency is there for the Division to function as quite a separate and independent unit. It is not difficult to understand why, in Antigua, the Extension Office has been a separate entity since it was born and developed, not primarily as an Extension Office properly so called, but as a Peasant Development Organization. It is, in fact, still referred to and viewed as the PDO.

If the Extension Division is to function effectively in the new scheme of things, its functional relationship with the other sister agencies must be well enunciated and properly understood by all concerned. An Extension Office can assume, or be expected to assume, a leadership role in the whole process of agricultural development. By proper co-ordination with other agencies, it must be fed with the basic data which it can then translate, in its own terms, to feed back to the farming community to allow the plans to take root on the ground. The impression is conveyed that, at present, there is relatively little of this co-ordination, and that the Extension Division is trying to do its job to the best of its ability, as a separate entity.

Advisory bodies which are expected to translate plans into projects on the field are always in a difficult position, if such plans are not clearly and concisely laid down and understood. Giving advice in agriculture is particularly difficult and hazardous. The fruits of the advice given take a considerable time to manifest themselves, and mistakes made in one stage are not easily corrected in the second. A major requisite for its success, as in the case of the Division of Agriculture, is a cadre of trained and competent extension workers who are able to use highly technical data and translate it in terms that farmers can understand and accept.

The former PDO depended heavily on rangers, which represent the third rank in the advisory service they provided. Much of the work of the rangers was associated with sugar, in which they would have developed considerable competence. With the new slant to agricultural production and productivity, the effectiveness of the rangers must, necessarily, be curtailed substantially and, in fact, it is felt now that there is not the need for as many rangers as previously. The true situation would seem to be that there is need for rangers (by whatever name called) trained in the new skills that are required for translating the plan at the grass roots level. In other words, there is still need in Antigua, perhaps more need now than previously, for demonstration farms, well run and well organized.

With its knowledge of the farming community and the control which it can still exercise on them, through its responsibility for giving credit for ploughing and related services, the Agricultural Extension Division can play a major part in the supervision of credit given to farmers by the Antigua and Barbuda Development Bank. The ploughing services given on credit to farmers by the Agricultural Extension Division can easily be suspended when the farmers default, since these services are required continuously, at least from year to year. The Extension Division is in a good position to assess the credit-worthiness of farmers and to recommend to the Bank which farmers are, or are not, good risks. While the Service sees this, at present, as part of its responsibilities, it

appears that the whole programme is not sufficiently well co-ordinated and monitored to have the desired overall effect, and there are no direct channels of communication on a regular basis between the Extension Division and the Bank.

In the opinion of the Extension Officer, the main factors inhibiting the programme of diversification are:

- (i) the need on the part of farmers for quick cash, which operates as an incentive for them to concentrate on short-term crops, for which there are guaranteed prices;
- (ii) the limited knowledge on the part of farmers of other potential crops; and
- (iii) the difficulties in obtaining credit when required.

It is felt that if these factors are eliminated, farmers would more readily follow the advice given by the Agricultural Extension Division and cultivate the recommended crops.

It is also important in the work of the Division for there to be an established National Production Target towards which all farmers can be geared. With a well-defined target, there would be a goal to which farmers could be encouraged and this would facilitate the work of the Extension Division.

The Central Marketing Corporation

The problems confronting central marketing agencies in developing countries have been well documented, and in most cases they are not dissimilar. Such problems, including those of having to dispose of surplus in a glut situation, lack of facilities and the capital required for innovation on a massive scale, lack of proper market intelligence and forecasting systems, the high seasonality and perishability of the crops in which the agencies must trade are all in evidence in Antigua. On the other hand, the Central Marketing Agency is seen as one of the crucial instruments for rationalizing production and marketing and in bringing about a sound transformation of the agricultural sector.

The goals of the marketing agency must not only be clearly defined but they must be set at a realistic level. When once these goals are established, there must be a scientific assessment of the facilities required to attain these goals and such facilities must be provided.

The end of all production is sale, and farmers who have been encouraged to produce must have some reasonable guarantee that what they do produce will be sold at the right time. It is futile to attempt to give such guarantees where the capacity of the agency cannot justify them. Reference to facilities in this context must not be interpreted only in terms of physical structures. As Collins and Holton¹ have aptly pointed out, more often, the really critical need is a change in the organization and operation of the distributive sector, rather than a few new physical facilities. They go on to make the crucial observation that:

¹ Collins & Holton. "The Process of Change in Agriculture." In Agriculture in Economic Development. Eds. Eicher & Witt. McGraw-Hill publication.

"Planners, no doubt, prefer the latter to the former kind of change because of their fondness for activity with obvious physical manifestations. Moreover, materials are notably more malleable than men, and this simple principle dictates that the planner first alter the physical facilities in the hope that the more intangible aspects of distribution will follow suit with the new configuration, of their own accord."

In one situation, there might be need for emphasis on changing or improving the physical structures to facilitate the marketing board. In another situation, it might be quite sufficient to alter the operating principles and policies that are being pursued.

In the case of Antigua there might, indeed, be need for improvement in the physical facilities and progress is being made in this direction. However, there seems to be a need for more emphasis on improvement in the organizational and operational structures of the central marketing agency, if it is to discharge its responsibilities.

The background against which the Central Marketing Corporation must discharge its functions includes:

1. A large number of small peasant farmers pursuing independent and generally unknown production plans from season to season.
2. Related to the above, almost complete lack of reliable statistical data on which marketing projections and programmes can be based. This lack of advance information on production can make scientific marketing almost impossible.
3. A number of the crops which come to the marketing agency are faced with very tight market situations and in some cases there is no market, either locally or overseas.
4. The Marketing Corporation can exercise little or no influence on what is going to be purchased, for there are no guarantees of quality and continuity of supply for produce brought into the Corporation.
5. It is the practice of farmers, large and small, to market their produce directly in situations of scarcity, while using the Central Marketing Corporation as buyer of last resort, in cases of surplus supplies.
6. Guaranteed minimum prices established by Government commit the Marketing Corporation to buying unsaleable surpluses whenever they are presented by farmers.
7. The Marketing Corporation is not free to refuse to purchase surpluses that are brought in.
8. Farmers view the Central Marketing Corporation as a government agency, established to support them and farmers feel no moral responsibility to ensure that they only bring in to the Corporation what can be sold.

9. Because of its political sensitivity and the national programme of promoting agricultural production, the Corporation cannot appear to be acting in any way as a deterrent to production of any commodity.
10. It is difficult, if not impossible, to enforce forward contracts with farmers. These contracts usually commit the marketing agency to buying, while leaving the farmer free not to supply.

An analysis of any of these considerations is likely to justify the need for reorganising the framework in which the Marketing Corporation operates. And the time and ingenuity spent by a country on this, in attempting to diversify and develop agricultural production on a scientific basis, will be more than amply rewarded in the final outcome. The alternative is to continue operating along lines that are known, in advance, to be leading to a dead end. The enumeration of the above points will also in themselves indicate the close relationship which must exist between the marketing agency and the other agencies jointly charged with responsibility for developing the agricultural sector. Any plan to put these responsibilities into air-tight compartments will, inevitably, be self-defeating.

For a long time, the Marketing Corporation has been in a position where it does not know what type and quantity of products will be delivered to its depot. Recently, information mechanisms have been established to get the necessary information. These mechanisms for advanced reporting are, needless to say, not yet perfected because of the difficulty of collecting reliable data from about 2,000 farmers. Even when the information mechanisms are established, there will still be the problem of how to dispose of the anticipated surpluses, or to make up for the anticipated shortfalls. What a proper information system can do is to provide the sort of historical data that is required for monitoring production plans in subsequent periods and, in this exercise, the marketing agency is only one of the agencies which must be involved. Information on what the market can or cannot take must be supplied by the marketing agency to the Division of Agriculture and the Extension Division which will, in turn, feed the information to farmers before the planting period. In all this, the reference point is, in fact, the requirements of the market and, therefore, a preliminary stage must be thorough knowledge of the real market possibilities, both locally and overseas. It is risky, at best, and, at worst, disastrous to stimulate production of the wrong crops because of the lack of certain market and price information, and reliable data is even more crucial in exporting.

In the export trade, the buyer requires assurances of quality, continuity of supply and the right price. It is difficult to depend on small farmers who are unreliable and do not keep to their agreements in building up an export market. The Central Marketing Corporation has, therefore, had to rely up to this point on government estates for their supplies for export. Because of political sensitivity, the Marketing Corporation has to be cautious in refusing supplies brought in by the small farmer. The policy in Antigua has, therefore, been to refuse acceptance of supplies from government projects first, in the effort to control direct production. Of course, in the long term, this is a wasteful and uneconomic policy since government farms, in order to benefit

the country in a real sense and to promote agricultural development, must be as efficiently run and organized and must be as viable as private commercial farms.

Every year, Antigua faces a glut of certain specific items - cucumbers, hot peppers, sweet potatoes. In addition to the price guarantee, the farmers have the guarantee that the Marketing Corporation will purchase all that they produce. The maintenance of these guarantees is likely to exacerbate the problem of surpluses since the farmer does not have the incentive to turn to other, more difficult, but more potentially lucrative crops. It is instructive that farmers have been willing to accept a price for some of these commodities below the guaranteed minimum price, by their own volition, in times of surplus. This shows the importance of the guarantee to buy, relative to the guaranteed minimum price.

One of the central problems faced by the Antigua Corporation is the political imperative of doing nothing to deter production by the farming community. This is not only politically expeditious - it is a real problem which the Government of a country such as Antigua would necessarily face. Anything that operates as a deterrent to production is likely to discourage farmers and to make it difficult, if not impossible, to get their co-operation in producing at a later date. The situation is particularly difficult in a country that has not got the tradition of producing the types of crops which it is desired should be stimulated, i.e. fruits and vegetables. Loss of confidence in the authorities in one year will lead to a long period of suspicion and doubt which could destroy long-term plans for agricultural diversification. On the other hand, as long as the policy of guaranteed buying is maintained, as an incentive to diversification, the capital resources must be made available to the agency that is required to buy the surpluses, otherwise, such an agency would soon become bankrupt.

While it can be accepted that there should not be a deterrent to production at this stage, there must, at least, be some sort of direction and control and this should be accepted even by the more recalcitrant farmer. The credit mechanism is one which could be used to direct production into the right channels. Most farmers rely on the rainfall for successful cultivation, and they naturally opt for quick cash crops in order to hedge against climatic conditions. In order for them to take the risk inherent in the programme of diversification, they would need credit to help them along over the longer periods when there is no income, in their attempts to produce long-term crops. The Antigua and Barbuda Development Bank could make agricultural loans available for production of specified crops and not simply for farm production on an ad hoc basis.

Another control mechanism would be a system of farm registration. The registration of farmers, apart from serving to give reliable data on the land that is available to small farmers and the land that is put into cultivation, would also insure some measure of control of the farm plans by the Central Marketing Corporation which could stipulate that purchases will be made only from registered farmers who do specific, required things.

The Antigua and Barbuda Development Bank

The Antigua and Barbuda Development Bank (ABDB) loans policy does

not appear to meet the favour of the farmers or the other agricultural agencies. Although a development bank, the ABDB is constrained to operate along the strictest possible commercial lines. Indeed, the success of the Development Bank depends on the high credit standards it maintains in its initial phases, and the reputation it develops for sound judgement and sound loans policies with the international and governmental agencies from which it hopes to attract funds for lending. A Development Bank cannot fall into the trap of being associated in the minds of sectors of the community with being a semi-charitable institution. The Bank could not, for instance, operate for long like the Central Marketing Corporation, in relation to the farming community. As one Director of the Bank put it, agricultural loans are the easiest way to give away money, yet the Bank recognizes the importance attached to agriculture and accepts this as an essential priority.

Giving loans to agriculture, however, means giving loans that are likely to be defaulted on in repayment. The Bank must guard against getting a reputation for being another government agency, which gives loans which need not be repaid. There is, in its limited period of operation, already a tendency to develop this image. In response to the view that the Bank was very slow to disburse loans to farmers and that there was too much red tape in obtaining farm credit from the Bank, the Bank insists (in our view, quite rightly) that loans to farmers must be given on the basis of sound production and marketing plans, supported and recommended by the relevant agricultural agency. In the Bank's view, these have not been forthcoming.

If Government is to exercise a political influence in a banking institution, it must also bear the concomitant responsibilities of underwriting loans that are not repaid by the recipients. The ideal form of credit would appear to be supervised credit. But, in Antigua, many farmers seem to resent this, and they shy away from accepting loans which involve too many conditions and controls. The farmer does not like to be told what to do and what not to do.

Farmers are also reluctant to give real collateral security for the loans that they require from the Bank and it is not rare, even after a loan has been approved, for a farmer to refuse to take the loan because of the security requirements. The risk could be reduced if there was an accepted system of deducting loan repayments at the point of sale. But this is not easy to enforce in the event of crop failures, and in the very frequent situations in which the farmer, having produced the crop, does not sell to CMA. Farmers with good credit ratings find it easier to get loans. Loans are processed very quickly, if the farmer's credit rating is good.

The Agricultural Development Corporation

As indicated earlier, the Agricultural Development Corporation (ADC) is not intended to be simply an advisory or regulatory body. Its functions include undertaking a wide range of agricultural development projects, including irrigation and large-scale production. Its emphasis will be on commercial undertakings with a development impact. While such an agency could effectively complement the work of the other existing agricultural sector agencies and, indeed, take up where they leave off,

it could also represent a source of new frustrations. In concept, the creation of a new institution always appears in developing countries to offer promise of much development. Indeed, in some cases, the mere act of setting up the institution is seen as development. Because of the limited manpower and other resource constraints in the country, a new agency might merely serve to diffuse these limited resources over a wider area of activities to no real advantage.

The central concern should be how the new agency fits into the existing institutional arrangements. How will it supplant, replace, or supplement the work they are expected to do. The omnibus provision in Section II of the draft Agricultural Development Corporation Bill allows the ADC

"to carry on all activities which appear to it to be requisite, advantageous or convenient for or in connection with the discharge of its duties."

This may give rise to, or augment the problems of overlapping and inter-agency conflict which are already in evidence and which it must be the aim of policy to eliminate. Fortunately, in the case of the ADC, provision is made for membership on its Board by the Director of Agriculture and the Chairman of the Central Marketing Corporation, and this would seem to recognize the need for co-ordination. But this is clearly only a partial solution.

The Problems and Prospects of Inter-Agency Co-ordination

Examination of the relative functioning of the different agricultural agencies suggests a real need for more effective co-ordination in many important areas. The matrix below attempts to show the common reference points of these agencies. Before examining these areas in more detail, however, some general observations are in order.

First, correct interpretation of the relative roles of different agricultural agencies will not, in itself, bring about the desired co-ordination of activities. Systems are only as good as the people there are to implement them. The human reaction can as effectively stultify sound programmes as they can augment them. The responsibility for developing an agricultural sector devolves on all the agencies working in unison. Any attempt to disclaim responsibility for action, where action is conceived as being necessary, by one agency, can frustrate the overall programme. Mature responses on the part of personnel involved in the development of the agricultural sector are necessary, if goals are to be realised and targets met. The tendency must be avoided for one agency to be overcritical of the deficiencies of the other, in respect of supportive actions which the criticising agency requires from the agency being criticized. A further point is that the agricultural sector, like a private company, cannot be well run and organized, other than by frequent and continuous interchange and inter-reaction between the key directive personnel of the several agencies. Continuous communication is the sine qua non in the pursuit of agricultural sector plans. In addition to inter-agency consultation, responsibility must reside in, and must be effectively discharged by a central co-ordinating agent. Some agency must be recognized as being the central

Areas of Responsibility of Antigua Agencies in Relation to Agriculture

Prime Areas of Responsibility	Sector .	Marketing	Production	Extension	Research	Pilot Prod.	Credit	Land	Land	Seed	Husbandry	Quality	Production	Incentives	Infra-structure	Information	Training	Nutrition	Farm	
Agency/Division	Planning		Programming	Services		Programmes		Development	Clearance	Distribution		& Control	Control		structure	Systems			Input	
Ministry of Agriculture	**	*	*	*	*	*	*	**	*	*	*	*	*	**	**	*	**	**	*	
Ministry of Econ. Dev.	**	*			*			*					*	**	**	*	**	**		
Division of Agriculture	**		**	**	**			**	**	**	**	**	**	**	**	*		**	**	
Extension Division	*	*	*	**	*		**	*	**	**	**	**	**	**	*	*	*	*	**	
Lands and Surveys	*		*					**	*					*	**	*				
Prices & Consumer Aff.	*	**	*	*	*	*						*	**	**		*		**		
Food Technology Div.	*	*	*		**	**							**		**	*		**		
Central Marketing Corp.	*	**	*	*	**	*	*			**	*	**	**	**	*	*		**	**	
Comm. on Marketing & Prod.	*	**	*	*	**	*	*	*	*	*	**	**	**	**	*	**	*		*	
Agricultural Dev. Corp.	*	*	*	*	**	*	**	**	**	*	*	*	*	**	**	**			**	
Industrial Dev. Corp.	*	*			**	**	*	**	*			*		*		*				
Antigua Dev. Bank	*			**			**	**	**	**			**	**	**	*	**		**	
Research Division	*				**	**		**		**	**	**	**			*	**	*	**	
Statistical Unit	**				*											**				

Notes: These Agencies are not yet established

* Supportive role

** Leadership role

co-ordinator of the efforts at co-ordination and communication between the agencies. By organizing the flow of information within a ministry, and within the agricultural sector along the same lines as a large private corporation, better results can be achieved in establishing responsibilities and objectives and seeing that they are realized.

Having made these preliminary observations, we can now proceed with an examination of some of the areas in which more effective co-ordination suggests itself.

The Relationship Between Marketing and Production

While, for convenience, production and marketing are treated as separate processes, in fact they are no less than links in the same chain. The modern definitions of marketing, however phrased, include the process of production, since it is recognized that what is produced is produced for a market and must meet the full requirements of this market and must, in addition, be distributed to the market, once it has been produced. Marketing, quite the reverse from being an offshoot of production, must be the starting point. Goods being produced must be conceived, first of all, in terms of the market requirements and then be constructed or devised or adapted to meet the market. If this is so, then, clearly, at all stages of production the processes followed must bear in mind the ultimate objective of distribution and marketing. This can only be realised if there is continuous co-ordination between the production and marketing functions.

In agricultural production, just as production is linked, as described, to marketing, so too is, for instance, credit closely linked with production. Credit is given for the development of products or projects which, in the first place, have a chance of being successfully produced and, in the second place and ultimately, which have a chance of being marketed successfully. It would be fruitless for a national credit agency to give credit to, say, a group of farmers for production of crops for which the technology is unknown. The credit agency would simply be throwing away money. Thus, it is essential for there to be, as well, a functional relationship between the credit agency and the production agency.

In Antigua, whatever co-ordination there is between the agencies would seem to be a function of the personal relationships which might exist from time to time between the heads of the several agencies and is, thus, subject to factors such as individual pressure of work, individual needs and preferences and individual interpretation of priorities. The principle of co-ordination is not built into the system of production, credit and marketing, so that it can be said that whatever co-ordination there is occurs by chance. On occasion, the agencies consult with each other in an informal way and one agency may, or may not, pursue the action indicated in their dialogue. On the other hand, nothing less than continuous communication and full co-ordination over the whole range of activities involved in marketing, credit and production will suffice to ensure the realization of national goals and targets. Again, we can allude to the absurdity that would arise if production, marketing and finance within one private sector agency, were pursued independently.

Diversification of Production

The Agricultural Division sees, as one of its main targets, the diversification of agricultural production. This is encouraged by means of a number of inducements and incentives to small farmers, including the provision of support services and advice. However, the small farmers, as has been pointed out, all operate independently of one another, and this practice has resulted in overemphasis on one or two crops, the crops that are easiest to produce and which promise the quickest return. For example, there is a perennial surplus of cucumbers and potatoes. The agency responsible for disposing of these crops is the Central Marketing Corporation and, from year to year, the Marketing Corporation has sustained considerable losses in handling these commodities. In 1976, 1.6 million pounds of sweet potatoes were produced in Antigua. Most of this was unsaleable on the local market and overseas and the Marketing Corporation sustained serious losses on this crop. Co-ordination between the marketing and production functions should, thus, have commenced well in advance of the production plans and mechanisms devised and agreed between the agencies, to keep production to a realistic level, where what is produced is guaranteed sale.

While there is an annual glut of cucumbers, sweet potatoes, egg plant, hot peppers in Antigua, there are shortages of carrots, onions and peanuts, and these latter three crops are seen to be good crops for cultivating in Antigua by the Central Marketing Corporation. However, much more research work needs to be done on these crops by the Agricultural Division, in order to perfect the technologies for their production, harvesting and storage. Because of the lack of this knowledge, farmers do not emphasise the production of these crops. There is some attempt at rationalization in this area, since there is a verbal agreement between the Agricultural Division and the Central Marketing Corporation, that production on government farms will be integrated with the production programmes of the Agricultural Division, thus allowing the CMC to obtain the requirements of scarce products from the government farms, leaving the individual farmers free to produce the other crops. That is, the thrust is for the government farms to produce crops which are not being produced by the small farmers.

This programme, as a start, needs to be co-ordinated, so that, in fact, the production on the government farms makes an impact on the marketing requirements of the CMC. At present, the policy being followed on the government farms does not take proper cognizance of the requirements of the CMC on a systematic basis. The CMC does not have the influence or authority to select the crops that will be produced on the government farms, so that it is left to the discretion of the managers of the government farms to respond or not to what is indicated by the CMC.

On the production side, the CMC is supposed to provide most of the production inputs required by the farmers - seeds, fertilizers, etc. - yet one of the complaints of the farmers and, indeed, of the Agricultural Division, is that the inputs are not always available when required for planting. This has given rise to a situation in which farmers get their supplies from overseas by private means. Since the sale of seeds, for instance, is one way of controlling and monitoring what is being produced, this "leakage" from outside can seriously affect attempts at planning and monitoring production. The right kind of co-ordination with the

Agricultural Division, which should be the agency to recommend the types and varieties of inputs needed by the farmers, would enable the CMC to stock the farm inputs in time for use by the farmers. However, there is still the limitation of finance available to the CMC to stock all that is required by the farmers. Too much of the resources of the CMC is diluted in the purchase of unsaleable crops, and since it is to operate as a strictly commercial enterprise, it obviously would not have funds normally provided in a government vote for the purchase of the requisite qualities and quantities of farm inputs.

In the case of the Agricultural Extension Division, a vote, which now stands at \$50,000, is provided for ploughing services for farmers. While there is a scale of charges for this service, it is usually given on credit and there are many defaulters. This amount is voted by the Central Government, and ploughing services are given to farmers indiscriminately, without controls as to what crops they should produce on the land. Means should be considered of linking the ploughing services given to farmers to the services offered by the Agricultural Division, and for crops required by the Marketing Corporation.

Prices

The Central Marketing Corporation inherited a system of price guarantees to farmers which is proving, at present, to be out of keeping with the diversification requirements of the agricultural sector. The guaranteed prices were installed at a time when it was necessary to provide an incentive to farmers to produce new crops. The need for the old incentive price, which was indeed fixed too high in the case of some crops, is no longer there, so that the Marketing Corporation finds itself in a situation of responding to guaranteed prices which are no longer required to achieve the original objectives and finds itself unable to remove these guarantees for purely political reasons. There can be no justification for maintaining guaranteed prices which have the effect, year after year, of inducing surpluses which must be purchased by a government agency, which in turn must operate along strict commercial lines, and finds itself in positions of recurring deficit.

The Central Planning Committee recognizes the urgent need for review of the guaranteed price system, but no action can be taken in this area unless the political motivation for maintaining it is removed.

Credit

Agricultural credit is recognized as being an important instrument in the whole programme of diversification. As the main credit agency in the State, the ABDB, therefore, has an essential role to play in this process of diversification and agricultural development. Again, to discharge its role effectively, it must work in close co-ordination with the other agricultural agencies. The evidence suggests that there is no functional co-ordination between the Bank and the other agencies, such as the Extension Division, the Division of Agriculture and the Marketing Corporation.

The Bank, in recognition of this has, on occasion, taken the

initiative in getting all the parties together in an attempt to establish ground rules for working as a team. This has been attempted in order to determine the best way of giving loans, bearing in mind how these loans were to be recovered. It was agreed, in principle, that the CMC would be the agency for deducting or collecting loans payable to the Bank. This experiment worked up to a point. An attempt was also made to organize a scheme for giving loans in kind. The principle would be to use an order system with orders placed through the CMC, requesting delivery of so many units of a particular farm input, up to the limit of the loan approved for the particular farmer by the Bank. While this suggests not only the recognition of the need for co-ordination, but the attempt at achieving it, the ongoing implementation of such arrangements has been based on personal undertakings rather than on definite schemes laid down, policies which cannot be diverted from. In their ongoing implementation, these arrangements suffer from being impeded by other considerations which have not yet been straightened out. For instance, the CMC must be the leader in determining what crops should be produced and, thus, what inputs the farmers would require. If the CMC is not in a position to declare what crops they intend to encourage on an ongoing basis, the Bank's programme is, thereby, frustrated to that extent. The Bank itself is clearly not in a position to tell the farmers what to cultivate and in what quantity. But, before disbursing money, the Bank should have this information from the farmers to whom the loan is being given. While, from the knowledge of the situation of gluts and shortages, the Bank can insist that the farmer does not go into a particular crop, it cannot suggest which crop the farmer should use as an alternative, since this may not coincide with the actual market situation.

From the point of view of credit-worthiness of the applicant for a loan, the Bank must try to get the Agricultural Extension Division more involved in undertaking preliminary investigation of the farmer, and recommending approval or otherwise of the loan. There is, however, no indication or record of this being an institutionalized pattern and to the extent that it operates in an ad hoc manner may, in fact, be a disservice to certain farmers. The Bank should lay down concise guidelines on a prescribed form which the Agricultural Extension Officer involved would be required to fill in, in respect of every farmer who is seeking a loan.

Since one of the important criteria for granting a loan must, inevitably, be the ability to repay, the Bank's partiality towards firm contract selling by the farmers is understandable since this would ensure the deduction of loan repayments at a central point. However, the CMC is not in a financial position to undertake firm contracts and the difficulties of enforcing such contracts would, in any event, make them unattractive to a central marketing agency.

When it is considered that even the Ministry is inclined to be critical of the Bank's lending policy, it is clear that there is insufficient recognition of the criteria which each agency needs to establish for discharging its responsibilities and the dangers inherent in failure to adhere to the established criterion.

A ministry, taking a political position that loans from a banking agency should be more freely available to farmers, should also be able and willing to give the commitment that defaults in repayment of bad

loans would be made good from the Government's coffers. In fact, the terms available from the Caribbean Development Bank to the Antigua and Barbuda Development Bank for agricultural credit specifically stipulate that loans below \$3,000 should not be granted from these funds. If the majority of farmers need loans smaller than this, the Bank cannot infringe the terms on which they negotiated the loan with the CDB, and it must, therefore, be the responsibility of the Government to provide funding for all the smaller loans. While this is accepted, so far, no funds have been forthcoming from Government to the Bank for such loans. The desired results cannot be achieved from such an ambivalent policy. Such ambivalence, however, could simply be a result of the lack of proper communication. In the case of the Bank, it is interesting, in this connection, to note that there is no representative of either the CMC or the Ministry on the Bank's Board.

Conclusion

No sector in a developing economy is without major constraints to development, and all the measures which need to be taken cannot be taken at once. However, working within the resource and institutional constraints, it is always possible, and the objective of policy should be, to maximize the efficiency of arrangements and the use of the limited resources. In the case of Antigua, there are areas where the prospect of improvement suggests itself, and these prospects that are there can best be taken advantage of by more thorough co-ordination of the agricultural sector agencies and, consequently, by the rationalization of production and marketing. The burden of the following section is to indicate how this can be achieved.

SECTION III: THE FRAMEWORK FOR INTEGRATION OF MARKETING AND PRODUCTION

This study deals with a problem which involves complex decision-making in an uncertain environment. The problem is concerned with the co-ordination of production and marketing of agricultural commodities in a developing economy. The previous discussion in this report has highlighted the complexity of factors that have to be taken into account, in order to bring about the desired level of co-ordination in the agricultural economy. Therefore, a model that attempts to provide the means for solving this problem must be useful in analysing complex decision situations.¹ The Systems Approach is designed for dealing with such situations, and it is for this reason that this approach is used in the following analysis.

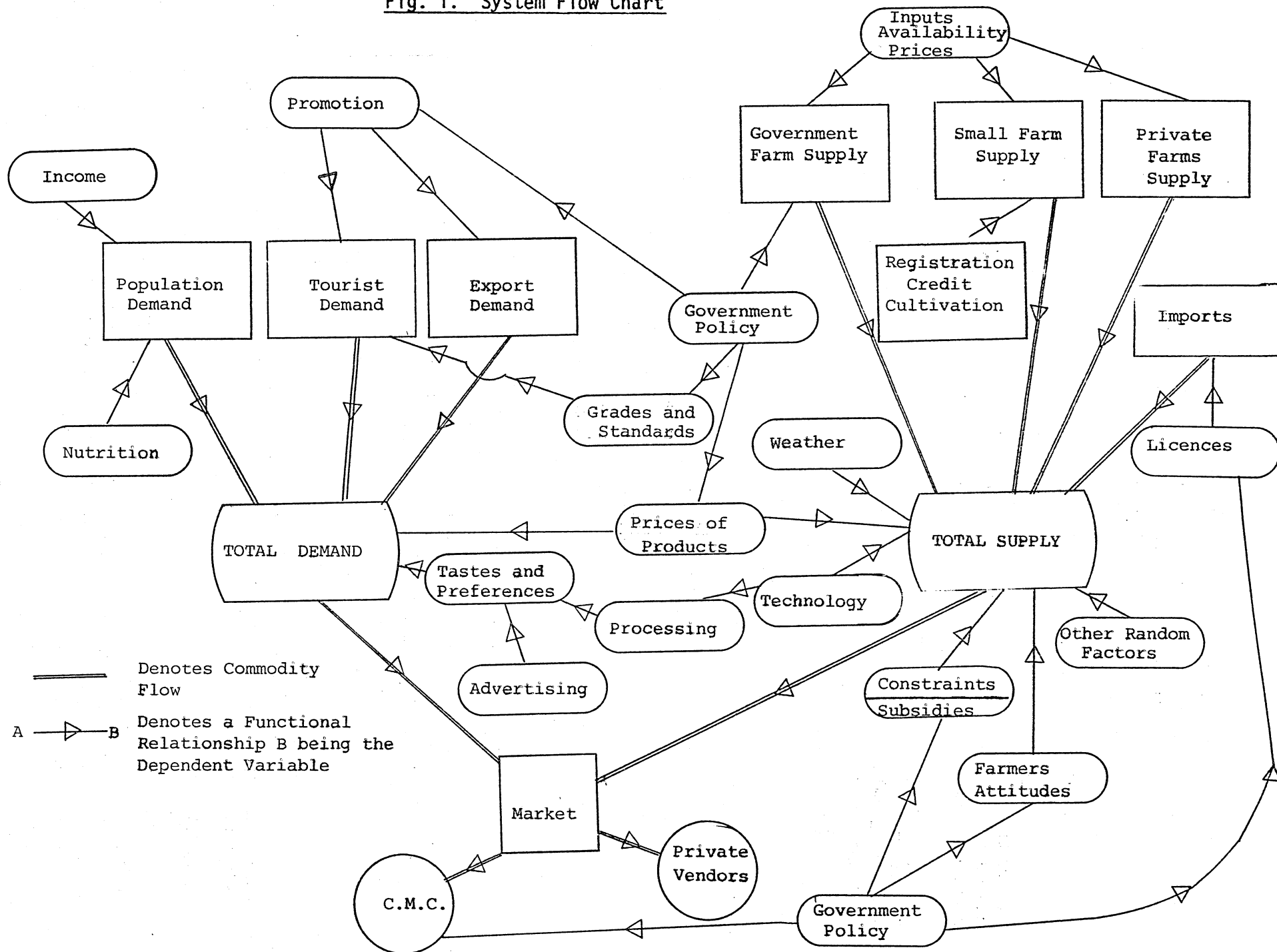
The Systems Approach

In the Systems Approach, a large scale (complex) decision problem (or Real World System) is separated into its relevant parts (or elements). These parts are then carefully examined, and the inter-relationships between and within the parts themselves are determined. Once these inter-relationships are known, the elements are synthesized into a model. This model can then be used to give insights into the original problem as it provides a working representation of the Real World System. The stages to be followed in applying the Systems Approach, with appropriate adjustments to meet the requirements of a specific case, can be stated as:

- (i) Delineating the problem, establishing objectives and setting up of hypotheses that require testing (and explanation in achieving objectives, i.e. clear establishment of the purpose).
- (ii) Analysing the inter-relationships of the decision problem and its elements, in terms of the classification of variables, their causes and effects, and the associated functional forms they take on. A preferred method of representing the inter-relationships is by means of a system flow chart.
- (iii) Formulation of analytical and empirical models of the decision problem and specifying the information that is required to operate the model.
- (iv) Collecting the information that is required to operate the model, and organizing the initial inputs into the model. The initial inputs may be referred to as the initial structure of the model.

¹ The word "model" will be used frequently in this section. In most cases, it will be interchangeable with the word "system" or "method", as the context indicates. In the strict economic definition, the term model refers to a hypothetical framework, constructed to determine the implications of a theory in the real world situation.

Fig. 1. System Flow Chart



- (v) Testing the validity of the model in whole and in part.
- (vi) Performing experiments with the model, or utilizing the model to carry out the procedures necessary to provide tests of hypotheses or other objectives given in (i).
As such, this could be called the implementation phase.

Application of the Systems Approach to the Case Study Problem

The problem under investigation has been set out quite clearly in the earlier sections of this report. The analysis proceeds immediately to the specification of the inter-relations of the decision environment, by means of a system flow chart. This flow chart is given in Figure 1.

The flow chart at Figure 1 illustrates two types of relationships. The first involves the flow of commodity in the system, the second, the functional relationships between the different factors in the decision environment. The first set of inter-relationships is now described.

- (i) Utilizing inputs, farmers produce the domestic supply of the commodity by incorporating these inputs with the technological processes available and known to them. Total supply of the commodity is composed of this domestic supply, plus imports into the economy.

Demand for the commodity may come from three sources: the domestic population, the tourist industry and exports. Several entities may be involved in facilitating the transfer of the commodity from the producers to the final consumers. Two important ones, in the context of developing agricultural economies, are private vendors and a Central Marketing Corporation (or agency).

- (ii) The second type of relationship shown in Figure 1 involves functional relationships between the different factors involved in the production and marketing of agricultural commodities. The direction of the arrows indicates the hypothesized causal relationship between the different factors. (While only one-way functional relationships are shown in Figure 1, it is clear that in some cases, the inverse functions may also exist. The causal relationships shown are judged to be the most relevant).

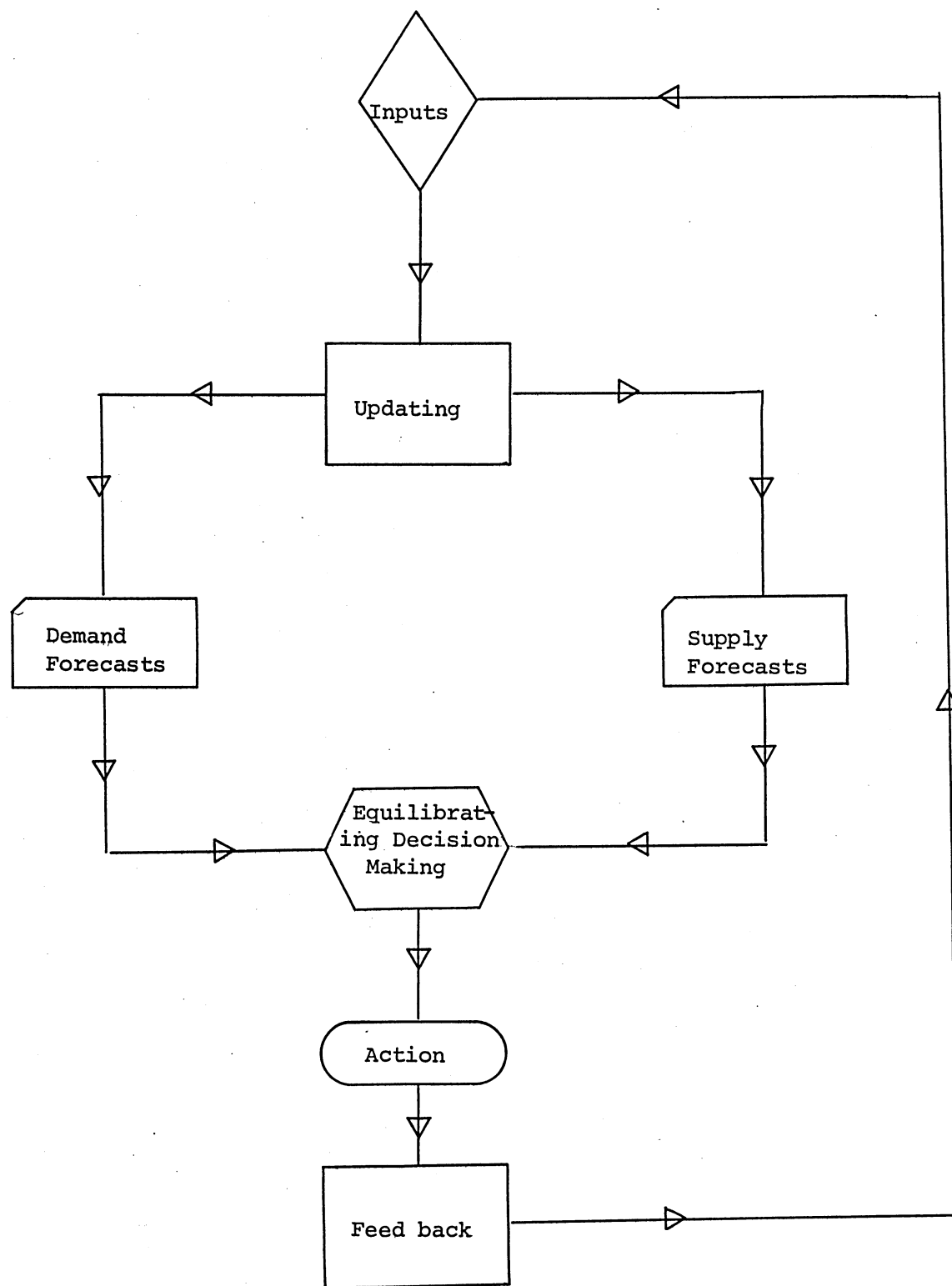
The Analytical Model

Two possible ways of developing an analytical model for the problem under study are, adopting either a behavioural decision-making approach, or a simulation approach.

The Behavioural Approach

The behavioural approach is based on the human element as the major component in the entire decision process. The major attribute of this approach is that it facilitates the implementation of the system designed to solve the decision problem. Successful implementation of any decision system requires that human beings interact in a positive manner, to meet

Figure 2. Schema of a Behavioural Model



the suggested goals and objectives. If a system can be devised, which directly involves the human element in the entire decision process, then it may be expected that the necessary co-operation could be elicited to allow effective implementation.

The Simulation Approach

The simulation approach, on the other hand, is an operations research approach. As such, it involves the construction of a mathematical model of the decision problem. This model is usually put into a computerized form and is then utilized as a major tool in the decision process.

The behavioural approach is adopted for the present problem for two main reasons:

- (i) the system devised is to be recommended for use in developing agricultural economies. In these economies, the facilities and technical knowledge may not exist for the use of complex computer models which form an essential component of the simulation approach; and
- (ii) the second reason is related to the problem being dealt with in the study. This problem involves the relationship and co-ordination of several agencies, and numerous individuals. Implementation of the proposed system, to solve this problem, is thus of primary concern since the necessary co-ordination and co-operation of the different human elements must be obtained.

Since the behavioural approach tends to ensure a greater degree of co-operation at the implementation stage, it is, therefore, adopted. In Appendix 1 to this report, a simulation approach is sketched.

Behavioural Model

A schema of a behavioural model for the case study problem is given in Figure 2. The "Inputs" terms in that model constitute the initial conditions of the model. This structure is composed of the agencies and individuals involved in the decision-making process. For this particular problem, the inputs would include governmental agencies involved in the agricultural sector, the farmers involved in the production of the commodity, final consumption entities (domestic population, tourists and exports), as well as the private vendors involved in the marketing of the commodity or agricultural inputs.

The model is designed to provide a system of co-ordinating production and marketing of agricultural commodities. It relies on the regular availability of relevant production and demand information on commodities to allow the appropriate decisions to be taken. An integral part of the implementation of the model is thus the establishment of an appropriate statistical information system, to provide domestic production, imports and total demand forecasts for commodities.

Given the proper forecasts, the next phase of the model involves the equilibrating process. In this phase, the actual decision-making by the individuals is carried out.

Having outlined the analytical model, we now attempt to describe the several terms more fully, and the dynamic operation of the system. The model can be divided, for analytical purposes, into three parts: (i) the demand sub-model, (ii) the supply sub-model, and (iii) the equilibrating or reconciliation sub-model. We will look at these in turn.

Demand Sub-Model

Referring to the System Flow Chart, Figure 1, we see a number of the factors influencing total demand for an agricultural commodity or group of commodities. Essentially, demand for agricultural products derives from the domestic population, the tourist sector and from export. The demand from these three sectors creates the need for the Production and Marketing Sub-models. Effective demand would be a function of factors such as income, prices and tastes and preferences of consumers. In the operation of the model, all the factors which are considered to have an effect on demand must be known and analysed - both independently and in relation to each other.

The basic objective is to prepare a demand forecast on which production and marketing plans will be based. In preparing the forecasts, we start from where we are, that is, we obtain as much historical information on sales, prices, etc., with a view to obtaining a clear picture of the current situation. Projections will then be made from the information available to the forecasting agency.

Domestic demand for locally produced agricultural commodities is always difficult to quantify or estimate and, in the developing country, there is likely to be very little readily available information on this. In order to determine demand, in relation to the domestic population, there must be some consumer expenditure survey, the results of which would indicate precisely what the domestic consumers want. It needs to be noted that this is not a once-and-for-all exercise. Since consumer expenditure patterns change, the survey must, therefore, be continuously up-dated. Thus, if the growth rate of the population is known, relating this to the wants or needs of the population, as indicated in the expenditure survey, it would be possible, at any given time, to forecast the approximate level of demand from the domestic population.

In assessing and forecasting the demand for food products generated by the tourist sector, it would be necessary to know the anticipated tourist arrivals into the country. Admittedly, the tourist industry is subject to seasonal fluctuations, influenced by many unpredictable factors, and thus projection of tourist arrivals can be subject to a wide margin of error. However, under normal circumstances, steady growth could be assumed. In projecting tourist arrivals, consideration would have to be given to the present condition of the tourist industry and of the identifiable trends in related areas, both domestic and overseas.

In the case of Antigua, forecasting food demand generated by the tourist sector is of vital significance in the light of the emphasis being placed on this industry's development. Tourist food consumption, therefore, cannot be viewed as a marginal input since what happens with tourism fundamentally affects every other area of life in the economy. The projection of food demand created by the tourist sector is facilitated by the ready availability of historical information on the food needs of the industry. In preparing the forecast, one possibility is to require that hoteliers submit all their orders, both domestic and import, for their food requirements to the Supply Division. To enforce this, it might be necessary to introduce complete licensing of all imports of food by hotels. In addition, the Supply Division could require that all tourist requirements, say for the subsequent three months, should be notified to the Division in advance, that is, before orders are placed. All this information, however compiled, would constitute the tourism input of the model.

In projecting overall demand, consideration also has to be given to the export demand for agricultural produce. Projection of export demand is, perhaps, more difficult in that it has to be related to the overall export policy and programme to the efficiency of the export sector, to the availability of market surveys, and to the determination not only of the market potential but the actual volumes which are likely to be sold overseas. This simply underscores the fact that, in developing the agricultural sector, thorough information is essential and export development must be planned as efficiently as the growth of any other sector of the economy. The term "Export Promotion" in the System Flow Chart, which is given as one of the primary inputs in relation to exports, must be seen as covering the whole range of export promotion and marketing activities, including the provision, where necessary, of physical facilities such as storage, shipping, etc. This can be linked with the Government policy, grades and standards, processing, advertising and other terms in the flow chart. It is also closely linked to the programme for the removal of resource constraints in the system.

While population, tourism and export are the basic inputs of the Demand Sub-model, it is clear that they must be related to the whole range of other crucial variables affecting demand, and it is important to emphasize the linkages between these variables. The actual level of effective demand depends, for instance, on factors such as the price of goods and the tastes and preferences of the population. Tastes and preferences would, in turn, be determined by factors such as presentation of the product which would be influenced by processing and grades and standards, etc. Consumer acceptance, or tastes and preferences, could also be influenced by advertising and a proper retail network.

Supply Sub-Model

The major sources of domestic supply would be the small farms or tenancies, the larger private farms, and the government farms, which were described in Section 1. In addition, part of total demand would be met from imports of agricultural products. Among the primary factors influencing the supply are farmers' attitudes and responses to incentives, etc., technology, the ability of the land to produce different crops, irrigation of land, the quality and availability of farm inputs, physical

characteristics such as zoning and land use, and price. No attempt will be made to elaborate on how each of these inputs, in turn, affects the supply of agricultural produce in general. However, the same procedures must be followed, as we indicated in the previous section on demand, in obtaining full information on the supply variables with a view to preparing the necessary supply forecasts.

The difficulties of promoting the supply of certain scarce commodities in Antigua can be related, principally, to climatic conditions, and related to this, the high cost of irrigation as well as the relatively low levels of technology in relation to the production of some of these crops. On the supply side, there are a number of control variables which would have to be manipulated by the relevant organizations within the structure. Three of the variables which can be used to influence farmers' output are farm registration, credit and access to other government incentives to cultivation.

It needs to be pointed out that, through the system of price guarantees which has been established for some time in Antigua, the price factor has been the predominant influence on supply and, as has been previously noted, has accounted for severe gluts of certain commodities in season. This pattern shows the inadequacy of price as the sole or primary variable in influencing supply, since it leads to imbalanced production of agricultural commodities - farmers tending to concentrate production on those crops which, in their view, yield quicker returns, with little consideration of the relative efficiency in production of different crops, in terms of effective demand. Farmers, the world over, are greatly influenced by price in deciding on the alternative uses of their land and other resource inputs. A system of price guarantees, even when based on realistic costs of production information, will tend to lead to gluts and shortages over the whole agricultural sector. To stimulate the production of crops subject to low supply, factors such as the appropriate techniques, irrigation of the land, the availability of the right farm inputs at the right time, etc., must be carefully monitored by the relevant authority.

The Equilibrating Sub-Model

After the supply and demand forecasts have been drawn up, the next stage is the equilibrating process. The forecast for a particular crop will show that demand is greater than supply or vice-versa. The task is now to determine how they should be equated. It is important to note that the supply forecast must be based on the known, or projected demand for a particular crop. In forecasting supply, it is necessary to take into account the plans and programmes which must be implemented in order to meet the demand. It must be known, for instance, whether and to what extent irrigation is necessary, the quantity and types of farm inputs which should be ordered, etc. This suggests that demand must be properly forecasted, before the supply forecasts are made. The equilibrating process is essentially a decision-making process. At this stage, it is indicated how the action should be taken, and who should undertake it. The model starts with certain basic information going into the system. On the basis of discussion and thorough analysis, certain decisions are made which ultimately will result in action. Decisions, for instance,

have to be made on "what production plans should be recommended for Crop A", for the next given period, "what import licence strategy should be recommended for Crop A", for the equivalent period, "what importation of agricultural inputs should be recommended to meet these production requirements", and so on. These and similar decisions have to be made continuously - almost daily - for one crop or another over various time periods.

In the working of the model, the decision-making process is thus of vital importance. The actual decision-making process in Antigua has to be developed and has to be based on thorough co-ordination of all the sector agencies. It must be known what decisions have to be made, and when these decisions are to be made; or, in other words, when to accept a particular course of action or when to reject it.

It must be noted that the decisions and even the process of decision-making will be influenced by official policy. In the equilibrating process, a range of decisions in regard to one action or one crop might suggest themselves. It is for the equilibrating committee to enumerate all the types of decisions which can be made, on the basis of the information fed into the model. For instance, official policy might be to stimulate production of a specific crop and subsidize its purchase. In such a case, it is then only necessary to encourage farmers to produce, on the understanding that the Marketing Corporation will purchase the total surplus. If, on the other hand, the policy is to minimize waste, then it becomes necessary to plan production to meet the demand more closely. All the possibilities of this type of decision, in relation to equating supply and demand, must be listed as an exhaustive set of alternatives and the appropriate action taken on the basis of the final decision made.

There will, necessarily, be a number of subjective or intuitive judgements in making decisions because of the inadequacy of the available data and, thus, informed hunch is inescapable in the whole process. The objective, however, must be to get as much accurate data as possible, bearing in mind the need, at some stage, to terminate discussion.

It is important to note that, if official policy dictates the stimulation of production of a crop, and the creation of surpluses which are unsaleable, it is not an economic decision. It might, however, be prudent political policy, and the system can be operated in the way that such policy dictates. In the long term, the objective must, however, be to increase efficiency in the agricultural sector by minimising waste, on the one hand, and maximising satisfaction to the consumer on the other.

The Action Stage

The decision taken will lead to action. In the decision stage, the co-ordinating body would have listed all the ways in which supply and demand of a particular commodity or group of commodities being studied could be increased or decreased. The action, or output end, indicates what has to be done. Given that demand is greater than supply, or vice-versa, the checklist is then examined, and the factor or factors

which can bring the system into balance are identified. The network of activities associated with production and marketing have to be listed and organized in a time frame, so that the sequence of activities from start to finish is fully appreciated. The method of equilibrating supply and demand that disturbs the system least is then chosen. The criteria of disturbance of the system might be the minimising of waste, maximising of prices, or as official policy dictates.

The process is represented graphically by the curve below:-

Figure 3.

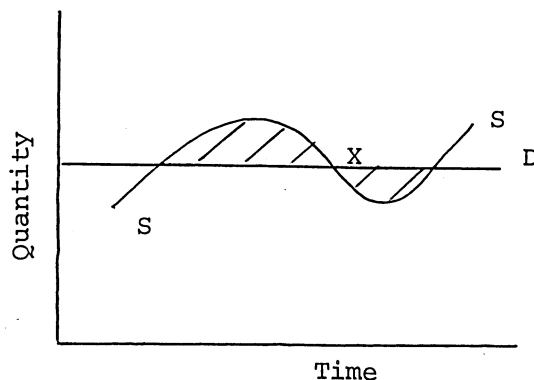


Figure 3 illustrates the levelling-off process. The objective is to get Supply (S) equal Demand (D), at point X. Above the line DD in the shaded area, supply is greater than demand and the shaded area represents the surplus. Conversely, below the line DD, the shaded area indicates that supply is lower than demand, and the shaded area represents the deficit. The control variables identified will thus be manipulated to bring the system into equilibrium at X.

Recommended action is undertaken by one or other of the agricultural sector agencies in Antigua. Each of these agencies is already aware of its function in relation to production, marketing, research, credit and so on. For instance, in the case of the Central Marketing Corporation, one of its functions would be to provide much of the basic data on which market forecasting is to be based. On the action side it would also be the Corporation's function to offer the right price or to set up the right grades or to have the storage facilities available. In the case of the Agricultural Division, its responsibility would be in areas such as field research, research into the appropriate techniques to be used, the appropriate farm inputs (seeds, fertilizers, etc). After all the information on demand and supply has been gathered and analyzed, and decisions made as to what action should be taken, and the sequence of the various activities considered necessary, it is then the responsibility of the various agricultural sector agencies to take whatever action is appropriate to that agency.

Any action taken in regard to supply and demand would, necessarily, change the overall environment. Action taken will suggest further amendment to the data or to the information. The process must, therefore, be seen as a cyclical one, and the information has to be continuously

updated and fed again through the system.

It is the responsibility of the relevant sector agency to study the variables which suggest themselves as needing to be influenced in order, for instance, to control production. Control of these variables involves taking into consideration the real world situation which the farmer faces. The farmer needs to earn an income and he could not be expected to respond to a decision or a direction not to grow a particular commodity unless and until preparation is made for a suitable alternative. This preparation involves all the inputs of the various sector agencies in assisting him in establishing and developing the alternative crop which is recommended. It is, therefore, of basic importance that alternative crops and alternative measures which can be used by the farmers in producing these crops are well listed and known, in order to avoid making the wrong decision.

The Information System

The equilibrating or action sub-model depends for its effectiveness on accurate and reliable information, particularly in regard to supply forecasting. The model, therefore, presupposes a comprehensive and sophisticated crop reporting service. Not only must it be known, for instance, the acreage planted per crop, the expected time of harvesting, yields per acre, etc., but there must also be information on primary considerations such as the impact of weather on production during the production period. If these factors are unknown, the supply forecasts would be to that extent, unreliable.

There is, at the present time, some elementary type of crop reporting undertaken by the Extension Service in their normal operation, and this information is submitted for use by the Central Marketing Corporation. There is scope for improving and regularising the collection of basic data by the Extension Division and it could, indeed, become one of the duties of Extension personnel, that they collect farm data on their regular rounds. In addition, the provisions of the Small Tenancies' Act could also be re-introduced, or at any rate enforced, to assist the work of the Extension Division. Under the Small Tenancies' Act, all farmers are required to register their farms and acreages. The provisions could be expanded to require that, in addition to registration, farmers should provide regular, up-dated information on their production and production plans. In this, they could be assisted by the Extension Division personnel.

It is, however, recognized that, in making supply and demand forecasts, whatever the reporting system used, because of the difficulties of collecting data, at least at the outset, much of the projections would have to be based on value judgements, predictions and first principles. This will necessarily result, in the equilibrating stage, in some inaccuracies. The overall and long-term objective must, however, be to maintain the trend of bringing the system into balance, to eliminate or reduce the incidence of waste in so far as supply is concerned, and the incidence of inconvenience to customers in so far as demand is concerned.

The Agricultural Planning and Co-ordinating Agent

The System Flow Chart (Figure 1) shows the principal variables to be manipulated in the process of equating supply and demand. The mechanics of the equilibrating process have just been described, based on the behavioural model (Figure 2). We must now be concerned with describing the agency which is to make the whole system work.

Before considering the structure of the agent, we must first review its functions. One of the principal functions of the co-ordinating agent is the co-ordination of the work of the agricultural sector agencies. Each of these agencies, as previously described, is already charged with specific functions, the discharge of which constitutes its normal workload or responsibility.

In terms of the broad sector objectives, whether measured by agricultural output, increased farm incomes or an increase in the agricultural sector share of the GDP or any other relevant measure, the responsibilities and programmes of these agencies impinge, very closely, on each other. However, it is evident that the areas in which these functions relate are not always appreciated or, if they are, are not sufficiently and systematically co-ordinated, in order to realize the overall agricultural sector objectives.

A prime requirement is, therefore, an organizational arrangement built into the system which brings about proper co-ordination of the work of the agencies, and this arrangement must go beyond occasional meetings between personnel of the several agencies on specific questions as they arise. It is too seldom recognised that different parts, for instance of one Ministry, are not working on competitive objectives but on different, but closely related, activities in the same operation. For instance, a decision to undertake an irrigation project in a certain part of Antigua, taken by the Agricultural Division, can only be rationalized in terms of the demand for the particular agricultural commodity or commodities, which this irrigation project is intended to satisfy; and if the activities of the Central Marketing Corporation do not recognize that, at some stage, the production of the particular commodities will be forthcoming from the irrigated area, then there could have been no justification for expending resources on the irrigation project in the first place.

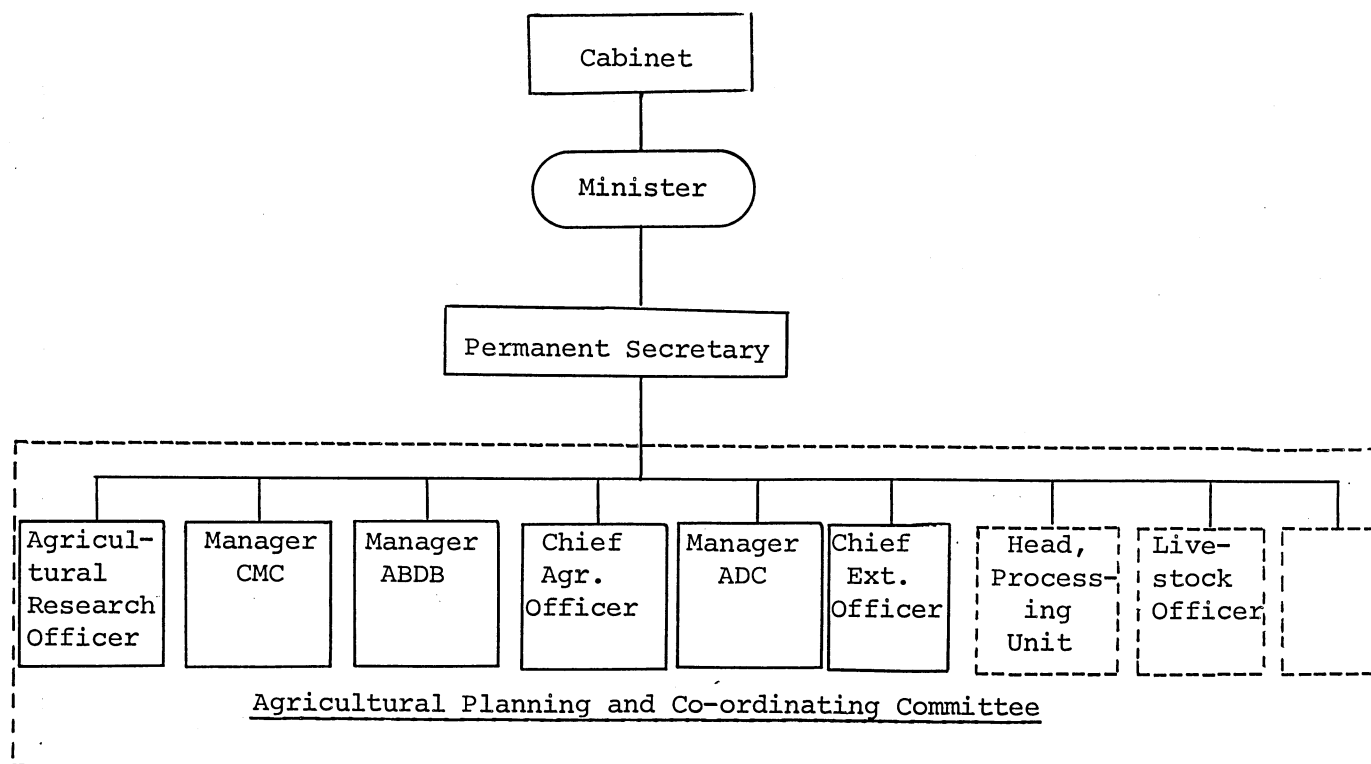
It is, therefore, clear that proper co-ordination of the agricultural sector agencies is at least as important as the individual functions which these agencies now undertake. Co-ordination could be as simple, or as sophisticated, as the circumstances or the complexity of the structure of the economy dictate. In our view, the basic criteria will be satisfied, if it is agreed that the key agents from each sector agency are formed into a co-ordinating and planning committee to comprise appropriate representatives of all the primary agricultural sector agencies in Antigua including the Chief Agricultural Officer (CAO), the General Manager of the Central Marketing Corporation (CMC), the Manager or Agricultural Credit Adviser of the Antigua and Barbuda Development Bank (ABDB), the Chief Extension Officer, the Manager of the Agricultural Development Corporation (ADC), and the Agricultural Research Officer, with other members being co-opted to serve on the committee, depending on the need for the individual inputs (see Figure 4).

Composition of the Co-ordinating Committee

A Chairman, selected from among the members of the Committee, should be appointed by the Minister of Agriculture and his selection should be based exclusively on considerations relating to the individual's ability to function effectively. While it might be considered superfluous to emphasize the role and function of a Chairman, it needs to be observed that committees are frequently rendered ineffective, owing to the lack of performance by their chairmen. And, in this case, there should be no question of the Chairman of the Planning and Co-ordinating Committee failing in his task on the grounds, for instance, that his other duties command too much of his time.

Even more important, perhaps, is the selection of a Secretary for the Committee. The Secretary's functions must go beyond the routine of servicing meetings, preparing agendas and minutes, etc. He must be the link between meetings with the heads of the agencies, and must have the responsibility for following up the action indicated by the Committee when it meets. To discharge his functions effectively he must, therefore, enjoy the full confidence of the members and be sufficiently senior as to exercise the requisite influence and authority. We recommend that someone at the level of a Senior Assistant Secretary be appointed Secretary of the Planning and Co-ordinating Committee.

Figure 4. The Composition of the Committee



The special significance of the secretarial function is indicated by the organizational framework within which the Committee is to operate. Within the present established Civil Service structure and within ministries, there are clearly defined levels of command and authority: the Permanent Secretary reports to a minister, and the heads of the divisions under the ministry report to the Permanent Secretary, in some instances through an Assistant Secretary. Even in the case of statutory corporations there is a clear line of communication between the corporation and the ministry; and it is further provided that the Minister shall give directions to the corporation in certain policy matters. In the case of the Committee being proposed, since there will be no legislative provisions or sanctions, much will be left to the attitude to the Committee's work adopted by members. The Committee must, therefore, be fitted logically into the national structure. This, we feel, can be achieved by the appointment of a Senior Assistant Secretary, preferably from the Planning Division, as secretary to the Committee.

It is appropriate, at this stage, to distinguish between the planning functions and the co-ordinating function of the Committee proposed.

First, it needs to be recognized that overall responsibility of planning the economy of Antigua rests with a separate ministry - the Ministry of Economic Development and Tourism. The planning function of the Committee is not viewed as a substitute for that of the Development and Planning Office. However, in relation to the agricultural sector, the latter must depend upon the inputs of the various agricultural sector agencies. While at the moment, these inputs are being made individually by the agencies in the normal course, the existence of a committee with responsibility for co-ordinating the functions of these agencies, will offer some guarantee of consistency in the plans of the agencies, and should greatly facilitate the work of the Planning Office.

The Committee's planning function would, therefore, relate to planning in the agricultural sector. Here, planning is viewed as a continuous process and not as the formulation of elaborate targets, objectives and programmes stated in a single document. The very act of preparation of production and supply forecasts and of determining the variables to be used in influencing them, constitutes a planning act as a dynamic process. Planning, therefore, results automatically from the continuous interaction of the heads of all the agencies. With a Senior Assistant Secretary to the Ministry of Planning or to the Planning Division functioning as Secretary to the Committee, a vital link is established between the national planning division and the agricultural sector. It is desirable for the officer selected to serve as the Secretary of the Committee to have this as one of his principal duties and to operate under the overall supervision of the Chief Planning Officer. Thus, he will have the authority of the Ministry of Development and Planning behind him in ensuring that the plans are, in fact, implemented; or at any rate, to indicate to the various agencies, by continuous reporting, where a specific activity is lagging behind.

Summary of the Equilibrating Process

In summary, the stages involved in the process of equilibrating are:-

1. The demand and production forecasts must be available in sufficient time to allow remedial action to be taken, if this is necessary, to alleviate anticipated gluts or scarcities.
2. Given the demand and production forecasts, an evaluation has to be made of the need to take any remedial action. This evaluation is left to the individuals involved in the co-ordination exercise (the Planning and Co-ordinating Committee or Authority).
3. Given that action is needed to alleviate anticipated discrepancy between total supply and total demand, the decision-making process then has to arrive at the appropriate remedial action.
4. All the factors that can either increase or decrease total supply and total demand have to be identified and listed. These factors may be among those given in the flow chart in Figure 1. If, for example, it is anticipated that there will be a shortfall in the domestic supply of a commodity, all the factors that can bring about an increase in supply, or a decrease in demand, for the commodity have to be examined. This examination will try to determine the factor that will most efficiently bring about the co-ordination of supply and demand.
5. Each factor is examined individually to determine its effect and efficiency in achieving the object of balancing supply and demand.
6. The actions needed to implement each factor have to be clearly established. These actions may cause repercussions throughout the integrated system.
7. These repercussions are examined via the feedback mechanism in the schema given in Figure 2. The anticipated results of the actions on the system have to be clearly established for each factor.
8. The efficiency of each factor is gauged in two ways:-
 - (a) the ability to minimize the anticipated shortage or glut situation of the commodity; and
 - (b) the ability to bring about co-ordination with the minimum of disturbance to the overall system.
9. The most efficient factor is chosen and the action prescribed by this factor is implemented.
10. At the end of the period of attempted co-ordination (say, one quarter) an evaluation is made of the actual efficiency of the control measures. Any adjustments or modifications to the decision process or environment is fed back to the model, via the updating term in Figure 2.

Appendix I: Sketch of a Simulation Approach

The Simulation Approach to decision-making problems requires that a mathematical model of the system be devised. This mathematical model is then used as a control model, whereby changes in different variables may be put through the model to determine the actions that result from the changes.

A probable (and generalized) mathematical form of the model for the problem investigated in this study is now given:

Demand Function

$$Q_d = F_1(N, T, E, Y, P_h)$$

Q_d = Quantity demanded of commodity

N = Population

T = Tourist numbers

E = Export demand

Y = Income of population

P_h = Prices of relevant commodities

Supply Response Function

$$Q_p = F_2(P_n, P_i, S)$$

Q_p = Acreage of commodity planted

P_n = Prices of relevant commodities

P_i = Prices of relevant inputs

S = Government incentives or controls (e.g. quotas)

Technological Function

$$Y_e = g(I_n, W, V)$$

Y_e = Yield per acre (hectare)

I_n = Relevant inputs

W = Weather

V = Random term

Total Supply Function

$$Q_s = Q_p Y_e + I_m$$

Q_s = Total supply

I_m = Imports

Equilibrium Condition

$$Q_s = Q_d + U$$

U = Slack or surplus variable.

The model as set out above would have to be estimated. This estimation would require data to be collected and the appropriate form of the relationships (quadratic, logarithmic, etc.) be found. Once these are available, the parameters for the model may be estimated. This estimation would usually require computer facilities. In the present case, the model may also require simultaneous equation estimation techniques.

Once the model is estimated, it can be used as a control mechanism. The values of some of the variables are determined within the model (the so-called endogenous variables) and the values of some variables are determined outside of the model (the so-called exogenous variables). Given changes in some of the exogenous variables (for example, population growth or export growth), the changes in the other variables within the system necessary to keep the system in equilibrium can be determined by solving the model. In an analogous manner, given forecasts of supply and demand conditions for a commodity, the model can be solved to determine the changes in the other variables that are necessary to keep supply and demand in balance.

To trace the effects of changes in several variables at one and the same time, the control model may have to be put in a computerised form, so that the calculations necessary to feed changes throughout the system can be completed efficiently. A computerized form would also allow weather and other random factors to be simulated by, for example, Monte Carlo techniques. In this way, the control model could incorporate uncertainty aspects of the decision environment.

The simulation model can determine the changes in the different variables that are necessary to bring about equilibrium in the production and marketing system. However, the appropriate actions needed to bring about these changes have to be determined and implemented by the relevant decision makers. In other words, the human element also plays a crucial role in the simulation approach. However, the changes that are necessary to solve the problem are handed to the individuals, via the mathematical model. The human input is then needed to implement the mathematical solutions.

Appendix II: Sample Application of Model - Pineapples

The application of the model can best be illustrated by taking an example of one commodity - pineapples - and following it through the process.

At the outset, there may be preliminary interest in the development of cultivation of pineapples in Antigua, based on past production experience of farmers, and a general sense that pineapples are a good crop for Antigua. The initiative might come from the Central Marketing Corporation or, for that matter from the Cabinet, that the prospects of developing this crop should be exploited. It could come from Cabinet as a policy proposal, though not an order, that the prospects of developing pineapple production in Antigua should be examined. However the idea originates, it should be channelled either in discussion or by formal written communication to the officer who, for the time being, holds the post of Chairman of the Co-ordinating Committee.

The next step would be a meeting or a series of meetings of the Co-ordinating Committee to discuss the proposal. The Committee's discussion would take the form of examining all the information at present available on pineapple production from the various agencies represented on the Committee. These discussions would be supported by the technical data already available to the agencies on the production, processing, marketing, etc. of pineapples, and on the farm experience which has been gleaned by the Extension Division. The Committee might decide, as a committee, to make a field tour to areas where pineapples have been produced and to hold discussions with pineapple producers. These preliminary discussions, which should be exhaustive, would indicate the additional technical information which would have to be accumulated before any programme of activities is set, and to indicate also what research needs to be undertaken, for example, whether a pilot plot should not be established in a given area. These discussions may be of any duration, depending on the complexity of the problems which are brought to light in the initial discussions.

It is possible, at the given time, that there will already be a certain amount of pineapples under cultivation, or perhaps the response might be that a number of farmers are planning to produce the crop in the near future. Before any action is taken, the Committee should ensure that it has access to the fullest possible information on the domestic and export demand for pineapples. This would necessitate a thorough study of the market, including prices, tastes and preferences, methods of shipment, the demands of the tourist sector, the possibilities of processing, the availability of appropriate processing facilities, etc. This study would establish the production targets for pineapple production in Antigua.

However, before action is taken to promote production, arrangements would have to be made with potential buyers, domestic and overseas, and firm arrangements drawn up for the sale of the commodity. If at this stage it is considered that a product imported into the market, say canned pineapples, is a substitute which could restrict the domestic demand, the measures must be implemented for controlling the imports of

this substitute. The hotel industry should also be advised of the plans and given information on when pineapples would become available.

There are some aspects of the production programme which could, naturally, be undertaken simultaneously with some measures in relation to estimating demand. Up to this stage, all the agencies would be involved in making their inputs and in assessing the contributions their individual agencies can make to the programme. The Agricultural Division should be able to say what variety would be best to produce, what areas are most suited to production, the extent of the land available for production of pineapples, and so on. The Extension Division should, from its contact with the farmers, be able to give some idea of farm response, price expectations, techniques to be used in production, etc. The Antigua and Barbuda Development Bank should be able to indicate whether funds are available for giving credit to farmers, for instance during the establishment stage of the crop, and under what special conditions credit should be given as an incentive.

The next stage would be to assess all the supply information that has come to light and to discuss and determine the strategy that will be employed in bringing about the desired supply. It may be necessary to establish conclusively from a survey what farmers' attitudes are to the planting of this crop, what their experience has been, diseases, etc. It should also be established what is the best planting time to minimize the risk of crop failure. The appropriate farm inputs, for example fertilizers, weedicides, etc., should be determined, sources located, prices established and perhaps orders processed. Perhaps the demand considerations might suggest that production be limited to a certain number of farmers, small farmers, or perhaps even to a government estate.

After this information is thoroughly assessed and analysed, the decision is then taken to introduce a particular programme for production of pineapples in Antigua, and the work of all the agencies in that direction is co-ordinated. Each agency would be aware from its membership on the Co-ordinating Committee of the action and the sequence of action which is involved. All the action that needs to be taken might not fall within the purview of the agencies represented. There might need to be supporting government policies and programmes, for instance, irrigation or additional extension staff which would have to be agreed to by the Government. Arrangements must be made to ensure that there are no resource constraints to the whole programme and any bottlenecks there are should be eliminated as far as is possible. This indicates a sequence of information, decision and action.

As the programme of production develops, the Committee continues to meet to discuss its progress, to identify areas of weakness and to propose new action. This new action might suggest new information which has to be obtained or the slowing of action in one area, and the speeding up of action in another. The information would be brought back in to the Committee and the process continued again.

Appendix III: Forecasting Demand in the Hotel Sector for Agricultural Products

- A Note

1. The demand for agricultural goods in the tourist sector is contingent on the demand for accommodation and related food service activities. Normally, advanced orders are based on the expected occupancy which the hotel has projected. A hotelier would normally get a good indicator from the advanced bookings made and generally on the overall amount of tourist arrival activity in the sector.
2. In view of this, projecting demand for agricultural produce in the tourist sector must be carried out in close liaison with the hoteliers themselves. This would require that an officer of the Central Marketing Corporation (say) visits individual hotels, to ascertain the amounts of food by commodity, quantity, and grade, which might be required in a given time frame. In addition to this, it is essential that a mechanism is set up within the hotels by Government (either directly or indirectly) to implement a system of tabulation of food being utilized by commodity, quantity, price, quality, grade, frequency and data, as a further indicator for scheduling production.
3. To ease the problems associated with such a system, it is perhaps best that such records be made at the point of delivery in the hotels or restaurants, as opposed to the time of utilization (i.e. when served). The rationale behind this is that the hotelier would place orders according to his perceived rate of utilization, and the amounts of stock which he would want to hold for precautionary reasons to avoid problems associated with shortages due to delays in delivery or unavailability of supply. At this point, it must be noted that tying capital up in inventory represents both a financial and opportunity cost to the hotelier, and that if he acts in a rational way, it may be expected that he would want to minimize the amount held as much as possible.
4. It may, therefore, be expected that the distance from the market, and the length of the marketing channel (i.e. number of organizations and activities involved from production to purchasing) will be important factors in the purchasing policies and attitudes in this sector. Bearing this in mind, one can normally expect that, as the emphasis shifts to local production and supply, this will be interpreted by hoteliers as good justification for increased delivery frequency. However, every effort must be made to reduce the perceived implications of the geographical distance from the market. The concepts of economic order quantities and delivery runs to a particular area should be applied rigidly, which would require a sophisticated approach being introduced by the farming community, preferably under the organized umbrella of the Central Marketing Corporation. Failure to introduce such an approach can only result in absurd, fragmented and uneconomic delivery methods being introduced, or rather being forced upon the farmer, by hoteliers who are attempting to minimize amounts invested in inventory to their own advantage. Once the principles of economic order quantities are appreciated as being applicable to both supplier and purchaser, then one can expect a different type of behaviour pattern being demonstrated in this sector.

5. In addition, from the preceding discussion, the need for the farmer to deal with a central institution to service the sector can now be appreciated in order to ensure that patterns based on economic considerations are followed and that, through such centralized effort, a pulse is kept on the overall requirements of the market, in order to ensure:-
- (i) right commodity at the right time in terms of:
 - (a) quality/grade/size
 - (b) quantity
 - (c) continuity
 - (d) guaranteed delivery at reasonable frequencies; and
 - (ii) to a lesser extent, price.
6. Price can be seen as an exogenous variable in this sector, since, as long as the above conditions are reasonably met, then if local price is less than or equal to foreign landed price, one can expect that the local commodity will not meet stubborn resistance from the hotel sector.
7. This now leads to another consideration. On the supply side, one often hears that hoteliers are unreasonable if they are not prepared to enter into a contract to purchase certain commodities at a certain date. In order to reason this through, one must appreciate the role of contracts in this exercise. Hoteliers should not, reasonably, be expected to enter into contracts for a specified commodity until they themselves have ascertained that they have a need for such food commodities within their food service departments and that the delivery dates specified within the agreement can be met. Given the current system of purchasing by the hotelier from overseas, a contract is usually established on the point of placement of order. However, as a modification to this, several hoteliers might combine in order to obtain economies of scale on each order, which might be direct or through one of the local wholesalers. In view of this, the point of transference on the local scene would be when the order is placed with the Central Marketing Corporation, either directly, or indirectly through a wholesaler (farmers should be encouraged to deal with the CMC as much as possible). At this point, a contract can be seen to exist. The farming community will have to indicate to the Corporation whether they can meet the strict delivery dates, and if they cannot do so, then the responsibility will fall on the Corporation to ensure that import licences are issued, and the goods obtained from overseas. However, adherence to the strict requirements of the contract should be a priority in all respects.
8. Given this type of system and background, the hotel sector's requirements can be estimated in time to advise the farmers on what to plant and, secondly, to ensure that, if local production output cannot satisfy demand requirements, alternative sources of supply can be found (first within Caricom, and secondly, in the wider region) in order to satisfy the requirements of the local hotel sector. Fortunately, the harvesting season coincides with the high season in the hotel sector which would give the added advantage of ensuring that there is a market for what is produced. One caution must, however,

be given - it is not enough to assume that whatever is produced can be readily used in the food service section of the industry. Hoteliers must be shown new ways and recipes for using local food (i.e. peculiar to the region). In addition, specialists must constantly work with the farmers to ensure that their produce meets the requirements of size, quality and grade. Through such an approach, one may expect that the utilization of local supply will be greatly enhanced.

Appendix IV: Minimum Price Structure

Commodity	Recommended buying price/lb. delivered to CMC 1976 (¢)	Buying price/lb. delivered to AED 1973 (¢)
Beet	24	35
Cabbage	42	35
Carrots	28	25
Cauliflower	32	-
Cucumber	15	18
Eggplant	18	15
Peanuts	126	-
Onion	25	12
Pineapples (Pl. crop)	26	-
Pineapple (ratoon)	26	-
String beans	60	50
Sweet pepper	25	24
Sweet potato	15	12
Tomato	36	50
Ochro	18	18
Yams	25	-
Cassava	12	-
Eddo	30	-
Corn (green)	10	-
Corn (dry cob)	12	-
Corn (shelled)	15	-
Hot pepper	20	-
Melon	22	15
Squash (table)	25	25
Squash (long)	6	-
Pumpkin	10	10
Pawpaw (green)	10	-
Pawpaw (ripe)	15	-
Peas (green)	15	-
Beans (Lima Barbuda)	70	-
Banana (green)	10	-
Bugament	15	-
Limes	10	-

Appendix V: System of Production in Small Farm Sector

Vegetable production in the small farm sector follows roughly the pattern outlined below (based on a farm of two (2) acres).

Before the onset of the rains in August, the farmer obtains the necessary credit to cultivate his two acres through the facilities of the Extension Division. These facilities appear to be well established and offer reliable service to farmers.

At the onset of the rains, the land is ploughed, then harrowed. Once the land is cultivated, the farmer plants approximately one acre of land to the cash crops that yield the quickest returns. These crops include cucumbers, string beans and tomatoes, but cucumbers seem to be specially favoured. At the same time, he plants approximately half an acre to crops like cabbage, eggplant, pumpkins and melons and approximately half an acre to corn and sweet potato, intercropped.

Cucumbers and string beans bring returns in approximately eight weeks. Tomatoes bring returns soon after. Harvesting from these crops may continue for about a month thereafter. October to November thus brings about large supplies of cucumbers and perhaps to a lesser extent tomatoes on the market. These large supplies sometimes cause gluts in the cucumber market.

When these first cash crops (cucumbers, tomatoes, etc.) are finished by, say, December, the farmer may obtain another crop of, say, sweet peppers, beans, cabbage or even tomatoes, depending on the prevailing soil moisture conditions. The next set of crops - eggplant, pumpkins, etc. - come onto the market from November onwards. Since the acreage planted to these crops is usually much less than the first set of crops (cucumbers, tomatoes, etc.) glut situations are less severe.

On the final half acre (corn, intercropped with sweet potato) when the corn is reaped in about three months, the sweet potato stands remain for harvesting after five months. Since sweet potato is also suitable for growing on slopes too steep for other vegetables (tomatoes, etc.) the acreage of this crop may be large enough to bring about gluts in production. Steeper slopes may also be planted to other root crops especially yams.

By April, all the short-term annual crops are harvested, and the land is left fallow. Production does not commence again until the rains in August. During the period April to August, then, the domestic supply of vegetable commodities is insignificant.

Appendix VI: Estimate of Small Farmer Vegetable and Food Crop Production

Crop	1972	1973	1974
	(tons)		
Sweet potato	503	137	72
Yams	322	168	66
Eddoes	46	52	80
Cassava	146	67	17
Maize	89	28	36
Tomato	142	83	49
Cabbage	110	54	14
Cucumber	92	84	76
Carrot	54	27	11
Sweet pepper	35	24	14
Okra	35	13	13
Beans	96	36	15
Eggplant	115	89	38
Onions	22	14	3
Melons	n.a.	n.a.	19
Squash	n.a.	n.a.	20
Pumpkins	n.a.	n.a.	39

Source: Report of Committee established by Ministry of Agriculture and Supply, 1976.

Note: n.a. = not available.