



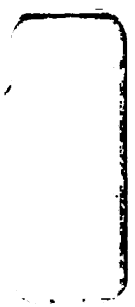
MINISTRY OF AGRICULTURE,
LANDS AND FORESTRY



REPORT
ON A STUDY OF THE AGRICULTURAL STATIONS
OF THE MINISTRY OF AGRICULTURE
(GRENADA)

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MINISTRY OF AGRICULTURE (MOA)
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REPORT
ON A STUDY OF THE AGRICULTURAL STATIONS
OF THE MINISTRY OF AGRICULTURE
(GRENADA)

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"The views expressed in signed articles are those of the authors
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INTRODUCTION

Of the five Agricultural Stations under the direct control of the Ministry of Agriculture (MOA), one (Mt. Hartman) undertakes only livestock development activities while the others (Ashenden, Maran, Mardigras and Mirabeau) are concerned mainly with crop research and propagation activities. These Stations are the sources of improved livestock breeds and crop planting materials, and are therefore expected to provide critical support to the MOA's Crop and Livestock Development Programme. However, the degree of efficiency with which these Stations operate leaves much to be desired, and if necessary remedial action is not taken, then the success of the MOA's plans and programmes for the agricultural sector could be jeopardized.

Although the Ministry of Agriculture's (MOA's) hierarchy have expressed dissatisfaction with the Stations' mode of operation, necessary remedial action has not been taken because of the lack of adequate information on the Station's resource availability and use.

Information provided in this report serves a dual purpose. Firstly, it constitutes a baseline document on Agricultural Stations likely to benefit from IICA's Technology Generation and Transfer programme. Secondly, the report will contribute towards MOA's efforts, through its planning unit, to collect and analyze as much information as possible to facilitate effective planning of the Agricultural sector's overall development.

The main portion of this report consists of information on the Stations' resources. This is preceded by some background information on each of the five Stations, and an outline of their administrative arrangements. Towards the end of the report, consideration is given to the acquisition and utilization of supplies, and the production costs of planting materials of four fruit tree crops (mango, avocado, citrus and soursop). Comparative expenditure and revenue for selected activities on two Stations are also considered. This report ends with a number of pertinent conclusions and recommendations.

BACKGROUND INFORMATION ON STATIONS

1. Ashenden Agricultural Station

The Ashenden Agricultural Station, located in the south-eastern section of the island, has an area of forty-eight (48) acres. It is at an elevation of approximately 1000 feet above sea level.

From its establishment in 1984, until 1987, the Ashenden Station was concerned only with cocoa propagation and research activities. Although it still maintains cocoa nursery plots, it no longer undertakes cocoa propagation. Its propagating facilities are now available for propagating of non-traditional export crops (mainly minor spices), and small plots of anthurium lilies (ornamentals) are cultivated. Clove trees, mainly as windbreaks, are also found on the Station.

2. Maran Agricultural Station

The Maran Agricultural Station, located on the western side of the island, was established in 1948. It is only 223 feet above sea level, and has a total land area of approximately 30 acres. From its establishment, until 1987, the Station's activities were concentrated on cocoa propagation and research. In 1987, a decision was taken to discontinue cocoa propagation activities on the Station. However, established cocoa nursery and research plots are being maintained, but these seem to be in danger since there are indications that the Station's land may be used, at least in part, for non-agricultural purposes. It must also be mentioned that one of the Station's buildings is being used as a kindergarten school, and other structural facilities are being modified to be used for production of clean banana planting materials in support of the Moko Eradication Programme.

3. Mardigras Agricultural Station

The Mardigras Agricultural Station comprises 80 acres of hillside land. It is located in the south central part of the island at an elevation of just over 1000 feet. The Station was established in 1987 as a UNDP Funded Agricultural Development Project. Its main focus was on soil and water conservation and watershed management. Emphasis was therefore placed on hillside terracing for vegetable and fruit crop production.

At the termination of the project in 1984, the MOA decided to use the Station as a demonstration and training centre for farmers, extension officers and agricultural students. With French aid, a training centre was built on the Station in 1987. However, this facility is grossly underutilized. Vegetable and fruit production are the Station's major activities.

4. Mirabeau Agricultural Station

The Mirabeau Agricultural Station, established in 1956, is located on the eastern side of the island at a height of 450 feet above sea level. It originally comprised 75 acres, 36 of which were used for housing purposes during the early 1970's.

Propagation of, and research into non-traditional crops (vegetables, roots, fruits and ornamentals) are the Station's major activities. However, on behalf of two other Agricultural Stations (operated by Statutory Boards) the Mirabeau Station also maintains small acreages of cocoa and nutmeg nursery plots. Additionally, it engages in limited cattle rearing activities mainly for providing stud service and producing pen manure for the Station's use.

Although the Station has been propagating fruit and ornamental crops from its inception, it has only recently (early to mid 1980's) begun propagating vegetable and root crops. To date, the Station has been unable to mass produce some of the root crop planting materials (eg. yams) which are in very great demand mainly because of existing lucrative domestic and export markets.

A "Seed Testing Laboratory" was established on the Station in 1983 through FAO's Seed Improvement Development Programme. It is well equipped to treat and test relatively large quantities of seeds. (An inventory of equipment and materials at the laboratory is given in Table 1). However, of the two technicians trained by FAO to operate the equipment, one has migrated and the other is currently attached to the Extension Division of the Department of Agriculture. Meanwhile, a graduate from the Mirabeau Agricultural Training School, with no formal training in seed testing and treatment, is employed full time at the laboratory where seeds are treated for farmers as well as for the Mirabeau Station which operates a vegetable seedling nursery from which seedlings are sold to farmers.

During the period February to November 1987, the laboratory provided seed treatment service to a total of eighty (80) farmers; and the total quantity of seeds treated was 7 pounds 2.75 ounces, comprising mainly seeds of cabbage (2 pounds 4 ounces for 36 farmers), tomato (1 pound 12 ounces for 18 farmers) and salad beans (1 pound for 2 farmers). Other seeds treated at the laboratory during that period include: carrot (12.5 ounces for 4 farmers), radish (0.5 ounce for 1 farmer), lettuce (0.5 ounce for 1 farmer), cauliflower (5.5 ounces for 4 farmers), parsley (0.25 ounce for 1 farmer), water melon (9.5 ounces for 4 farmers), sweet pepper (4 ounces for 5 farmers), cucumber (0.5 ounce for 1 farmer), eggplant (0.5 ounce for 1 farmer), and beet (1 ounce for 2 farmers).

From the early 1970's to the present, the Station's research activities have been very limited, and those undertaken were poorly organized and documented. The Station's propagation activities showed much improvement mainly because of technical and material assistance received through an FAO project funded by the United Nations Development Programme during the period 1977 - 1986.

5. Mt. Hartman Livestock Development Station

The Mt. Hartman Station is approximately 35 acres in size. It is located towards the south of the island and is approximately 150 feet above sea level. It was established in 1980 mainly for providing high pedigree animals (mainly sheep, goats and pigs) to upgrade the indigenous stock.

The Station's future is somewhat uncertain since there are alternative and apparently more economically rewarding activities (tourism and agroindustrialization) for which the Station's site has been earmarked. Efforts to obtain an alternative site for the Station have apparently been unsuccessful, so far.

STATIONS ADMINISTRATIVE ARRANGEMENT

Traditionally, each agricultural station was managed by an "Officer-in-Charge" directly responsible to the Chief technical Officer (CTO). However, since 1987 (or earlier, in the cases of Mardigras and Mt. Hartman Stations) the day-to-day management of the Stations has been the responsibility of Office Clerks or Field Foremen.

An Agricultural Assistant (Horticulturist) has responsibility for the overall supervision of the Ashenden and Mirabeau Stations. The Mardigras and Mt. Hartman Stations are respectively supervised by an Agronomist and a retired Agricultural Assistant (Extension). The MOA has not found it necessary to assign a supervisor to the Maran Station. On a fortnightly basis, the Foremen/Clerks report to the overall supervisors who in turn report, on a quarterly basis, to the CTO.

Ashenden and Maran Stations maintain only a few field workers who receive instructions directly from the Clerk or Foreman of the respective Station. (The Clerk at the Maran Station reports to the Field Assistant of the Cocoa Rehabilitation Project).

Preparing reports, certification of Pay Sheets and attending to staff complaints and requests are the major responsibilities of the overall supervisors with regard to the five Stations.

STATIONS RESOURCES

1. Human Resources

Established staff

Assigned to the five Stations are nineteen (19) established staff members most (74 percent) of whom have operated in their present positions for more than five years. The staff is relatively young (average age is 38 years), with seven members being under 30 years of age while only four are above 50 years. Most (63 percent) of the staff have had formal agricultural training; 42 percent possess certificates from the local Agricultural School, 10 percent possess diplomas from regional agricultural institutions, 10 percent have Bachelor of Science (B. Sc) degrees in Agriculture and 37 percent have been trained on the job, with more than ten years work experience (Table 2).

Non-established Staff

There are two non-established staff members, employed at the Mardigras Station - one holds a Certificate in Agriculture while the other has a Diploma in Agronomy.

Daily Paid Workers

The registered daily work force for the five Stations is 132 most (68 percent) of whom are employed at the Mirabeau Station. Most of these workers at the Mirabeau Station are engaged in plant propagation and food crop production activities. Tables 3 & 4 indicate the different areas of activities in which the daily paid workers on all five stations are involved; their wage rates are also indicated.

Among the daily paid workers on the Mirabeau Station are five young graduates from the local Agricultural Training School. Three of these graduates have also obtained Ordinary Level passes at the General Certificate of Education (GCE) examinations.

2. Natural Resources

Land

Lands at the Mirabeau Station, except for a 3-acre portion of hilly terrain, are generally flat to gentle sloping, and can be mechanically cultivated with minimum erosion risks. However, lands at the Mardigras Station are steeply sloping, but have been terraced in parts to facilitate intensive vegetable production activities. On the other Stations, the land slopes vary from "gentle" to "steep", and whereas a high proportion of lands at the Mt. Hartman Station can be mechanically cultivated, lands on the Maran and Ashenden Stations are generally too steep and too bouldery to be safely mechanized.

Soils on all Stations are generally deep, of good texture and structure, and are reasonably fertile. They are of the clay loam type and are moderately to well drained with pH ranging between 5.5 and 8.5.

The Stations' land use pattern is indicated in Table 5.

Water

The Mirabeau, Mardigras and Ashenden Stations have well maintained water sources (dams and reservoirs) independent of the domestic water supply. The Mirabeau and Ashenden supply sources are located, away from the Stations, at high elevations which allow for gravity flow to the Stations. However, the Mardigras supply source is at a relatively low elevation, on the Station, and

water therefore has to be pumped to and stored at a high elevation to be subsequently fed, through gravity flow, to the Station's production sites. Additionally, the Mardigras Station collects and stores rain water (from the farm building's roof) in a large (4,800 gallons capacity) water tank.

Maran has a small dam, but this has been inadequately maintained. This Station, as well as the Mt. Hartman Station, depend on domestic water supply sources. Water supply at Mt. Hartman is sometimes problematic, especially during the dry season (January to May).

Climate

The rainfall zone in which each of the five Stations is located is indicated in Figure 1. Generally, the Stations experience uneven rainfall distribution (Tables 6-9) and the number of "dry months" varies from 2 (for Ashenden and Maran Stations) to 3 (for Mardigras and Mirabeau Stations) to as high as 6-7 for the Mt. Hartman Station (Figure 2). Rainfall data for the Mt. Hartman Station are not available.

Average air temperatures normally range between 20 degrees C (68 degrees F) and 31 degrees C (88 degrees F). Temperatures are generally higher at Mt. Hartman than at the other Stations. On average, the lowest temperatures are recorded at the Ashenden Station. The Mardigras Station experiences a fairly constant wind, and has maximum exposure to full sunlight. The other Stations are well protected by windbreaks.

3. Capital Resources

Included in the Stations' capital resource inventory are items of investment capital (Permanent crops, buildings and installations) as well as operating capital (machinery, tools, implements, livestock and supplies).

Investment Capital

The Stations, except for the Mt. Hartman Livestock Station, have cultivated one or more tree crop species. Many of these plots were established initially as experimental or nursery plots which were eventually commercialized because of partial neglect at one time or other.

There are buildings and installations on all five Stations. Relevant information concerning these buildings and installations is given in Table 10. Maintenance of these buildings and installations is undertaken by a team of carpenters/masons attached to the Mirabeau Agricultural Station.

Buildings used as offices on the different Stations are furnished to varying degrees (Table 11).

Operating Capital

MOA operates a Farm Machinery Pool based at the Mirabeau Agricultural Station. However, two of the tractors are based at the Mt. Hartman Station. Most of the machinery and equipment are relatively old, and few are in good working condition (Table 12). It must also be noted that certain bits of equipment (fertilizer spreaders, harrows and seeders) at the Machinery Pool have never been used.

Each station is expected to have its own supply of farm tools, but the Ashenden and Maran Stations have none; however, both Stations have access to tools belonging to the Cocoa Rehabilitation Project. The Mirabeau Station has a fairly good stock of farm tools (Table 13).

Mardigras and Mt. Hartman Stations purchase and store their own farm supplies. However, supplies for both the Ashenden and Mirabeau Stations are purchased and stored by the latter station which provides the former with needed quantities, on request. It must be pointed out that

no records are kept concerning supplies requested by and provided to the Ashenden Station. Also, no records are kept with regard to supplies utilized by the Mirabeau Station. Items of supplies in stock at the Mirabeau Station during mid-September, 1988 are indicated in Table 14.

Small stock (Pigs, sheep and goats) are kept at the Mt. Hartman Station; Mardigras and Mirabeau Stations keep a few heads of cattle (Table 15).

4. Managerial Resources

None of the Stations' employees has had any specialized training in management or related disciplines. However, included among the Stations' nineteen established staff members are two University (B. Sc.) Graduates and two Diploma Graduates all of whom are likely to have some limited managerial capabilities which can be developed.

One of the Diploma Graduates was trained as a Veterinary Assistant but functions as a clerk at Mt. Hartman Livestock Station; the other supervises both the Ashenden and Mirabeau Stations in addition to providing technical guidance to workers at those Stations. One of the University Graduates has responsibilities for sugar cane development activities while the other is involved with vegetable and root crops development. None of the University Graduates has any managerial functions on any of the Stations, and both report directly to the CTO.

Although information on the Stations' activities is routinely collected, such data have never been analyzed so as to be of any use as a planning tool or as a means of reviewing the outcome of the Stations' activities.

The Stations have no planned programmes. They lack clear directions regarding what (which species/cultivars) to develop/propagate, and which species/cultivars to give priority consideration. Consequently, crop species and cultivars in least demand are often propagated in largest quantities. Also, agronomic problems investigated do not always coincide with those perceived by farmers as major production constraints.

Although the Stations' Management are aware of their shortcomings, very little has been done to analyze the situation and effect necessary adjustments. The prevailing situation is due mainly to limited collaboration and coordination between the Stations and the Extension Services. It is also probably a reflection of the MOA's failure to provide clear policy guidelines to the Stations' Management.

ACQUISITION AND UTILIZATION OF SUPPLIES

Mirabeau and Mardigras Stations purchase most of their supplies in bulk on an annual basis. However, the Mt. Hartman Livestock Station purchases feed and medication monthly and quarterly respectively. Because of storage problems, feeds purchased are not collected all at once but are taken from the feed mill in small quantities at a time.

To obtain supplies, the Stations must follow a set procedure, an appropriate bill Head is submitted to the MOA's Accounts Department which, provided funds are available under the relevant Accounts vote, then processes a Local Purchaser Order (LPO) for submission to the Ministry of Finance. Provided funds are available at the Government Treasury (i.e. if there are no cash flow problems), the Station's employee then converts the LPO into cash for purchasing the required items. Certified bills for the purchases made are later presented to the MOA's Accounts Department.

Because of uncertainties surrounding the Maran Station, the MOA has not implemented any activities there. Supplies are therefore not channelled to that Station. Ashenden keeps no records of supplies utilized. Information on supplies utilized at the Mardigras and Mt. Hartman Stations

could not be obtained. The estimated quantities of supplies utilized by the Mirabeau Agricultural Station during 1987 are given in Table 16. The Station keeps no separate records of supplies (fertilizer and pesticides, etc.) channelled to its major activities - food crop production, tree crop production and propagation - or to the Ashenden Station.

PRODUCTION COSTS

Production costs for planting materials of selected fruit crop species (mango, avocado, citrus and soursop) have been calculated based on information provided by the Officer-in-charge and the Foreman of the Mirabeau nursery. These, as well as the current selling prices for plants of the relevant crop species, are presented as follows:

<u>PLANTS</u>	<u>PRODUCTION COSTS (EC\$)</u>	<u>SELLING PRICE (EC\$)</u>
Mango	4.19	1.50
Avocado	4.47	1.50
Citrus	4.85	1.50
Soursop	3.11	1.00

Details of the calculations to arrive at the production costs of planting materials of the four fruit crop species are presented in Table 17. Relative to these calculations, the following must be borne in mind:

- 1) According to the nursery Foreman, the average percentage bud take for mango, avocado and citrus is 75%, 85% and 80%, respectively; production of soursop plants amounts to only 50%, on average, of the number of rooted cuttings potted; rooting of soursop cuttings is erratic.
- 2) The number of mango, avocado and citrus plants produced is equivalent to only one-third of the number of seedling rootstocks potted.
- 3) Soil and sand (for potting mixture) are obtained free of cost. Transportation costs are computed based on average minimum rates of private trucks plying for hire.
- 4) Capital depreciation and cost of maintaining parent stock are not included in the calculations.

Production costs for seven selected vegetable crops at the Mardigras Station are presented in Table 18.

The Mt. Hartman Station is believed to be operating with high levels of Government subsidy. For example, it is alleged that one piglet produced by the Station is sold for EC \$80.00 whereas the break-even price is EC \$220.00. However, attempts to obtain information to support this allegation proved futile.

STATIONS' EXPENDITURES AND REVENUE

Based on available information, the Stations' annual expenses (excluding salaries of established staff) are far in excess of revenue generated. A comparison of expenditure and revenue for selected activities at the Mirabeau and Mardigras Stations is presented in Table 19.

CONCLUSIONS AND RECOMMENDATIONS

- 1) On an overall basis, the Agricultural Stations under review appear to have adequate human and physical resources relative to activities undertaken. However, there is a grave shortage of

managerial skills. It is therefore considered essential that appropriate training opportunities be made available to selected Stations' personnel whose managerial capabilities need to be much improved to ensure greater efficiency in the management of the Stations' resources.

2) There is a wide variation in wage rates of daily paid employees within the same activity and doing similar jobs. This could adversely affect worker productivity. Clear criteria should be established for the categorization of daily paid workers, and such criteria should be reflective of worker productivity.

3) Supplies utilization/distribution at the Stations, especially Mirabeau Agricultural Station, must be rectified; appropriate records must be kept, and disbursement of supplies must be justified at all times.

4) Stations' operational expenses far exceed revenue collected. The reasons for this unhealthy situation must be investigated and appropriate action taken.

5) The future of the sole Livestock Development Station in the country is uncertain. Given the importance of the Livestock subsector and the difficulties related to the possible establishment of a new Livestock Station, consideration may be given to expanding and developing the Livestock component at the Mirabeau Agricultural Station.

6) The Station's organizational structure is rather loose and disjointed, and staff functions are not documented and streamlined. There is therefore need to define clearly the structural framework within which the Station's personnel must operate. Staff duties and responsibilities must also be clearly defined and documented.

7) The Stations' daily paid workers are under-employed. For example, sixty percent (60%) of those at the Mirabeau Station are employed for less than three days per week, on average. This situation brings into focus the questionable levels of productivity of supervisors and other monthly paid staff whose output is related to the activities of daily paid workers. The Stations should seek to maintain a stable work force whose skills and productivity could be constantly monitored and improved to the Station's advantage.

8) Vegetable production at the Mardigras Station is a very profitable activity. However the Station operates at a relatively large deficit which means that significant losses are incurred through the non-vegetable activities. If the Station is to strive towards becoming financially self-supporting, then greater emphasis must be placed on vegetable production.

9) Given the limitations of the present propagation techniques utilized (sub-division of tuber), the Stations are unable to satisfy the current demand for yam planting materials. However, because of their limited capabilities, the Stations' personnel cannot adequately address the situation. They need to be trained in the utilization of mini-sett technology which could be used for rapid multiplication of root and tuber crops.

10) Government subsidy on planting materials of mango, avocado, citrus and soursop vary from 179% (for mango) to 223% (for citrus). It is likely that planting materials of other crop species are also highly subsidised. There appears to be little or no justification for such subsidies. It is therefore recommended that subsidies on mango, avocado, citrus and soursop plants be removed, over a three-year period, beginning with a 50% subsidy reduction in 1990 followed by a further 25% reduction in each of the subsequent two years (1991 and 1992). It is further recommended that production costs for all other planting materials produced at the Mirabeau Station be determined, and selling prices adjusted accordingly. Production costs determinations and selling price adjustments should be undertaken and published annually.

The recommended new selling prices for mango, avocado, citrus and soursop plants in 1990, with an approximate 50% reduction in subsidy, are respectively \$2.85, \$3.00, \$3.20 and \$2.00.

ANNEX I: TABLES

Table 1: Inventory of Equipment and Materials at the Seed Testing Laboratory
Mirabeau Agricultural Station (March, 1989).

TYPE OF EQUIPMENT/MATERIALS	QUANTITY
Airconditioner	1
Copenhagen Baths for Germination	2
Lighted Workboards and Diaphanoscope	
Model MS5 Five Power 1 3/4" double lens 43 mm Magnifier	1
Model ML5C Magnifier lamps	2
Transparent plastic containers-square 4" x 3/4"	167
Transparent Plastic containers-square 4 5/16" x 4 5/16" x 1 1/8"	126
Transparent plastic containers approx. 1.22 x w13 x H8 for germination in sand	83
Transparent acrylic boxes for germination in towels H14" x 18" x 18"	5
Filter paper (round) diameter 9 cm	2,900
Filter paper for towels 46 x 57 cm	1,020
Counting board 9 3/8" x 15" with 100 holes	1
Model VPWS complete vacuum seed	
Counting work station with counter heads: 3 1/2" round x 100, size 2; 4" x 4" x 100, size 1; 5" x 6" x 50, size 7; 5" x 6" x 100, size 4	1
Roll carts approx. L100 cm x W50cm x H120cm with 5 adjustable shelves-for germination containers	3
M8 microscope with drawing tubes	1
Seed containers	4
Whatman grade 1 610mm x 37mm wicks for Copenhagen Baths	20
Germination dishes	48
30 mm aluminum dishes with close fitting lids	32
250mm vacuum desiccator	1
Desiccator plates, 100 mm diameter	3
Torsion balance scale	1
Harvard Trip balance scale, complete with sets of 12 weights totalling 1,000 gmms	1
Triple purpose Heet-cab oven	1
Refrigerator	1
Hot water bath	1
Hamboldt Testing equipment (Model H-3966)	1

Source: File of the Ministry of Agriculture, Archibald Avenue, St. George's

Table 2 : Stations' Established Staff

AGRICULTURAL STATION	NAME OF STAFF MEMBER	QUALIFICATION	DESIGNATED POSITION	NO. OF YEARS IN PRESENT POSITION	MAJOR DUTIES
Mirabeau	N. Burris	Diploma	Agricultural Assistant	9	General Supervisor
	S. Taylor	—	Foreman	9	Plant Propagation
	I. Welsh	Certificate (Mats)	Student Agri. Instructor	6	Plant Propagation
	M. Samuel	Certificate (Mats)	Student Agri. Instructor	5	Plant Propagation
	A. Isaac	Certificate (Mats)	Student Agri. Instructor	6	Plant Propagation
	A. Neckles	Certificate (Mats)	Propagator Attendant	6	Plant Propagation
	P. John	Certificate (Mats)	Student Agri. Instructor	6	Field Supervisor
	J. Wharwood	Certificate (Mats)	Student Agri. Instructor	6	Record Keeping
	W. Alexander	Certificate (Mats)	Seed Technologist	1	Seed Testin Treatment
	A. Domnic	—	Propagator Attendant	17	Plant Propagation
	A. Charles		Clerk	13	Compiling data and Keeping
	G. Charles		Clerk	26	Plant Propagation records; making pay sheets to paying in cash to the revenue office
		K. Joseph	B.Sc (Cuba)	Agronomist	2
R. O'Neale		B.Sc (Cuba)	Agronomist	2	Food Crop Development
Ashenden	K. Bishop	—	Foreman	3	Supervisor
	C. Victor		Clerk	9	Clerical
Mardigras	L. Moore	—	Foreman	12	Supervisor
	A. Hillalre	Certificate (Mats)	Student Agri. Instructor	7	Clerical & Supervisory
Mt. Hartman	S. Cox	Diploma	Veterinary Assistant	3	Veterinary Services

* MATS = Mirabeau Agricultural Training School

TABLE 3: Utilization and Cost of Daily Paid Labour (1987) Mirabeau Agricultural Station

STATION'S ACTIVITIES	NO. OF EMPLOYEES ASSIGNED	DAILY WAGE RATE (\$)	TOTAL NO. OF DAYS WORKED	AVERAGE DYS/WK WORKER	TOTAL WAGE BILL (\$)	TOTAL SAVINGS BONUS PYMNTS	GRAND TOTAL PYMNTS
Plant		10.13-					
Propagation	25	19.80	3,818	2.9	48,023.86	1,181.00	49,204.86
Food Crop	15	10.13- 11.47	3,476	2.3	37,813.66	1,138.00	39,551.66
Livestock	8	11.47- 16.02	1,774	4.3	18,644.12	887.00	19,531.12
Carpentry	5	32.10- 60.59	779	3.0	30,735.04	389.50	31,124.54
Chauffeur	1	27.50	261	5.0	6,463.17	130.50	6,593.67
Tuck Loading	3	16.02	647	4.1	9,872.72	323.50	10,196.22
Watchman	2	20.88	728	7.0	13,545.75	364.00	13,909.75
Tractor Operator	2	16.50- 30.00	1,527	5.9	37,083.30	763.50	37,846.80
Machinery Repairs	10	8.00- 12.00	1,821	3.5	31,031.17	910.50	36,941.67
Clerical	2	19.80 27.50	520	5.0	12,298.00	260.00	12,558.00
TOTAL	90				245,510.79	6,947.50	252,458.29

TABLE 4: Daily Paid Employees (1987) - Ashenden, Maran, Mardigras and Mt. Hartman

STATION	ACTIVITIES UNDERTAKEN	NO.OF EMPLOYEES ASSIGNED	DAILY WAGE RATE (\$)	AVE. NO OF DAYS WORKED PER WEEK
Ashenden	Security	1	15.78	7.0
	Plant Propagation	2	16.02	3.7
	Field Maintenance	3	12.50	3.0
Maran	Nursery Maintenance	5	12.50-17.77	2.5
Mardigras	Stock Keeping	1	15.95	7.0
	Security		15.00-16.50	5.0
	Crop Production	14	15.00	4.0
Mt. Hartman	Clerical	1	28.33	7.0
	Stock keeping		15.04-18.61	5.0
	Planting and			
	Harvesting grass	7	13.50-15.46	3.5
	Field Supervision	1	21.65	5.0
	Repairs & Maintenance	2	37.45-48.15	5.0
	Security	2	18.56	7.0

TABLE 5: Agricultural Stations' Land Use Pattern

ITEM	AREA OCCUPIED (ACRES), BY STATION				
	ASHENDEN STATION	MARAN STATION	MARDIGRAS STATION	MIRABEAU STATION	MT. HARTMAN STATION
Permanent Crops	8.0	4.0	24.0	9.0	—
Temporary Crops	0.5	—	10.0	10.0	5.0
Nurseries	7.0	6.0	0.2	9.0	—
Propagating Sheds, etc.	2.0	2.0	—	3.0	—
Livestock Pens	—	—	—	1.0	2.0
Other Buildings	0.5	0.5	0.8	2.0	0.5
Grazing Pasture	—	—	0.5	2.0	10.0
Forest/Uncultivated	30.0	5.5	44.5	3.0	17.5
Total Acreage	48.0	18.0	80.0	39.0	35.5

TABLE 6: Ashenden Agricultural Station - Monthly Rainfall Data 1978-1987)

MONTH	RAINFALL (INCHES), BY YEAR									
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
January	6.32	2.32	12.09	6.67	6.44	5.61	7.14	8.17	4.19	4.1
February	0.75	2.83	4.09	4.79	7.84	1.82	6.17	5.87	2.18	0.6
March	1.46	3.58	4.40	2.63	2.37	1.41	3.12	3.37	6.15	6.05
April	3.31	5.77	1.84	10.93	3.03	4.14	1.01	3.88	0.92	0.4
May	3.61	5.16	2.83	7.03	2.38	12.13	7.55	3.67	2.29	3.6
June	4.77	6.70	9.50	8.49	8.36	11.66	3.93	6.22	13.36	10.4
July	3.97	13.61	9.44	9.18	5.47	11.11	9.13	12.67	6.58	16.4
August	0.52	0.09	11.97	10.71	9.67	9.70	11.22	8.19	8.24	8.1
September	5.29	11.32	8.79	8.60	5.27	11.69	8.09	11.86	18.39	13.3
October	6.89	N.A.	19.69	4.03	12.99	9.90	13.57	16.01	12.41	9.0
November	7.39	15.76	7.19	7.64	7.67	9.70	11.21	13.65	8.62	9.3
December	3.66	20.70	11.76	9.59	8.27	7.18	8.32	13.46	8.32	5.9
TOTAL	67.94	87.84	104.30	90.29	79.76	96.04	90.46	107.02	91.65	88.0
MEAN	5.66	7.99	8.69	7.52	6.65	8.00	7.54	8.92	7.64	7.3

N.A. means "Not Available"

Source: Land and Water Resource Unit, Ministry of Agriculture

TABLE 7: Maran Agricultural Station - Monthly Rainfall Data (1978-1987)

MONTH	RAINFALL (INCHES), BY YEAR									
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
January	4.37	5.00	12.70	3.77	6.28	6.51	6.34	6.97	3.85	2.24
February	0.73	2.39	2.86	6.35	8.68	0.81	8.07	4.49	2.10	0.89
March	2.93	4.19	3.29	2.06	3.19	1.43	2.28	2.99	3.90	N.A.
April	1.52	3.63	1.42	11.03	3.85	1.54	1.89	4.80	1.00	0.25
May	3.87	5.11	3.27	8.59	3.42	8.27	5.91	3.31	2.78	4.36
June	7.80	12.94	13.67	8.22	7.80	11.48	6.18	5.51	14.72	9.34
July	17.65	17.92	12.00	12.28	7.79	12.91	12.20	10.71	7.09	9.52
August	17.38	15.33	13.67	13.33	11.97	9.27	10.98	10.87	11.30	9.94
September	4.45	12.43	9.65	8.01	7.89	16.69	12.05	11.06	8.30	11.58
October	13.45	7.79	21.89	7.91	12.61	8.61	16.30	14.45	9.25	6.59
November	8.63	21.54	11.90	6.61	8.06	12.42	17.52	8.50	6.22	10.56
December	4.22	16.26	5.70	9.34	7.91	12.06	8.03	11.46	9.08	4.93
TOTAL	87.04	124.52	112.02	97.53	89.45	102.00	107.75	95.12	79.59	70.20
MEAN	7.25	10.37	9.33	8.13	7.45	8.50	8.98	7.93	6.63	6.38

N.A. means "Not Available"

Source: Land and Water Resource Unit, Ministry of Agriculture

TABLE 8: Mirabeau Agricultural Station - Monthly Rainfall Data (1978-1987)

RAINFALL (INCHES), BY YEAR										
MONTH	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
January	5.29	1.93	8.81	5.03	4.67	4.02	7.72	7.76	4.16	2.81
February	0.92	2.16	2.77	4.75	5.89	0.67	9.21	3.27	3.02	0.39
March	2.22	5.79	2.54	3.36	0.89	1.38	2.40	1.85	1.38	4.53
April	2.54	4.48	1.43	15.08	4.07	2.24	2.24	8.03	0.85	0.48
May	1.62	4.31	2.51	4.95	3.23	11.06	6.10	3.27	1.86	2.25
June	6.89	12.39	7.41	7.26	6.56	9.29	4.57	5.83	10.79	5.13
July	13.12	16.21	5.95	11.46	6.10	11.06	10.63	9.02	5.13	8.63
August	14.84	12.95	9.67	10.10	7.58	8.86	12.83	12.40	7.30	6.79
September	5.70	10.48	7.77	9.69	4.16	13.35	8.23	10.43	16.87	14.31
October	6.53	7.97	16.56	7.04	12.57	10.43	16.18	13.82	11.18	9.74
November	7.88	20.37	7.94	4.23	8.69	9.21	17.76	7.44	7.13	9.81
December	5.33	17.80	8.54	6.59	6.41	7.68	9.96	7.56	5.66	5.21
TOTAL	72.88	116.84	81.94	89.54	70.82	89.25	107.83	90.68	75.33	70.08
MEAN	6.07	9.74	6.83	7.46	5.90	7.44	8.99	7.56	6.28	5.84

Source: Land and Water Resource Unit, Ministry of Agriculture

TABLE 9: Mardigras Agricultural Station - Monthly Rainfall Data (1978-1987)

RAINFALL (INCHES), BY YEAR

MONTH	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
January	-	-	11.07	2.96	6.14	N.A.	N.A.	N.A.	3.72	1.74
February	-	-	4.18	3.76	7.67	N.A.	N.A.	N.A.	7.50	N.A.
March	-	-	4.68	1.24	2.31	N.A.	N.A.	N.A.	0.39	13.20
April	-	-	1.33	7.66	N.A.	N.A.	N.A.	N.A.	N.A.	1.67
May	-	-	2.22	2.25	2.04	N.A.	N.A.	N.A.	2.00	8.69
June	-	-	8.23	11.02	7.16	N.A.	N.A.	N.A.	26.33	9.82
July	NOT AVAILABLE		9.62	9.58	5.85	N.A.	N.A.	10.28	21.03	18.03
August	-	-	11.01	10.12	9.36	N.A.	N.A.	6.05	29.12	12.04
September	-	-	8.05	6.86	6.83	N.A.	N.A.	11.72	8.36	15.52
October	-	-	N.A.	5.78	10.76	N.A.	N.A.	12.53	N.A.	10.36
November	-	-	8.51	6.54	7.87	N.A.	N.A.	11.82	N.A.	9.95
December	-	-	9.37	9.33	1.16	N.A.	N.A.	15.17	N.A.	6.19
TOTAL	87.04	124.52	78.27	77.10	67.1	-	107.75	-	-	107.21
MEAN	7.25	10.37	7.12	6.43	6.11	-	8.98	-	-	9.75

N.A. means "Not Available"

Source: Land and Water Resource Unit, Ministry of Agriculture

TABLE 10: Station's Building and Installations

STATION	BUILDING AND INSTALLATIONS	NO.	TYPE	SIZE (SQ FT)	YEAR - CONSTRUCTED	CONDITION
Mirabeau	Officer's Quarters	1	Concrete	900	1957	Fair
	Watchman's Quarters	2	Concrete	144,120	1957	Good
	Office	1	Concrete	1,200	1957	Fair
	Store Room	1	Concrete	300	1957	Good
	Seed Laboratory & Store Room	1	Concrete	800	1982	Good
	Potting Shed	2	Concrete	1200,400	1957	Good
	Storage Shed	2	Concrete	4170,325	1958	Good
	Livestock Shed	2	Concrete	2100,1260	1960	Poor
	Rotting Bin	6	Concrete	90x6	1978	Good
	Nursery Shed	1	Saran	11,776	1957	Good
	Water Tank	1	Metal		1978	Good
Ashenden	Officer's Quarters	1	Concrete	1,000	1981	Good
	Watchman's Quarters	1	Concrete	140	1948	Poor
	Office	1	Concrete	425	1948	Poor
	Store Room & Garage	1	Concrete	1,520	1948	Good
	Sliding Roof	1	Wood	176	1983	Fair
	Potting Shed	1	Concrete	720	1983	Good
	Storage Shed	1	Concrete	3,819	1988	Good
	Soil Shed	1	Concrete	660	1963	Good
	Foreman Quarters	1	Wood	440	1948	Poor
Maran	Officer's Quarters	1	Concrete	920	1948	Poor
	Office	1	Concrete	286	1948	Fair
	Foreman's Quarters	1	Concrete & Wood	418	1948	Poor
	Potting Shed	1	Concrete	1,400	1948	Fair
	Nursery Shed		Saran	39,800	1948	Poor
	Rotting Bin		Concrete	4,900	1948	Fair
	Storage Floor		Saran	2,000	1948	Fair
Mt.Hartman	Office	1	Wood	288	1980	Fair
	Watchman's Quarters	1	Wood	468	1980	Fair
	Garage	1	Concrete	300	1980	Fair
	Store Room	1	Concrete	570	1980	Fair
	Livestock Pen	5	Concrete	384	1980	Good
				1,824	1980	Good
				11,400	1980	Good
			2,208	1980	Poor	
			4,410	1980	Fair	
Mardigras	Office & Store Room	1	Concrete	1,056	1978	Fair
	Training Centre	1	Concrete	3,500	1987	Good
	Pump House	1	Concrete	100	1980	Fair
	Cow Pen	1	Concrete	546	1980	Fair

TABLE 11: Office Furniture and Miscellaneous Items

STATION	ITEM	YEAR	TYPE	NO	CONDITION
Mirabeau	Chair	1986	Wood	11	Good
	Desk	1957-1986	Wood	3	Fair
	Table	1957	Wood	6	Fair
	Cupboard	1986	Wood	2	Good
	Filing Cabinet	1957	-	1	Fair
Ashenden	Desk		Wood	3	Good
	Chair		Wood	3	Good
	Cupboard		Wood	1	Good
	Iron Safe		Metal	1	Good
	Platform Scale		Metal	1	Good
	Counter Scale		Metal	1	Good
	Rain Gauge		Metal	1	Good
Maran	Desk		Wood	2	Good
	Table		Wood	1	Good
	Cupboard		Wood	2	Good
	Chair		Metal	5	Good
	Bench		Wood	1	Good
	Stool		Wood	1	Good
	Book Shelf		Wood	1	Good
	Filing Cabinet		Metal	1	Good
Iron Safe		Metal	1	Good	
Mardigras	Desk		Wood	5	Good
	Chair		Wood	3	Good

TABLE 12: Station's Machinery and Equipment

STATION	ITEM	NO.	YEAR PURCHASED	CONDITION	
Mirabeau	Tractors (Rubber Wheel)	10	1976, 80, 81	Good (3) Fair (2) Poor (5) Poor	
	Tractor (Track- Type)	7	1980	Poor	
	Fertilizer Spreader	3	1982	Never Used	
	Harrow	3	1982	Never Used	
	Seeder	5	1982	Never Used	
	Ridgers	1	1981	Good	
	Rotovator	1	1981	Fair	
	Disc Plough	3	1981	Fair	
	Truck	2	1979, 1986	Good	
	Jeeps & Pickups	3	1986	Good	
	Low Volume Sprayer	2	1987	Good	
	Knapsack Sprayer	2	1986	Good	
	Rainers (Sprinklers)	12	1986	Good	
	Mt.Hartman	Tractors (Rubber Wheel)	1	1980	Fair
	Maran	None	-	-	-
Mardigras	Knapsack Sprayer	2	1981	Poor	
	Low Volume Sprayer	1	1981	Fair	
	Sprayer Spray Can	1	1986	Good	
	None				
Ashenden	None				

TABLE 13: Station's Farm Tools

STATION	ITEM	NO.	YEAR PURCHASED	CONDITION
Mirabeau	Fork	5	1988	Good
	Spade		1988	Good
	Rake	3	1988	Good
	Water Hose	500 ft	1988	Good
	Pruning Shears		1988	Good
	Shovel	6	1988	Good
	Scoops	24	1986	Good
	Hoe	3	1988	Good
	Wheel Borrow	3	1983	Poor
	Budding Knives	9	1985, 1988	Good
	Pruning Saw	2	1988	Good
Ashenden	None	-	-	-
Maran	None	-	-	-
Mt. Hartman	Shovel	1	1982	Good
	Fork	1	1982	Good
	Rake	2	1982	Good
	Watering Hose	100 ft	1982	Good
	Livestock Scale	2	1982	Good
	Hand Scale	1	1982	Good
	Hanging Scale	1	1982	Good
	Wheel Barrow	1	1982	Fair
Mardigras	Pruning Saw	1	1986	Good
	Fork	4	1986	Good
	Spade	4	1986	Good
	Shovel	2	1981	Fair
	Grub Hoe	2	1981	Fair
	Rake	3	1981	Fair
	Hoe	3	1981	Fair
	Hand Fork	1981	Good	
	Hand Scale	1	1981	Good
	Hanging Scale	1	1981	Fair

TABLE 14: Supplies in Stock at Mirabeau Agricultural Station (September, 1988)

ITEM	QUANTITY
Insecticides:	
- Folithion	2 x 26 oz
- Basudin	18 x 250 cc
- Tambo 440 E. C.	2 x 500 cc
- Ambush	1 litre
- Karate	2 liters
- Actellic 50 E. C.	1 litre
- Dipterex	8 lb
- Sevin	
Miticide:	
- Kelthane	1 x 26 oz
Nematicide:	
- Vydate	3 gals
Herbicides:	
- Roundup	
- Gramoxone	8 x 5 liters
Sticker:	
- Extravon	5 x 26 oz
Paint	5 gals
Paint Brush	2
Formalin	2.5 gals
Fertilizers:	
- Calcium Ammonium Nitrate	0.5 ton
- Sulphate of Ammonia	0.75 ton
- Triple Super-phosphate	0.35 ton
Potting bags(approx. number)	60,000
Budding Tape	60 rolls
Labels	9 rolls

TABLE 15: Station's Livestock Inventory (September 1988)

STATION	TYPE OF ANIMAL	NUMBER
Mt. Hartman	Sheep:	
	- Ewes	51
	- Mature Rams	4
	- Male Lambs	15
	- Female Lambs	5
	Pigs:	
	- Sows	22
	- Gilts	24
	- Weaners	28
	- Boars	6
	- Piglets	25
	Goats:	
	- Does	14
	- Bucks	4
- Male Kids	4	
- Female Kids	11	
- Wether	2	
Mardigras	Cattle:	
	- Bulls	2
	- Cows	4
	- Calf (Male)	1
Mirabeau	Cattle:	
	- Bulls	2
	- Cows	5
	- Heifers	2
Ashenden	None	
Maran	None	

TABLE 16: Farm Supplies Utilized by Mirabeau Station During 1987.

ITEM	QUANTITY (APPROXIMATE)
Potting bags	60,000
Hormones (rotting)	10 lb
Budding Tape	60 rolls
Labels	1 roll
Fertilizer:	
- Calcium Ammonium Nitrate	2 tons
- Sulphate of Ammonia	1.5 tons
- Triple Superphosphate	0.5 ton
Pesticides:	
- Fungicide	60 lb
- Nematicide	
(1) Vydate	2 gal
(2) Furadan	25 lb
- Insecticide (Liquid)	4 gal
- Insecticide (Powder)	25 lb
- Herbicide	
(1) Roundup	4 gal
(2) Gramoxone	30 gal
- Miticide	gal

TABLE 17: Production Costs for Planting Material of Selected Fruit Crops
(Mango, Avocado, Citrus, Soursop) At Mirabeau Agricultural Station.

INPUTS	COSTS (CENTS) PER PLANT			
	MANGO	AVOCADO	CITRUS	SOURSOP
<u>MATERIAL</u>				
Seeds	N.A.	30.00	0.00	N.A.
Pen Manure	10.97	10.97	10.97	7.31
Soil	0.00	0.00	0.00	0.00
Sand	0.00	0.00	0.00	0.00
Chlorax for treating seeds	0.00	0.06	0.00	0.00
Potting bags	23.90	23.90	23.90	15.93
Dlothene Bags for Covering Scion	0.75	0.75	N.A.	N.A.
Budding Tape	7.31	7.31	7.31	N.A.
Rotting hormone	N.A.	N.A.	N.A.	2.57
Soil Sterilant (Basamled)	0.56	0.56	0.56	0.37
Pesticite	0.80	0.80	0.60	0.40
Fertilizer	30.80	30.80	61.50	15.40
Label	0.60	0.60	0.60	0.60
Sub-Total	75.69	105.75	106.54	42.58
<u>LABOUR & TRANSPORTATION</u>				
Collecting fruits to extract seeds	N.A.	N.A.	10.13	N.A.
Preparing seeds for sowing	N.A.	25.00	4.32	N.A.
Collecting Seedlings	16.20	N.A.	N.A.	N.A.
Collecting Cuttings	N.A.	N.A.	N.A.	31.68
Preparing rooting bin	N.A.	N.A.	N.A.	15.84
Treating and setting cuttings	N.A.	N.A.	N.A.	32.08
Collecting soil, sand and pen manure	7.56	7.56	7.56	5.04
Preparing potting mixture	17.35	17.35	17.35	11.57
Moving potting mixture to sterilizing area	8.10	8.10	8.10	5.40
Sterilizing potting mixture	5.40	5.40	5.40	3.60
Filling pots	27.00	27.00	27.00	18.00
Potting seedling rootstock	20.25	N.A.	20.25	N.A.
Potting cuttings	N.A.	N.A.	N.A.	13.50
Sowing Seeds	N.A.	1.53	2.29	N.A.
Watering seedling rootstock	11.80	27.53	11.80	N.A.
Moving seedlings to open area	10.13	N.A.	10.30	N.A.
Preparing scion material	24.75	N.A.	N.A.	N.A.
Collecting scion material	16.50	22.77	2.38	N.A.
Grafting/Budding	20.73	22.77	24.62	N.A.
Moving potted plants to Nursery shed	N.A.	N.A.	N.A.	10.30
Watering propagated plants	0.00	47.52	0.00	31.68
Uncovering and untaping graft, and cutting back rootstock	33.75	13.20	40.50	N.A.
Applying Pesticides and fertilizer	49.68	49.68	74.52	24.84
Weed control and general Maintenance	33.75	27.00	71.07	27.00
Supervision and Management	27.53	27.53	27.53	27.53
Transportation of soil, sand and pen manure	10.00	10.00	10.00	10.00
Transportation of seedlings, seeds, cuttings and budwood	3.00	1.50	3.00	0.00
Sub- Total	343.48	341.44	378.12	268.06
Grand Total	419.17	447.19	484.66	310.64

* N.A. means "Not Applicable"

TABLE 18: Production costs for selected Vegetable and Root Crops (Mardigras Station)

CROP	VARIETY	PRODUCTION (LBS) PER ACRE	PRODUCTION (COST \$) PER ACRE	PRODUCTION (COST \$) PER LB	SELLING PRICE PER LB	PER CENT PROFIT
Beans	Contender	9,674	5,140	0.53	1.40	164
Cucumber	Slice Master	11,050	3,654	0.33	0.70	112
Carrot	Danvers 126	6,027	3,555	0.59	1.28	117
Sweet Pepper	California Wonder	6,666	4,456	0.67	2.03	203
Cabbage	K. K. Cross	6,678	2,467	0.37	1.75	373
Cauliflower	White Confessa	3,742	2,004	0.54	2.25	317
Sweet Potato	A 26/7	11,596	2,488	0.21	0.85	305

Source: Files of the Mardigras Agricultural Station

TABLE 19: Comparative Expenditures and Revenues for Selected Activities -
Mirabeau and Ashenden Stations.

STATION	REFERENCE PERIOD	ACTIVITY	EXPENDITURE (\$)	REVENUE (\$)
Mirabeau	Jan. - Dec., 1987	Tree Crop Production	68,106.38	17,278.55
		Food Crop Production	39,342.57	7,473.62
		Farm Machinery Service	82,630.20	13,867.00
Mardigras		All Activities	80,882.19	27,511.00
		Vegetable Production	Not Available	26,313.55

Source: Files of the Mirabeau and Mardigras Stations.

ANNEX II: FIGURES

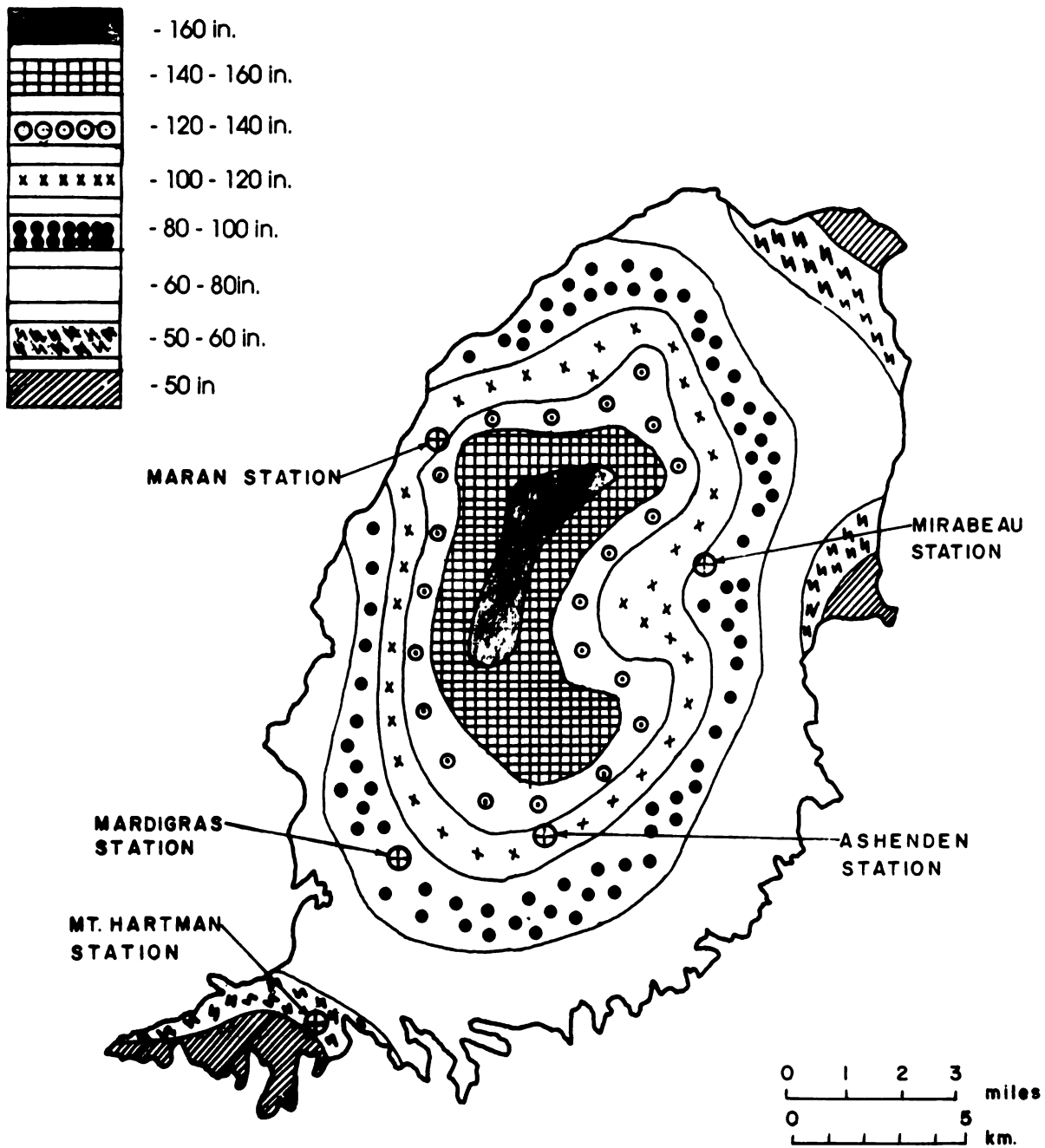


FIGURE 1: MAP OF GRENADA, SHOWING LOCATION OF AGRICULTURAL STATIONS WITHIN RAINFALL ZONES.

SOURCE: SOIL AND LAND USE SURVEY, GRENADA 1969

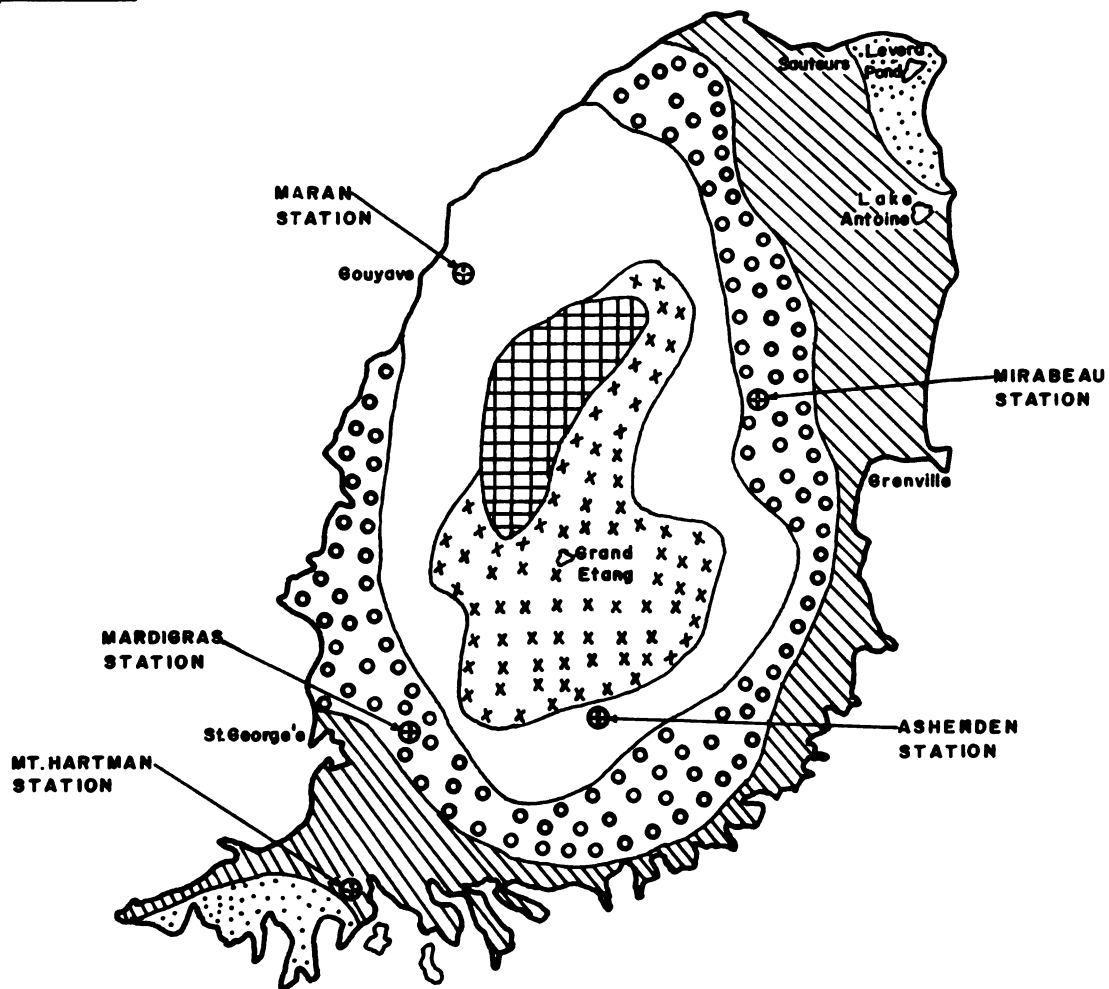
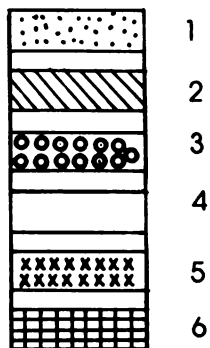



FIGURE: 2 MAP OF GRENADA SHOWING LOCATION OF AGRICULTURAL STATIONS WITHIN ZONES CHARACTERISED BY "LENGTH OF DRY SEASON"

1= 6-7 DRY MONTHS, VERY INTENSE DRY SEASON; 2=4-5 DRY MONTHS, INTENSE DRY SEASON; 3=3 DRY MONTHS, MARKED DRY SEASON; 4=2 DRY MONTHS, WEAK DRY SEASON; 5-1-2 DRY MONTHS, VERY WEAK DRY SEASON; 6= LESS THAN 1 DRY MONTH.

SOURCE: LAND USE IN GRENADA (BY CHARLES H. FRANCIS SEPTEMBER 1974.

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