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THE SMALL FARMER IN WESTERN PORTLAND AND EASTERN ST. MARY (JAMAICA)

BASES FOR AN INTEGRATED RURAL DEVELOPMENT PROGRAM

Report of the Agriculture Sector Assessment team of
the Office of International Cooperation and Development
U.S. Department of Agriculture to
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Introduction

Our main concern in this assessment of the agricultural sector is the small farmer: the conditions under which he is operating, the role he is playing--and might play--in the continuing transition from a traditional to a more modern agriculture, and his present and future welfare. The small farmer is viewed, however, against the background of the agricultural sector as a whole. In switching the spotlight from one to the other, matters implicit in this relationship have been brought to the surface for review and examination. One result of this process has been the confirmation (to some) and the discovery (to others) that the rhetoric on behalf of the small farmer, for the past couple of decades, has been greater than the value received. What the small farmer has obtained is a small, and in certain instances a declining, share of the technical and financial assistance intended for this sector. It should be added--to the disadvantage and detriment of both.

Although successive Governments have shown a continuing interest in the welfare of the small farmer in the postwar period, it cannot be said that a consensus ever emerged with respect to his potential to contribute to his own welfare and to the Nation's goals in this sector. The present study is an effort to bring together the relevant data on this subject, to up-date 'old' data where possible, to identify the key constraints to the improvement of his condition, and to offer some suggestions for their neutralization. It is hoped that the study will serve as a basis for action in specific areas.

The assessment is divided into two parts. Part I (Volume I) is an island-wide view of the small farmer. It deals with the characteristics of the small farmer and the conditions under which he is operating. It examines the constraints which press upon him at various levels: economic, social, administrative and cultural. Part I also provides the background and standard of comparison for the appraisal of the assets and liabilities of the Target Area. The performance of the agricultural sector and its contribution to national production goals and targets are examined in Chapter 1. The physical environment (topography, soils, climate, and water) is described in Chapter 2. In Chapter 3, the characteristics of the Jamaican small farmer are reviewed--how his means of production have remained traditional even as the economy moved forward during the 50s and 60s; and how, despite it all, he remains the chief producer of domestic food crops and of a substantial part of the export crops. By using unpublished census data on the constituency (a smaller unit than the parish), small farmers numbers and location were delimited more precisely. The resources and operation of the typical small farm, including inputs and implements, are examined in Chapter 4. The extent to which the small farmer has access to rural infrastructure is examined in Chapter 5. Chapters 6 and 7 are devoted to agricultural support activities, commercial and non-commercial, respectively. Demographic, social, and attitudinal aspects, including a profile of the small farm family, are considered in Chapter 8. In Chapter 9, the question of the number and spacing of market towns is examined, including the place of these in the rural development/urban heirarchy, and regional development. Finally, in Chapter 10, the constraints named and analyzed in the preceding chapters are summarized, and a strategy is suggested for reducing or neutralizing their impact.

Part II (Volume II) deals with the small farmer in the Portland Region (West Portland and Eastern St. Mary parishes). The project area consists essentially of the constituency of Western Portland plus that portion of the constituency of Eastern Portland that includes Port Antonio, and that part of Eastern St. Mary parish contained within the Portland Region (defined by the Town and Country Planning Department). A special effort was made to look into the specific problems of the farms and farming communities along the valleys of the Rio Grande River, Swift River, Spanish River, and Buff Bay River, and into the potential for future development food crops, export crops, agro-industry, market towns and regional centers. A number of indicators (income, acreage, volume of production, yields, population growth and migration, etc.) show that this part of the North Coast has seen its development needs postponed, particularly as they apply to the small farmer. The analysis makes use of the methodological consideration that, whatever the problems of the small farmer on an island-wide basis, they combine in a very specific proportion in a particular area. Projects are proposed for the elimination or neutralization of these constraints. The inter-sectoral nature of these projects provides the basis of an integrated rural development program in the Target Area.

Such a program would not only fill a deeply felt need in the region, but, it is believed, would have some degree of replicability in other parts of the country.

Participants of the Agricultural Sector Assessment team were: Dr. Harold Brodsky, Dr. Joan Campbell, Dr. Frank Erickson, Mr. Francis Kutish, Mr. Ray Williams, Dr. Orlin Scoville, and Mr. David Sarfaty, Team Leader.

For further details with respect to any of the chapters in this report, reference may be made to the individual studies made by members of the Agricultural Sector Assessment team.

Brodsky Harold. Regionalism and Rural Development.

Campbell, Joan. Demographic, Social and Attitudinal Aspects in the Rural Sector of Jamaica and Constraints to Agricultural Development in Jamaica and Suggested Strategies to Overcome Some of Them.

Erickson, Frank. Location of the Rural Majority, Physical Resources and Infrastructure and Portland Parish: Location of the Small Farmer, Physical Environment and Developmental Infrastructure.

Kutish, Francis. Assessment of Agricultural Marketing in Jamaica with Special Reference to Small Farmers in Portland Parish.

Scoville, Orlin J. The Rural Poor in Jamaican Agriculture, Farm Resources and Resource Potentials on Small Farms in the Target Area (Central and West Portland and Eastern St. Mary), Production Constraints on Small Farms and Production Potentials, Institutional Constraints of Development to Small Farms in Jamaica, Strategy and Projects for Development in Target Areas, and Small Farm Development in Jamaica: A Summary.

Williams, Ray. Agro-Industry Report.

1. The Target Area

1.1 Characteristics; Reasons for Selection

The Target Area consists of the constituency of Western Portland, and that portion of the constituency of Eastern Portland which includes the city of Port Antonio, plus the adjacent strip of the parish of St. Mary which includes the towns of Enfield and Iter-Boreale. The area is about 175 square miles. Total population is roughly 50,000, of which 35,000 are rural. The Target Area is typical of rural Jamaica. Small farmers predominate. They occupy less than five acres on which they practice mixed cropping; they use the characteristic implements of hoe, machete, and fork. There are numerous small villages with incomplete services and few market towns.

Indeed, it might be said of the Target Area that it is "more than" typical. In respect to the following indices, its proportion is higher than the national average: (a) rural population, (b) acreage cropped on small farms in Western Portland in relation to total acreage cropped, and (c) workers employed in agriculture in relation to total workers employed. (Table 1-1)

For Jamaica as a whole, almost 60 percent of the total population is rural; for the parish of Portland, the figure is 77.5 percent. For the constituency of Western Portland (which contains the bulk of the population and land of the Target Area), the figure rises to 87.1 percent. Acreage cropped on farms under five acres averaged 27.9 percent of total acreage cropped in Jamaica; in West Portland, the figure is 29.4 percent. And while the number of workers employed in agriculture in Jamaica is 30.0

percent, for the parish of Portland, the figure is 47.0 percent. For the constituency of West Portland, the figure is 59.0 percent.

In still other ways, the Target Area is strongly typical of the nation's small farmers. Probably the most characteristic feature of the Jamaican agriculture is the hillside farmer. The vast majority of the nation's small farmers--over 80 percent of the total--occupy the inland slopes.* In terms of annual income, the provision of basic infrastructure, health, housing and educational services, and 'urban' amenities, the Target Area has lagged behind the rest of the country. To be sure, this is a matter of degree, since the distribution of rural population and of small farmers is fairly even throughout the country, and the degree of difference is, in many instances, without sharp distinction. Nevertheless, after taking the above into account, these conditions plus the heavy rainfall and erosion along the steep hillsides, the stagnant economy, the considerable migration and the slow growth of the population, mark the Target Area as one which has progressed little over the past two decades.

Annual income is estimated to be about J$900-$1200 for a four- to five-acre farm of which there may be an acre in banana or coffee (depending on the altitude), another acre intercropped with cocos, peas or dasheen, and the rest in unimproved pasture or woods.

There are only two small agro-industrial installations in Portland Parish which puts it at the bottom of all the parishes in this respect.

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*A rough calculation of Portland's topography is the following: Less than 500 feet, 88 square miles; 500-1000 feet, 65 square miles; 1000-2000 feet, 90 square miles; and over 2000 feet, 88 square miles. In short, about 75 percent of the topography is over 500 feet versus 60 percent for Jamaica as a whole.

Table 1-1. Portland Parish vs. Jamaica: Rural Population, Farms Under Five Acres, and Workers in Agriculture, 1968.

	West Portland Constituency	East Portland Constituency	Portland Parish	JAMAICA
Rural Population	22,346	31,328	53,678	1,055,619
Urban Population	3,285	10,426	15,565	746,722
Total Population	25,631	41,754	69,243	1,802,341
Rural Percent of Total Population	87.1	75.0	77.5	58.6
Farms under Five Acres	3,684	3,556	7,240	151,698
Total Number of Farms	4,989	4,825	9,814	193,359
Farms Under Five Acres Percent of Total Farms	73.8	73.7	73.8	78.5
Acreage Cropped on Farms Under Five Acres	4,289	4,426	8,715	151,510
Acreage Cropped on All Farms	14,595	25,934	40,529	542,227
Acreage Cropped on Farms under Five Acres Percent Total Acreage Cropped	29.4	17.0	21.5	27.9
Workers in Agriculture	4,056	4,416	8,472	147,939
Total Employed	6,833	11,107	17,940	488,791
Workers in Agriculture Percent Total Employed	59.0	40.0	47.0	30.0

SOURCE: Agricultural Census, 1968

The region's potential is well above the actuality described above. Small farmers of the region can sell "all they can produce" of bananas, coffee, cocoa and coconuts. Soil and climatic conditions range from good to excellent. Still, production of these export crops has barely risen over the past decade. Considering the fact that they contribute 30 percent to 40 percent on average (and up to 50 percent in individual cases) of the small farmers' cash earnings during the year, the lack of growth is a severe limitation on the rise of the small farmers' living standard. Similarly, the potential for domestic food crops is well above current consumption levels (despite the relatively high prices), and the export potential of these food crops and other exotic crops and spices has hardly been tested.

Acreage cropped in Portland on farms under five acres was 8,715 in 1968 (as reported by the Agricultural Census), and it didn't change much in the decade which followed: in 1975, 1976, and 1977, it was 8,999, 6,951, and 8,746, respectively.*

In short, the challenge is: What are the constraints that are standing in the way of small farmers in the Target Area meeting these encouraging production prospects, and what can be done to eliminate or reduce these constraints?

In addition to the considerations mentioned above, the selection of the Portland Region as a Target Area by the Ministry of Agriculture conforms to its plan of covering the Island with integrated rural development projects. These would have the dual purpose of meeting the deeply felt needs of the small farmers and rural residents of these areas and of

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*The value of domestic food crops per acre in 1977 was J$1,366 which put Portland in <u>penultimate</u> rank among the parishes, ahead only of Westmoreland with a value of J$1,235. St. Elizabeth was first with a value of J$1,799.

having testing concepts and procedures for their replicability in other parts of the Island. In the year 1974, the Government of Jamaica and the World Bank agreed upon the main lines of the First Integrated Rural Development project for the county of Cornwall, which covered the parishes of Hanover, Westmoreland, St. James and St. Elizabeth. In 1976, the Government of Jamaica and the United States Agency for International Development agreed on the terms for the Second Integrated Rural Development Project. This project aims at tackling the problem of hillside erosion by means of a terracing system.

The consideration being given to the Portland Region reflects the Government's concern to extend the concept of the integrated rural development to still another part of Jamaica--the North Coast.

1.2 Location of the Small Farmer

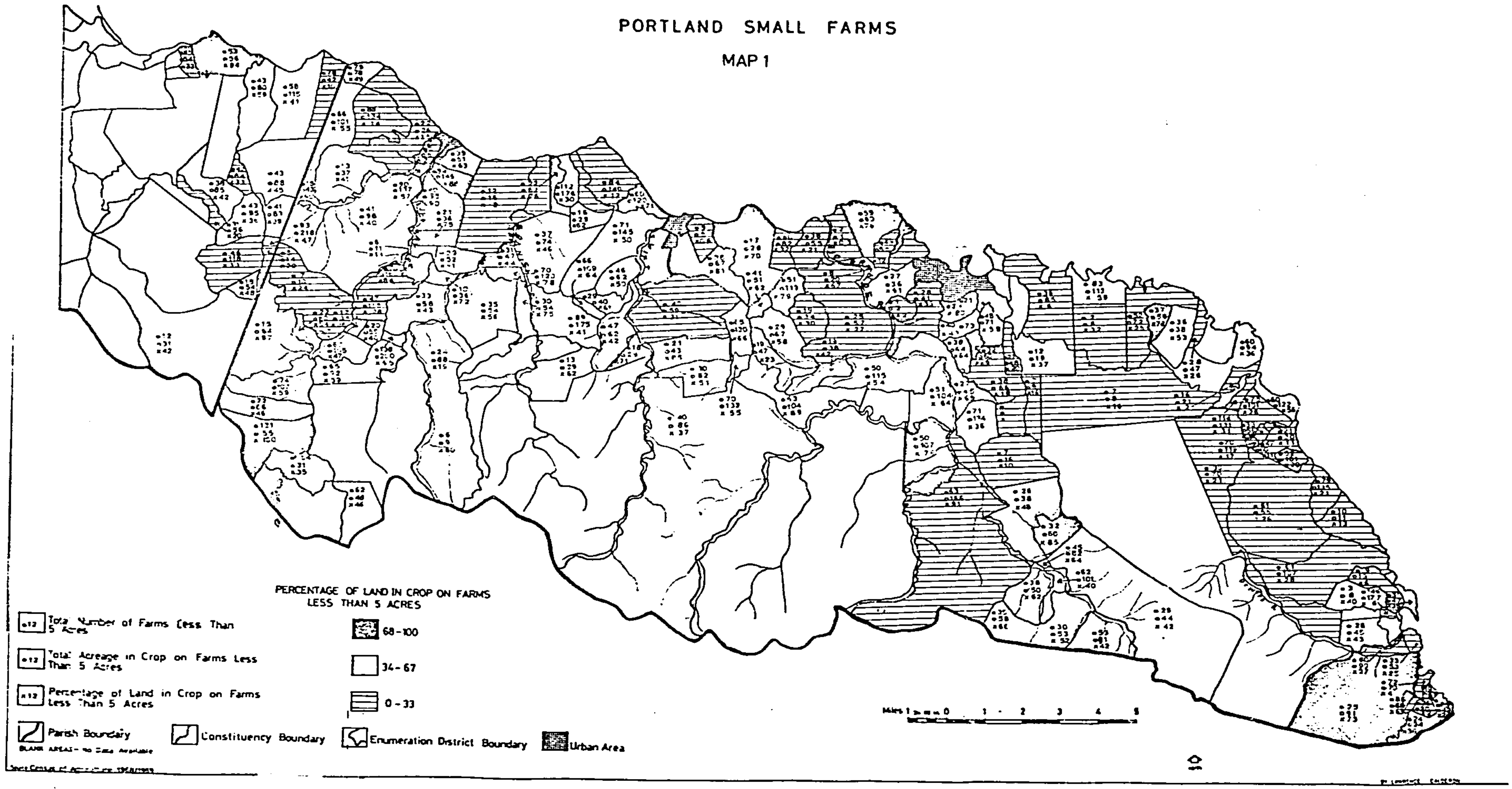
Map 1 shows the distribution of small farms in Portland Parish by enumeration district. As is well known for Portland, the northern half of the Parish has nearly all of the farms, as this is the region which includes the coastal plain and the middle and lower courses of the rivers. The land above 2,000 feet is hardly inhabited except in the Buff Bay Valley, where settlement continues along the only road which crosses the mountains. The drier aspect of this western end of the Parish also makes conditions more suitable for farming at higher elevations. The Rio Grande Valley, which is a low trough, has numerous small farms all the way to the boundary with St. Thomas Parish.

The eastern coastal plain and the lower slopes of the John Crow Mountains, on their east facing slope, have quite a few small farms, but generally this area is dominated by large estates. For this report and the Portland project as conceived, emphasis will be placed on the four river valleys of the central and western part of the Parish and the adjacent strip of St. Mary which includes the towns of Enfield and Iter-Boreale. The four river valleys of Portland are from west to east, the Buff Bay River, the Spanish River, the Swift River, and the Rio Grande River. (See Map 1)

The southern half of the Parish lies within the high (2,000 to 7,000 feet) Blue Mountain area and this area plus the John Crow Mountains is nearly uninhabited. These high mountain zones show up as largely blank areas on Map 1. The smaller blank areas in the settled areas represent gaps in the census data.

Within the settled areas there is no strong areal pattern of small farmer location which is discernable from Enumeration District data presentation. It is evident that there are many districts along the coast where small farmers are very numerous, e.g., near Black Hill, Windsor Castle and Drapers, though this pattern is not much correlated with the percentage of crop land controlled by small farms (see Map 1 for locations). The river valleys also are evident on the map as areas of population concentration, though the size and shape of Enumeration Districts tend to somewhat obscure the pattern of population concentration that is known to exist.

The total acreage in <u>crop</u> on farms of less than five acres is a measure of the importance to total production of the area reported and of the contribution of small farms, as the cropped land is by far the most intensively utilized. Non-crop land includes pasture, forest, fallow,


PORTLAND SMALL FARMS
MAP 1
PERCENTAGE OF LAND IN CROP ON FARMS LESS THAN 5 ACRES
68-100
34-67
0-33
Total Number of Farms Less Than 5 Acres
Total Acreage in Crop on Farms Less Than 5 Acres
Percentage of Land in Crop on Farms Less Than 5 Acres
Parish Boundary
Constituency Boundary
Enumeration District Boundary
Urban Area
Miles 1 0 1 2 3 4 5

and ruinate land. A comparison of total crop acreage on small farms with the number of small farms allows by inspection the careful reader to mentally calculate approximate crop acres per farm, a general measure of income and prosperity. Considerable variation is found in this measure with most observations occurring in the one to two crop-acres per farm category.

The percentage of crop on farms of under five acres (defined as being small farm) presents a picture of regions of concentration of land in various size groups. In the east, along the coastal plain and at several locations in the interior, e.g., behind St. Margaret's Bay and northern John Crow, more than 67 percent of the land is in farms of over five acres. The largest cluster where small farmers dominate land holdings is to be found along the north side of the Back (Swift) River from Rock Hill to the coast. Another concentration may be noted on the east bank of the lower Buff Bay Valley.

Map 2 shows the acreage of crop in pure stand on small farms* and the shaded pattern depicts the proportion of small farmer crop land which is in small farms. The Rio Grande Valley stands out as an area of small farmer cash crop specialization in pure stand cash crops, as well as the area between Rock Hill and the coast, and on the east bank of the lower Buff Bay Valley--the latter two areas noted in the previous section as having high proportions of crop land in the hands of small farmers.

For the areas with lesser proportions of pure stand, a tentative conclusion may be that there is a higher proportion of subsistence cropping.

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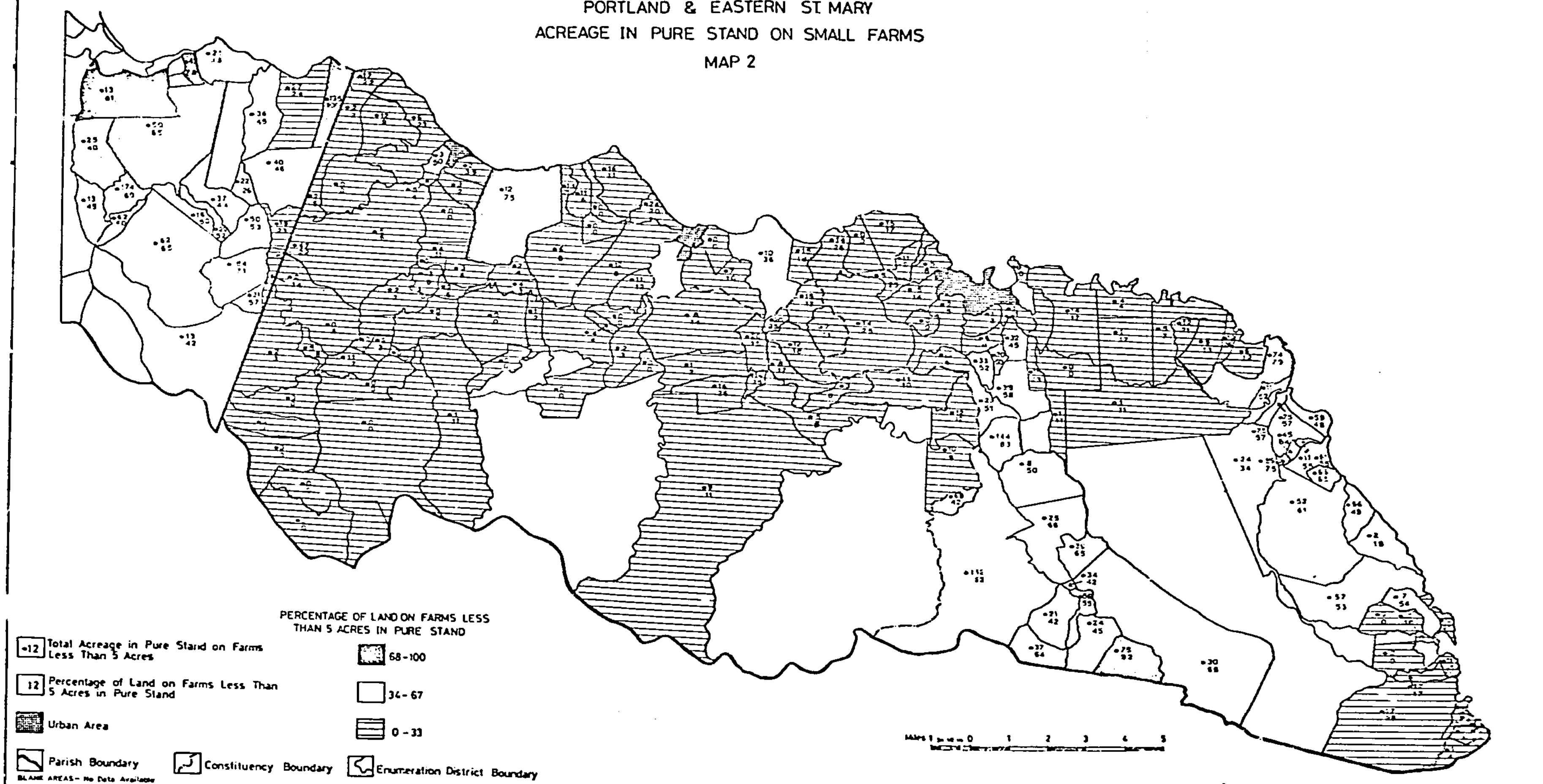
*Pure stand in the census includes: sugar cane, banana, coconut, yams, cocoa, coffee, and others (16%).

PORTLAND & EASTERN ST. MARY
ACREAGE IN PURE STAND ON SMALL FARMS
MAP 2



Source: Census of Agriculture 1968/1969

But alternate explanations of specialization in crops for sale not counted in pure stand seems a possibility. It should also be noted that a high proportion of subsistence on very small plots is consistent with non-farm employment, so that non-pure stand cropping does not necessarily define low income areas.

The population distribution map shows a correspondence to the major topographic features of the Parish. Relatively high population densities occur along the coast and the major river valleys, and each is discernable even though the size and shape of the enumeration districts tend to slightly obscure the real pattern. The empty zones of the Blue Mountains and John Crow Mountains also stand out clearly. Poor road access, as on the east side of the Buff Bay Valley, the Swift River above Chepstowe, and the lower west bank and upper right bank of the Rio Grande, show as sparsely settled areas. (Map 3)

There are large areas in Portland Parish, much of it marginal land, incorporated into Land Settlements. These Land Settlements represented the governmental land reform program from the 1930s to the late 1960s. Land Settlements allowed small holders fee simple ownership of small tracts of generally undeveloped land. Many problems came to be associated with these settlements, including non-development and exploitive use of the land. In Portland, large tracts of Land Settlement exist with poor access and with unused potential.

Project Land Lease began in 1973, and new lands continue to be acquired and distributed. The land acquired was generally unutilized or underutilized. In Portland, over 10,000 acres were acquired for Land Lease. (Table 1-2) Production from these lands after redistribution should be greatly increased. (Map 4)

PORTLAND POPULATION DISTRIBUTION BY ENUMERATION DISTRICTS

MAP 3

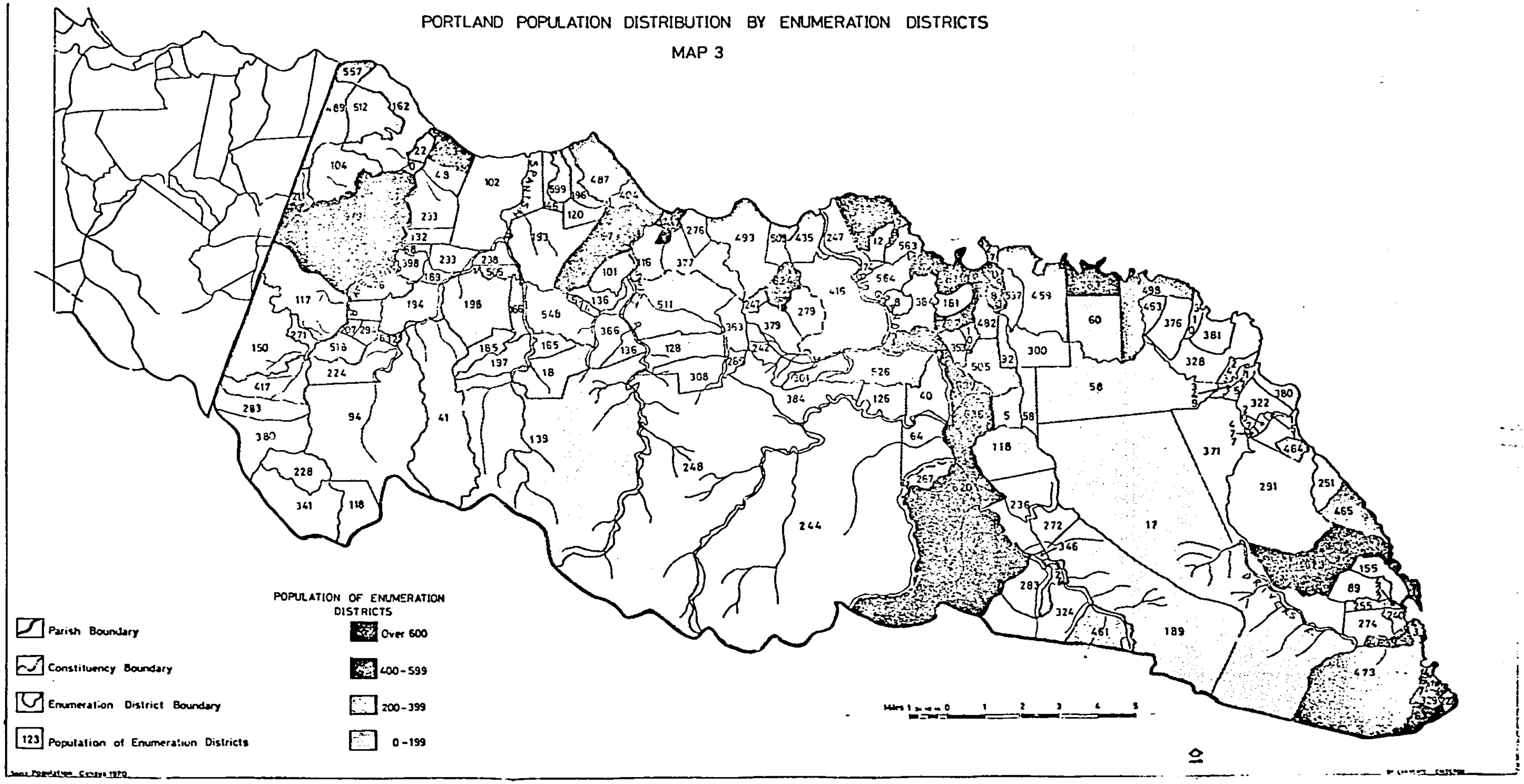


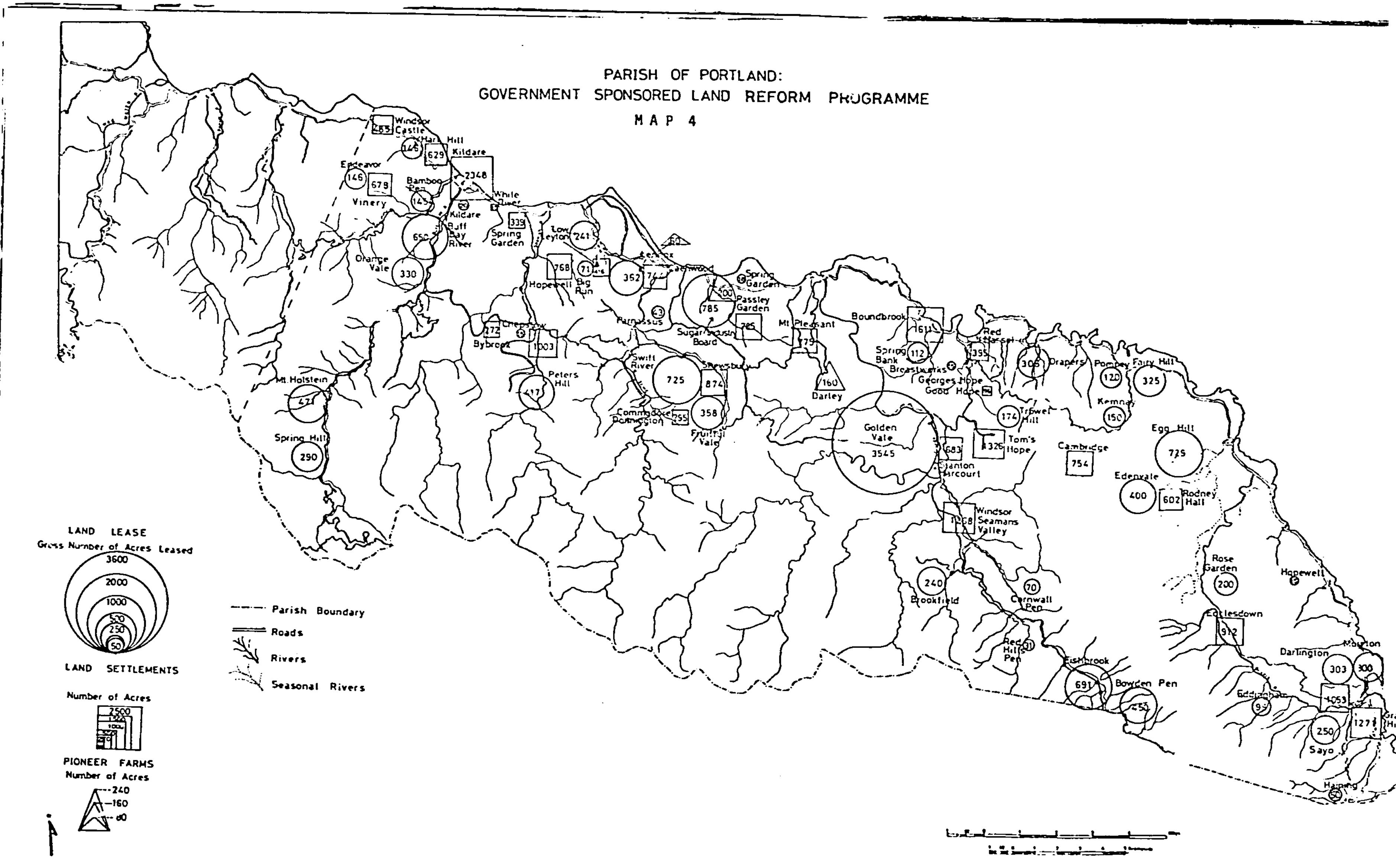
Table 1-2

PROJECT LAND-LEASE PARISH OF PORTLAND

Status as of April 26, 1978

PROPERTY	ACREAGE LEASED	ARABLE	GROWING
Kenny Grove	150	70	31.00
Soyo	250	235	103.50
Bamboo Pew	145	117	35.00
Rose Garden	200	120	109.40
Endeavour	146	120	12.00
Summit Farm	32	23	17.50
Springfield	170	68	113.00
Drapers	305	230	132.50
Fairy Hill	325	150	107.85
Heart Hill	146	60	8.00
Kildare	20	19	9.95
Peters Hill	417	200	37.50
Red Hills pen	31	31	35.75
Cornwall Pen	70	65	102.25
Swift River	725	250	61.00
Fruitful Vale	358	300	132.00
Breastworks	15	15	5.45
Golden Vale	3,545	1,500	1,336.70
Haining	50	27	27.00
Pompey	120	63	40.30
Parnasus	48	39	3.00
Pleasant Farm	123	110	76.80
Darlingford	303	223	86.00
Eddingham	99	70	31.50
Spring Garden	18	18	6.60
Hopewell	13	12	21.50
Elmwood	23	18	20.75
Trowel Hill	174	105	35.48
Eden Vale	400	100	5.00
Spring Bank	112	90	54.00
Fish Brook	691	400	152.00
Orange Vale	330	272	126.25
Egg Hill	729	400	177.45
TOTAL	10,283	5,609	3,253.98

SOURCE: Ministry of Agriculture.



Ministry of Agriculture

2. Agriculture in the Target Area*

2.1 Small Farms

Farms under five acres numbered 7,240 in the parish of Portland in 1968 with the western and eastern constituencies having 3,684 and 3,536, respectively. These represented 73.8 percent of total farms in the Parish, and 73.8 percent and 73.7 percent for the constituencies. The constituency of St. Mary southeast had 3,489 farms under five acres, and these were 71.0 percent of the total. For Jamaica as a whole, farms under five acres represented 78.5 percent of the total. (Table 2-1)

2.2 Domestic Food Crop Production

Acreage devoted to domestic food crops in Portland was 8,999 in 1975, 6,951 in 1976, and 8,746 in 1977, and the corresponding tonnages were 29,165, 21,660, and 30,138. The drop in the volume of production in 1976 was due primarily to the unseasonal drought which reduced the number of acres reaped. The resurgence in output in 1977 was due in part to the improved weather and in part to the introduction of the Crop Lien credit program. Under the terms of the latter, credit in kind was extended to the small farmer with the crop assigned as collateral.
Portland's domestic food crops were valued at J$12.0 million in 1977 at farmgate prices. Almost half was represented by yams and other tubers. These were valued at J$5.6 million or 46.7 percent of the parish total. Vegetables were next in line with a value of J$2.4 million or 20.0 percent of the Parish total. Portland's production of food crops was 5.9 percent of the value of the national total.

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* References to western Portland in respect to potential often apply to Eastern St. Mary.

It is also worth noting those crops in which Portland seems to have an advantage, that is, where its share of the national total is higher than average. These are: red peas (8.7 percent), okra (9.1 percent), pumpkin (8.7 percent), hot pepper (29.2 percent), paw-paw (10.9 percent), plantains (13.9 percent), renta yams (10.3 percent), dasheen (22.9 percent). (Tables 2-2, 2-3, and 2-4)

For details on acreage, yields, and production on a quarterly basis for 1977, see Table 2-4.

2.3 Export Crops

Export crops represent for the Target Area small farmer somewhere between 30 percent and 40 percent of his annual income. At lower altitudes, bananas are the most important; at higher altitudes, coffee takes on a greater importance. Cocoa, coconut, and pimento may also contribute to his annual income but in smaller measure.

Bananas, coffee, coconuts and cocoa are well adapted to the soil and climatic conditions of Portland Parish. All can be grown in small plots, and all have established marketing channels. They carry a minimum of price uncertainty. Their prices do not fluctuate in the market, but rather are fixed by the industry boards of the respective crops. For the present, there is no problem of oversupply should output be expanded, for in each case, national production is insufficient to meet market demands.

Increased production of all four of these crops will reduce industry overhead marketing costs, for all have underutilized capacity. This would permit the industry boards to make higher payouts to the producers of coffee and cocoa especially, and probably for coconuts. If

Table 2-1

AGRICULTURAL DATA FOR PORTLAND PARISH
BY CONSTITUENCY

		Portland East	Portland West	Portland Parish
1.	Total Acreage in Farms	45,340	30,084	75,424
2.	Total Acreage in Crop	25,934	14,595	40,529
3.	Total Acreage in Crop Under 5 Acres	4,426	4,289	8,715
4.	Percentage of Land in Crop on Farms Under 5 Acres	17%	29%	22%
5.	Total Acreage in Pure-stand on Farms Under 5 Acres	1,939	408	2,347
6.	Total Number of Farms	4,825	4,989	9,814
7.	Total Number of Landless Farms	256	88	344
8.	Total Number of Farms Less Than 1 Acre	1,045	1,167	2,212
9.	Total Number of Farms Less Than 5 Acres	3,556	3,684	7,240
10.	Total Number of Farms Under 5 Acres, Less Landless and Less-Than-1-Acre	2,255	2,429	4,684
11.	Percent of Farms Less Than 5 Acres of Total Farms (9 ÷ 6)	73.7%	73.8%	73.75%

SOURCE: Agricultural Census 1968/69.

Table 2-2

PORTLAND AND JAMAICA: VALUE OF PRODUCTION OF DOMESTIC CROPS 1977

	Value of Production at Farmgate (J$)		Portland Percent of Jamaica
	Portland	Jamaica	
LEGUMES			
Broad Bean	$ 13,680	$ 307,040	4.5
Sugar Bean	18,240	246,240	7.4
Cow Pea	92,040	2,020,160	4.6
Gungo Pea	111,180	2,493,920	4.5
Red Pea	892,380	10,302,680	8.7
Peanut	1,120	2,275,840	--
Subtotal	$1,128,640	$17,645,880	6.4
VEGETABLES			
Beetroot	$ 10,920	$ 274,260	4.0
Cabbage	460,920	9,002,200	5.1
Calaloo	177,600	2,586,960	6.9
Carrot	271,560	5,338,820	5.1
Cauliflower	--	43,240	0
Celery	--	93,120	0
Cho-Cho	118,720	1,715,280	6.9
Cucumber	27,560	2,083,120	1.3
Eggplant	--	10,240	0
Iceburg Lettuce	--	625,300	0
Other Lettuce	6,600	192,000	3.4
Okra	36,380	398,480	9.1
Pumpkin	931,680	10,740,960	8.7
String Bean	7,280	486,080	1.5
Tomato	365,560	20,274,520	1.8
Turnip	29,960	434,840	6.9
Subtotal	$2,444,740	$54,299,420	4.5
CONDIMENT			
Escallion	$ 5,800	$ 3,165,640	0.2
Ginger	3,720	524,520	0.7
Onion	609,280	11,302,620	5.4
Hot Pepper	158,840	544,160	29.2
Sweet Pepper	2,700	224,100	1.2
Thyme	--	784,400	0
Subtotal	$ 780,340	$16,545,440	4.7
FRUITS			
Canteloupe	--	--	0
Paw-Paw	$ 79,040	$ 726,700	10.9
Pineapple	82,320	1,498,560	5.5
Watermelon	2,600	2,482,600	0.1
Strawberry	--	--	0
Subtotal	$ 163,960	$ 4,707,860	3.5

Table 2-2. (Continued)

	Value of Production at Farmgate (J$)		Portland Percent of Jamaica
	Portland	Jamaica	
CEREALS			
Hybrid Corn	$ 183,600	$ 3,456,400	5.3
Ordinary Corn	14,520	680,680	2.1
Sweet Corn	1,040	1,560	66.7
Rice	--	--	0
Subtotal	$ 199,160	$ 4,138,640	4.8
PLANTAINS			
Horse	$ 510,120	$ 4,003,220	12.7
Other	368,160	2,332,460	15.8
Subtotal	$ 878,280	$ 6,335,680	13.9
POTATOES			
Irish	$ 24,800	$ 5,755,460	0.4
Sweet	641,580	10,288,060	6.2
Subtotal	$ 666,380	$16,043,520	4.2
YAMS			
Lucea	$ 145,200	$ 6,281,880	2.3
Negro	268,840	11,596,640	2.3
Renta	801,300	7,782,300	10.3
St. Vincent	504,320	3,697,280	13.6
Sweet	15,580	2,661,140	0.6
Tau	42,180	3,718,300	1.1
Yellow	926,900	23,655,040	3.9
Other	116,840	2,388,320	4.9
Subtotal	$2,821,160	$61,780,900	4.6
OTHER TUBERS			
Bitter Cassava	$ 147,360	$ 5,586,960	2.6
Sweet Cassava	88,080	3,290,400	2.7
Coco	1,077,440	5,112,960	21.1
Dasheen	1,521,600	6,648,300	22.9
Subtotal	$2,834,480	$20,638,620	13.7
MISCELLANEOUS			
Sorrel	$ 29,400	$ 456,120	6.4
Subtotal	$ 29,400	$ 456,120	6.4
GRAND TOTAL	$11,946,540	$202,592,080	5.9

Table 2-3 . Portland: Acreage and Production of Domestic Food Crops 1975, 1976, and 1977.

Food Crop	1975		1976		1977	
	Acreage	Production (short tons)	Acreage	Production (short tons)	Acreage	Production (short tons)
Legumes	1,305	303	1,349	315	1,613	433
Vegetables	1,414	4,530	1,189	3,810	1,652	5,542
Condiments	129	208	150	230	274	687
Fruits	174	855	184	755	135	611
Cereals	1,021	856	440	300	663	496
Plantain	711	3,479	543	2,475	656	3,378
Potatoes	380	760	287	840	400	1,927
Yams	1,845	9,261	1,277	6,035	1,408	7,609
Other Tubers	1,974	8,861	1,482	6,885	1,904	9,420
Miscellaneous (Sorrel)	46	46	50	15	41	35
Total	8,999	29,165	6,951	21,660	8,746	30,138

SOURCE: Ministry of Agriculture

Parish of Portland 1977

Crop	Total Production	Total Acreage	Acreage 1	Acreage 2	Acreage 3	Acreage 4	Acreage Total	Yield 1	Yield 2	Yield 3	Yield 4	Yield Total	Production (sh. tons) 1	Production (sh. tons) 2	Production (sh. tons) 3	Production (sh. tons) 4	Production (sh. tons) Total
Broad Bean			8	6	7	11	32	.25	.33	.29	.25	.28	2	2	2	3	9
Sugar Bean			11	15	11	9	46	.27	.27	.27	.25	.26	3	4	3	2	12
Cow Pea			47	36	26	31	140	.25	.31	.31	.25	.28	12	11	8	8	39
Gungo Pea			87	22	29	65	203	.25	.32	.21	.25	.25	22	7	6	16	51
Red Pea			238	306	270	375	1184	.20	.30	.25	.30	.27	48	92	68	113	321
Peanut	433	1608	--	1	2	--	3	--	.40	.50	--	.46	--	.4	1	--	1.4
Beet Root			5	2	1	3	11	2.0	2.5	3.0	2.5	2.36	10	5	3	8	26
Cabbage			93	85	8	9	195	2.0	3.0	3.5	3.5	2.56	186	255	28	32	501
Calaloo			32	54	54	42	182	4.0	4.0	5.0	3.0	4.06	128	216	270	126	740
Carrot			60	70	13	3	146	3.0	3.0	3.0	3.0	3.00	180	210	39	9	438
Cauliflower			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Celery			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cho Cho			40	37	36	35	148	2.50	2.51	3.5	3.0	2.86	100	93	126	105	424
Cucumber			18	16	4	6	39	2.0	3.0	4.0	3.5	2.71	36	33	16	21	106
Eggplant			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iceberg Lettuce			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Lettuce			5	5	1	--	11	1.0	1.0	1.0	--	1.0	5	5	1	--	11
Okra			23	28	20	36	102	1.0	1.0	1.0	1.0	1.0	23	28	20	36	107
Pumpkin			122	194	167	143	626	4.0	4.0	4.5	4.0	4.13	488	776	752	572	2588
String Bea			1	5	1	--	7	2.0	1.5	3.0	--	1.85	2	8	3	--	13
Tomato			58	53	11	17	139	3.0	4.0	4.0	3.0	3.46	174	212	44	51	481
Turnip	5542	1636	26	10	2	3	41	2.5	3.0	3.0	2.0	2.6	65	30	6	6	107
Escallion			2	2	2	2	8	.5	.5	1.0	.6	.62	1	1	2	1	5
Ginger			--	1	--	1	2	--	2.	--	.75	1.50	--	2	--	1	3
Onion			20	33	3	1	57	4.0	5.0	3.0	2.0	4.49	80	165	9	2	256
Hot Pepper			41	52	57	55	205	1.0	1.0	4.74	1.0	2.03	41	52	270	55	418
Sweet Pepper			1	1	--	--	2	3.0	2.0	--	--	2.5	3	2	--	--	5
Thyme	687	274	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Canteloupe			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Paw Paw			10	19	20	21	70	4.5	5.0	4.0	4.0	4.34	45	95	80	84	304
Pineapple			--	16	45	1	62	--	4.0	5.0	5.0	4.74	--	64	225	5	294
Watermelon	611	135	2	1	--	--	3	4.5	4.0	--	--	4.33	9	4	--	--	13
Hybrid Corn			29	330	230	12	601	1.0	.75	.75	.75	.76	29	248	173	9	459
Ordinary Corn			6	29	25	--	60	.67	.55	.52	--	.55	4	16	13	--	33
Sweet Corn			1	1	--	--	2	2.0	2.0	--	--	2.0	2	2	--	--	4
Rice	496	663	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Giant Plantain			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Horse Plantain			91	124	163	26	404	4.51	5.0	5.0	4.5	4.85	410	620	815	117	1962
Other Plantain	3378	656	37	58	77	80	252	5.51	6.0	5.51	5.5	5.61	204	348	424	440	1416
Irish Potato			4	3	2	2	11	5.0	3.0	3.0	2.5	3.63	20	9	6	5	40
Sweet Potato	1927	400	71	133	127	58	389	5.0	5.0	5.0	4.0	4.85	355	665	635	232	1887
Hard Yam			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lucea Yam			20	4	19	23	66	5.0	5.0	5.0	5.0	5.0	100	20	95	115	330
Renta Yam			163	191	23	72	449	6.0	6.0	5.0	6.0	5.94	978	1146	115	432	2671
Negro Yam			33	15	26	43	117	5.0	5.0	6.0	5.0	5.22	165	75	156	215	611
St. Vincent Yam			125	58	4	104	291	6.0	5.0	4.0	5.0	5.4	750	290	16	520	1576
Sweet Yam			7	--	--	4	11	3.0	--	--	5.0	3.72	21	--	--	20	41
Tau Yam			4	6	--	11	21	5.0	6.0	--	5.0	5.28	20	36	--	55	111
Yellow Yam			74	122	90	117	403	5.0	5.0	5.0	5.0	5.0	370	610	450	585	2015
Other Yam	7609	1408	22	10	2	16	50	5.0	5.0	4.0	4.37	5.08	110	50	8	86	254
Bitter Cassava			30	35	55	36	156	3.0	3.0	5.0	3.5	3.93	90	105	275	144	614
Sweet Cassava			30	23	31	24	128	4.0	3.0	3.52	4.0	3.39	105	69	109	84	367
Coco			110	219	276	200	805	3.0	3.0	5.0	5.0	4.18	330	657	1380	1000	3367
Dasheen	9420	1924	124	219	234	258	835	6.5	6.0	6.0	6.0	6.07	806	1314	1404	1548	5072
Sorrel	35	41	12	--	--	29	41	.5	--	--	1.0	.85	6	--	--	29	35
Total	30138	8745															

Source: Ministry of Agriculture

banana output were large enough to fully meet the United Kingdom quota, the Banana Industry Board would be able to operate without a governmental subsidy and pay a higher grower price as well.

Bananas

According to the Banana Industry Board, small growers (five acres and under) numbered 3,508 in Portland, and these represented 88.4 percent of the parish's 3,967 growers. These small growers occupied 6,386 acres or 49 percent of the 13,185 acres devoted to this purpose in the parish.

Table 2-5 gives an indication of the size distribution among banana growers in Jamaica and Portland. It indicates a heavy preponderance in numbers of small producers, with a bimodal distribution of acreage among small and large growers. The smaller growers have a lower level of technology and smaller yields per acre.

Most of the small farmers in Portland Parish grow bananas. The lower elevations of the parish have an ideal climate for banana production--adequate water, temperature and suitable land. If planted over 500 feet above sea level, the banana is less productive, but still is to be found. Proper fertilization affects the yield by increasing the weight per stem and bringing the plant into earlier production. Bananas are harvested year around. Bananas, when planted alone are ideally spaced 7 x 9 feet. This provides 691 plants per acre, out of which an average of 600 will survive. With good cultural practices, one can count on 80 percent bearing plants annually, or 480 stems marketable. At 30 pounds per stem, this would yield a potential of about seven tons per acre, yet average yield is only about three tons per acre. Application of 1,200 pounds of 12-8-28

Table 2-5

Distribution of Banana Growers Registered for Spraying by Size, 1977

Size of Banana Planting (Acres)	Number of Growers	Percent	Acreage	Percent
Jamaica				
5 and Under	24,984	94.4	36,795	54
Over 5 to 10	989	3.7	6,876	10
Over 10 to 25	287	1.2	4,314	6
Over 25 to 100	149	.5	7,402	11
Over 100	57	.2	12,891	19
TOTAL	26,466	100.0	68,278	100
Port Antonio Division*				
5 and Under	3,508	88.4	6,386	49
Over 5 to 10	347	8.7	2,024	15
Over 10 to 25	74	1.9	974	7
Over 25 to 100	31	.8	1,600	12
Over 100	7	.2	2,201	17
TOTAL	3,967	100.0	13,185	100
Portland as Percentage of Jamaica				
5 and Under		14.0		17.4
Over 5 to 10		35.1		29.4
Over 10 to 25		25.8		22.6
Over 25 to 100		20.8		21.6
Over 100		12.3		17.1
TOTAL		15.0		19.3

* Port Antonio Division area corresponds approximately with Portland Parish.

SOURCE: Banana Industry Board.

fertilizer is recommended by the Banana Industry Board technicians--it produces heavier and more marketable stems. Previously, the Banana Industry Board had a fertilizer credit program for growers, with repayment by deduction at the boxing plant, but the Board no longer has a line of credit at the Bank of Jamaica to finance this program.

Small farmers have expressed themselves frequently about the twin problems of high rejections and low price. In fact, these are interrelated, since a high rate of rejections effectively reduces the return to the grower.*

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*Typical of small farmers' complaints are these excerpts from the 22nd Report of the All Island Banana Growers Association:

"Mr. -- said that one of the problems facing the grower was that he sold 33 1/3 percent of the banana at 6 cents, 33 1/3 to higglers at 3 cents, and the other 33 1/3 was wasted, so that when one calculated the returns the grower was getting only 3 cents a pound on the average for the bananas and 3 cents could not carry the weight of the expenses. If all the bananas were sold at the export price, the grower would be able to overcome the problems. They should also bear in mind that bananas generally come in from June to August and at that time of the year, they had several varieties of fruit on the local market--mangoes, apples, etc.; so the sale was not as good as it was throughout the rest of the year. At that time, the farmers' rejection was 60 percent, and the farmer had to throw away the bananas and the higglers exploited them as well." (p. 22)

"Mr. -- complained of the frequent breakdowns in trucks which transported bananas from St. Thomas to Port Antonio causing delays and the ultimate rejection of the bananas." (p. 24)

"A delegate from Highgate also complained about the poor condition of roads in the Camberwell area (St. Mary parish) and said that if growers had good roads, the industry would get more and better bananas. The growers had to head over long distances, so the tendency was to sell to the higglers." (p. 24)

"The weather pattern over Jamaica in recent years has pointed to one important factor--that bananas could no longer be cultivated without the provision of adequate water." (p. 52)

The second major banana grower complaint concerns the price the grower is paid by the Banana Board at the boxing plant. The growers claim it is an inadequate incentive to grow bananas and that it constitutes too small a share of the export price going to the grower. Some blame the Banana Board for being top heavy with management personnel.

The Banana Board claims that the decline in banana production has left the Board with excess capacity and underutilization of its facilities--and that the solution is to expand banana production to permit Jamaica to fully fill its United Kingdom quota.* (Table 2-6)

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*Recommendation

Consideration might be given to including small farmers in the campaign to increase production of bananas to between 125,000 and 150,000 tons and not restricting the campaign only to public sector farms and to medium and large private growers. (Five Year Plan for Agriculture, pp. 161-2). According to these proposals, little can be expected from the small growers. It should be noted, however, that small growers have more acres in bananas island-wide (37,000 out of 68,000) than public sector farms (3,000) or medium and large growers (11,000). True, their yields are much lower: one to three tons per acre versus eight to ten tons for public sector farms and four to five tons for the larger private growers. But, then, small farmers have not had access to the means of increasing yields: no fertilizer or weedicides or supplementary watering systems. If each of the Commodity Boards continues to look upon the small farmer as the least able to provide the additional margin of production for export, as has been the case over the years, this contributes to justifying the poor expectations of him held by the same Commodity Boards. Under the improved delivery system for inputs in general suggested in this study (Chapter 7), there is the promise that yields can be increased across the board and not just for one product. For small farmers growing bananas, the slogan might be: "ONE TON MORE."

Table 2-6. Bananas: Volume and Price of Exports and Average Prices to Growers, 1965 - 1977.

Year	Export	Average U.K. Prices	Growers Average Prices	
			Stems	Boxes
	(tons)	(per ton)	(cents/lb.)	
1965	199,629	$114.90	1.099	2.289
1966	200,274	108.70	1.096	2.555
1967	197,473	115.06	1.040	2.500
1968	163,356	161.80	1.178	2.428
1969	150,937	155.81	1.275	2.525
1970	134,255	162.66	1.606	2.869
1971	125,849	173.50	1.660	2.910
1972	127,045	176.84	1.660	2.970
1973	107,706	246.65	1.810	3.120
1974	71,343	293.68	2.780	5.290
1975	70,206	359.08	5.900	-
1976	79,248	294.51	6.000	-
1977				

SOURCE: All Island Banana Growers Association, Ltd.

Coconuts

Portland Parish has favorable climatic conditions for coconut production, particularly in the Orange Bay-Buff Bay area. But like all producing areas of Jamaica, it was struck by the lethal yellowing disease which appeared in 1961. Coconut production fell sharply after 1972. Portland Parish was the first area to start replacement of the disease-struck tall coconut trees with one resistant variety of Malayan Dwarf trees, ten years ago. Production now is increasing in Portland Parish.

However, the copra factory in Buff Bay burned down in 1976, and the owner decided not to rebuild because of difficulty in acquiring enough coconuts for efficient operation. The copra factory in Port Antonio ceased operation in 1975. Likewise, there are idle copra factories in Orange Bay and Hope Bay. Two of the idle factories are currently owned by the Coconut Industry Board.

For awhile factories outside came in with trucks weekly and if a seller had sufficient quantity, a special trip would be made on other days. But so many of the producers began selling to higglers and traders that the supply available shrank to the point where this truck service became uncertain. At present, the Coconut Industry Board is trying to get someone in the area to erect a copra factory, but so far has been unsuccessful. The net result is an uncertain and unsatisfactory coconut market outlet for copra production in Portland Parish.

The Coconut Board has an intensive research program backing up the industry, and climatic and soil conditions are good for coconut production in Portland Parish; still, large growers have been reluctant to produce a crop which takes about three and a half years to come into production. Under poor cultural practices, it may take over six years, since the Malayan Dwarf coconut has to be farmed. Some don't want to engage in that much work. There also is a reluctance to make longer term capital commitments.

Coconuts and bananas can be interplanted profitably. Interplanting is traditional to spread risk and appeals to smaller farmers. But production by small growers currently lends itself more to the higgler and jelly trade than to copra production.

One approach to the copra problem would be for the Coconut Industry Board and the Government of Jamaica to base the copra-coconut oil price structure more in relationship with what consumers are willing to pay for crude boiled coconut oil. The rationale for such an approach is this: because of the more favorable extraction rate, the copra factory buying price for coconuts then could become more than competitive with that of the boilers, stopping most of the diversion of coconuts away from copra to crude boiled oil; then it would be profitable for the grower to produce coconuts for the copra industry, and because of the higher extraction rate, the country then would have more coconut oil in total.

Those opposed to this approach argue that the demand for coconut oil is so strong in relation to the supply that even with the increase in oil supply that would result from extraction by the refiners rather than the inefficient boilers, the latter would continue to outbid the copra factories until the price of oil was driven to an unacceptably high level. Their solution is to import coconut oil rather than depend on soybean oil to fill the vacuum. Then the combination of domestic and imported refined oil would be sufficient to make the more inefficient boilers an unprofitable business. But at least over the short-term, foreign exchange costs would be high due to the world price premium of coconut over soybean oil.

Coconut production should be up considerably within three years, as the yellowing disease-resistant plantings made under the rehabilitation program come into bearing. The increased availability of coconuts then should mitigate the boiler problem.

Ample copra factory capacity exists to handle the increased production. At the beginning of 1976, the national drier capacity was rated at 29,350 tons annually. Not all plants are in operation, and of those that are, most are underutilized. The 1977 copra output was only 3,400 tons.

Recommendations:

1. Portland Parish coconut growers should form a cooperative and lease one of the non-operating copra driers now owned by the Coconut Board. This would overcome the constraint of the present lack of copra drying facilities in the parish. Small growers (as well as large ones) should be represented on the board of directors of this cooperative. Small growers should feel a sense of involvement and responsibility to provide coconuts necessary for the economic success of the cooperative.

2. The Coconut Industry Board and the Government of Jamaica should re-examine its price policy with respect to the coconuts-copra-coconut oil complex with a view to reducing the diversion of coconuts to the inefficient crude oil boilers which lose half the coconut oil which could be produced from the nuts.

3. Coconut production by small farmers should be encouraged. Coconuts and bananas can be interplanted profitably, thus spreading the risk from a one-crop culture.

Spices

Portland Parish has an ideal climate and soil for growing black pepper. It can be grown on hillsides, but the soil must have adequate drainage. Black pepper plants need four to five years to come into production. A half-acre plot in full production will yield around 1,500 pounds of dry peppers which currently sell at $1 per pound.

Turmeric and nutmeg likewise are adapted to the parish. Nutmeg in full production will gross about $2,500 per acre. Turmeric can be grown on marginal lands, around fences, etc. An annual crop, it currently returns about $150 per acre. A small semi-processing (drying) plant could be located at Buff Bay to handle the first stages of processing for all these spices. The Jamaican Industrial Development Corporation has recently made a feasibility study of such a plant. Current cost would be about $30,000.

For most of the spices, development hinges on the task of organizing sufficient production in not too dispersed an area to provide the basis for economical gathering of the crop and semi-processing. The world market for spices has been expanding steadily, with the highest demand for spice imports in North America and Western Europe. Thus, the market demand is adequate, though obviously not unlimited.

Spice production is well adapted to production by small farmers. Except for pimento where some of the production is on large farms, virtually all the spice production in Jamaica is on small farms.

Recommendations:

1. The earlier feasibility study by JIDC of a black pepper industry for the western area of Portland Parish should be re-evaluated in relation to its applicability to increasing incomes of small farmers in that area, aiding in the economic development of Buff Bay as a market town, and contributing to the saving in foreign exchange by substituting for the black pepper now imported.
2. If the feasibility evaluation shows the project economically sound, steps should be taken to organize a Buff Bay Black Pepper Growers Cooperative. The cooperative should serve as the focal point for getting a sufficient number of growers to provide an economically viable volume of production needed for successful operation of the processing plant.
3. The cooperative should own and operate the plant and either market the product itself or turn the processed pepper over to the Government Pimento Board for distribution.
4. Grower returns for their marketings should be in the form of a payment at the time of delivery, with a patronage dividend at the end of the year based on the final profit earned by the cooperative from the marketing of the crop.
5. Producer credit will be needed for the growers to finance the growing of the crop since it takes four years for the pepper plant to come into maturity. Other crops can be interplanted with pepper for the first few years on land where suitable.
6. The cooperative itself will need credit to finance the construction of the processing plant and for working capital to finance the annual processing and marketing of the crop itself.
7. Demand for the other spices is adequate and where they can fit into the small farmers' farm organization production plans, should be included. Most can be produced in small, not otherwise utilized plots.

3. Physical Environment

3.1 Topographic Structure

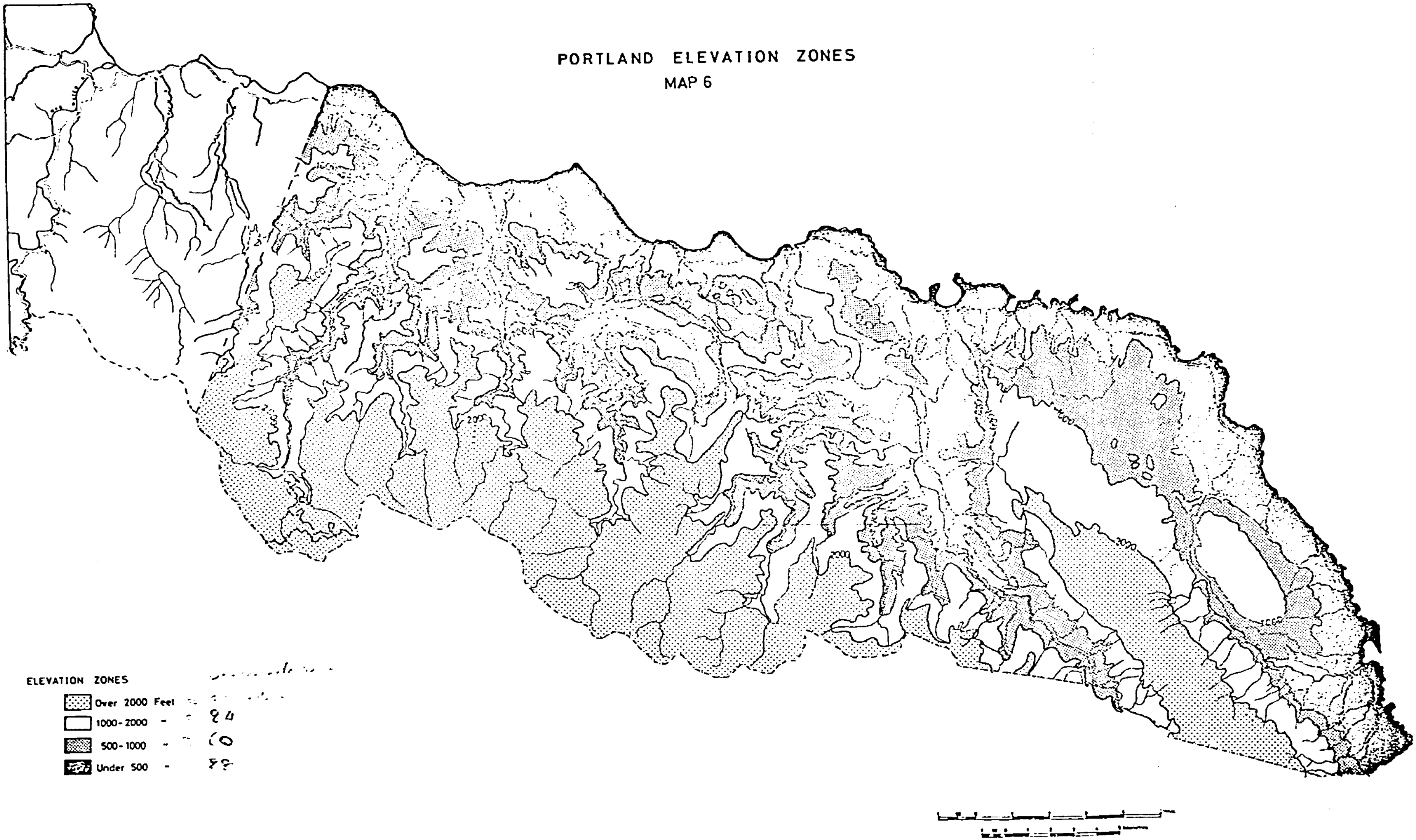
Map 6 shows the major elevation zones. An interpretation of this map should highlight the location and outline of the river valleys. These river valleys play a major role as access route-ways, as the areas of the best quality soils, and as places of major population concentration. The elevation zone below 500 feet is the most important to farming and settlement. This is especially the zone of the large property and the plantation (see Map 1 and compare with Map 6). Even though land ownership and land use is dominated by a high proportion of land in large properties, the absolute number of small farmers is also significant. Areas below 500 feet where small farmers are predominant are generally Land Settlements or areas of restricted access due to transport barriers. Examples of the latter include the John's Hall-Golden Vale on the west bank of the Rio Grande and the roadless east bank of the lower Buff Bay River Valley.

The area between 500 and 2,000 feet is the zone of small farmer dominance, as this land is generally steep in slope and of difficult access. Above 2,000 feet, except in the Buff Bay Valley, there is generally little or no settlement.

The following topographic and lithologic zones can be found on Map 7. The three major topographic divisions of Portland Parish are the Blue Mountains, the eastern and the western region. The high Blue Mountain ridge runs parallel to the coast along the full length of the south edge of the Parish, and this region is mainly land in steep slope and above 2,000 feet in elevation.

PORTLAND ELEVATION ZONES

MAP 6

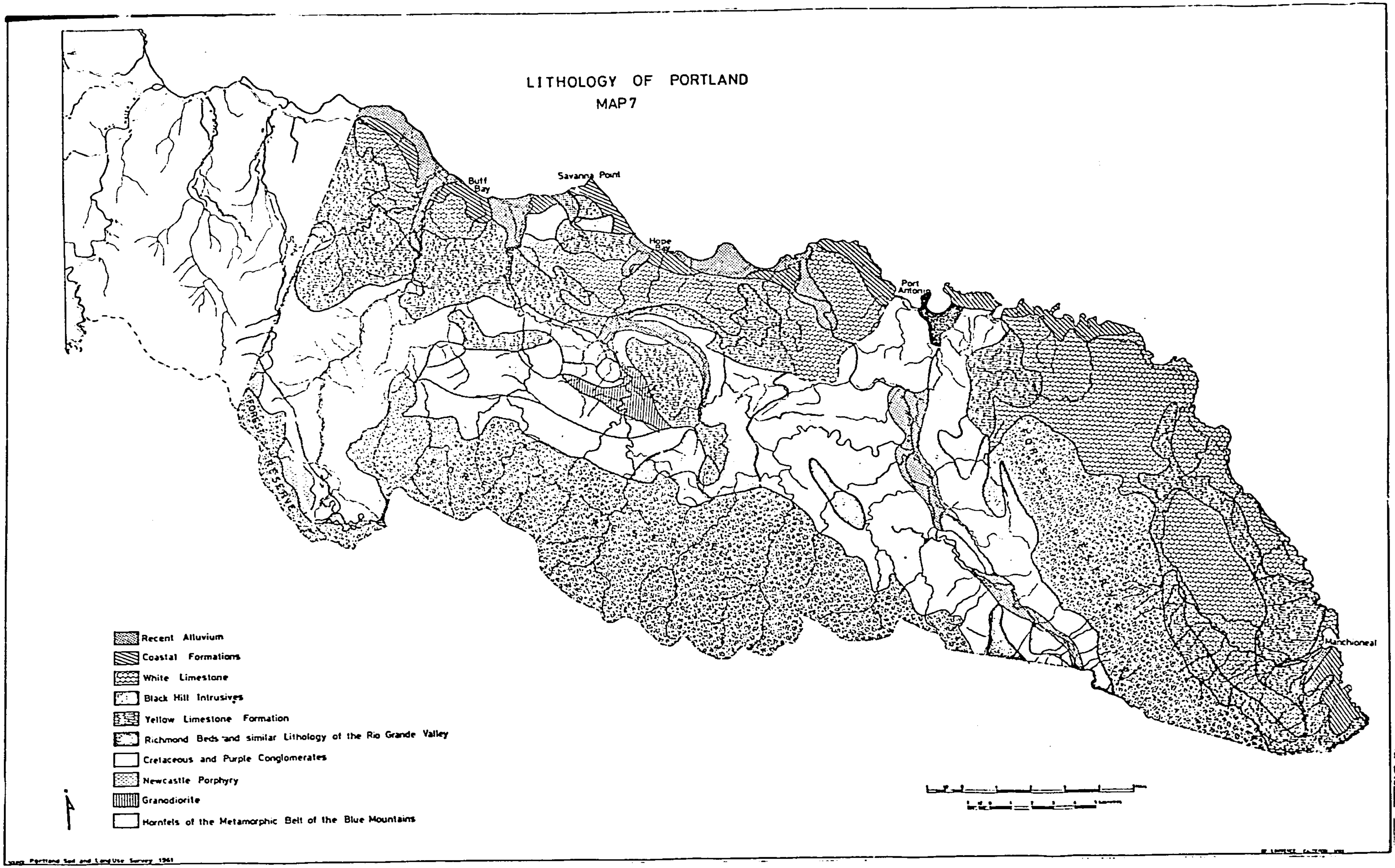


West Portland region is in the northern part of the Parish, is mostly below 2,000 feet, and extends from the western boundary of the Cretaceous Conglomerates near the mouth of the Rio Grande. In West Portland the structures of sedimentary rocks run parallel with the coast, while the major drainage lines cross them at nearly right angles.

A major topographic feature is the narrow and discontinuous coastal plain of alluvium and raised coral. There is a band of white limestone hills rising just behind the coastal plain and flanked by yellow limestone-shale along much of its length. These hills rise to about 1,500 feet within two miles of the coast.

The major river valleys (Buff Bay, Spanish, Swift and Rio Grande) all trend at nearly right angles to the rock structures. Long ridges between the river valleys extend from the Blue Mountains down to the hilly coastal belt. In the middle courses of the major streams, they widen where they cross the shale beds, and a low hilly zone of lesser slope is created. Also tributary streams, which flow parallel with the rock structure, provide access and better agricultural land in this zone. The Back (Swift) River is a good example of streams in this zone. In their middle course, the major rivers and their east-west tributaries are in the geomorphic stage of maturity or early maturity, with some alluvial accumulation. The major rivers are rejuvenated where they cut through the limestone hills in rocky gorges 1,000 feet deep and often offering restricted passage so that access roads do not generally follow the river gaps.

The white limestone areas, shown on Map 7 are usually weathered into cockpits with difficult access and a lack of surface water. The yellow limestone has shale with it and is not so soluble, so that no cockpits form and surface streams and surface erosion may occur.


LITHOLOGY OF PORTLAND
MAP 7
Buff Bay
Savanna Point
Hope Bay
Port Antonio
Manchioneal
FOREST RESERVE
FOREST RESERVE
Recent Alluvium
Coastal Formations
White Limestone
Black Hill Intrusives
Yellow Limestone Formation
Richmond Beds and similar Lithology of the Rio Grande Valley
Cretaceous and Purple Conglomerates
Newcastle Porphyry
Granodiorite
Hornfels of the Metamorphic Belt of the Blue Mountains
Portland Soil and Land Use Survey 1961

A major change from West Portland (the boundary is just one mile west of Port Antonio) to East Portland is the parallelism in the east of lithic and topographic structures, which all trend northwest-southeast. These major topographic structures are the Rio Grande Valley, John Crow Mountains and eastern coastal plain and the lithic structure conglomerates west of the Rio Grande, the Richmond shale beds of the Rio Grande Valley, and the broad white and yellow limestone of the John Crow Mountains and eastern hills and plain.

The Rio Grande Valley is a structural depression or rift of much greater length and width and of gentler gradient than other Portland rivers. The valley bottom is still below 1,000 feet in elevation where it passes into St. Thomas Parish with the high Blue Mountain and John Crow peaks rising steeply above. At one half the distance from the coast and far beyond road access, the upper Swift River is at 4,000 to 5,000 feet.

The Rio Grande creates a corridor of easy access far into the interior and the road is passable into the Blue Mountain region, but lacks a few miles and some rough topography of connecting to the road system of the south side of the island. The volume of water flow of the Rio Grande is much greater than other rivers of the Parish due to the larger drainage basin and the greater rainfall of the eastern area. Bowden Pen at the road head in the upper valley reaches an average 298 inches of rain per year. The heavy rainfall and high river levels in October/December create a great barrier to transit as land and population on the side of the river opposite the road cannot be reached and this is a major constraint in all aspects of life and economy in these areas.

The Rio Grande has numerous tributaries. Those with the largest flow entering from the west. None has road access. The eastern tributaries come from the uninhabited escarpment of the John Crow Mountains. One eastern tributary, the Negro River, has a motorable road to just beyond Mooretown and then forms a connection (not now passable) back to the main road beyond Cornwall Barracks.

The lower Rio Grande has no road on either side of the river, and given the importance of tourist rafting on this stretch, no road should be built which would impinge upon the scenic beauty. Major western tributaries are the Back Rio Grande, Guava, Foxes, Corn Husk, then a series of much smaller streams in the upper valley.

A short, three-mile road up the lower Back Rio Grande would open up that territory and form a needed interconnection with the road from Fruitful Vale (Swift River Valley) to Durham Gap.

The John Crow Mountains, which are formed by an uplifted, tilted block of white and yellow limestone is a region virtually uninhabited at its core, and the lower slopes partially utilized and sparsely settled. This area of Cockpits, steep slopes and high rainfall does not seem to offer any potential for expansion.

The coastal plain east of the John Crow Mountains and the settled hilly country between the mountains and the coastal zone are not specifically part of the project area.

The Swift and Spanish Rivers cut across the coastal mountains and the lower portion of their valleys are not places of major settlement or access. East-west access is provided along the tributary rivers such as the Back River and the Mabess River, The main stem of the Swift and

Spanish Rivers has a narrow valley above the zone of the shale beds and currently has no road access. The roads which penetrate the mountain interior are built along the ridges, not in the valleys. A road has been proposed for the Swift Valley above the 1,000 foot contour level, up to the 2,000 foot level, to open new lands and to serve the several hundred persons already living there.

The Buff Bay River Valley has road access along its entire length. The major problem is access across the stream and its steep lower slopes for communities and products from agricultural land which lies on the opposite bank from the road. The effects of this isolation were noted in the discussion of the location of the small farmer.

3.2 Climate

The most significant climatic aspect of Portland Parish is its very high rainfall. Generally, rainfall increases as one moves from the coast (Port Antonio, 136 inches) to the higher elevations inland (Bowden Pen, 298 inches). Also rainfall totals increase from west to east, and rainfall variability decreases along the same gradient. (See Map 9 and associated Table 3-1.) Despite the generally high rainfall and an abundance of permanent streams and springs, water supply can be a major constraint in agricultural production and a community problem. Two main factors account for rainfall being an agricultural constraint; one is the occurrence of somewhat irregular dry periods (see Map 10) of two to three month duration, and the second is the widespread occurrence of sandy soils, lacking in moisture retention capacity (see soil map).

Two consecutive months of under two inches of rainfall per month can lead to stress in crop plants and reduced yield on sandy soil, and the three to five months of low rainfall experienced by some stations can cause problems with any soil type. Supplemental irrigation is needed to avoid loss with perennial crops and in low intensity systems crop planting can be adjusted to avoid the dry period. In fact, for harvesting many crops, some dry periods are necessary or desirable.

The decline of temperature with altitude affects cropping patterns in Portland. Commercial banana production is generally restricted to zones below 1,000 feet (ripening time is noticeably affected above 500 feet). Coffee, however, is favored by the cooler temperatures and the premium price garnered by coffee from this area can properly be marketed as "Blue Mountain Coffee."

3.3 Rainfall Controls

The two major factors which affect precipitation generation in Portland are altitude and exposure to the prevailing wind. Orographic uplift occurs with increased altitude and triggers generally much higher rainfall inland at higher elevations. Some minor variations of this general pattern are observable. For example, Bowden Pen with 298 inches of rain is in the immediate lee of the John Crow Mountains and the uplift over the mountains triggers rainfall in these adjacent areas.

The other factor is a position to the leeward of the coastal mountain system, i.e., with winds prevailing from north to east; the eastern area receives most seaborne winds first and the western areas receive the portion of the air flow which has moved along the mountain

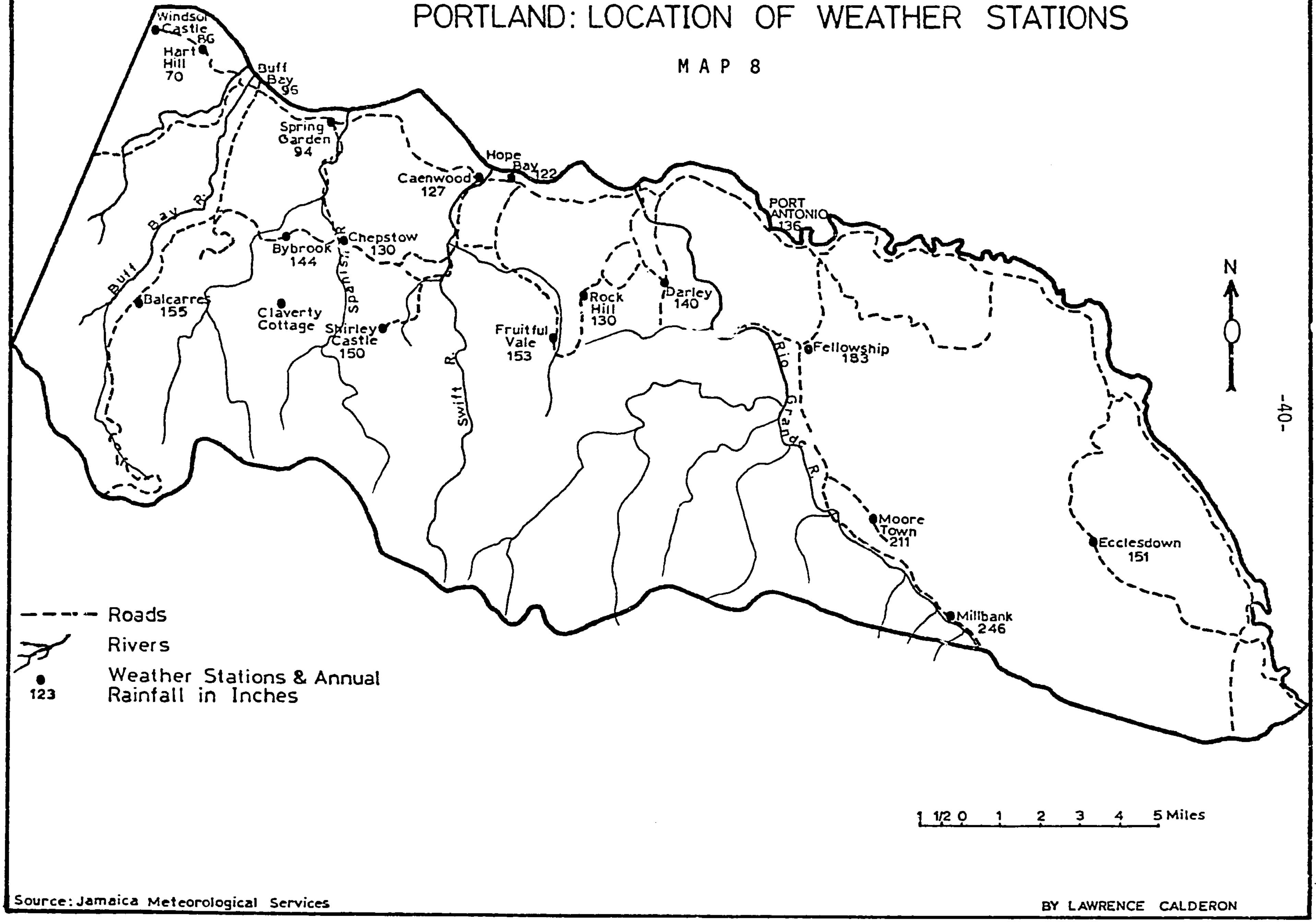
Table 3-1

PORTLAND MONTHLY AND ANNUAL RAINFALL AVERAGES (1931-60)

STATION	LOCATION	TOTAL RAINFALL	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Buff Bay Valley														
Buff Bay	Coast, west.	96.5	8.2	7.9	4.8	6.2	10.7	6.1	7.2	5.6	5.5	9.2	13.4	11.7
Belvedere	White-Buff Bay Valley, middle elevation.	104.6	11.1	8.2	6.8	7.9	10.6	4.0	4.2	4.9	5.6	9.2	15.8	16.3
Belcarres	Upper Buff Bay Valley.	155.3	13.9	11.1	6.5	9.5	14.5	4.6	4.7	6.8	8.6	16.1	29.8	29.2
Spanish-Swift Valleys														
Caenwood	Coast, middle.	127.4	9.6	8.3	5.2	7.6	14.0	11.2	10.6	8.7	9.4	13.6	16.2	13.0
Bybrook	Middle Spanish River.	144.2	15.3	10.4	7.6	9.6	13.7	4.9	5.2	6.3	7.1	13.0	26.2	24.9
Swift River	Middle Swift River.	151.1	13.6	11.5	7.6	10.3	15.0	10.6	8.9	8.9	8.9	14.8	22.1	18.9
Fruitful Vale	Middle Back-Swift River.	152.8	13.0	10.8	8.1	9.5	13.9	12.2	10.7	9.8	10.1	14.4	22.1	18.2
Middle District														
Spring Garden	Near coast.	93.6	7.7	7.2	4.6	6.4	10.3	5.6	7.2	5.4	5.4	9.2	13.0	11.6
Darley	700'.	140.3	10.4	7.1	6.2	8.3	14.1	12.8	12.6	9.7	10.9	15.1	18.1	15.0
Rio Grande Valley														
Port Antonio	Coast.	136.4	9.0	6.6	4.4	7.1	15.0	15.5	12.7	10.5	12.4	16.3	15.7	11.2
Fellowship	Lower Rio Grande.	183.3	13.7	10.6	7.1	9.6	18.0	18.5	17.2	12.8	14.3	19.8	23.0	18.7
Mooretown	Middle Rio Grande - Negro River.	211.2	15.6	12.7	10.2	12.2	18.0	17.5	19.0	15.7	16.2	21.6	31.0	21.5
Mill Bank	Upper Rio Grande.	246.5	19.9	13.5	10.9	13.8	21.4	21.4	21.1	17.5	17.7	25.5	35.0	28.8
Eastern														
Manchioneal	Coast.	115.0	5.4	5.3	3.5	6.0	12.7	11.6	7.3	9.6	12.5	18.6	14.5	8.0
Ecclesdown	Eastern exposure of John Crow Mountains.	151.0	9.1	6.8	5.6	8.0	15.3	15.1	12.8	12.0	15.1	20.0	18.4	12.8

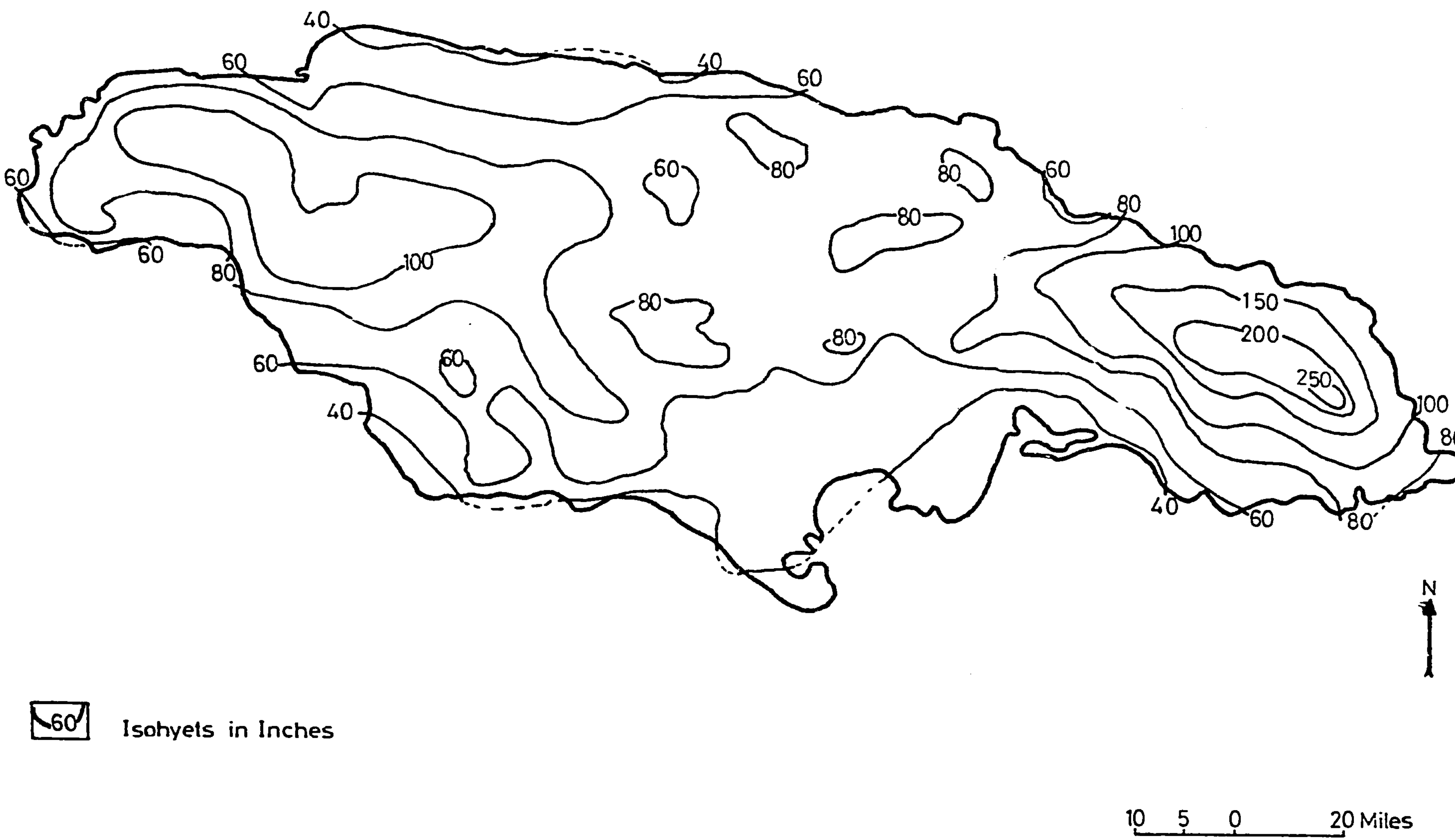
PORTLAND: LOCATION OF WEATHER STATIONS

MAP 8



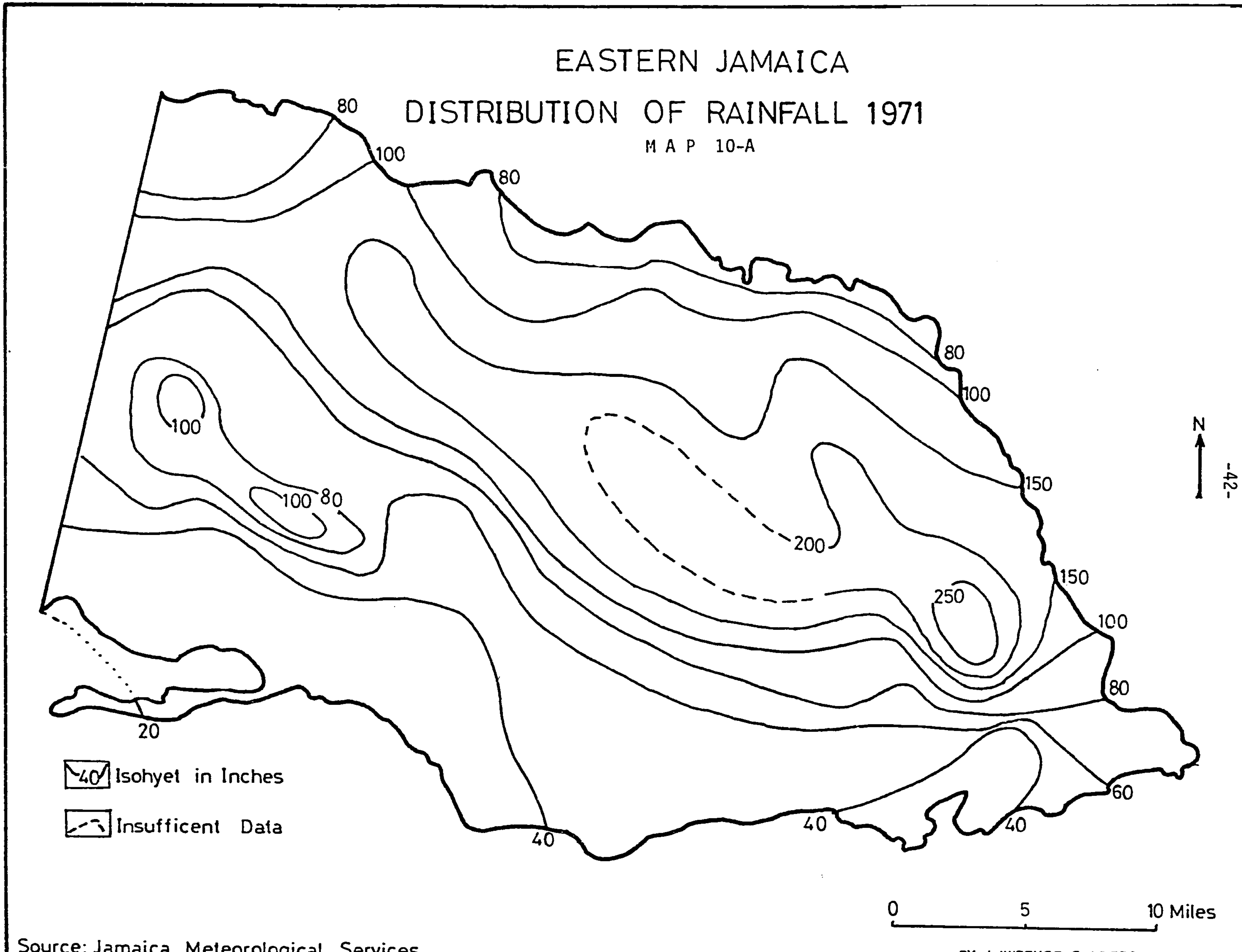
DISTRIBUTION OF MEAN RAINFALL (1931-1960)

MAP 9



Source: Jamaica Meteorological Services

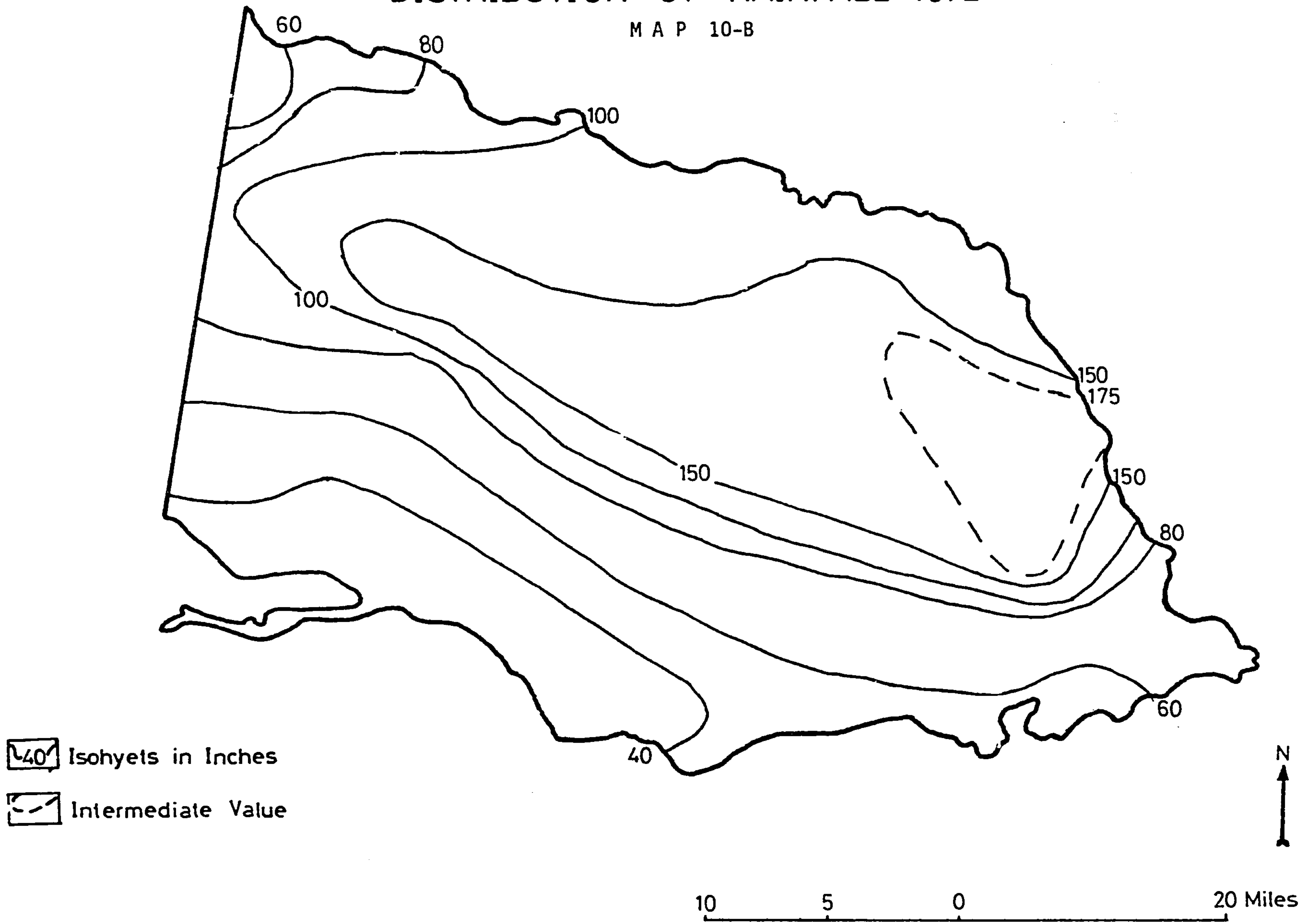
BY LAWRENCE CALDERON


EASTERN JAMAICA
DISTRIBUTION OF RAINFALL 1971
MAP 10-A
80
100
80
80
100
150
150
100
80
60
40
40
40
20
100
100
80
200
250
N
Isohyet in Inches
Insufficent Data
0
5
10 Miles
Source: Jamaica Meteorological Services
BY LAWRENCE CALDERON

EASTERN JAMAICA

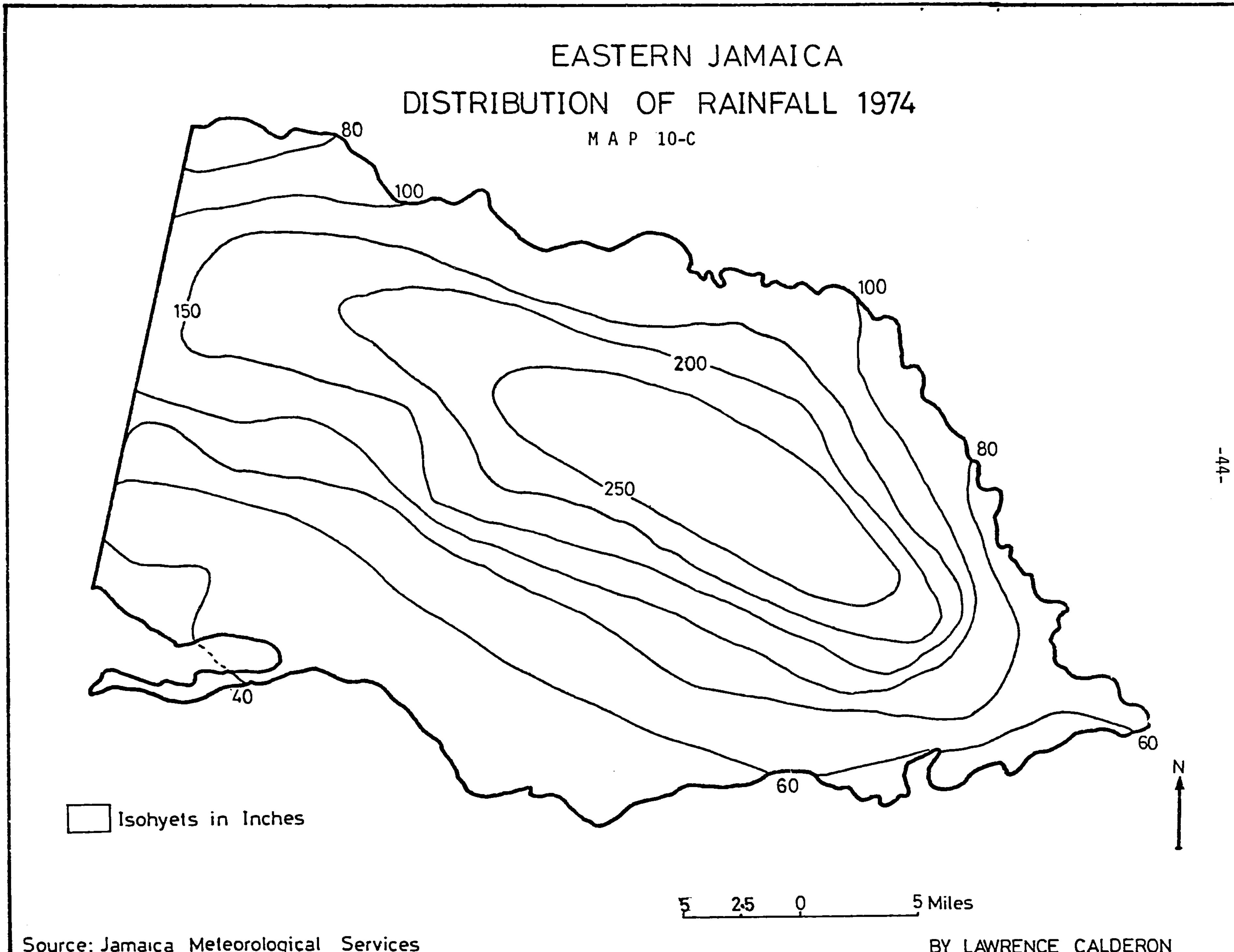
DISTRIBUTION OF RAINFALL 1972

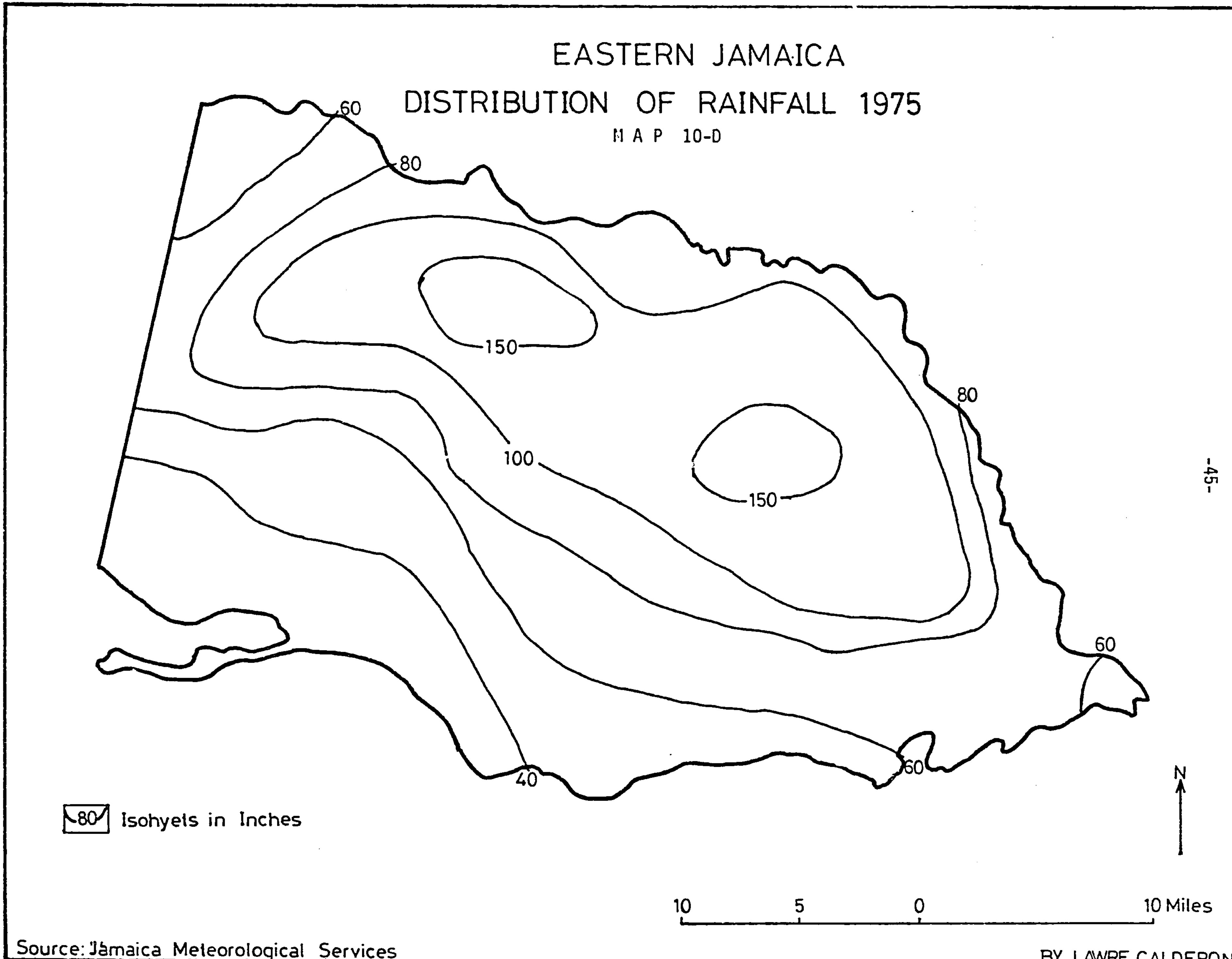
MAP 10-B



Source: Jamaica Meteorological Services

BY LAWRENCE CALDERON


EASTERN JAMAICA
DISTRIBUTION OF RAINFALL 1974
MAP 10-C
80
100
100
150
200
250
80
40
60
60
Isohyets in Inches
N
5 2.5 0 5 Miles
Source: Jamaica Meteorological Services
BY LAWRENCE CALDERON


EASTERN JAMAICA
DISTRIBUTION OF RAINFALL 1975
MAP 10-D
60
80
150
100
80
150
60
40
60
80 Isohyets in Inches
N
10 5 0 10 Miles
Source: Jamaica Meteorological Services
BY LAWRE CALDERON

front and has had much of its abundant moisture removed by previous uplift. The high ridges separating the major rivers of the areas create a rain shadow effect, especially noticeable in the Buff Bay Valley where Hart Hill has received only 67 and 61 inches during the past two (dry) years.

"Northers" or outbreaks of polar air from North American bring cool conditions for a week or more at a time and strong winds. The winds may topple banana trees or at least tatter leaves. The coastal areas may find these winds desiccating while rains are triggered in the hills and mountains behind.

The dry months are February to early May, and again a secondary minima in September. The wettest period and the time of access problems due to floods is October, November, and December.

3.4 Portland Soils

3.4.1 Characteristics

Portland has a considerable variety of topographic and lithographic characteristics which give rise to great soil diversity. These soils present the farmer and the planner with an areally diverse set of opportunities and problems for crop management, road construction and runoff control.

A very thorough study of the soils and land use problems of Portland was written by Finch in 1961.* It is difficult and likely futile for any effort short of a full field survey to attempt to add or detract from this work for questions concerning the Parish as a whole. For large

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*T. F. Finch, Soil and Land-Use Surveys, No. 11, Jamaica, Parish of Portland, Soils Research and Survey Section of the Regional Research Centre, Imperial College of Tropical Agriculture, University of thw West Indies, Trinidad, July, 1961, 32 pp. (Copies may be obtained by writing to the University or on loan from the MOA Library.)

scale, local area specific needs, the Soil Chemistry Division of the Ministry of Agriculture has land capability maps at 1:12,500 (incomplete series) which may be obtained as blueprint copies. This same office will also undertake, given adequate notice, an investigation of soil properties of farms or project areas.

The major factors which affect soil formation and characteristics, climate and rock-parent material, have been discussed in a separate section. A third factor, angle of slope, operates mainly within soil types to generate major land capability distinctions. (Table 3-2)

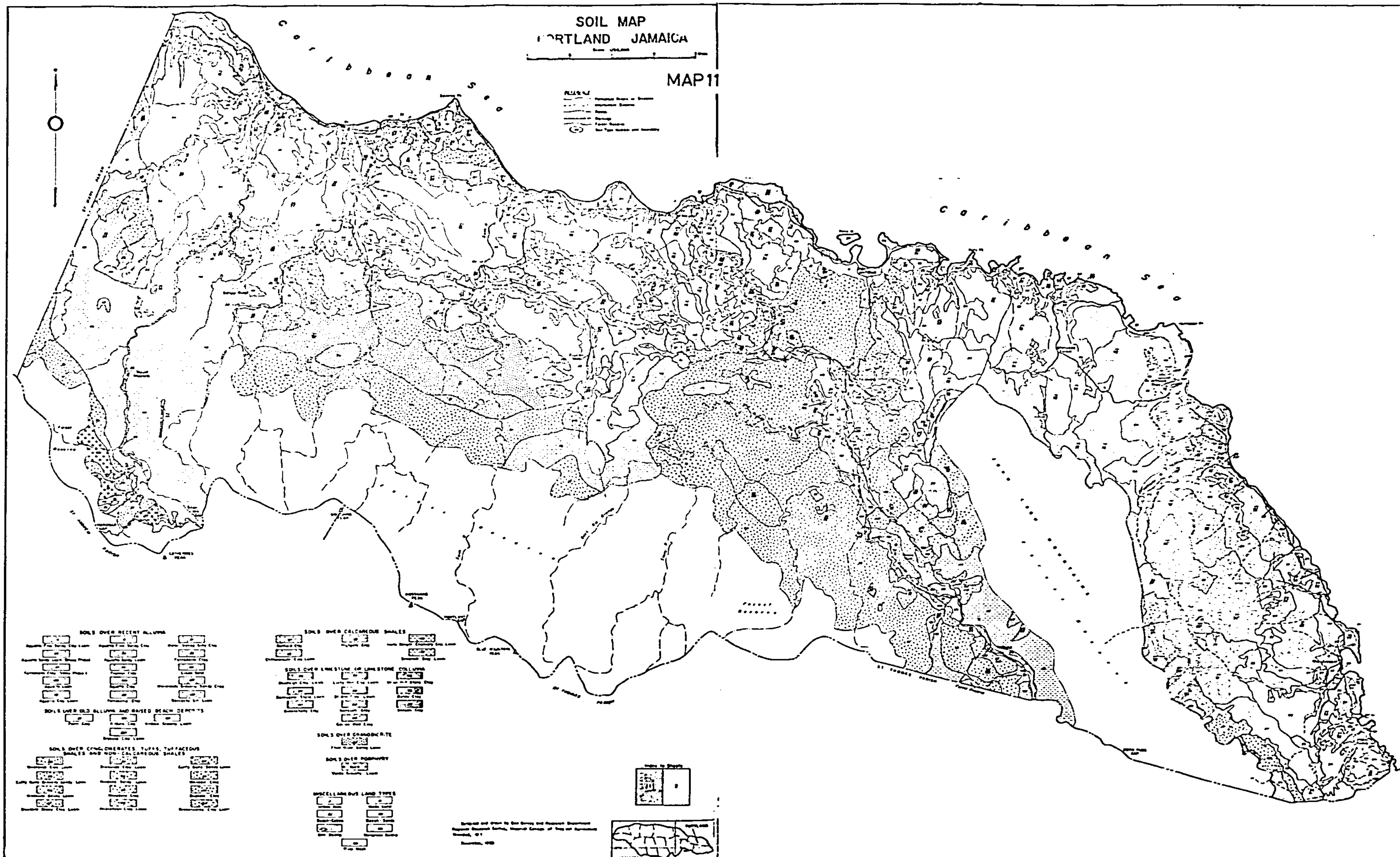
Finch emphasizes the effects of parent material (rock type) as the major factor which determines the differentiation of soil characteristics within Portland. Topography is a secondary factor and accounts for the areas of accumulation of alluvial soils and the coastal formations of old alluvium and raised coral. All seven major soil associations are dominated by parent material characteristics, e.g., white limestone soils are strongly differentiated from carbonaceous shales in regard to fertility, color, internal drainage, erodability, etc. The accompanying soils map (Map 11) shows each soils series classified with its related parent material origin.

The relative uniformity of high rainfall in Portland may help distinguish its soil-forming processes from those of less wet environments, but it is not a major factor of internal differentiation. Heavy rainfall promotes deep and rapid weathering, rapid erosion and leaching.

The youthful, mountainous topography of Portland assures that the soils are geologically young, so time as a differentiating factor in soil formation is not important. Likewise, natural vegetation makes

TABLE 3-2

Slope and Acreage in Portland			Land Capability Classes and Most Intensive Suitable Use	
A	0^{o}-2^{o}	5,950 acres	I	Suitable for cultivation (tillage) with almost no limitation.
B	2^{o}-5^{o}	8,050 acres	II	Suitable for cultivation (tillage) with moderate limitations.
C	5^{o}-10^{o}	28,750 acres	III	Suitable for cultivation (tillage) with strong limitations.
D	10^{o}-20^{o}	17,000 acres	IV	Suitable for tree crops, grasses and very limited cultivation.
E	20^{o}-30^{o}	59,900 acres	V	Not suitable for cultivation, but suitable for planted forest, tree crops or improved grass.
F	over 30^{o}	18,400 acres	VI	Not suitable for cultivation. Suitable for poor forest.
Forest Reserve Unmapped		47,800 acres No agriculture		


SOIL MAP
PORTLAND JAMAICA
MAP 11
Caribbean Sea
Caribbean Sea

little impress on young soils and the climatic uniformity implies a general vegetative uniformity as well. The major vegetative differences in this youthful area arise from soil/parent material differences rather than being a cause of those differences.

Elevation differences which result in temperature differences have an effect on soil formation, but within the relevant zone of sea level to 2,000 feet and within which nearly all agriculture is found, the temperature difference of $6^{o}F$ is not recognized as a major factor. The major effect would be on the rate of organic matter breakdown, favoring greater accumulation in the higher, cooler zones. This is offset by the higher rainfall, steeper slopes and resultant erosion conditions, if the land is cleared for agriculture. Some of the higher elevation areas of the Blue Mountains and the John Crow Mountains have the distinction of having vegetation and soil in natural condition, never having been cut or farmed. These areas, though, which offered no inducement to settlement in the past, are relatively more isolated and lacking in potential today.

3.4.2 Erosion

Erosion is a major hazard faced by the small farmer, as a high proportion of the land he occupies in Portland is often steep and naturally erodable. A comparison of number of farmers (Map 3) to the lithology map (Map 7) will show the correspondence of farming to the yellow limestone, Richmond bed shales and purple conglomerates rock zones. The yellow limestones consist of interbeded shales and impure limestone which in Portland do not form cockpits and often have surface drainage. The major soils in this rock group, Halls Delight Clay Loam (15,000 acres) and Belfield Clay (6,040 acres) respectively, are characterized as highly and moderately erosive. These develop over calcareous shales. Over yellow limestone, the Bonnygate Stony Loam (23,625 acres) is very erosion prone and is the most areally extensive soil type in Portland. The second most extensive, Canon Hall Clay (22,850 acres) which also develops over yellow limestone, has a slight erosion hazard, but reference to Table 3-3 on cultivation practice recommends erosion-control measures. The likewise extensive St. Ann Clay Loam (5,050 acres) is moderately to highly erodable.

Soils over shales and conglomerates include the important soils Cuffy Gully Gravelly Sandy Loam (19,450 acres) and Diamonds Clay Loam (6,850 acres). Both of these soils are highly erodable.

If the first 22 soils were ranked by areas they cover, as in Table 3-3, we have tabulated 97 percent of the potential agricultural area.* The 4,280 acres of soils not listed are divided amongst 27 other soil types, none of which have more than 500 acres and the average is 158 acres.

If we add together all of the areas with moderate to high erosion hazard in Portland, we find that it amounts to 100,000 acres out of a total 138,000 acres of mapped soils of possible agricultural use (referred to as settled area), or 72.5 percent of the total settled area.

It may be noted also that in the areas where small farmers are congregated, e.g., the Rio Grande Valley and the shale, yellow limestone

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*46,450 acres of unmapped, unsettled high mountain Forest Reserve is excluded as well as 1,270 miscellaneous urban, swamp, mangrove, and beach land.

Table 3-3. Portland Soil Types, Area and Erosion Hazards.

Rank	Soil #	Name	Area in Acres	Erosion Hazard	Internal Drainage*	Coffee Suitability**
1	(77)	Bonny Gate Stony Loam	23,625	Very high	-	x
2	(94)	Carron Hall Clay	22,850	Slight	+	x
3	(38)	Cuffy Gully Gravelly Sandy Loam	19,450	High to very high	-	xx
4	(46)	Halls Delight Channery Clay Loam	15,000	High	-	xx
5	(34)	Diamonds Clay Loam	6,850	Very high	-	xx
6	(41)	Belfield Clay	6,040	Moderate	m	x
7	(78)	St. Ann Clay Loam	5,050	Moderate to high	-	x
8	(74)	Lucky Hill Clay Loam	4,250	Very slight	+	xx
9	(95)	Wait-a-Bit	4,100	High to very high	m to -	xx
10	(144)	Mooretown Clay	4,000	High	m to -	x
11	(75)	Union Hill Stony Clay	3,650	Moderate to slight	-	x
12	(91)	Killancholly Clay	2,700	Moderate	-	x
13	(50)	Flint River Sandy Loam	2,700	Very high	-	x
14	(103)	Agualta Loam	2,500	Very slight	-	-
15	(73)	Chudleigh Clay	2,200	Moderate	-	x
16	(144)	Breastworks Clay Loam	1,300	High	m to -	x
17	(122)	Fellowship Clay	1,300	None	-	-
18	(23)	Agualta Sandy Loam (Stony Baldy Phase)	1,040	Very slight	-	-
19	(24)	Agualta Sandy Loam	1,025	Very slight	-	-
20	(99)	Boghole Clay	950	Slight	+	-
21	(32)	Wirefence Clay Loam	750	High to very high	-	xx
22	(52)	Valda Gravelly Sandy Loam	750	Very high	-	x
		27 Other soil types	4,280	(Not counting Forest Reserve, 46,450 acres, and 1,270 acres miscellaneous beach, swamp, urban, etc.)		

* - = rapid, m = moderate, + = slow.
** - = not recommended, x = recommended, xx = highly recommended.

SOURCE: Soil and Land-Use Surveys, No. 11, Jamaica, Parish of Portland. Regional Research Center of the British Caribbean at the Imperial College of Tropical Agriculture, Trinidad, West Indies, University College of the West Indies, July, 1961, 31 pp.

area of the middle Swift and Spanish Rivers and the Buff Bay Valley, nearly all have soil series rated high to moderate erosion.

Finch in his study points out two places of extreme erosion hazard and damage. The soils which have developed over granodiorite (Flint River Sandy Loam) and found on the farm margins (beyond road access) in the upper Spanish and Swift River valleys (2,700 acres) are a special erosion hazard. These soils are on very steep slopes, are shallow, droughty and many farms are working recently-weathered parent material, all of the true soil horizon having been removed from some cleared areas. In flying over this country, it is possible to see sheets of rock exposed where the vegetation was cleared and a few years of farming practiced. This area would seem relatively undesirable for agricultural expansion.

The other place of great erosion damage is on either side of the Dons River, behind Windsor on the Middle Rio Grande. This erosion is on Mooretown Clay, steep slopes and accelerated by banana production.

3.4.3 Soil Drainage

If the first set of physical land problems of Portland is steepness and erodability, the second set of physical problems relates to shallowness, stonyness and lack of moisture retention capacity. Many of the eroded soils are shallow even in their natural state. In the cultivated state, they are often stony and shallow because they are eroded into the subsoil and to the parent material. This shallowness limits root development, water infiltration and coarse soils have limited capability to exchange nutrients at the plant root.

A special problem is the droughtyness of soils which are excessively internally drained (and/or shallow), usually sandy soils which are so coarse that little total moisture is retained within the root zone. This is perhaps an unexpected problem in Portland due to its high rainfall, but it has been recognized and commented upon in numerous accounts, including Finch. Our team's interview experience confirms this need for moisture retention practice and/or irrigation on such soils. As was discussed in the climate section, one dry month does not cause problems, two months below two inches of rain begins to show some stress, and three dry months can severely limit crop yield. Inspection of the monthly rainfall data for Portland over the past six years will show an irregular occurrence of dryness, both in time and space. Often three of four, or four of five, months may be below normal moisture. This year (1978) is a dry year in Portland, as was last year (1977). This writer was told by a representative of the Blue Mountain Coffee Co-op (Buff Bay Valley, western Portland) that in 1976 the co-op sold 9,000 bushels of coffee. Last year this was reduced to 5,000 bushels by drought and that "this year we will have none." July, 1978 was far below normal according to the weather summary in the Daily Gleaner of September 5. Swift River was 7.4 inches below normal for the month and Buff Bay Valley received under two inches of rain. Substantial losses of planting stock are said to have occurred at the Caenwood Experiment Station (located at the mouth of the Swift River) due to drought. In addition to the drought or in interaction with it, are the sandy soils of the Buff Bay Valley. The upper valley is dominated by Halls Delight Channery Clay Loam which is characterized as having "very rapid" drainage through the soil, fair to low moisture supplying capacity, and being shallow, steep (over 20^0) and highly erodable. A shattered shale layer is typically found at 12 to 24 inches. Bonny Gate Stony Loam, found prominently in the lower Buff Bay Valley, has very similar characteristics, though is even worse in each category. The other major soil of the lower Buff Bay Valley, the Carron Hall Clay, has a high moisture retention capacity, moderate to slow internal drainage, and little erosion hazard.

If we look at the same 22 major soil areas for Portland as they are presented in Table 3-3, only 2 of the 22 are not characterized by rapid to moderate drainage and 80 percent (reduces to 75 percent if the Belfield Clay with moderate drainage is removed) of the total soil area of the settled area of Portland is characterized by droughtyness and often shallow stony/sandy conditions. We may also note that the very well-drained soils are preferred for coffee.

The explanation for the correspondence between erodability and rapid internal drainage in most Portland soil series lies in the third characteristic of shallowness. Normally, or in a soil of full vertical development, these two characteristics would show an inverse relationship. However, in a shallow soil, the little altered subsoil shows slow permeability, so that with heavy rains, the entire soil profile becomes saturated and then surface runoff begins carrying with it soil particles, especially during episodes of high intensity rainfall. Balcarres in the 'dry' western end of Portland and the heart of the middle Buff Bay coffee zones, receives 155 inches of rain per year and 29 inches fall in both November and December, almost one inch per day.

3.4.4 Crop Recommendation by Soil Type

Banana

Table 3-4 shows Finch's recommendations regarding crops in relation to soil type. The most important cash crop for large and small farmers in Portland is the banana. As the dominant crop and as a crop cited for having caused a great deal of soil damage through erosion, banana is worthy of special consideration.

According to Finch and in recommendations received in interviews with the Portland Parish Ministry of Agriculture staff and with the Banana Board, banana is not recommended for steep hill slopes and erodable soils. Banana is only recommended by Finch for alluvial lowland soils. Unfortunately, most small farms are on land in steep slopes and most of the soils of the Parish are highly erodable.

The reputation of banana as a soil destroyer is due to the general practice of clean cultivation where the soil is kept bare of grass and weed competition. However, according to the Soil Conservation Unit at the Ministry of Agriculture, research has shown that clean cultivation is only necessary in an 'island' around the tree. If weed control is by chemical herbicide so that the soil surface and structure is not disturbed and the weed tops and roots cover and bind the soil, little erosion will be experienced, even on a slope.

It seems apparent that the dominance of banana as a small farmer hillside crop will persist due to the Parish's infrastructure of boxing plants, proximity to the Port Antonio shipping wharf, familiarity with the crop, tradition, and lack of alternatives. This situation requires the means for improved cultivation of banana be made available to small, hillside farmers.

TABLE 3-4

Recommended Crops for Soils in Portland

Soil Types	Bananas	Coffee	Cacao	Coconuts	Food Trees	Timber or Farm Woodlots	Food Crops	Vegetables
1 Bonny Gate Stony Loam	–	x	–	–	x	xx	–	–
2 Carron Hall Clay	x	x	–	–	x	x	x	x
3 Diamonds Clay Loam Cuffy Gully Sandy Loam	–	xx	x	x	xx	xx	x	x
4 Halls Delight Clay Loam	–	xx	–	–	xx	x	x	–
5 Mooretown Clay Breastworks Clay Loam Belfield Clay	xx	x	x	x	xx	x	xx	x
6 St. Ann Clay Loam Chudleigh Clay	–	x	–	–	x	x	x	x
7 Lucky Hill Clay Loam	–	xx	x	x	x	––	xx	xx
8 Wait-a-Bit Clay	–	xx	x	–	xx	x	xx	x
9 Union Hill Stony Clay	–	x	–	–	xx	x	x	x
10 Killancholly Clay	–	x	–	–	xx	x	xx	–
11 Flint River Sandy Loam Valda Gravelly Sandy Loam	–	x	–	–	–	xx	x	–
12 Agualta Loam Agualta Sandy Loam	xx	–	xx	xx	x	–	x	xx
13 Boghole Clay Fellowship Clay	–	–	–	–	x	–	x	–
14 Agualta Sandy Loam (Stony phase)	x	–	–	xx	x	–	xx	xx

xx = Highly suitable x = Suitable – = Not suitable

SOURCE: Soil and Land-Use Surveys, No. 11, Jamaica, Parish of Portland. Regional Research Center of the British Caribbean at the Imperial College of Agriculture, Trinidad, West Indies, University College

Coffee

Coffee is worthy of special note in relation to recommendations in Table 3-5 also. Most of the important soil series of Portland are recommended for coffee and of those highly recommended, all, except Lucky Hill Clay Loam, are very erodable and show rapid internal drainage.

Coffee, too, has a reputation for having caused massive erosion losses in the Blue Mountain region, but little awareness of this seems evident in the current enthusiasm for expanding coffee acreage. Unless careful and correct land preparation, planting, and cultivation practices are followed, great erosion losses on the soils and slopes proposed for coffee seem inevitable. All Government financed coffee development schemes should be carefully analyzed with this problem given full consideration.

Rapid internal drainage of coffee soils is a desirable characteristic and a major problem. As was discussed in the climatic section, two to even five months of subnormal rainfall (less than two inches) occurs with sufficient frequency in western Portland to be an important production constraint. The low moisture retention capacity of well-drained soils turns a normal season soil advantage into a major liability in a dry season. Some form of supplemental irrigation or moisture-saving technique, such as mulching, terracing, contour drains, is indicated. Soil mulching is reportedly being practiced in the Buff Bay Valley area and producers there are acutely aware of the drought risk problem.

Unless the costs of drip irrigation are found to be justified and the farmers adaptive to its use, coffee might return more in the long run from only moderately recommended soils such as the Carron Hall

TABLE 3-5. RECOMMENDED CULTIVATION - CONSERVATION PRACTICES

SOIL NAME	SLOPE CATEGORIES A	B	C	D	E	F
Bonny Gate Stony Loam			contour planting tree crop no drains	contour planting tree crops no drains	forest	forest
Carron Hall Clay Lucky Hill Clay Loam Union Hill Stony Clay		contour planting diversion channel graded drains	contour planting diversion channel graded drains	contour planting diversion channel graded drains strip cropping vegetative barrier stone walls	contour planting strip cropping no drains strip cropping vegetative barrier stone walls	contour planting tree crops no drains
Cuffy Gully Gravelly Sandy Loam Diamonds Clay Loam			contour planting diversion channel no drains	contour planting diversion channel no drains strip cropping vegetative barrier	contour planting strip cropping no drains vegetative barrier	contour planing tree crops no drains forest
Pelfied Clay Mooretown Clay Breastworks Clay Loam			diversion channel contour drains contour planting	diversion channel contour drains contour planting strip cropping vegetative barrier.	no drains strip cropping contour planting vegetative barrier	no drains tree crops contour planting
St. Ann Clay Loam	contour planting no drains earth bunds	contour planting no drains earth bunds channel diversion	contour planting no drains earth bunds channel diversion vegetative barrier	contour planting no drains earth bunds strip cropping vegetative barrier	contour planting no drains stone walls strip cropping vegetative barrier	contour planting no drains tree crops
Wait-a-Bit Clay Wirefence Clay Loam	earth bunds contour planting diversion channel contour drains	earth bunds contour planting diversion channel contour drains vegetative barrier	earth bunds contour planting diversion channel strip cropping	no drains contour planting vegetative barrier strip cropping	contour planting tree crops no drains	contour planting tree crops no drains
Killancholly Clay Boghole Clay		contour planting diversion channel contour drains	contour planting diversion channel contour drains strip cropping	contour planting diversion channel strip cropping no drains vegetative barrier	contour planting diversion channel strip cropping no drains vegetative barrier	contour planting forest tree crops no drains
Flint River Sandy Loam Valda Gravelly Sandy Loam			contour planting no drains strip cropping diversion channel vegetative barrier	contour planting no drains strip cropping vegetative barrier	contour planting no drains tree crops	contour planting no drains tree crops

Clays, which are able to retain moisture and show only a slight erosion hazard.

3.5 Erosion Control Measures

Table 3-5 is adopted from Finch and shows recommended cultivation and erosion control measures by soil group and type, and for six slope categories. This table is a guide to good farming practices and can aid in evaluating agricultural potential and necessary investments in conservation where expanded use or intensification of production is considered. For example, to develop Lucky Hill Clay Loam on a D (10^0-20^0) slope requires contour planting, strip cropping (alternating strips in crop and cover), graded drains, diversion channels, vegetative barriers and stone walls for soil retention on the steep parts of semi-terraces. The investment costs of such careful development might easily lead to a recommendation of no development, an acceptance of soil loss, or some lesser degree of erosion control.

Table 3-5 perhaps can be viewed as a guide to the problems of these soils and for an appreciation of the effects of slope, rock type, soil depth, etc., on the expected erosional losses.

4. Small Farm Resources and Production in the Target Area

The importance of small farms was discussed generally for Jamaica in Part I, Chapter 3. A closer scrutiny now will be given to small farm resources and characteristics and of resource potentials in the Target Area of Central and Western Portland and Eastern St. Mary. Data are presented here from the point of view of the small farms. Since much the larger part of the Target Area is in Portland, Parish statistics for Portland will serve for the two parishes.

4.1 Physical Resources

4.1.1 Land

According to the Census of Agriculture for 1968/69, the proportions of farms that were small in Portland and St. Mary were:

Parish	Landless	With less than 1 a.	With 1-5 a.	With 5-10 a.
	%	%	%	%
Portland	3.5	22.5	47.2	15.1
St. Mary	1.9	28.8	48.5	13.0
JAMAICA	2.5	27.4	48.6	13.0

These same small farms had the following acreages and proportions of all farm land:

Parish	With less than 1 a.		With 1-5 a.		With 5-10 a.	
	acres	%	acres	%	acres	%
Portland	894	1.2	10,712	14.2	9,825	13.0
St. Mary	1,942	1.8	16,772	15.7	13,301	12.5
JAMAICA	22,736	1.5	206,480	13.9	165,905	11.1

Farms of 200 acres or more, of which there were only 41 in Portland and 65 in St. Mary, had 30,781 acres and 45,972 acres respectively of farm land, or 41 percent of the total in Portland and 43 percent in St. Mary. That concentration is a little less than the Jamaican average of 50 percent.

Land concentration has probably been reduced somewhat through the Land-Lease Program. By April 30, 1978, 13,588 acres in Portland, and 8,152 acres in St. Mary had been put under lease. This is more than half the total area of farmland on farms of less than ten acres as reported by the Census of 1968. Acreages arable under Land-Lease were 8,017 and 6,014 for the two parishes. Only a part of the Land-Lease acreage has gone to farm enlargement. A considerable part of it has been used to establish new farms, including Pioneer Settlements.

Not only are farms in the Target Area predominantly small, but they also suffer from unusually severe constraints on quality of land. For all land in Portland, excluding forest land and miscellaneous uses, only 14 percent is of less than 10^{o} slope. Twenty-two percent is in slopes of 10^{o}-20^{o}; 21 percent, 20^{o}-30^{o}; and 43 percent of more than 30^{o}.*

The Soil Conservation Unit in the Ministry of Agriculture considers that, generally, crop farming can be practiced successfully on slopes of up to 25^{o} with hillside ditches on the gentler slopes and bench or orchard terraces or hexagons on the steeper ones. Slopes of 25^{o} to 30^{o} can be put in orchards or coffee plantings by constructing narrow benches between rows of trees or hexagons. Land above 30^{o} is useful mainly in forests.**

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*Finch, T. F. Soil and Land Use Surveys, No. 11. Jamaica, Parish of Portland. Imperial College of Tropical Agriculture, UWI, Trinidad. 1961, p. 29.

**Information supplied by Soil Conservation Unit, Ministry of Agriculture.

The use-capability classes of land in Portland are about as follows (excluding 47,800 acres in forest reserve and miscellaneous land):*

	Acres	Percent
Can be cropped with simple or no conservation practices	14,000	10
Can be cropped with complex practices	28,750	21
Mainly suited to grass and tree crops, some cropping with complex practices	17,000	12
Forest and tree crops only, but suitable for improvement	59,900	44
Poor forest, not suitable for improvement	18,400	13
TOTAL	138,050	100

The area that can be safely cropped with suitable practices is something over 42,750 acres. The economic limit could be expected to be somewhat less as a result of high costs of development or transportation. The 1968 Census reported 41,236 acres of cultivated land, an increase of 2,000 acres over the 39,296 acres reported in 1961. Over that period, the number of total acres in farms had decreased, however, from 90,544 to 75,473, indicating that pressure on land use has resulted in reducing the amount of bush fallow in crop rotations.

The total land in cultivation, mostly with few if any erosion control practices, is only a little below the maximum that can be easily cultivated. Land-Lease may have improved the situation a little, but only if the additional land is of better quality than the average of that being farmed by small farmers. Data are inadequate to assess the quality of Land-Lease lands. Since the small farmers occupy mainly the hilly areas, it is apparent that their land resources are indeed limited in quantity and cropability, and that cropping in total has been pushed to a point where erosion is a serious threat. Extension officers feel

*Finch, op.cit., p. 29.

that some hill lands similar to areas now in farms could be brought into cultivation by opening new roads.

The mixing of several crops on the same field makes it very difficult to estimate production per unit of area for any one crop. The usual convention is to divide the field acreage by the number of crops grown, which is satisfactory as long as each crop is evenly distributed over the field. But often, there will be a major crop with only parts of the field planted to a second crop. In the absence of careful mapping and measurement, an estimate of the number of trees, plants or hills and the yield per tree or bush is easier to obtain than to estimate yield per acre directly.

The Division of Statistics, Ministry of Agriculture, prepares yield estimates on a "pure stand" basis. Parish average figures for a few major food crops are given in Table 4-1 for 1975-77. As these were all years of subnormal rainfall over most of the island, they are probably below the long-run average. Yields for Portland are seen to be below average for all the crops listed except plantain. The low yields of red peas in Portland is surprising in view of the fact that it is one of the major producers among the parishes.

4.1.2 Water

The Target Area has the most abundant rainfall supply in the island, with average precipitation ranging from something less than 100" in the coastal areas to about 160" in the hills and over 200" in the mountains. Rainfall is well distributed over the year with relatively dry periods in March and April and again from June to September. The

Table 4-1. Crop Yields Per Acre by Parish, 1975-77. (short tons)

Parish	Red Pea		Carrot	Cucumber	Plantain	Yellow Yam	Pumpkin	Tomato
	(lbs.)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)
Portland	460	.23	3.12	2.32	4.65	4.65	4.12	3.06
St. Mary	560	.28	3.35	2.64	4.38	4.67	3.90	3.54
St. Ann	480	.24	3.59	2.73	4.30	4.47	4.22	3.92
Trelawny	500	.25	3.05	3.44	3.48	5.06	4.96	3.34
St. James	500	.25	3.11	3.50	3.62	5.55	5.19	3.48
Hanover	540	.27	2.96	3.61	3.56	5.29	4.88	3.64
Westmoreland	580	.29	3.10	3.99	3.39	5.43	4.98	3.88
St. Elizabeth	780	.39	4.49	4.70	3.69	5.92	3.74	7.23
Manchester	680	.34	3.14	3.08	3.90	4.87	4.13	4.47
Clarendon	680	.34	3.31	4.18	4.64	5.65	4.84	5.48
St. Catherine	360	.18	3.07	4.01	3.48	4.41	5.37	3.48
St. Andrew	480	.24	3.38	3.40	3.47	4.61	5.24	3.45
St. Thomas	430	.23	3.84	3.16	3.63	4.52	5.07	3.55
ALL	600	.30	3.48	3.91	3.90	5.06	4.63	4.62

SOURCE: Ministry of Agriculture. Unpublished data.

Some approximate current yields for other crops, as gleaned from conversation with farmers and extension officers are:

Coffee: about 20 boxes of coffee per acre and perhaps 400 bushes per acre.
Bananas: about .8 stems of 30 pounds each per tree and possibly 300 trees per acre.
Coconuts (dwarf): 25 nucs per tree and about 40 trees per acre.

usual pattern is for the spring rains to arrive in late April or May, followed by a drier period from June to September. The winter rains arrive in September or October, reach a peak in October or November and then taper off to a low in March. The area does suffer occasionally from shortages of rain for periods of three or four months. The soils tend to be highly permeable, and dry periods may cause yields to be sharply reduced. There is little irrigation in the parish, and few ponds or dams for irrigation or fish.

Most communities are served by pipe-borne domestic water. Isolated farmsteads must carry water from public taps or rely upon springs and streams which in normal times are perennial over most of the parish. Convenient access to water is a problem for the more isolated farmers.

The high and frequent rainfall in the Target Area, particularly the eastern and mountainous parts of it, limits the days a farmer can work in the field. Monthly distributions of rain frequency and amount of precipitation for Rose Hill on Buff Bay are shown below:

Month	Days of Rain	Inches of Rain	Month	Days of Rain	Inches of Rain
January	15	3.1	July	14	6.3
February	12	3.6	August	18	10.3
March	12	2.7	September	21	12.2
April	14	5.8	October	24	15.6
May	21	11.8	November	22	9.6
June	17	7.6	December	20	5.0
			TOTAL	209	93.6

SOURCE: Jamaica Meteorological Service Report

Information on the number of rainy days is also available for Bowden Pen on the Rio Grande. This station, with an average precipitation of 273 inches only recorded 180 days of rain, indicating that the average rain is much heavier. However, the Meteorological Service indicates that some rains may not have been recorded.

On the basis of rainfall data, an estimate was made of the number of days in each month that would be suitable for field work, with allowance for the fact that many rains occur at night, and that the porosity of most soils permits quick return to the field after a rain. It was concluded also after discussion with local people, that most farmers do not go to the fields on Saturday or Sunday except in dire emergency. By months, days available for field work were assumed to be:

January	18	July	16
February	18	August	14
March	18	September	14
April	16	October	14
May	14	November	16
June	14	December	18
		Total	190

4.1.3 Equipment and Housing

Non-land capital resources are modest on most small farms. Interviews with 30 farmers in the Buff Bay, Swift and Spanish Rivers and Rio Grande watersheds indicated that the average house on small farms has about three rooms, that only one-fourth have indoor bathrooms and electricity. Farmers interviewed were on or near to motorable roads and hence are better served by electricity and piped water than the average. One-fourth have a donkey or mule, one farmer in 15 who responded had a bicycle. Farms tools are universally the hoe, cutlass, and fork, with only one reporting owning a sprayer. Donkeys cost about $400 and mules

$600. Otherwise, a sprayer is as sophisticated a piece of equipment as one might expect to find on these farms, a knapsack model costing from $75 to $190.

Tree crops are a major investment in land improvement. In 1977, per-acre first-year establishment costs, properly done, were about as follows:

Banana or plantain	$850
Coffee	590
Coconut	750

Acreages of the above crops were not large on the survey farms and stands were old. Of 25 farms for which usable information was obtained, 10 reported a total of 36 acre-equivalent in bananas or plantains. Age of plantings was not recorded for enough cases to give a reliable estimate, but conversations, on-site inspection and reported yields indicated many were very old. New plantings were reported for only two coffee growers for a total of 3.5 acres. New plantings of banana and plantain were reported by five growers in a total amount of 4 acres. The fact that so few coffee growers were replanting, and the low acreages of banana and plantain planted, suggests that many farmers were using up their capital invested in trees.

4.1.4 Inputs

Three-fifths of the farmers surveyed used some fertilizer, but usually in amounts far below recommendations. Bananas, when fertilized, tended to get one small bag (56 lbs.) of 12-8-30 per acre, spread around the base of the plants. The usual application of fertilizer to coffee ran around a hundred pounds of ammonium sulfate per acre. Use of fertilizer was said to be lower than usual because of limited availability.

Small farmers in the sample areas leave most of the spraying for pests to the Banana Board which does aerial spraying, or the Coffee Co-op which sprayed for some farmers. The Ministry of Agriculture provides pesticide chemicals at no charge and will spray farmers' fields gratis within its limited capacity. Our survey did not yield reliable estimates on the amount of spraying done. Two or three of the banana growers reported using Gramoxone for weed control. The one farmer who owned a sprayer grew onions and cabbage.

4.2 Land Use

The high rainfall in Portland and the geographic variation in rainfall, elevation and soils permit a wide variety of tree and food crops to be grown. Most of these are in mixed stands of two, three, or even more crops. A listing of acreages of each crop would be misleading, and in any event is not available for most tree crops.

The main permanent crop in the parish is banana, which is found all over the parish, especially on the alluvial areas, but also along stream valleys and on the hill farms. Farmers like the steady flow in income over the year at frequent intervals provided by these crops.

Portland was once second only to St. Mary in coconuts, but hurricanes and lethal yellowing disease have decimated coconut groves to such an extent that there now is only one copra factory in the eastern end of the parish and one collecting center in Kildare. Considerable replanting has taken place with disease-resistant dwarf trees, but mostly on larger farms. Coconuts are found mostly on coastal areas and the alluvial flatlands, although some appear on hill farms. The current low production of nuts for the copra industry comes principally from the large growers, most of the product from small farms going to home use or to higglers.

A few old cocoa trees can be found on small farms. These are on non-limestone soils at the lower elevations. Most are old and poorly cared for.

Scattered fruit trees, such as breadfruit, mango, soursop, and ackee, are also found in the parish. There is little citrus except occasional trees for home use.

Coffee acreage is not large, but is an important crop on small farms at higher elevations, especially along the Buff Bay River.

The principal ground provisions include various kinds of yams; cocos, dasheen, especially on the lower reaches of the Rio Grande; pumpkins and sweet potatoes, and many others. Acreages of the various food crops for the Target Area appear in Table 4-2. There is considerable regional variation.

The long growing season and favorable rainfall permit many crops to be planted over a period of dates to stretch out the growing and harvest season. However, for many long-season crops, planting usually occurs in the spring so as to take advantage of the spring rains and avoid excessively wet or dry periods when plants are small. Some planting is also done in advance of the fall rains, but this is less favorable for some crops because of the ensuing very wet and cold period. Plant photoperiods have also to be considered. Coffee is planted in spring and fall. The wide distribution of harvest dates is indicated in Figure 4-1, which shows the proportion of various crops estimated to be ready for harvest by months in 1977 in Portland.

Table 4-2. Estimated Acreages Reaped, 1977-78 Crop Year by Extension Area, Portland (Crop year beginning April 1).

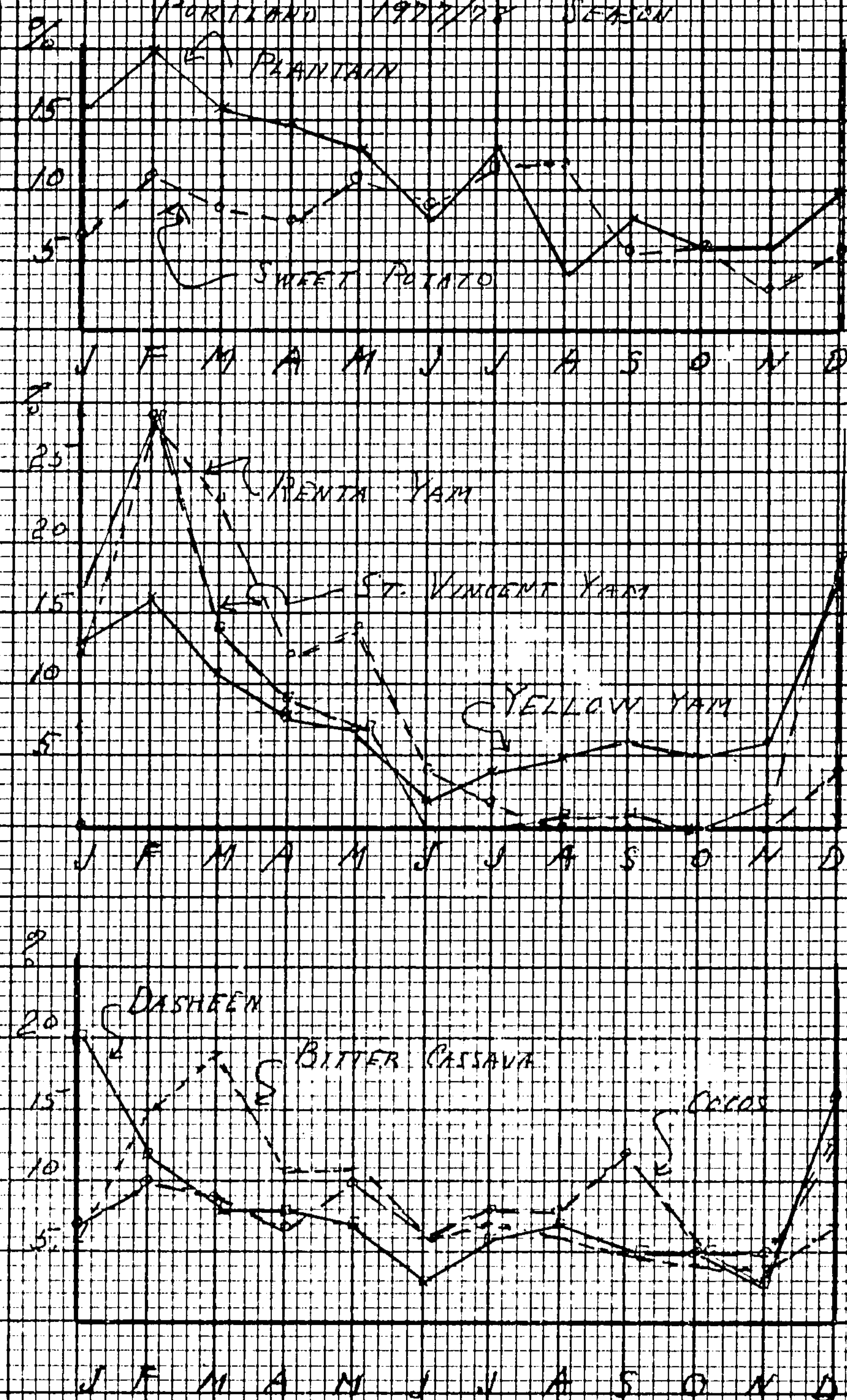
Crop	EXTENSION DIVISIONS		
	Rio Grande (acres)	Central (acres)	Western (acres)
1. Gungo Pea	35.0	51.5	91.5
2. Red Pea	38.0	154.0	861.5
3. Other Pulses	12.3	35.2	31.8
4. Cabbage and Leafy Vegetables	32.5	71.7	48.3
5. Pumpkin	29.2	46.0	87.0
6. Hot Pepper	14.7	17.5	23.0
7. Corn	28.0	79.0	99.0
8. Plantain	129.0	117.5	91.5
9. Other Vegetables[1]	63.1	108.0	105.8
10. Sweet Potato	20.5	51.5	48.0
11. Renta Yam	89.5	107.5	87.5
12. St. Vincent Yam	17.0	26.0	71.5
13. Yellow Yam	70.4	55.5	57.0
14. Other Yam	55.5	25.5	13.0
15. Cassava	20.0	28.0	55.1
16. Coco	110.5	131.0	105.0
17. Dasheen	199.5	108.5	25.0
TOTAL	964.8	1213.4	1901.5

1. Includes 10.0 acres of pineapple and 10.7 acres of paw-paw.

SOURCE: Unpublished data of Ministry of Agriculture. Includes only 51 specified food crops on which the Ministry makes regular reports. Bananas, sugar cane and tree crops are not reported. Data were not available for 6 of the 21 extension areas in the target area.

Figure 4.1

MONTHLY DISTRIBUTION OF PRODUCTION OF SELECTED FOOD CROPS
PORTLAND 1977/78 SEASON



SOURCE: UNPUBLISHED ESTIMATED PRODUCTION FIGURES.
DATA BANK, MIN. OF AGR.

Most farmers appear to grow somewhere between five and ten different crops, deployed in mixed cropping systems intended to maximize use of land by taking advantage of the different light, moisture and soil requirements of each crop. The system also assures a flow of produce over the year and reduced price and production risks. The systems are so varied and complex that it is not possible to analyze them in full detail with information presently available. Consequently, two much simplified models are presented later in this paper, one for a medium to high elevation, and one for a low elevation.

4.3 Human Resources

4.3.1 Family Labor

Small farms in Jamaica tend to be operated by families that are not much smaller than on larger farms, but that have small numbers of persons who do much work on the farm. The general situation with respect to family labor was discussed in working papers of the team.

Family labor resources on 19 small farms in the four Portland villages studied were about as follows:

Farmers 60 or more years old:		11
Living alone	2	
With spouse only (including one with grown daughter who cared for house)	5	
With male children over 14 (with or without spouse)	3	
With children 14 and under (with spouse)	1	
Farmers less than 60 years old:		8
Living alone	2	
With spouse only	2	
With male children over 14	3	
With children 14 or under	1	

In addition to the categories listed, there were some families who had aged parents, or children at home while seeking employment elsewhere. The average total size of family on all farms was 5.3 persons.

Information obtained from the survey on participation of family members in farm work is fragmentary. Conversations indicated that wives were mainly involved in housekeeping and sometimes care of minor enterprises, perhaps a few chickens or a few coffee plants. They also did some produce marketing and one or two were higglers. Few girls were said to do field work and most children in school of both sexes did not appear to do much work on the farm. This probably is related to the relatively low demand for farm work in summer months. A more extensive study of family resources in the Buff Bay area and eastern St. Mary found the average age of farmers to be about 60. Forty-seven percent of families were classed as "stable," that is, with two parents and offspring, 18 percent as "single head" families, and 34 percent as having a "loose structure."* That study reported that elderly farmers retain control of farm decision making.

A study of farms in the Highgate area of St. Mary, commented on the limited participation of juveniles in farm work and observed that:

> "In recent times . . . there has been a steady withdrawal of the services of womenfolk from farm work, due possibly to the changing economic and social conditions and the consequent status changes engendered by these new conditions. The tendency now is for the wife to confine her services to the domestic sphere, to the marketing of minor products and to other off-farm occupations. The unattractiveness of farming to young people is also producing similar effects."**

Farmers in Portland primarily work on the farm. Only three of 18 respondents said they worked off the farm in 1977. Family members

*Gardner, Carleen. "Upland Forestry Development Project." Report for the Department of Forestry, Ministry of Agriculture, March 1978.

**Division of Economics and Statistics, "The Economic Organization of Small-Scale Farming Based on Banana, Coconut, and Cocoa." Highgate area, St. Mary. Ministry of Agriculture, Kingston, 1962, p. 10.

also did not do much off-farm work. Most farmers said there was little off-farm opportunity aside from occasinal work on the roads or for other farmers. A number said they exchanged work with other farmers, and a few mentioned "morning sport," a Jamaican practice whereby a farmer invites in his neighbors to help on some task with no compensation except food and drink. There is some obligation to share in other people's "morning sport," but no specific terms as with exchanges. Gardner also reported that few farmers worked off their farms, 80 percent depending solely on farming. She found the forest to be the best source of off-farm work.*

The limited opportunities for off-farm employment suggest that profitable new farming activities should not have to compete quite so keenly against labor opportunity costs as in some parts of Jamaica.

4.3.2 Hired Labor

Most small farmers in the Target Area hire labor. Eleven of 16 respondents in the survey said they hired some labor, with an average of 80 days hired per farm (including those not hiring). Wage rates varied from $3 paid to some female coffee pickers to $7.50 per day The most common rate was $6 per day plus lunch. Most common tasks for which labor was hired were coffee and banana harvest and land clearing or preparation. Some farmers complained that they needed credit in order to employ workers, but none suggested that labor was not available at prevailing rates.

The skills of the farm labor force including farm operators are adequate for the early stages of modernized agriculture. There is awareness of the kinds of fertilizer and agricultural chemicals needed,

* Gardner, op.cit.

but not of the optimum levels of application. However, advisers and crop specialists almost always state recommended levels of application in physical rather than economic terms. Several farmers knew that larger inputs than they were using would pay. Reasons for not using more included non-availability, lack of credit, and higher priorities elsewhere. As one said, "Until I get control of the weeds, there's no point in adding fertilizer."

The production of livestock is at a considerably more elemental level than for crops--the goal rarely being to market a product--and apparently little concern even for meeting family food needs. One farmer with a large number of half-grown children was asked why he didn't have a milk cow or goats. He said his children liked condensed milk. Only a few families milked cows, and although several had goats, none were milked.

4.4 Financial Resources

4.4.1 Family Sources

Our small field survey did not give sufficient data to permit statistical estimation, but conveyed an impression that small farmers can save very little. The Gardner study further supports this conclusion. In the Buff Bay Valley, she reported that 82 percent of her sample of 403 farmers had no savings, 10 percent had savings in banks, 2 percent in credit unions, and 6 percent in other institutions. For the Enfield Camberwell area in western St. Mary, 87 percent of 341 farmers had no savings, 7 percent savings in banks, 1 percent in credit unions, and 5 percent elsewhere. Gardner cautions about the tendency for interviewees to under-report savings.*

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*Gardner, op.cit., p. 51.

It appears that agricultural investment must rely primarily on borrowing, including a substantial part of the labor costs of development, since farmers have to use some hired labor even for annual expenses of production.

4.4.2 Credit

Two-thirds of 18 respondents in our field survey borrowed money. Sources of loans for these 11 farmers were:

Crop Lien	7	
Peoples Co-op Bank	3	
JAS Cattle Loan	1	(also had a Crop Lien)
Coffee Board	1	

In addition, the Coffee Co-op had furnished fertilizer to several farmers with collection to be taken from their bonus payments, so this also is an important source of credit for coffee growers.

The specific financial agencies available to small farmers will be only briefly identified here. The Crop Lien Program is administered by the Ministry of Agriculture. Loans are restricted to farms of up to five acres on the recommendation of the area extension officer. The loan proceeds must be used for production of specified food crops and the maximum loan is for $1,500. For Portland and St. Mary the crops include: onion, red pea, hybrid corn, gungo pea, cow pea, most varieties of yams, cassava and sweet potato.

The only security for the loans is the crop grown, and the farmer promises to sell through AMC to facilitate collection. In fact, he often sells through other outlets and the repayment record is poor. Disbursement and collection of loans is handled by the Peoples Cooperative Banks. The Buff Bay PCB had 834 Crop Liens outstanding in July, 1978.*

*In addition to the PCB at Buff Bay, the Target Area has PCBs at St. Margaret's Bay, Manchioneal, Long Bay, Port Antonio, and Annotto Bay.

The PCB also makes loans through its own funds or funds available to it through the Agricultural Credit Board. The local bank may approve loans of up to $1,000, but still has to ask the Kingston headquarters to release the funds to it. Above $1,000, loans require ACB approval. Loans, even for small amounts, obviously require considerable time to be processed.

The terms of PCB loans are up to seven years. Of the loans serviced by the Buff Bay branch (including Crop Liens), 75 percent are in default. According to the PCB, needs for credit in the Buff Bay area are primarily for:

Cleaning fields (cultivation)
Replanting
Buying planting material
Fertilizer

The bank does not lend for livestock or for construction of houses. Demand for credit is said to be in excess of the bank's resources. Land is pledged as security for bank loans, not including Crop Lien, and good titles are essential, but most farmers do not have them. The Title Facilities Law has a procedure whereby a bona fide occupant of land can get a certificate on the basis of sworn statement of neighbors showing that he is in legal possession of the land. The procedure requires about six months and is non-transferable. Each new owner, or an heir, must repeat the procedure. The Small Farmers Self-Supporting Assistance Scheme of the Jamaica Development Bank has made loans in Portland, of which 43 percent are to farmers of five to ten acres. They do not, usually, lend to farmers of less than five acres, but in Portland, 28 percent of loans are to this group. Loans are serviced from their office in Port Antonio.*

*JDB Socio-Economic Evaluation Report on SSFDP, December 1977, Appendix Table 1.

The Coffee Cooperative does not make loans, but does supply fertilizer and some pest control work to members with payment taken from the bonus payment. Fertilizer distribution over the past three years has been as shown in Table 4-3.

4.5 Prices and Costs

Prices received and costs incurred influence the use of resources. Prices received by Jamaican farmers have been rising steadily for several years and now are at levels that are often higher than in the U.S. Average prices since 1973 are shown in Table 4-4. As noted on the table, prices come from a variety of sources. The Ministry of Agriculture systematically reports prices only on its list of 51 "food crop" commodities. No regular reports on farm prices for livestock and its products are made by the Ministry or elsewhere.

Estimated prices paid by farmers for production items in 1977 are shown in Table 4-5, and come mostly from the Jamaica Agricultural Society.

4.6 Resource Utilization on Typical Farms

In order to illustrate the way resources are combined on typical farms and give an idea of the costs, labor, and material inputs used and production and incomes realized, two examples of farms are presented here. These are not actual farms, but rather composites, patterned after actual farms, but not being an exact image of any one. An actual farm could have been taken if there had been sufficient time to do the field work necessary to make that approach meaningful.

The farming systems have been simplified a little as actual systems with three or even four crops in varying parts of a field at varying densities, a few food trees scattered in odd corners, and a few coffee bushes around the house become too complex for analysis.

Table 4-3. Quantity of Fertilizer Distributed by the Blue Mountain Coffee Cooperative.

Group	Number of Farmers in Group	1975/6 Number of Farmers Receiving Fertilizer	1975/6 Amount of Fertilizer Received (cwt.)	1976/7 Number of Farmers Receiving Fertilizer	1976/7 Amount of Fertilizer Received (cwt.)	1977/8 Number of Farmers Receiving Fertilizer	1977/8 Amount of Fertilizer Received (cwt.)
Regale	144	38	66.0	22	60	28	60
Spring Hill	327	32	70.1	10	80	22	80
Balcarres	483	22	31.5	20	80	49	20
Mahoe	177	34	52.5	5	10	9	10
Bangor Ridge	298	116	237.0	22	100	54	100
Bybrook	260	14	15.5	10	20	9	20
Claverty Cottage	123	22	58.5	22	37	31	40
All	1,812	278	531.1	111	387	202	330

SOURCE: Blue Mountain Coffee Co-op. Buff Bay. Number of farms in each group did not change much over the period. 1 cwt. = 112 lbs.

Table 4-4 Average Farmgate Prices, Selected Food Crop 1974-77.
(Dollars per pound, except as noted)

Commodity	YEAR				
	1973	1974	1975	1976	1977
Gungo Pea	.36	.40	.43	.47	1.09
Red Pea	.45	.58	.66	.63	1.39
Cabbage	.13	.16	.26	.32	.46
Carrot	.10	.22	.25	.20	.31
Iceberg Lettuce	.11	.12	.21	.25	.37
Pumpkin	.06	.08	.12	.11	.18
Tomato	.16	.20	.30	.35	.38
Pineapple	.06	.09	.10	.12	.14
Hybrid Corn (a)					.20
Horse Plantain	.05	.08	.10	.07	.13
Sweet Potato	.07	.10	.12	.18	.17
Lucea Yam	.12	.15	.15	.15	.22
Negro Yam	.09	.09	.17	.17	.22
Renta Yam	.05	.11	.11	.12	.15
St. Vincent Yam	.06	.12	.11	.11	.16
Sweet Yam	.10	.15	.16	.15	.19
Tau Yam	.06	.07	.12	.15	.19
Yellow Yam	.08	.13	.17	.19	.23
Bitter Cassava	.03	.06	.08	.10	.12
Coco	.05	.09	.12	.14	.16
Dasheen	.06	.08	.10	.09	.15
Onion	.20	.26	.39	.37	1.19
Hot Pepper	.09	.10	.10	.10	.19
Sweet Pepper	.12	.12	.14	.13	.27
Coconut (per nut)					.09(b)
Coffee (cherry)					.33(c)
regular					
Blue Mountain					
Cocoa					.15(d)
Banana (e)					
export					.06
domestic					.04
Pimiento (f)					.72
Black Pepper (f)					1.00
Goat (dressed) (g)			.95		1.35
Cattle (dressed) (g)			.53		.55
Fish (dressed) (g)			1.40		1.80
Pigs (dressed) (g)					.65
Broilers (dressed) (g)					.77
Eggs (dozen, loose) (g)					.86
Milk (fluid)					.32
Milk (condensory)					.22

(a) Mostly eaten green.
(b) Malayan Dwarfs @ 20 nuts per unit.
(c) Regular coffee @ $10 plus $10 bonus per 60 lb. box of cherry coffee. Blue Mountain initial payment was $20, but the bonus rate has not yet been determined.
(d) Price of wet cocoa @ $7 + $1.50 bonus per box of 56 lbs.
(e) Export price reported by Banana Board. Domestic price as reported by growers interviewed.
(f) See report of F. Kutish.
(g) Prices supplied by Agricultural Planning and Policy Review Unit, Ministry of Agriculture (unpublished).

Table 4-5. Prices Paid by Farmers for Inputs, Portland Area.

Input	Unit	Price Paid 1977
Plants and Seeds:[a]		
Coffee seedlings	100	$ 1.20
Yam nodes	100	50.00
Plantain suckers	100	25.00
Banana suckers	100	10.00
Dasheen suckers	100	3.00
Red pea seed	/lb.	2.00
Gungo pea seed	/lb.	1.20
Corn, hybrid	/lb.	1.10
Fertilizer:[b]		
NH_4SO_4 (cocoa, coconuts)		
12-4-28 (banana)		
12-8-30 (coconut)	112 lb.	8.00
10-5-20 (coffee)		
16-18-27 (yams)		
17-0-20 (corn)		
16-9-18 (cocoa)		
Pesticides and Weedicides:		
Gammoxone	1 gal.	35.00
Dipterex	4.5 lb.	17.00
Basudine	1 lb.	6.00
Malathion	1 lb.	6.60
Rattex[c] (cocoa & coconut)	1 lb.	.13-.16
Feeds:		
Pigs	56 lb.	5.00
Chickens	56 lb.	6.00
Yam poles	each	.30
Custom land clearing and preparation[d]	acre	85.00
Custom spraying (Extension Service)	acre	3.00
Field labor	day	$6 + lunch

(a) Most other seeds or plants are furnished free by Ministry of Agriculture or the Boards.

(b) Fertilizer prices vary somewhat by formula, but in view of small variation, non-availability of some formulae and varying costs of local delivery, an "average" price has been taken. Prices assume farmers claim the Ministry of Agriculture subsidy.

(c) Subsidized costs to grower. (Reported by Coconut Board). Cost to Board was 57.5¢ per pound in June, 1978.

(d) These are Ministry of Agriculture rates for 1977. If private contractor is used, rate, minus government subsidy is only a little more.

4.6.1 Buff Bay Valley. Middle elevations.

The "example" or simulated farm discussed here is fairly representative of farms growing coffee on hilly areas of around 1000'-2000' in those parts of the target area with around 90"-120" of rainfall with soils suitable for coffee. These are free-draining, deep soils of medium to high fertility. Coffee roots extend to a depth of ten feet.[11] Farm organization is shown in Table 4-6 along with assumed family composition and land ownership. Prices for products and inputs are as of 1977. Both are considerably higher than would be used in appraisal studies. They are used here to approximate the present situation and because no logical basis has been found for selecting a "normal" period or to identify individual prices that were "out-of-line" in 1977.

From the table, one can find the crops that were grown under mixed cultivation. Plant densities also are shown. Before comparing the very low yields used in the table with published per acre average yields, one should convert the plant populations given to a pure stand basis.

Annual cash expenses are shown in Table 4-7 along with a calculation of net cash income without allowance for interest or charges to maintain capital. If one assumed that our example farmer had to borrow enough to cover three-fourths of his operating costs at the Peoples Cooperative Bank rate of six percent, costs would only be increased by $20 since the cash outlay required at this level of production is so small.

As will be noted, the principal expense item is for 22 man-days of labor. The calculations involved in arriving at hired labor needs involved a number of assumptions, but the results match up quite closely with labor costs reported to us on our survey.

To arrive at labor needs in relation to resources, it was assumed the farm operator was available full-time every working day. His spouse, considering time available for farm work and work-effectiveness, was put down as 0.2 man-equivalent year-round. Children above 14 were estimated at 0.1 man-equivalent while in school and 0.5 man-equivalent in June, July and August. The balance sheet of labor available and required appears in Table 4-8.

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11. Jackson, M.G., in "Short Course on Hillside Farming." IICA, Vol. II, p. 280. Kingston, 1978.

Table 4-6. Simplified Example of a Small Holding, Buff Bay Valley - Medium Elevation. Resources, Production and Income, 1977 Prices.

Family: Man and woman, age 55, three children in school of which one is working age.

Land: Total 4 acres, 1 acre owned, 3 rented, 3 parcels.

Crops:

Old coffee and cocos (750 planted)	1.5 a
Banana (300 roots), Gungo Pea (1/3 a.) Coco (500 planted)	1.0 a
Red peas	0.5 a
Ruinate	1.0 a
	4.0 a

Livestock: One calf bought each year, sold second year. Ten hens.

Production, Sales and Home use (1977 prices):

Coffee: 16 boxes per acre = 24 boxes @ $20			$ 480
Bananas: 300 roots @ 80% = 240 stems @ 30 lb. =	7200 lbs.		
Less home use	500 lbs.		
Less 30% rejects	2010 lbs.		
Sold @ 6¢	4690 lbs.		$ 281
Cocos: 100 roots harvest @ 2 lbs. ea.	2000 lbs.		
Less home use	500 lbs.		
Sold @ 16¢	1500 lbs.		$ 240
Red Peas: 300 lbs. per acre =	150 lbs.		
Less storage loss	30 lbs.		
Less home use	100 lbs.		
Sold @ $1.40 lb.	20 lbs.		$ 28
Gungo Pea: 200 lbs. per acre =	200 lbs.		
Less home use	100 lbs.		
Sold @ $1.10	100 lbs.		$ 110
One calf sold at 2 years at	300 lbs.		
Less 10% death loss allowance	30 lbs.		
Sold @ 75¢	270 lbs.		$ 202
		TOTAL SALES	$1,341

Table 4-7. Annual Cash Expenses and Net Cash Income, Buff Bay Small Holding.

Expenses (Cash)

Fertilizer on coffee 2 cwt. @ 8¢	$ 16
Banana pesticide @ 1 gal/3 a @ $30/gal	10
Banana hauling @ 30¢/stem	67
Pea Seed @ 30 lb/a = 15 lb. @ $2	30
Congo Pea Seed @ 30 lb/a = 10 lb. @ $1.20	12
Taxes and Rent @ $9/a	36
Purchase of calf, 60 lbs. @ $1.25	75
Labor, 22 days @ $6 + $1 (lunch)	154
Miscellaneous @ 10% of above	40
Total Cash Expense	$ 440

Operator's Net Cash Income

Gross Income	$1,341
Cash Expenses	440
Net Cash Income	$ 901
Value of Food Produced[1]	402
TOTAL	$1,303

Return per Day of Family Labor (222 days) = $5.87
(To cover family labor, interest, and maintenance of capital)

---

[1]

500 lbs. bananas @ 4¢	= $ 20
500 lbs. coco @ 16¢	= 80
100 lbs. red peas @ $1.40	= 140
100 lbs. Congo peas @ $1.10	= 110
750 eggs @ 7¢	= 52
TOTAL	$402

Table 4-8 Labor Balance, Buff Bay Farm. Man-Days.

Item	J	F	M	A	M	J	J	A	S	O	N	D
Family labor, man-equivalents	1.3	1.3	1.3	1.3	1.3	1.7	1.7	1.7	1.3	1.3	1.3	1.3
Days available[a] for work	18.0	18.0	18.0	16.0	14.0	14.0	16.0	14.0	14.0	14.0	16.0	18.0
Potential man-days family labor	23.0	23.0	23.0	21.0	18.0	24.0	27.0	24.0	23.0	18.0	21.0	23.0
Total required	25.0	30.0	31.0	18.0	18.0	13.0	18.0	29.0	13.0	13.0	18.0	17.0
Hired labor needed	2.0	7.0	8.0						5.0			

Table 4-9. Labor Requirement for a Buff Bay Farm, Half Cocos Planted Spring, Half Fall.[a] Man-Days.

Crop or Purpose	Acres	J	F	M	A	M	J	J	A	S	O	N	D	Total
Coffee	1.5	6.0	6.0	6.0	1.5	3.0	1.5	1.5	1.5	1.5	6.0	7.5	7.5	49.5
Coco Yam (750 holes)	(1.5)	7.5	13.0	11.0	5.0	3.0	3.0	3.0	3.0	--	1.0	1.5	--	51.0
Banana (400 roots)	1.0	1.5	2.2	2.2	.8	1.5	2.2	1.5	.8	1.5	.8	2.2	.8	18.0
Gungo Pea (1/3 a.)	(1.0)	2.0	--	8.0	8.0	5.0	--	--	2.0	--	--	2.0	--	27.0
Coco Yam (500 holes)	(1.0)	2.0	2.0	--	--	1.0	--	5.0	14.5	7.7	2.7	.7	.7	36.3
Red Pea	.5	3.5	4.0	1.0	1.0	2.5	1.5	3.5	4.0	1.0	1.0	2.5	1.5	27.0
Ruinate	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--
Livestock		.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	2.4
Subtotal		22.7	27.4	28.4	16.5	16.2	8.4	14.7	26.0	11.9	11.7	16.6	10.7	211.2
Miscellaneous or Overhead														
10% shiftable							4.0	2.0		5.0	5.0		5.1	21.1
10% non-shiftable		2.3	2.7	2.8	1.6	1.6	.8	1.5	2.6	1.2	1.2	1.7	1.1	21.1
TOTAL		25.0	30.1	31.2	18.1	17.8	13.2	18.2	28.6	13.1	12.9	18.3	16.9	253.4

(a) Assume interplanted crop requires no land clearing.

Estimated labor requirements by crop distributed by months are shown in Table 4-9. Distribution obviously depends upon planting times, which tend to be in advance of the spring and fall rainy seasons. Further data on labor requirements per acre of crop with customary cultural practices and yields are shown in the appendix tables.

4.6.2 Rio Grande Valley. Low elevations.
A comparable "example" farm is presented for the coconut-growing areas in the higher-rainfall, low-elevation sections in the eastern part of the target area with rainfalls from around 100" to 150". Soil requirements are not exacting, but good drainage is important. Rainfall should be at least 60", and without long dry periods. Coconuts do best below 1000' elevation. Resource use, production and income for this model is shown in Table 4-10 and expenses in Table 4-11. A balance sheet for labor supply and requirements appears in Table 4-10.

The total days of labor needed, 205, is somewhat less than for the Buff Bay example, and only 7 days need to be hired. Labor requirement by crop is shown in Table 4-13, Gross income and expenses are both a little higher than for the Buff Bay example, and net cash return is about the same.

The physical and human resources of the average small farm in Portland are somewhat less than has been shown for the two examples given.[1] But these in turn are somewhat smaller than are considered economically viable by many agricultural officers. They are presented in this chapter to illustrate in a concrete way the present "state of the art" on some small farms.

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1. See Table 13 in Working Paper No. 1, "The Rural Poor in Jamaican Agriculture.

Table 4-10. Example of a Small Holding. Rio Grande Valley, Low Elevations.

Resources, Production and Income, 1977 prices.

Family:	Man and woman, age 55, three children in school, of which one is working age.	
Land:	Total 4 acres, 1 owned, 3 rented, 3 parcels.	
Crops:	Coconut, with banana and coco	1.75 a
	Coconut 70 trees	
	Banana 400 roots	
	Coco 375 hills, planted in fall	
	Yellow Yam with dasheen	.25 a
	Yams, 400 hills	
	Banana with Gungo Pea 250 roots	1.00 a
	Ruinate	1.00 a
Livestock:	2 pigs bought as 30 lb. piglets, fed on reject bananas and mixed feed sold end or year @ 190 lbs.	
	10 hens producing 800 eggs	

Production and Sales, Minus Home Use.

Coconuts:	70 trees @25 nuts =	1750 nuts	
	Less home use	100 nuts	
	Sold @ 9¢	1650	$ 148
Bananas:	650 roots @ 80% harvest = 520 stems @ 30 lb =	15,600 lbs.	
	Less home use	500 lbs.	
	Less 30% rejects	-4,530	
	Sold @ 6¢	10,570	$ 634
Cocos:	750 hills @ 80% harvest = 600 hills @ 2 lb. =	1200 lbs.	
	Less home use	250 lbs.	
	Sold @ 16¢	950 lbs.	$ 152
Dasheen:	125 hills @ 80% harvest = 100 hills @ 2 lbs. =	200 lbs.	
	Less home use	50 lbs.	
	Sell @ 15¢	150 lbs.	$ 22
Yams:	400 hills @ 80% harvest = 320 hills @ 6.3 lbs. =	2016 lbs.	
	Less home use	200 lbs.	
	Sell @ 23¢	1816 lbs.	$ 418
Gungo Pea:	(1/3 a full stand equivalent) =	200 lbs.	
	Less home use	200 lbs.	
Two pigs	produced, 190 lbs. =	380 lbs.	
	Less 10% death loss allowance	38 lbs.	
	Sold @ 65¢	342 lbs.	$ 222
		TOTAL SALES	$1,596

Table 4-11. Cash Expenses and Net Cash Income, Rio Grande Small Holding.

Expenses (Cash)

Banana pesticide	$ 28
Banana Hauling @ 30¢/stem	151
Haul coconut @ 1½¢/nut	25
Congo pea seed @ $1.20/lb.	12
Dasheen suckers @ 3¢ for 150	45
Yam stakes @ 30¢ for 400 ÷ 2 (use 2 years)	60
Fertilizer on Yam @ 2 cwt/a = ½ cwt.	4
Fertilizer on coconut @ 4 lbs/tree	2
Labor, 7 days @ $7	49
Purchase 2 pigs @ $30	60
Feed for pigs @ 4 lb: 1 lb. gain @ $10/cwt.	128
Miscellaneous @ 10% above	56
Total Cash Expense	$ 620

Operator's Net Cash Income

Gross Income	$1,596
Cash Expenses	620
Net Cash Income	$ 976
Value of Food Produced[1]	395
TOTAL	$1,371

Return per Day of Family Labor (198 d) = $6.92
(Which also includes compensation for capital)

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[1]

500 lbs. banana @ 4¢	= $ 20
100 coconuts @ 9¢	= 9
250 lbs. cocos @ 16¢	= 40
50 lbs. Dasheen @ 15¢	= 8
200 lbs. yams @ 23¢	= 46
200 lbs. Congo peas @ $1.10	= 220
750 eggs @ 7¢	= 52
TOTAL	$395

Table 4-12 Labor Balance, Rio Grande Farm.

Item	J	F	M	A	M	J	J	A	S	O	N	D
Potential Man-Days family labor[(a)]	23	23	23	21	18	24	27	24	23	18	21	23
Labor required	16	18	24	19	17	12	14	30	19	11	15	11
Hired labor needed			1					6				

(a) For details, see Table 8.

Table 4-13. Rio Grande, Typical Farm Labor Requirements, Usual Practices.

Crop or Purpose	Acres	J	F	M	A	M	J	J	A	S	O	N	D	Total
Coconut (70 trees)	1.75	.3	.2	.2	.3	.3	.2	.2	.7	.7	.3	.3	.3	4.0
(Banana) (400)	(1.75)	1.7	2.6	2.6	.8	1.8	2.6	1.8	.8	1.8	.8	2.6	.8	20.7
(Cocos) (750)	(1.75)	3.0	3.0	--	--	1.5	--	7.5	21.7	11.5	4.2	1.1	1.0	54.5
Yellow Yam (400)	.25	5.2	7.0	8.8	6.8	5.1	2.1	1.5	.5	.8	.6	.8	.9	40.1
(Dasheen)	(.25)	.8	2.0	.8	.4	.4	.4	.4	.4	.9	.1	.5	1.8	8.9
Banana	1.0	1.0	1.5	1.5	.5	1.0	1.5	1.0	.5	1.0	.5	1.5	.5	12.0
Gungo Pea	(1.0)	2.0	--	8.0	8.0	5.0	--	--	2.0	--	--	2.0	--	27.0
2 Pigs 10 hens		.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	3.6
Subtotal		14.3	16.6	22.2	17.1	15.4	7.1	12.7	26.9	17.0	6.8	9.1	5.6	170.8
Miscellaneous														
Shiftable (10%)							4.5				3.1	5.0	4.5	17.1
Non-shiftable (10%)		1.4	1.7	2.2	1.7	1.5	.7	1.3	2.7	1.7	.7	.9	.6	17.1
TOTAL		15.7	18.3	24.4	18.8	16.9	12.3	14.0	29.6	18.7	10.6	15.0	10.7	205.0

4.7 Production Potentials for Small Farmers by Major Crops

Estimates of production potentials for major crops appear in Table 4-14. Details with associated practices are in Tables 4-15 and 4-16. These are rough approximations on the basis of pure stands under average conditions. For mixed cropping* and for unfavorable sites, the yields, practices and inputs should be adjusted. Specific formulas for fertilizer and pesticides represent commonly used ones, but there are others that are better or as good under some conditions. They are named in order to facilitate use of the data for farm budgeting. Similarly, specific numbers of sprayings or quantity of fertilizer will depend on the locality, and will vary between wet and dry years. In the opinion of authorities, substantial increases in yield should be possible. It is apparent that heavy applications of fertilizer, pesticides, labor and other inputs will be necessary.

Implications of moving to higher levels of technology with respect to costs and returns have been developed for the two example farms described in an earlier chapter. These do not represent optimum solutions for the use of resources on these farms. Determination of optima would require considerably better data and the application of linear programming. The examples

*For evidence of the favorable aspects of mixed cropping in traditional agriculture, see D. W. Norman, "Economic Rationality of Traditional Hausa Dryland Farmers in Northern Nigeria," ch. 3 in R. D. Stevens, Tradition and Dynamics in Small Farm Agriculture, ISU Press, 1978. Norman found that mixed cropping gave higher total output per acre and lower production risks under traditional practices. In Jamaica, the Banana Board and Coconut Board recognize that mixed farming has advantages for small holders and are adopting cropping programs around them even though they report yields to be lower than with pure stands. ("Banana News," October 1978, "The Coconut Grower," June 1978.)

Table 4-14. Portland: Estimated Potential Yields for Crops with Improved Practices on Small Farms.

Crop	Unit	Yield
Red Pea	lbs.	1,000
Gungo Pea (dwarf)	lbs.	1,000
Yam (yellow)	Short tons (plus 2 tons heads)	6.3
Dasheen	Short tons	7
Coco yam	Short tons	7
Coffee	Box (cherry, 50 lb.)	40 (year 3)
		80 (year 4)
		120 (year 5)
		150 (from year 6)
Cocoa	Box (wet, 56 lbs)	7 (year 4)
		12 (year 5)
		25 (year 6)
		38 (year 7)
		50 (from year 8)
Coconut, sole crop (100 bearing trees)	Nuts	2,000 (year 5)
		3,000 (year 6)
		4,500 (year 7)
		6,000 (from year 8)
Banana (690 plants per acre)	lbs. @ 30 lb/stem	2,070 (year 1
		19,680 (year 2 through year 4)
		12,420 (year 5)
		6,160 (year 6)

For details see Appendix Tables A and B. For bananas assume, only 75 percent of production is salable. For tree crops, assume life of 20 years.

are intended to indicate some of the potentials for income enhancement on small farms, the increased labor requirements, investments, and operating costs involved. The Buff Bay example involves spreading development over a period of years to show the extent that capital formation could be built around family labor supply, with cash expenditures mostly attainable through increased cash flow. The process, however, is slow, and dramatic income increases do not come for eight or nine years. The present organization of a 4-acre farm is:

Old Coffee interplanted with coco	1.5 acres
Banana interplanted with Gungo pea and coco	1.0 acre
Red peas	0.5 acre
Ruinate	1.0 acre

Proposed changes are:

Year 1 - Replant one-half acre old coffee and switch to improved practices on the red peas. Eliminate the cocos. Plant trees for shade.

Year 4 - Replant remaining one acre of coffee. Plant trees for shade.

Year 5 - Replant the one acre of banana. Continue cocos and Gungo pea in the banana.

The Rio Grande "example" farm is also 4 acres. Land use is:

Old coconut interplanted with banana and cocos	1.75 acres
Yellow yam with dasheen	.25 acre
Banana with Gungo pea	1.00 acre
Ruinate	1.00 acre

The Rio Grande example simply treats all labor, family and hired, alike and makes the land use adjustments as rapidly as biologically feasible. Changes made on this farm include:

Planting 100 coconuts among the existing ones on	1.5 acres
Utilizing shade from old coconuts for new cocoa (new coconut will also be on this land)	1.5 acres
Expanding yams and dasheens with improved practices	0.5 acre
Banana (the cocos are dropped and banana are again replanted in year 6)	1.0 acre

Neither example exhausts the possibilities for improvement. Other crops and livestock enterprises could be shifted from "customary" practices to "improved" practices where there is reason to make the necessary calculations. But, farmers are more likely to move ahead on only one or two major programs in the early stages of improvement.

For both farms, the enterprises for improvement included one or two major crops: coffee in Buff Bay and coconuts with cocoa in Rio Grande, and a quick-responding annual crop, red peas, in Buff Bay and yams with dasheen in Rio Grande. The quick boosts in income help offset the heavy investment demands of the tree crops. In calculating labor requirements and supply, it is assumed family labor will be used to capacity, and excess needs will be hired. Capital is assumed to be available through credit to make the necessary investments. In all instances, it is assumed that all working capital is borrowed at 8 percent. Calculations are carried for enough years to reach maximum yield levels for the permanent crops. Results are not calculated for Buff Bay in years 7 and 8 because the figures would only continue the trend for years 6 to 9, and the calculation requirements were becoming onerous. The net return is a return to family labor and owned capital, without charges for depreciation. It would be desirable to carry the figures out for a few more years, the cyclical nature of incomes and expenses could have been replaced by doing permanent crop establishment in smaller increments.

The results of the development programs on the two farms are shown in Table 4-15, with details given in the Appendix. At the prices, yields and costs used, coffee is clearly a superior crop to cocoa/coconut in the long run, although in earlier years it is not as attractive. The returns from both programs are sufficiently favorable to indicate economic feasibility, assuming the rewards are not too far into the future to interest farmers.

If the farms were budgeted entirely around short-term crops, it might be made to appear on paper that still higher returns could be realized almost immediately. But, the average farm in the region does not have land of sufficient quality, especially in regard to slope, to make that usually attainable. Even if it were possible, a large expansion in peas, yams and similar crops would probably depress the market if adopted by many farmers.

At Buff Bay, the coffee is assumed to be planted under shade trees of suitable varieties. No fruit tree varieties are considered suitable as shade for coffee,[1] so, while costs of tree planting are included in the budgets, no income is assumed to be forthcoming.

For Buff Bay it is assumed that red peas can continue to be cultivated in small patches with no conservation measures other than rotation into fallow or "ruinate" land. However, only one planting a year is assumed, whereas farmers often have one in the spring and one in the fall. A similar assumption is made for yams/dasheen at Rio Grande. On many farms, continuation of intensive cultivation of these annual crops will require investment in conservation structures. According to information imparted to us by the Ministry Soil Conservation Officer for Portland, "horticultural" terraces eight feet wide would cost $560/acre or $16/chain of terrace.

1. Jackson, P. "Coffee Establishment and Crop Care" in IICA Short Course in Hillside Farming, Vol. II, pp. 281-1.

Table 4-15 Income, Expense and Labor Requirements, on "Example" Small Farms, Present and Improved Practices, in Two Areas.

Item		YEAR								
	1977	1	2	3	4	5	6	7 [a]	8 [a]	9
Buff Bay										
Income	$1,341	$1,354	$1,312	$1,670	$1,708	$1,946	$3,771	$4,573	$5,375	$6,178
Expense	475	671	515	554	1,166	1,410	1,088	1,100	1,120	1,141
Net cash return	866	683	797	1,116	542	586	2,683	3,473	4,255	5,037
Home use food	402	402	402	402	402	402	402	402	402	402
Total net cash	$1,268	$1,085	$1,199	$1,518	$ 944	$ 988	$3,085	$3,875	$4,657	$5,439
Days labor total	244	274	249	265	324	349	284	286	288	291
Family labor	222	250	224	245	267	263	257	255	254	252
Rio Grande										
Income	$1,596	$2,279	$2,822	$2,810	$2,850	$2,764	$2,701	$3,674	$3,962	$3,962
Expense	713	2,110	922	961	1,111	1,141	1,944	1,355	1,490	1,490
Net cash return	883	169	1,900	1,849	1,739	1,623	757	2,319	2,472	2,472
Home use food	395	395	395	395	395	395	395	395	395	395
Total net cash	$1,278	$ 564	$2,295	$2,244	$2,134	$2,018	$1,152	$2,714	$2,867	$2,867
Days labor total	205	407	258	258	265	267	353	284	287	287
Family labor	205	260	258	258	260	260	260	260	260	260

(a) For Buff Bay, figures were not calculated separately for each year. Figures here are merely extrapolations from years 6 and 9.

At Pindars-Two Meetings, current c(; of wide terraces are estimated to be $400 an acre if done by bulldoz(and $1200 if done with manual labor. But terraces are not recommended for slopes above 25^{0} for food crops. At steeper slopes, 45 percent of the land is taken up by the risers.[1]

Neither of the improvement plans analyzed has assumed that the acre of "ruinate" could be put in crops. Usually, ruinate is a part of the traditional crop rotation, being brought back into cultivation as other fields are allowed to go back into fallow. The area in ruinate could be reduced with a system of conservation terraces.

The development program for the Buff Bay farm does not reduce the seasonality of labor much, but does raise the demand for labor in each month so that family labor has the opportunity to be almost fully employed if it so desires. The calculations assume family labor will do as much work as it can in both of the farm examples used. If this assumption is not correct, hired labor costs would, of course, rise.[2] Calculated returns to family labor in the base year are somewhat less than hired wage rates, but would be substantially higher under the reorganization plans.

Cash flows from the two farms, without interest charges, but with home-produced food included as income and family labor charged at $5 per day appear in Table 4-16. The charge for family labor is assumed lower than hired wage rates because hired rates, presumably are higher

1. Information from the Ministry's Soil Conservation Division, October 1978.

2. For Rio Grande, monthly labor requirements were not calculated, and it was assumed the annual family labor supply of 260 man-days would all be utilized as needed. This assumption overstates the family labor input to some extent.

Table 4-16 Cash Flow on Example Farms[a]

Year	Buff Bay	Rio Grande
Base (1977)	$ 203	$ 396
+ 1	- 116	306
+ 2	121	- 580
+ 3	343	1,023
+ 4	- 305	1,026
+ 5	- 223	916
+ 6	1,881	802
+ 7	2,685	- 4
+ 8	3,475	1,515
+ 9	4,270	1,677

(a) No interest charged, family labor included in cost at $5 per day. Value of home-produced food included in income at farm gate prices.

than family labor could expect, because of seasonality, and characteristics of the family work force.

Cash flows are only negative for two years in the Rio Grande example, and in three years for Buff Bay. The difference arises from the characteristics of the enterprises grown. If no charge is made for family labor, there are no years of negative return for either model.

Six years are required at Buff Bay to give substantial increases in income. At Rio Grande, because of the estimated returns for yams and dasheen, incomes are more than doubled in the second year, but they never rise as far as with the Buff Bay coffee farm and they fluctuate in six-year cycles because of replanting of the banana crop.

The income flows illustrate how important family labor is for capital formation, and indicate that if moderate amounts of financing are available to carry families over the first five or six years of development, capital should not be a barrier to farm improvement.

Analysis of the two example farms supports the hypothesis that farms of four acres in the Target Area can be economically developed to give incomes two to four times as high as at present, but that reliance on permanent crops means that farmers must be willing and able to go through some lean years before high returns are realized.

The two farms are examples presented to help visualize quantitatively the possibilities. The strategies for finding out what the optimum farm adjustment possibilities are, and how they might be realized are discussed in Chapter 7.

5. Production and Marketing Constraints in the Target Ar

5.1 Introduction

This section will focus on the ways in which specific constraints affect production potential in the Target Area and explore the possible remedies.

5.2 Five Principal Constraints

An idea of the principal constraints to farm production on farms of different sizes is given in Table 5-1 . The five constraints most frequently mentioned, from a list of 14, by a large sample of farmers interviewed in early 1978 are listed in descending order by size of farm. Concern with capital and credit is important on small- and middle-sized farms, and even for some large ones. It is surprising that marketing is not given more prominence. Poor roads and the marketing system usually are mentioned, but never frequently enough to put them in first place. The ranking of praedial larceny rises steadily with size of farm and is among the top constraints for farms of 50 acres and more. Availability of plant materials is of considerable concern among farmers of all sizes.

An informal canvass among about 18 extension officers in Portland indicated that they felt market and processing outlets for crops were clearly the leading constraints to expanded production in the Target Area, with access to inputs in second place.

Table 5-1. The Five Principal Constraints to Production as Mentioned by Farmers by Size of Farms - Jamaica, 1978.

Size of Farm (Acres)	Most Frequently Mentioned[a]				
Less than 1	Capital	Small farm size	Labor*	Water	Credit
1 - 1.9	Capital	Small size	Roads	Labor	Credit
2 - 4.9	Capital	Credit	Labor	Plant Materials	Roads
5 - 9.9	Capital	Credit	Labor	Marketing System	Plant Materials
10 - 24.9	Labor	Credit	Capital	Water	Praedial Larceny
25 - 49.9	Labor	Water	Poor Land	Marketing System	Capital
50 - 99.9	Labor	Praedial Larceny	Capital	Roads	Planting Materials
100 - up	Praedial Larceny	Roads	Poor Land	Water	Labor
ALL FARMS	Capital	Labor	Credit	Plant Materials	Water

SOURCE: Unpublished material from the Crop Production Survey. First Quarter, 1978. Ministry of Agriculture, Kingston.

(a) Arranged from left to right in descending order of frequency mentioned.

*It is difficult to understand why many farmers of less than one or two acres should have a labor problem, but similar findings appear in other surveys, the Pindars-Two Meetings survey, for example.

5.3 Priority Among Constraints

The analysis of the small farmers' list of production constraints on an island-wide basis (Part I of this study) were as follows: (1) Land of low productivity on steep slopes, (2) Small and scattered holdings, (3) Transport problems for products and inputs, (4) Limited family labor resources, (5) Limited capital resources, and (6) Some institutional constraints.

Further analysis calls for a re-examination of that list as a result of which the following 12 physical, economic, institutional, and attitudinal constraints are listed.

1. Imperfect Markets. There is so much concern among small farmers about market outlets that production expansion is directly keyed to dependability of markets. The behavior of markets has much to do with price risk and with transportation facilities.

2. Poor Land Quality. A constraint that has a mighty influence on how one farms. To quite an extent, assuming farmers will continue to exist in the area, land quality is a given, to be adapted to. But, conservation measures within economic limits and access to more land would help.

3. Uncertain Tenure and Limited Access to Land. Of high importance because of its effect on production decisions and availability of credit.

4. Limited Equipment and Structures. An important constraint that makes low worker productivity inevitable, and thus far one that does not allow much room for improvement, so improvement here is linked with improvement in the supply of new technology.

5. Limited New Technology. Small farms are in equilibrium at a low level of productivity partly because there is not enough reproducible known technology available to them. A careful search of the literature has turned up only one or two sets of data properly designed for use in calculating production functions.*

*David Edwards pointed out the gap in suitable production data for economic analysis in 1961. Edwards, An Economic Study of Small Farms in Jamaica, 1961, p. 207. The gap is still there.

6. Lack of Farmer (and Technician) Access to Proven Facts About Better Technology and the Market Situation. A field extension staff is in place with 34 positions in Portland. But there is a lack of authoritative information they can use with confidence about the levels of improved technology that will pay.

7. Poor Input Distribution Services. Farmers complain frequently of the problems of disappearance of fertilizers and chemicals from the stores, and problems of moving bulky fertilizer to their farms and of paying for it. The Blue Mountain Coffee Co-op shows how a cooperative, with affiliated farmer groups can help. But the problem of national shortage still remains as well as the need for more good co-ops.

8. Limited Access to Credit together with its close relative, lack of working capital. Small farms, with their insistent demands for subsistence and limited family resources leave little capacity for internal capital formation. So it is vital that funds from external sources be available on terms and conditions appropriate to small farmers. The value of more credit depends of course on the making available of new technology and more resources. Otherwise, more credit will only send up prices of existing resources or be frittered away.

9. Shortage of Family Labor. Despite its low rating, an important constraint. The ones with higher rating are there because if something is done about them, family labor will be attracted back to the farms. In the meantime, labor can be hired for activities that are productive enough to pay their wages.

10. Inadequate Water Supply. An inconvenience, and a barrier for some farmers. Probably of as much importance as an amenity to keep people happy on the farm as an inhibition to production.

11. Technological Difficulties Caused by Multi-Cropping. Not a major obstacle now, but may become one at high levels of technology. But in the meantime, it is an obstacle that can be lived with and adapted around, and that has off-setting benefits of reduced risk and higher total output per acre.

12. Skepticism with respect to constancy of Government commitment to help the small farmer. The small farmer has heard much about technical and financial assistance, but is a "doubting Thomas" with respect to delivery.

5.4 Constraints, Their Impact on Small Farms, and Action Needed to Reduce Them.

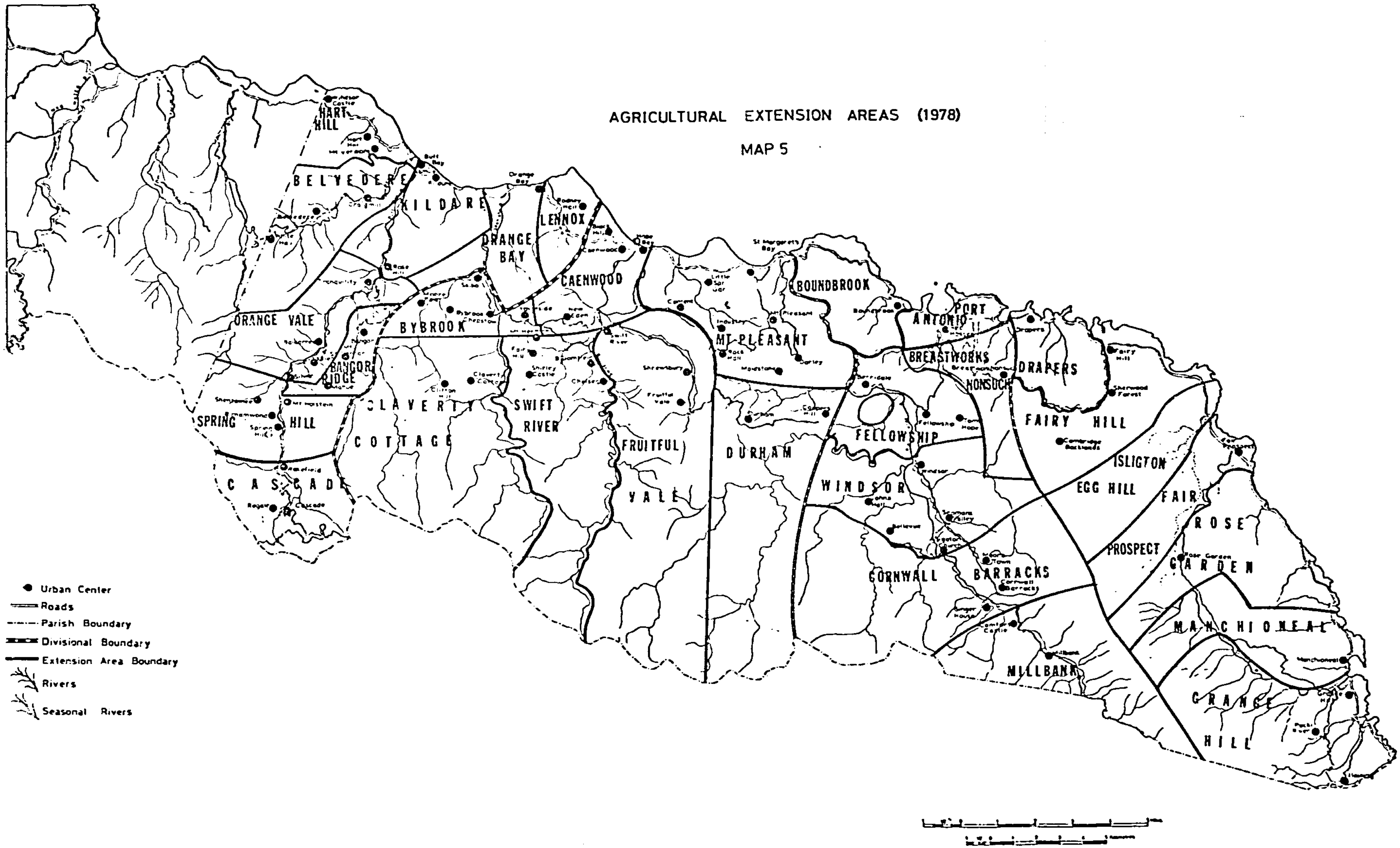
Taking into account the foregoing, the principal constraints affecting small farmers are presented with a statement of their impact on small producers and the action needed to relieve the constraints. The analysis begins with constraints at the level of the farm decision-maker and proceeds to those where the primary decision-making is external to the farmer. However, for all the constraints, the farmer has a vital role as decision-maker and initiator. Where action is contemplated, it will be noted that they take their place in a spectrum--at one end are those where the farmer could act alone and at the other end where he would have to adapt to circumstances he cannot change. In the majority of cases, he would have to act jointly with others, the initiative being mainly his, some of the time, and with others at other times.

All of the groups of constraints are important; they must be viewed as part of a total system in which each link of the chain is tested for its strength: planning-for-production, production, marketing (wholesaling, retailing, transport, market information), savings, credit, investment, and back to planning-for-production.

When the constraints exist at several levels--farm, group of farmers, community, parish, regional and national--as they do in this case--the question of priority in attending to these constraints becomes

AGRICULTURAL EXTENSION AREAS (1978)

MAP 5



all the more necessary. In the final analysis, each farmers' group has to make its feelings clear as to the strength of the constraints affecting it. Seen from this distance, it would seem (as a first approximation) that the provision of inputs and the disposal of outputs rank high in terms of the number of farmers whose progress is impeded by these categories of constraints.

For several examples of the specific types of constraints mentioned by Portland Parish's extension agents and a map of extension areas, see Appendix III.

A. Farm Resource Constraints

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
1. Steep slope and poor land quality. Only 10% of area croppable with simple practices and just over 20% more with complex practices.	1. Severe loss of soil when in food crops and frequently when in tree crops. 2. Landslides on shale soils. 3. Some soils droughty, resulting in crop losses even from moderate drouth. 4. Difficult terrain leading to high labor requirements for production and for transport of products and inputs. 5. Hill farmers ineluctably produce on a small scale. regardless of acreage, fields can rarely be consolidated for mechanization. 6. Conveyance of water for irrigation or domestic use very difficult because of topography.	1. Shift in land above 30^{o} into forest. 2. Shifts in land use out of arable crops above 25^{o} or 30^{o}. Contours and orchard terraces for tree crops. 3. Erosion control structures for arable crops on erosive sites. 4. Improved farm practices to conserve soil and moisture, e.g., mulches, chemical weed control and grass strips. 5. Grassland establishment on steep slopes or terrace risers, with concomitant development of a grass-using and conserving activity. 6. Highly selective and adaptive mechanization, e.g., cable transport for some products, donkey trails, portable mechanized tools.	1. Economic and social analysis to determine best paying soil conserving crop combinations and crop and livestock practices. 2. Educate farmers on land-use adjustment via farm planning. 3. Community educational materials on land-use planning.	1. Community-wide use adjustment mechanism to shift some farmers from hopelessly disadvantaged small hill farms to better lands via coordinate land-lease, land development and forest reserve activities. 2. Possibly community enterprise organizations to engage in cooperative woodlots or pastures.

A. Farm Resource Constraints (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
2. Insecure or uncertain control over land by the decision maker.	1. Insecure tenures result in short-term planning for investment of either labor or capital. 2. Difficulty in borrowing as most lending agencies require land as security, and insist on an approved title. 3. Titles received under the Facilities for Title law do not remove uncertainties about transmission of land to heirs and thus present some barriers to long-term planning by older farmers. 4. Land-Lease I has the same problems of insecurity as other short-term leases.		1. Study feasibility of applying the Torrens System of land registration and title insurance as used in Australia.	1. If improved title registration procedures are developed, introduce the new system. 2. Help credit agencies develop operational lending procedures that do not require land as a security. Small cooperative groups for guarantee of loans would be one possibility. Another is to develop link with marketing agencies to facilitate collections.
3. Insufficient land quantity.	1. Where labor and capital are not limiting, farmer uses his hilly land more intensively than he would if he could make a living from more extensive enterprises. 2. Ruinate or fallow cycle is too short to recondition soil. 3. Desire for more land leads to farming of multiple tracts with time wasted in travel and problems of field management.	1. Look for and open up additional productive remote areas through roads and trails. 2. Improve land classification and land development on Land Lease acquisitions.	1. Feasibility studies of road or trail development.	1. Utilize existing programs like Land-Lease to effect farm enlargement and consolidation. 2. Devise a program to facilitate functioning of the farm land market through "farm enlargement loans" available to small farmers who find a suitable piece of land to add to their holdings. JDB could make such loans.

A. Farm Resource Constraints (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
4. Non-availability of water at times and places.	1. Despite high rainfall and dependable springs, many farmers have problems of crop losses from droughts of 3 to 4 months. 2. Domestic water for family, livestock, and crop-spraying is not easily accessible for farmers with houses, fields, or pastures away from settled communities. 3. Lack of ponds precludes fishing and stored water for livestock and field use.	1. Highly selective developments where need is great and payoff is high. 2. Field trials of a few small impoundments for fish and farm use. 3. More extensive use of low-volume sprays or dusts where carrying water is onerous.	1. Feasibility studies of water development for supplemental irrigation and for small ponds. 2. Socio-cultural studies of potential for community or group ponds.	
5. Limited family labor supply in number, age composition, and motivation. Average age of farmer 50 years, 2/3 have no male children out of school and on farm. Half are without spouse.	1. Crops are not adequately cultivated. 2. Insufficient family labor to renovate existing permanent crop or plant more. 3. Older farmers take less risk and avoid long-term planning. 4. Few older children interested in planning their future on the farm. 5. Lack of motivation impedes working and planning at full potential.	1. Adjust farming system to improve seasonal distribution of work. 2. Try out selective mechanization to make labor more productive and attractive. 3. Extend some amenities in small farm communities.	1. Devise farming systems and practices that pay better. 2. Educate farmers through farm planning to see profitability of improving their programs and thus encourage them to invest in hired labor. 3. Make feasiblity studies of rural community amenities. 4. Study farmer motivation to identify programs and activities of most appeal.	1. Strengthen 4-H and Youth Club training and home-farm community projects to give income incentive to stay on farms, and indirect education to parents via the demonstration effect. 2. Utilize Youth Corps and crash programs to do soil conservation, community forest and similar programs for benefit of small farm communities. 3. Work via various farm and community groups to generate peer group pressures for agricultural improvements. 4. Tighten up Crop Lien and Land-Lease programs to push for higher performance.

A. Farm Resource Constraints (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
6. Limited structures, power and equipment, in quality and quantity. Tools are the hoe, fork and cutlass. Virtually no livestock shelter or pens. Hand tools in short supply. One in 4 has animal transport.	1. Low labor productivity (with customary practices, man-days per acre are: red peas (1-crop), 27; cocos or dasheen, 67; yellow yam, 160; coffee, 33). 2. Drudgery, leading to discouragement and migration, especially of youth. 3. Poor transport equipment leads to loss and damage of perishable commodities and difficulty in bringing inputs to the farm. 4. Inability to find essential tools in local markets (e.g., files for machetes). 5. Few suitable structures for storing perishables like onions, or for care of animals. Farmers report high mortality of calves and kids born in cold, wet weather.	1. Devise low-cost equipment for small farms. (e.g., the metal sockets for yam stakes developed at CARDI). 2. Encourage small-shop manufacture of small tools. 3. Construct simple farm-market roads and donkey trails. 4. Cableways to move products and input in hilly areas. 5. Experiment with applications of small gasoline motors and rechargable batteries for portable mowers, cultivators, sprayers, etc.	1. Feasibility of a wide variety of small tools, transportation devices and structures. 2. Work simplification studies of alternate crop and livestock practices to increase productivity. 3. Feasibility studies of alternate transport and road systems including donkey trails, motorable roads and cableways.	1. Improvement in group utilization of facilities and equipment. 2. Credit and insurance program for donkeys and mules.

A. Farm Resource Constraints (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
7. Inadequate capital. (e.g., in West Portland and East St. Marys, 82% to 87% of small farms say they have no savings.)	1. Inadequate investments to maintain and expand tree crops. 2. Insufficient working capital to properly handle annual crop production outlays for labor, fertilizer, and pesticides. (Farmers give lack of money as a common reason for low use of these, especially for hired labor.) 3. Insufficient funds to permit purchase of livestock.	1. Adaptive research to develop less expensive or labor-consuming practices for production, e.g., minimum tillage systems.	1. Research on more capital efficient farming systems, e.g., legume production in rotations to reduce need for Nitrogenous fertilizer, or minimum tillage practices.	1. Improve land-title procedures to facilitate borrowing, and devise loan programs based on farmer-group guarantees in place of using title as security. 2. Strengthen the co-op credit institutions. 3. Improve credit facilities for livestock. 4. Externalize more costs, especially where there are more effective ministry, co-operative, or board production and transport services, e.g., aerial spraying.

B. Provision of Inputs

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
1. Unavailability of fertilizers and some chemicals. Weedicides and pesticides also are said to be sometimes unobtainable.	1. Decline in fertilizer use over the past 3 or 4 years, while principally affecting large growers, has also resulted in lower yields on small farms (About 28% of fertilizer was used on farms of less than 10 acres in 1977. Tons of fertilizer distributed to members by the Blue Mountain Co-op was 531 tons in 1975/76 and 387 tons in 1976/77 and 330 tons in 1977/78.) 2. Unavailability of pesticides and weedicides at times is said also to be having adverse effect on production and causing farmers to travel from town-to-town in search of supplies.	1. Improve the local handling and distribution of agricultural chemicals, perhaps a mini-store should be set up near or at each area extension office.	1. Study the current awkward procedures for ordering, procuring and transporting bulky inputs like fertilizer. Devise schemes to have some of this done by setting up groups of farmers to consolidate ordering, delivery and payment. (Alcan has experience in this area.)	1. Improve the performance of the foreign exchange allocation and procurement procedures for fertilizer and agricultural chemicals. 2. Stimulate JAS, and the local co-ops to improve local planning, ordering, and distribution of fertilizers and chemicals including extension of arrangements for credit and collections.

B. Provision of Inputs (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
2. New technology is inadequate to move many farmers from present low technology equilibrium level to a higher level. Situation is spotty. Principal gaps appear to be: labor-saving technology for small farms, farm- or small-scale storage facilities, more knowledge of crop management practices and cropping programs for mixed cropping. Potentials for processing crop by-products are neglected.	1. In the absence of advice based on knowledge of the production potentials, farmers are told to increase fertilizer use by so many cwt., but the advisor has no good basis to insure the farmer of yields he can expect. Vogue recommendations are usually ignored. 2. Research findings on the physical, social and economic problems and potentials of small livestock enterprises are non-existent, especially for small increments, so these resources are neglected. 3. Farmers have little idea of what the possibilities are for improved grassland and forestland management.	1. Expand research on small farmer mechanization aimed at cracking key bottlenecks in labor use. 2. Expand research on small livestock production systems especially for small ruminants.	1. Feasibility studies of new farm enterprises, and of processing of selected farm products.	1. Expand the Allsides concept of field trials on farmers' fields into the Portland area. 2. Strengthen the research components of the Ministry of Agriculture and of the Commodity Boards.
3. Inadequate credit on suitable terms, and inefficient credit delivery systems. PCB and JDB loans said to take 2 to 6 months to obtain. PCBs have inadequate funds and poor collection procedures. Virtually all sources except Crop Lien require pledge of title deeds. Inefficient collection policies result in funds being tied up in poor loans and less is available for good farmers. Insufficient control over uses of loans.	1. Farmers are discouraged from seeking loans because of delay and title requirements. 2. Crop Lien, under which $13 million was disbursed in its first year did not include permanent crops, which did not have similar favorable credit access, so farmers were steered toward food crops, a few of which over produced. 3. Some funds, intended for specific production purposes are diverted to other uses.		1. Devise programs to make credit available in kind to expedite the timely availability of inputs. 2. Study possibilities of increased links with marketing agencies in collection of credit. 3. Study feasibility of developing crop insurance provisions in connection with credit programs.	1. Expand credit facilities of cooperatives that distribute inputs, e.g., the Blue Mountain Coffee Co-op. 2. Strengthen or reorganize the PCBs to improve effectiveness of credit disbursement and collection. 3. Encourage PDBs to experiment with livestock loans. 4. Encourage JDB/SSFAP to establish a small farmer window with less stringent collateral requirements for the longer term loans not obtainable from other sources.

B. Provision of Inputs (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint
4. The existing system of inputs assembly (fertilizer, seeds, seedlings, insecticides, pesticides, and weedicides) pits the small farmer against a number of persons and agencies and situations. The procedure is often drawn-out and time-consuming. Nor have the inputs been forthcoming even after the expenditure of effort to obtain them.	1. The unavailability of agricultural chemicals has had the twin effect of reducing his yields and of increasing his labors for a given output.	1. A way to begin would be to use an existing cooperative which is already doing this for one or two crops, such as the Portland Blue Mountain Coffee Cooperative. It provides fertilizer on a group basis, where payment is made out of the coffee bonus. The co-op disposes of the cherry coffee. Cooperative members have requested that a limited program of disposal of domestic food crops be initiated.
5. The advertisement of the existence of subsidies for one or another purpose (water catchment and tank systems, housing improvements, ground clearance and preparation, etc.) have the limitation that funds supporting the subsidy are too little for it to go far.	1. Different subsidies often require different application forms, and not many farmers are up-to-date on the source, location, and means of payment of one or another input of subsidy. Information from the extension agent reduces in small measure the steps in the procedure.	1. Probably needs such as bridle paths improvement, water catchment and tank systems, etc., can be better handled on a group basis (reducing handling overhead) by community. 2. Simultaneous with above is the completion of a domestic food crop supply and distribution study in which local, parish, and regional contributions are verified and assayed.

C. Marketing

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint: Physical	Economic and Social	Institutional
1. The markets for small farmers are volatile for food crops, and it is hard for him to meet quality standards for export bananas.	1. Moderate increases in production are soon followed by local declines in prices. (Retail produce markets show as much as a 50% to 75% differential among Jamaican markets, suggesting considerable market imperfection.) In the Rio Grande area, dasheen price in 1977/78 is said to have fallen from 24¢/lb. to 8¢/lb. When prices fall, AMC is said to tend to withdraw from the market. 2. Small farmers report rejection of from 30% to 40% of bananas sent to the boxing plants. They claim not to understand the causes or how to correct them.	1. Improve and increase local market collection facilities, storage, and distribution to make the market more responsive to supply and demand conditions. 2. Improve roads and transport.	1. Improve market intelligence and market information to growers and higglers, to AMC and others. 2. Develop new market outlets including lower-order uses for surpluses, e.g., starch, juices, or animal feeds. 3. Offer price and yield protection assurances to farmers in first phase of production campaigns.	1. Strengthen and realign the agricultural marketing system, clarifying and rationalize respective roles of AMC and higglers.
2. Price fluctuations and uncertainty are a common occurance, except for major export crops.	1. Price uncertainties discourage small farmers from expanding production. Even for export crops, some base prices have been too low to encourage growers, e.g., cocoa at $7.02 in 1977.	1. Improve and increase local market collection facilities, storage, and distribution to make the market more responsive to supply and demand conditions. 2. Improve roads and transport.	1. Improve market intelligence and market information to growers, higglers, AMC and others. 2. Develop new market outlets including lower-order uses for surpluses, e.g., starch, juices, or animal feeds. 3. Offer price and yield protection assurances to farmers in first phases of production campaigns.	1. Strengthen and realign the agricultural marketing system, clarify and rationalize respective roles of AMC and higglers.

C. Marketing (Continued)

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint: Physical	Economic and Social	Institutional
3. Inadequate information in the hands of small farmers on production, prices and markets. Area extension officers help in presenting technical information, but there is very little economic information available to extension officers, farmers and policy-makers to guide production and marketing decisions.	1. Farmers get confusing information. They are urged to grow crops that soon become in surplus, as with cassava in 1977 or that have low consumer acceptability, as with non-red cow peas in 1978. 2. Farm planning programs have been tried as early as 1957, but largely on the basis of physical plans on the basis of inadequate physical data.		1. Make economic cost and return studies and do linear programming to help select priority crop and livestock activities. 2. Disseminate cost, production, income and outlook information in a timely fashion to extension officers, cooperative and farm settlement officials and farmers.	1. Strengthen economic statistics and analyses services in the Ministry of Agriculture. 2. Post specialists in production economics or farm management in the regional extension offices and later in parish offices.
4. Small quantities marketed of domestic food crops and of export crops.	1. Low return to the grower. 2. Distributive margins are high in terms of social cost. 3. Attention to grades and standards is variable depending on farmer's deal with the higgler.			
5. Lack of alternative marketing outlets.	1. Farmer or member of his family (usually wife) will carry produce to Kingston to obtain better price than that available locally. 2. If expected price and/or quantity salable is below his expectations, commercial aspect of his operations will be retrenched.	1. The creation of suitable alternative marketing outlets is beyond the capacity of any single farmer or group of farmers. This falls within the province of the central Government and of public and private agencies specialized in: (a) the promotion of regional and sub-regional urban growth centers, (b) establishment of agro-industries in rural areas or market towns, (c) export promotion, (d) a policy of national economic growth within which food consumption and industrial raw materials will rise.		

C. Marketing (Continued)

Constraint	Impact on Small Farmer	Action Needed to Reduce Constraint
6. Large amounts of wastage and spoilage.	1. Leads to reduced quantities for the consuming public. 2. Higher costs to public. 3. Reduced returns to the grower.	1. It is clear that knowledge exists with respect to grades and standards, but often the results depart from the standards. 2. Small farmer needs to be shown, by demonstration, the correct agronomic practice for meeting the required grades and standards.
7. The existing system is functionally fragmented according to the major export crops--banana, coffee, coconut, cocoa, etc. For disposal of domestic crops, the small farmer deals with one or more higgler, the AMC, and he and/or his spouse may also participate in the wholesaling/retailing of these crops in the nearest regional center or in Kingston.	1. The small farmer thus finds himself in a one-to-one encounter with many different marketing institutions and channels. This costs him a lot in terms of marketing time and effort, and he is often in a disadvantageous bargaining position.	1. A cooperative which takes on the responsibility for the assembly of basic inputs and for the disposal of outputs should be able to do this more efficiently and with better returns to its members.

D. Credit and Cooperative Constraints

Constraint	Impact on Small Farm	Action Needed to Reduce Constraint
1. Inadequate supplies of short-term credit (during the 1970s, outstanding loans of P.C. Banks declined in real terms).	1. Since small farmer's own supplies of working capital are virtually non-existent, an expansion of production without adequate supplies of short-term credit would be problematical.	1. An increase in the P.C. Banks credit resources are needed, but only on condition that administration is improved, particularly oversight of loans.
2. Delinquencies on P.C. Bank loans: 39% on Crop Lien Program--95% of loans extended.	2. Continuation of this tendency leads inevitably to the restriction of small farmer loan programs, even as their credit needs are greater than ever.	2. Where possible, loans for agricultural production should be channeled through a small farmers' marketing cooperative.
3. Inadequate supplies of long-term credit (no formal institution exists for the extension of long-term credit.)	3. In the absence of better farming tools, equipment, edifices, the farmer is condemmed to permanent use of hoe, machete and pick. He cannot add new plantings of tree crops (coffee, cocoa, coconut) without assistance.	3. A separate line of credit is needed for long-term purposes. (This will probably require foreign-based funds.)
4. Marketing cooperatives are too few to meet credit and marketing needs of small farmers.	4. Small farmer is disadvantaged in his marketing encounters; he is regarded as being a risky client in seeking credit.	4. Marketing cooperatives are needed at the community level to handle assembly of inputs and outputs.
5. Attitude of small farmer that he doesn't have to repay Government loans (e.g., Crop Lien Program).	5. A consequence of this--if true and if it persists--is logically the end of any Government-sponsored credit program.	5. An integrated program covering the deficiencies in rural infrastructure and technical and financial assistance.

E. Rural Infrastructure Constraints

Constraint	Impact on Small Farm	Action Needed to Reduce Constraint
1. Roads: Local situations exist where short new roads or road maintenance are lacking.	1. Farmer finds it difficult, if not impossible, to carry crops via 'bridle paths' to main road, and thence to market. 2. Certain crops, e.g., bananas, are subject to injury and rejection at the boxing plant.	1. Ascertainment of the facts of the case in order to determine the number of farmers and the volume (actual and potential) of produce involved, followed by an action program.
2. Electrical Service: Only 11% of rural farmhouses are connected for simple lighting, and must less for operating motorized equipment.	1. The impact on the farm household is adverse economically, socially, culturally, and psychologically. The farmer cannot pursue his goal of light mechanization even where the topography permits; social and cultural activities are restricted; and the feeling of 'abandonment' is ever present when the delay in making the connection is prolonged. 2. Inability to use motorized tools restricts or inhibits other income-earning activities (handicraft, woodwork, construction, etc.)	1. Facilitate the programs, ongoing and projected, of the Rural Electrification Commission.
3. Inadequate supplies of water for domestic and farm use. Most rural households have to resort to springs and rivers for their drinking water.	1. Loss of time and effort on the part of the farm family to cover distances of a mile or more to obtain water; and the amount is restricted to what one can carry in relatively small containers. 2. The paucity and uncertainty of water supply conduces unsanitary living and working conditions. 3. Loss of crops in times of drought. 4. Feelings of discouragement: can't "get ahead."	1. Extension of the standpipe system along the secondary and tertiary roads. 2. Assistance to the farmer for the installation of rainwater catchment systems and tanks. 3. Where justified by the number of farmers and the economic potential, the installation of minor irrigation systems or micro-dams.

F. Agglomeration of Village Services and Designation of Regional, Sub-Regional and Market Centers

Constraint	Impact on Small Farmer	Action Needed to Reduce Constraint
1. There are many villages at a similar low or marginal level of development. Often no one village stands out as a higher order central place which would allow it to have more and better public and business functions. The common pattern is for populated places to have a linear and discontinuous form which may dribble along a road for one-half to three-quarters of a mile or more.	1. The farmer has to travel considerable distances to different higher order centers for different products or services, and often these are only sometimes available. This makes the provision of services more costly.	1. The availability of services in the designated Regional Center (Port Antonio) should be reviewed and brought up-to-date from the standpoint of its capacity to serve as a growth center, as a farm service center, as a tourist attraction, etc. A more clustered pattern should be encouraged.
2. The Target Area has the special characteristic that the important valleys have their outlet on the coast road. Communication between the valleys requires prior exit onto the coast road, but the services along the coast road are not what should be expected	1. The incentive value of properly equipped market towns, sub-regional, and regional centers on the farmer and his family is under-estimated, including the importance of 'growth centers' which would provide jobs for youth entering the labor force.	1. Similarly, the functions of sub-regional centers (Buff Bay, Hope Bay) should be reviewed 2. Market towns in each of the valleys should have their basic infrastructure services supplied, including their capacity to serve as collection points for the supply of inputs and outputs.

G. Small Farm System Constraints

Constraint	Impact on Small Farms	Action Needed to Reduce Constraint		
		Physical	Economic and Social	Institutional
1. Mixed farming system may make high output and moderni-zation difficult, although at present level of technology, it has advantages in diversi-fication and complementory in resource use.	1. Plant competition may re-duce yield of most valuable crop. 2. Mixture of crops may make fertilizer and pest control more difficult for any one crop. 3. Mixtures may complicate efforts to mechanize or use chemical weed control. 4. Where a main crop and a "cash" crop or a main crop and a shade crop are grown together, often a tendency not to eliminate the second-ary crop when the principal one needs the space.	1. Change cropping system by better choice of crop or changes in plant spacing or timing. Change to be made only when result is defin-itely more profitable than former one, with due regard to labor, risk, and soil con-servation aspects. 2. Do research to see if problems of mixed cropping can be simplified through changes in planting practice, row width, etc., to make mixed cropping compatable with higher technology.	1. Research to ascertain most profitable crop combination varying levels of technology and price-cost conditions. 2. Extension farm planning with farmers to improve sys-tem.	1. Organized inputs assem-bly and output marketing must be given national sup-port.

H. Constraints in Attitudes, Values and Aspirations

Constraint	Impact on Small Farm	Action Needed to Reduce Constraint
1. He feels small in relation to bigger entities and forces. He is, consequently, at turns, cautious and expectant.	1. Wherever he turns, the small farmer is confronted by bigger, often well-intentioned entities (Ministry of Agriculture, extension agent, PCB, JDB, Commodity Board, etc.). In few cases, is he a member of an organization that really speaks and acts for him.	1. Local farmer expression and organization are needed to assist him to modernize at a cost and with means available to him.
2. He feels that the economic margin above survival is small, so 'safety' and 'caution' are the guidewords.	2. He cannot take a chance that will wipe out his small margin. The 'chance' may be a new enterprise, a cash outlay for inputs (necessary but expensive), a credit application (which must be repaid with interest, however reasonable . .)	1. The common denominator behind the variety of actions that might be taken to neutralize these attitudinal constraints is his feeling that 'in unity there is strength;' that he is not facing the future alone, but is doing so on the best available expert judgment, and in company with fellow farmers in his community.
3. He wants his children to 'do better.'	3. He himself would be willing to clear some more ground for cultivation or even spend some of his savings (if he has any), if there is prospect of improvement . . .	3. The signals supporting an extra effort on his part and on the part of his family must be clear signals . . .

6. Rural Infrastructure and Village Services

6.1 Road Constraints and Recommended Improvements

6.1.1 Regional Roads and Interconnections

Of all portions of the island, the eastern Parishes have the least complete road system. Relatively large areas of Portland either lack road access entirely or have roads of such poor condition that crops are damaged, incoming commodities and services slowed or restricted in availability. The generally poor road condition may largely be attributed to the rough topography, unstable shale based soils, high rainfall, and a scattered pattern of too small pockets of good land to pay for expensive road construction. The only good road in the Parish is the coastal highway, which is a part of the national road network and runs along the coast from St. Mary to St. Thomas. A poor quality road, providing an interregional connection, runs from Buff Bay to Kingston up the Buff Bay Valley. The preferred connection to Kingston runs from Annotto Bay (St. Mary) up the Wag Water River, and the second choice connection runs around the coastal highway via St. Thomas (daily buses use both routes).

A major problem of the Portland roads is the lack of connectivity of roads, i.e., each road tends to run along its valley, to dead end in the mountains and to not be much cross linked to other roads and markets. Goods and services flowing from each valley must generally go the coastal plain before another valley can be entered. Also for goods and people going to Kingston or Port Antonio, this imposes extra time and cost barriers.

It has been noted by a roads planner for Portland Ministry of Agriculture, that a collector road high in the Blue Mountains and feeder roads down several major valleys would provide interconnection for the region and considerably shorten travel times in and out of the area. Specifically, a road through the Blue Mountains, along approximately the 3,000 foot level, would be 18-20 miles in length and would open that region for utilization of its forest resources, coffee potential, tourism and some small holder settlement. (See Map 12 for road locations.) Above about 3,500 feet, tree growth is slowed by persistent wind and mists, and presumably would reduce coffee yields also. The road from the head of the Rio Grande should be completed into the St. Thomas road system (four-mile gap) to increase the connectivity of the entire region.

The road along the 3,000 foot level of the Blue Mountain Ridge could be extended to the head of the Stony River (15 miles) or one of the other major streams which enter the Rio Grande near Windsor. This is currently a roadless area of scattered farms and some expansion potential. This road would provide access for the large, productive zone of the lower Rio Grande to Kingston and would allow forest products to flow towards Port Antonio which has been proposed for a sawmilling project and a plywood production project.

The Blue Mountain Ridge road might also be connected to the Swift River road, which is slated for possible extension to the 2,000 foot contour by the Geological Survey for access to proposed major hydroelectric scheme (two miles from 2,000 - 3,000 foot level). This upper Swift Valley road would provide alternative access for the established districts of the middle Swift River and a short connection (two miles) would also intertie Fruitful Vale and the Back (Swift) Valley. The construction of the lower part of this road has been independently proposed by the Parish Council, the Portland Ministry of Agriculture Roads Department, and to the Agricultural Sector team

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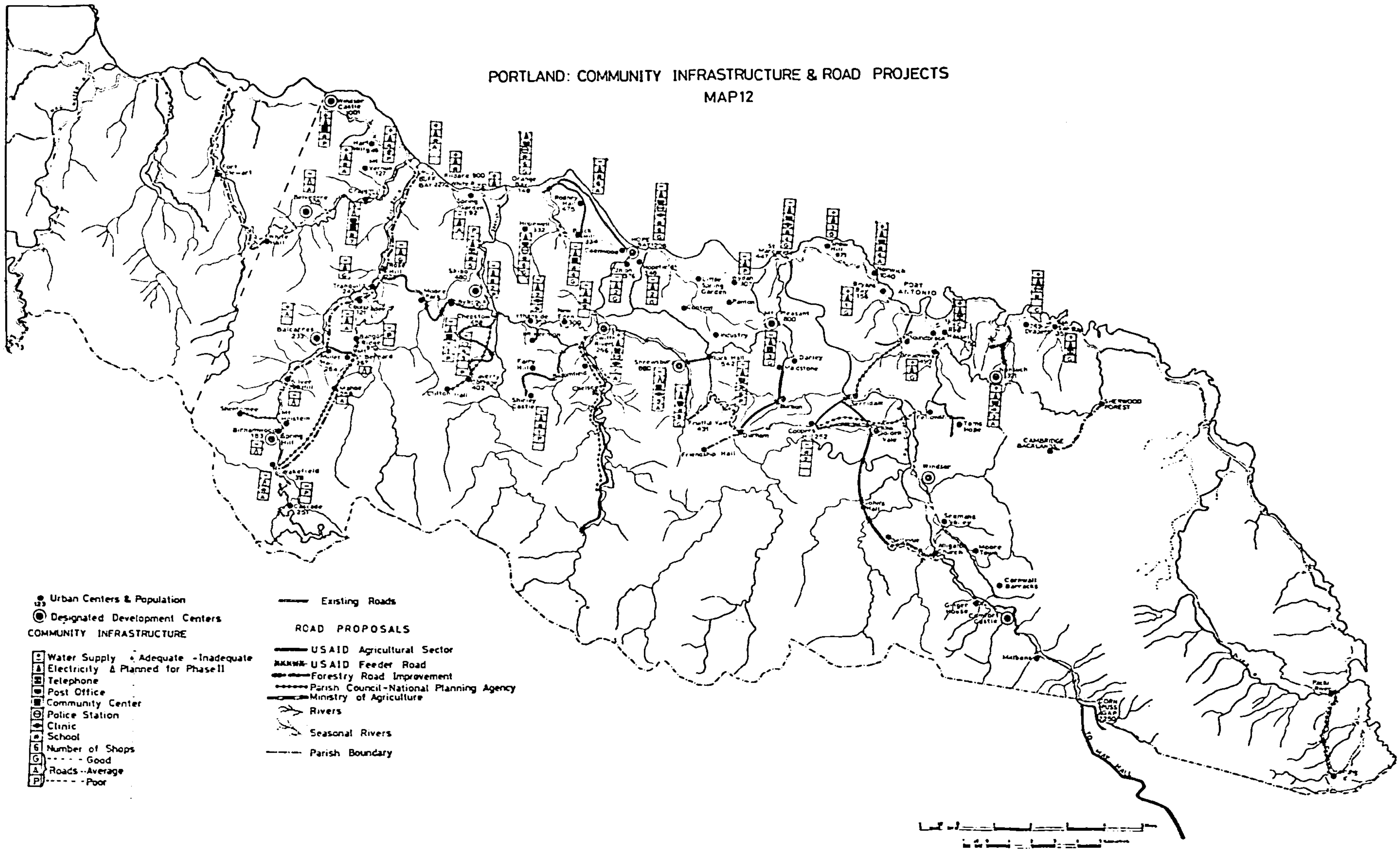
MAP12



by the area's extension agent as a badly needed route which would open new land and serve a population of many hundreds of farms already located here. Also, coffee potential lands lie along this road between 2,000 and 3,500 foot levels.

The road down the Stony/Back Rio Grande should be connected to Durham Gap and Fruitful Vale, providing a link between the lower Rio Grande and the middle Swift Valley, and each to the higher mountain country and Kingston. This road would shorten the distance from Windsor to Kingston from 65 miles to 35 miles.

The interconnection from the upper Rio Grande to the road system of St. Thomas, emerging into the Plantain Garden River Valley and to Port Morant on the coast, will provide alternatives for the middle and upper Rio Grande for access to Kingston and other market alternatives (from Millbank Port Morant would be slightly closer in miles than from Millbank to Port Antonio). The isolation of the area at the dead end of a long, poor road with no alternatives would be ended as some through traffic could be expected to flow along this route and a certain amount of economic activity might be generated through the servicing of vehicular and persons' needs, also from increased agricultural production and likely a flow of tourists in this scenic area.

6.1.2 Road Problems

A major concern of Portland roads is the rough condition of road surfaces and the damage this may inflict upon crops in transit, mainly to bananas. Banana is the major cash crop of the Parish, and the varieties grown have flexible stems and are especially susceptible to bruising and puncture in transit. The handling and transport methods generally used, i.e., transport of whole stems first by human or animal porterage on steep, slick trails and then stacked high on large trucks and packed with banana leaves, creates a vulnerable condition. When the truck is bounced and jostled over a rough, cobbled or eroded pavement and through washes, steep, rutted slick spots or sharp breaks on tertiary roads and virtual trails (for short distances), the banana on the stem is subject to further bruising. Also, damage occurs to bananas on top of the load from overhanging trees and branches which need to be trimmed, but are difficult to reach and cut for a man with a machete. One solution is to de-hand the stem and pack the hands in plastic boxes, which is done in some areas. Fewer bananas can be loaded on the truck by this method (will not stack as high) and the stems are generally still carted to the road as the boxes are not suitable for human or animal packing.

A general consensus exists amongst persons who maintain roads in Portland that a fundamental cause of many road problems and a major need of investment is the problem of drainage structures and conditions. Many roads were never "engineered" properly, but were simply upgraded through time from trail status, and water flows across and along roadways in an uncontrolled manner, eroding the surface, saturating the underlying base and causing internal breaking and slumping. There is a great need for construction and maintenance of ditches, culverts, and diversions to control these conditions and to protect investments made in grading or sealing the road surface. There has, it seems, never been enough funds to make these investments, rather just an attempt to patch and repair the resulting damage which ensues from the lack of proper design and construction.

Many roads which were asphalt surfaced sometime in the past, e.g. the P.W.D. road in the Upper Rio Grande Valley near Millbank, are now abraded to the point where only a thin, very incomplete surface remains and it is now filled with holes and small erosional channels. It is the opinion of a P.W.D. consultant engineer who was interviewed, that the scarce monies available could best be invested in upgrading roads to engineering standards, including drainage, and maintaining a gravel surface, rather than an expensive asphalt which must deteriorate because of underlying conditions.

6.1.3 Other Road Problems

A problem of road maintenance is related to underlying rock structure. On the shale rock as the Richmond Beds of the Rio Grande Valley, the weathered zone may be unstable and liable to slump. This can cause damage to agricultural fields and can temporarily close roads, either by the roadbed itself slumping away or by being covered by a landslide from a slump above. Just before our team visited Mooretown, a slump had destroyed a church in the town.

Stream undercutting of roads and bridges is also in evidence. During the time of our visit, the main Rio Grande Valley road was being undercut and the outer lane was unusable along a stretch of about 100 yards, and obviously expensive repairs were underway, involving cribbing, heavy equipment, etc. At times of flood, in October, November and December, this problem is no doubt considerably aggravated.

Areas with outcroppings of unweathered rock form special barriers to road construction according to road authorities in Portland.

These areas of rock cannot be dealt with by hand tools. They require drilling, blasting, and heavy equipment. Roads may be built up to and even beyond short stretches of rock along which the road remains uncompleted. Bridges also are very expensive and inhibit completion of certain roads, e.g., the Rio Grande Valley road stops at a deep ravine requiring a bridge, and the Drapers PLL access road stops at a washout on a small stream requiring a concrete non-erodable ford.

Few new roads are needed in Portland. Those which are needed are largely interconnecting pieces, short access roads in areas now farmed, and in several cases, bridges to open areas now isolated during high water periods. Specific recommendation for projects from the several road maintenance authorities can be found on Map 12 and will be discussed in the next section.

Four agencies have responsibility for roads in Portland: the national Public Works Department (PWD), the Parish Council, the Ministry of Agriculture (Land Settlements and Land Lease) and the Forestry Department.

The PWD, which has an administrative and equipment depot in Port Antonio, maintains the major coastal road and the primary roads up the river valleys, including the Buff Bay River Valley route to Kingston. The PWD is the best equipped and funded of the roads maintenance bodies, and the Portland operation has some heavy equipment in evidence. Major maintenance efforts seem to be reserved for the coastal road while the most remote sections, as in the upper Rio Grande Valley, are extremely rough and degraded. Even though it is the best equipped, the PWD administrators and its consultants feel that it lacks manpower, equipment, and money to adequately maintain the roads under its jurisdiction. The road conditions away from the coastal highway would seem to confirm this view. Any proposal to increase road mileage would need to keep this fact in view.

Portland Parish Council maintains an extensive road network of secondary and tertiary roads throughout the settled parts of the Parish. A total of 676 miles, including 335 miles of first class, 122 miles of second class, and 219 miles of third class roads are under their jurisdiction.

The Parish Council has little money or equipment for road maintenance or construction. No heavy equipment is owned, though some may be leased for special purposes. Most road work is done by hand labor with hand tools. Another aspect of this labor is the hiring of many part-time persons, especially from the ranks of the unemployed and very small farmers just before holiday periods as a charitable, make-work operation to provide a little cash income. Much of this work is done with the machete and consists of clearing weeds and grass from roadbanks.

The Ministry of Agriculture has responsibility for roads and trails which are internal to Land Settlements and Projects Land Lease areas. The Ministry seems to have very little money which can be budgeted to these roads and no road building or maintenance equipment. Roads are built and maintained by hand labor. Numerous complaints about these roads or the lack of them were heard by this writer in a short and selected exposure to roads in rural Portland. Very few, if any, Parish Council roads were completely unusable for vehicles, but several MOA roads were encountered or complained of as being impassable for a considerable length of time. In the already mentioned case of the Drapers Land Lease area, the road is completely cut by stream erosion and requires a concrete ford for vehicular passage. In other examples, such as the roads into a banana area of the Millbank PLL in the Upper Rio Grande, roads were made so steep that with any wetness (a near constant condition), they were too slick to traverse, even for a Land Rover in 4-wheel drive.

The Ministry of Agriculture uses farmers who are participants in the Land Lease or Land Settlement as road labor, and part of the work is paid for by credits against loans previously given.

A careful listing of priority road maintenance and construction needs was obtained from the Portland Ministry of Agriculture office. The general location of the MOA projects are located on Map 12.

There were 19 priority maintenance projects estimated to cost a total of $16,000 and four other, more elaborate projects which would require funding beyond MOA normal budgetary limitations which would cost $91,000 in total. These projects were identified by soliciting inputs from each extension agent about his area's needs. Notes on conditions of Parish Council and PWD roads leading to Ministry of Agriculture properties also were collected, but have not been compiled as a report.

The exact location of each section of road or trail improvement can only be defined at a very large scale, and with knowledge of individual farms; this is a level of detail beyond the depth of this survey.

The Forestry Department, a semi-autonomous division of the Ministry of Agriculture, also has road maintenance responsibilities, mainly for roads above the general agricultural zone. As an example, the road above Claverty Cottage on to Clifton Hall is a Forest Department road. As with the Ministry of Agriculture, roads are a secondary consideration and little funds or equipment are available. A list of roads which the Forestry Department has suggested for improvement is mapped on Map 12. This list is both an identification for road improvement needs and also gives an indication of zones expected for development.

6.1.4 'Bridle Road'

Many hundreds of miles of trails or 'bridle roads,' suitable for human passage on foot or pack animal use, exist throughout the Parish. Many of the current day roads are former bridle roads which have been widened and upgraded--a process which is still going on. Most bridle roads also have legal rights-of-way as roads, though others exist informally and on private land. Maintenance of the bridle roads is generally the province of the Parish Council, though each of the other road authorities also has bridle roads in their care. In general, bridle roads receive little maintenance expenditure and there is divided opinion and differing local conditions which affect the appropriateness of this neglect in favor of road investment. The Parish Council maintains 219 miles, 40 chains of bridle roads and in 1976 budgeted $8,341 (17.7% of the total road maintenance budget of $47,184) for their maintenance.

Bridle paths tend to be narrow footpaths, not requiring any great width due to the few and flexible requirements of human and animal porterage for passage. A donkey with a pair of baskets might use a minimum of four feet clearance side to side and a human carrying a stem of bananas can make do with six feet vertical clearance or less in restricted places. Surface smoothness and traction requirements are much less than for wheeled vehicles.

However, the economic use of trails is not insensitive to improvements, such as the provision of a regular surface, adequate drainage control, trimming of branches, etc., and investments in good construction and maintenance will considerably speed passage, increase loads, and lessen the hazard of damage to produce or injury.* Farmers in the Upper Rio Grande who were interviewed as they emerged onto the road from long, steep trails carrying banana stems showed this writer the mud and tears (and presumably bruises) where they had fallen several times on steep muddy areas of the trail. They also related that pack animals fell at these places and fruit was frequently damaged.

No respondent spoken with was aware that trails received maintenance by the Parish Council. Several did mention that community users occassionally did some work on the trails, but apparently only minimal and absolutely necessary repairs.

Human porterage is the most expensive form of transit in general use and animal porterage ranks near behind as also very expensive. Expensive in dollars if it must be hired, and expensive in time and effort and opportunities of alternate labour use or leisure in a non-monetary situation. Carrying banana stems (25-40 lbs.apiece) one or two at a time is heavy and difficult work and several respondents of medium age and of normal physical appearance claimed to no longer be physically capable and several others voiced strong dislike for the difficulty of the task. Farmers interviewed at Durham Gap revealed that they had brought their banana up from

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* A donkey has a value of $500-$600 and injuries such as may occur on slick trails, loose rock surface or stream fordings may represent a loss equaling two-thirds of yearly net income.

Bourbon one mile away and 1,000 feet below. These farmers argued convincingly of the need for a road and this location can be found as proposed by the Parish Council and of the 1972 Portland Development Plan.

Some other calculations can tell us further of the physical burden of human transport over these trails which can reach two to three miles in length. A good crop of dasheen (the second most important crop in the study area) can yield 15,000 pounds of tubers per acre. A farmer with one acre of dasheen which yields more or less continuously throughout the year would have to carry 300 pounds of crop per week from his one acre of dasheen farm just to clear this crop. After reaching the road, he would normally hire truck transport (at 40¢ per banana stem from Comfort Castle to Windsor Boxing Plant), or sell to a higgler who must deduct for these same transport costs. The heavy physical demands of this system can further be appreciated in the requirement of 59 man-days of labor per acre to establish the crops--mainly digging planting holes.

Bridle paths are subject to rapid deterioration. Vegetation can close in a trail in one season in some areas and needs to be kept at bay by frequent trimming. Trails also erode. An open rut running straight up the hillslope, unprotected by vegetation cover and bare at the surface, can become a minor waterway and erode into an irregular channel with steep sides, leaving slick exposed soil. Contour trails also are subject to erosional cross-cutting, slump, deep water and mud holes.

The conditions of bridle paths are of interest beyond mere access to fields and banana carriage. Children walk to school on these paths, farm inputs and extension services flow on these paths, mid-wives and family planning nurses try to reach families that live away from roads. Conditions of these paths may inhibit school attendance or receipt of information. No public water, electricity, and other public services are extended along paths.

6.1.5 Paths and Roads

A considerable difference of opinion may be found on the issue of whether and how much to invest in bridle paths vs. roads. One school of thinking feels that even a good path is still so limiting to economic and social development that spare funds should go to roads and specifically to efforts to upgrade paths to roads. An opposed school, while not denying the importance of roads, recognizes that funds and physical conditions limit road possibility and emphasizes the relatively low cost of paths and the great improvements in access achieved by simple efforts with hand tools and local materials through trail investment. A bamboo, five-foot bridge across a gully or a hoe-dug water diversion channel at the head of a slick trail can make much difference in the ease of passage. The question of road vs. trail construction revolves around multiple factors, including numbers of persons to be served per unit length, the difficulty of terrain for road construction, the productivity and amount of land to be served, the type of crop contemplated (coffee is much more valuable in relation to weight than banana or dasheen), whether people services are needed (do people live there) or whether just agricultural commodities may move over the route. The overall budgetary limits, maintenance capability and alternative investment opportunities also need to be considered.

6.1.6 Role of Bridges

Bridges are very expensive to construct and maintain compared with equivalent lengths of road or paths. For small rivers and creeks, during most of the year, fording is possible and fairly easy for vehicles and for porterage along paths. However, during periods of heavy rainfall and flood, especially October to December, there may be periods of days when small streams become barriers and periods of weeks or months when larger streams cannot be forded. This is especially critical in the Rio Grande River Valley owing to the much greater size of this river. Large areas of land are unutilized or underutilized because of this flood isolation and in some cases significant population can be cut off for months from marketing cash crops, buying food or receiving any public service or having off-farm employment.

In the middle and upper Rio Grande, the river is confined to a narrow, defined channel and the road closely parallels the river. The road crosses the river at Alligator Church and from that point remains on the west bank of the river for the remaining 7-8 miles to the road head at Bowden Pen. The land is of similar quality on either side of the valley, yet on the road side is much more intensively utilized. The only bridge across the Rio Grande in this stretch is a suspension bridge, not suitable for vehicular traffic, at Jupiter Fording. This represents the outlet or connection to the road in the Negro River to Mooretown-Cornwall Barracks and return to Rio Grande at Jupiter Fording.

During high water, the river cannot be crossed or only at great risk, so crops on the far side cannot be harvested for two to three months unless a long, difficult path is taken to the bridge. This writer was impressed in speaking with local farmers of the difficulty of these crossings and the opportunity of agricultural expansion if access were provided.

A major question in this area is what kind and quality of bridge to build. Any low or otherwise ill-conceived structure will be swept away by floods (109 inches of rain in four days in 1963, 300 inches annual average rainfall). A more difficult decision relates to building bridges suitable for vehicular traffic (very expensive), for human and animal foot traffic (expensive) or a mere cable car to haul people (but not animals) and crops across the river on a suspended cable (relatively cheap). The decision is related to the more general question already described of roads vs. trails. If trails are of little merit, then one or two motorable bridges and associated roads on the east bank might be considered, if there is enough developable land in any one area to justify a vehicular bridge. A closer spatial correspondence is possible between the fragmented areas of agricultural potential and access across the river by several foot bridges than by fewer vehicular bridges. Clearly, several (two to four) bridges suitable for walking traffic could be built to service existing trails and sited to correspond to the areas with greatest potential. With this choice all access in the area across the river would be limited to trails.

A cheaper solution to the river crossing problem would be to string steel cable across the canyon with a hand-powered car suspended underneath. Such a structure exists on the middle Rio Grande, but its purpose seems to be to measure water levels. A cable car may be cheap, but it has some problems. For one, such devices at best are scarey and at worst dangerous to use and the degree of acceptability to local farmers would be in question. It also matters greatly whether it would require an operator (salaried or toll basis) or whether it would be operable by any and all users. Liability in case of accidents could be a concern. A major problem of the cable car idea would be that pack animals could not be transported across, so that during times of flood the animal would have to be left untended on the far side of the river. This would then require some kind of structure for confinement and means of feeding. There are many reasons for not wanting to leave a valuable animal and also unavailable for use on the opposite bank.

A separate study is needed of the use of trails, the comparative merits of their improvements in relation to road construction/improvement and the potential of land and the social effects on farm families served by trails. The effects of distance and cost of trail transport and its effects on land use and social conditions are very much needed to guide in investment decisions both for projects and everyday maintenance decisions of the Portland area road and trail maintenance agencies.

Lower on the Rio Grande the situation is different and also critical in regard to access across the river. Below Alligator Church the road is on the east bank of the river and there is no bridge of any kind from there to the river mouth. In this middle and lower portion the canyon is wider and the river is less confined to a determined channel. This renders the problems and expenses of bridging considerably greater as any bridge will be more susceptible to flood damage and will have to be a much longer, larger, more expensive structure than in the smaller upper valley where it is confined to a deep, steep-sided channel.

Inspection of a large-scale topographic map of this west bank of the lower Rio Grande also suggests another physical problem: that is the interruption of access by a succession of major tributary streams focusing on the five-mile stretch between Alligator Church and Fellowship. From south to north, these streams are the Foxes, the quite large Back Rio Grande, the Corn Husk, Guava, Deluskies, and Snake Rivers. A road from the bridge at Alligator Church crosses the Snake and the relatively small Deluskies River as it approaches the community of Bellevue. The Guava River stands as a barrier to extension of the road to John's Hall, a community completely without road access and isolated by flood for several months per year. Part of the John's Hall district also lies beyond the Corn Husk River.

The area of John's Hall is one of the most isolated in Portland, though it is only 1¼ miles from Windsor on the main Rio Grande Valley road. Distance and several major streams block its access to the already remote road through Durham Gap and there down the Swift River. Any access across the Rio Grande is blocked several months by flood and even in low water it is a 1¼ mile trail. The best chance for a road would follow the four mile long route through Bellevue and to Alligator Church. This road has been suggested by several agencies as much needed.

While talking with farmers and community leaders at the Windsor banana boxing plant, this writer was told of substantial lands in this area unutilized and suitable for banana and almost within sight of a boxing plant. Also comments such as "those people (John's Hall residents) are not even in Jamaica" (they are so isolated), "they should quit paying their taxes" were heard.

The population in 1970 was small. Enumeration District No. 85, which includes most of John's Hall, reported 64 residents. Surrounding E.D.s had populations on the order of 40, 126, etc. (See Map 3). According to informants, over 300 persons voted in John's Hall recently, a figure which bears little correspondence with census reports. In any case, the situation here bears further investigation.

Immediately downstream on the west bank and across the Back Rio Grande is the vicinity of Golden Vale and Cooper's Hill (E.D.s 83, 84, 87, with 692 persons in 1970), which are also roadless and isolated by the Rio Grande. It is about two miles and across the Foxes River to the road at Darley (this road penetrates about three miles along the lower west bank of the Rio Grande). Either an extension of the road from Darley or a bridge and road across the lower Rio Grande near Berridale is needed and has been proposed previously. The bridge would be preferable because it would also foster the interconnecting link with the Swift Valley road system by a short 1-2 mile link with the road to Durham Gap (from Fruitful Vale). This type of interconnection between valleys and road system would considerably lessen isolation at both ends and increase the options and potentials of both. The interconnection to Darley would also be desirable and would further increase the connectivity of the road systems of both river valleys and the territory between Darley and St. Margaret's Bay.

Map 12 shows the major elements of the road system as it now exists. Road information is difficult to obtain. The P.W.D. roads have been recently surveyed and are known to exist and be open. They connect relatively important places. Forest roads are few and very marginal in location and little importance to most communities, so the lack of information is not critical.

Ministry of Agriculture roads on Land Lease and Land Settlements are mainly for farm access and/or to provide a single, direct link to the nearest road of next highest order. These are locally significant for farm and some commuting access, but for connections in the urban hierarchy they play almost no role. This leaves the Parish Council roads, which form the most extensive system and about which map information is conflicting and not current. The Portland Parish Roads Division does not have a map of their roads. What the Parish Council uses is a schedule listing of roads which designates roads by numbers and sub-sections by letters, with a written description of its location. The schedule is used for budgetary purposes. Descriptions of locations. such as "Pat Shand's Premises" or "via Fritz Jump's Property" are references not to be found on any map. Lacking a lifetime's experience in the region makes this schedule difficult to use.

The Division of Census maps which were developed from the standard topographic series, have Parish Council road numbers which were added to the census map from the parish booklet. The road numbers are incomplete, being noted mainly where these roads are used as enumeration district boundaries. Numerous errors or contradictions may be noted between the schedule and map in even the few areas where this writer has sufficient first-hand knowledge to detect errors. For example, the 'road' shown on the census maps which runs from Burbon to Durham (Gap) (See p. 79, Census map book), is in fact a trail as was attested by the perspiring banana farmers who were interviewed at Durham and demonstrably stated their need for a road along this route. A major discrepancy in the schedule can be seen for Road 96, which is said to run from Berrydale (on east bank of Rio Grande), across the river, via Cooper's Hill and Dumfries to Durham Gap. This road is listed as 3.4 miles, 40 chains of first-class road and 1 mile, 40 chains of second class road and received $405 for maintenance. Most of the route is third class (bridle path) and no bridge exists across the Rio Grande at Berrydale (also spelled Berridale). It may be pointed out here that this non-existent road is amongst the most-needed links in the Parish system.

6.2 Community Services and Urban Hierarchy

6.2.1 Trade Flows and Functional Areas

Portland is one of the less populous (eleventh of thirteen parishes), less prosperous and most physically rugged of the parishes of Jamaica. It can also be seen as an area of chronic depression with a history of alternately stagnant and slowly growing population related to the interplay of local economic condition and emigration opportunity. The area lost its touch of neo-colonial prosperity with the collapse of its banana plantation economy under wartime limits and plant disease. Port Antonio, the key urban center, was built to service a larger banana business and it survives on remnants of tourism, banana trade, small scale manufacturing, local trade and administration. Not even all of Portland Parish is within the functional hinterland of Port Antonio, as the west looks to Buff Bay and Kingston. Only administrative functions related to the Parish government are able to move from the west end of the Parish to Port Antonio, against the pull of Kingston. Manchioneal, at the extreme east end, also has its own market and maintains direct ties to Kingston via the circumferential island road the St. Thomas coast. Thus, not Port Antonio or any other center is situated to intercept all trade and service needs of even this small parish.

PORTLAND
TRADE FLOWS AND FUNCTIONAL AREAS

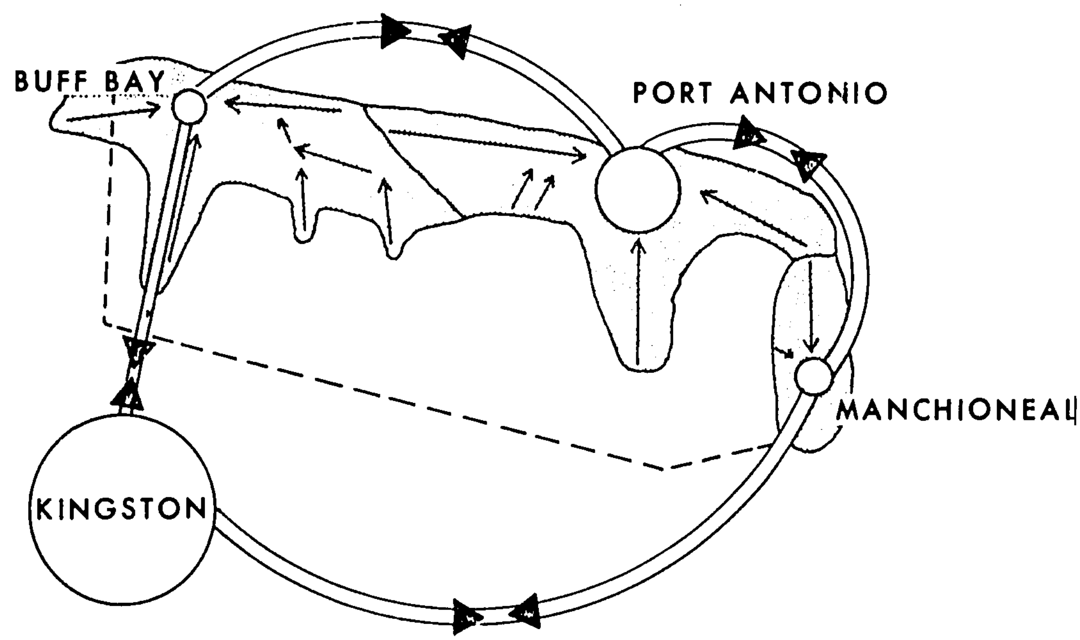
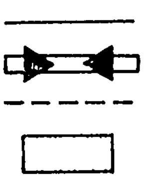


Diagram 1
The Current Situation



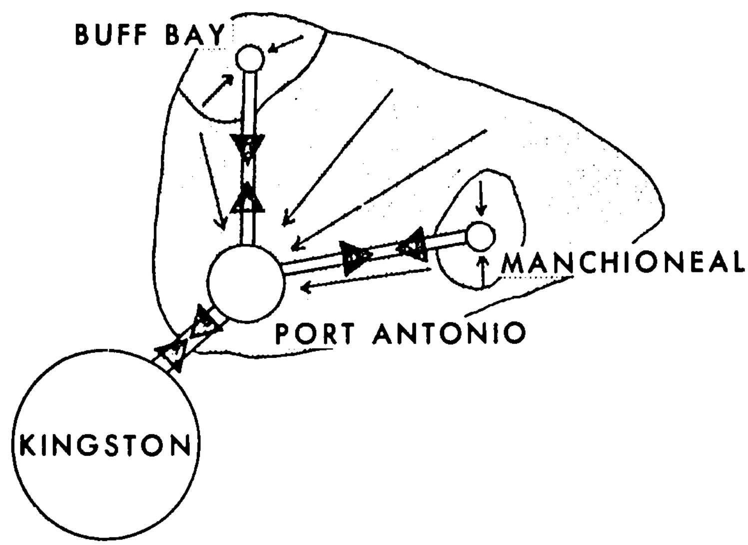


Diagram 2
Hypothetical Case With Dominant Parish Capital

The primary concern of this and the next section is the condition of services and infrastructure in the small towns and villages of the parish, but the quality and variety of these are related to the character of the centers immediately above them in the urban hierarchy. Thus, Buff Bay, Port Antonio, and Manchioneal lose many of their functions and trade to Kingston, reducing their size and variety of business activity, but Kingston is too far and in a different political jurisdiction so that it cannot supply good quality services. Diagram 1 depicts the current situation of transport and trade in Portland.

Consider how different the situation would be if the road system focused trade on Port Antonio before it went to Kingston, as in the hypothetical situation of Diagram 2.

It is not possible, of course, to alter the physical and historic economic forces which created the city, road, political framework which defines the situation of the Portland urban hierarchy in its relation to Kingston, but the contrasts of Diagram 1 and 2 hopefully will add to the reader's comprehension of the fragmented services situation which now exists in Portland. If Port Antonio were in a position to intercept the parish trade before it passed to Kingston as in Diagram 2, it would have a much larger hinterland, many more and healthier business functions, and could provide better servies to its trade area than is now possible.

It may be noted that Buff Bay has a better location for intercepting the Parish trade going to and coming from Kingston than does Port Antonio.

6.2.2 Village Sameness at Low Level of Development

A significant problem of villages in Portland is that there are too many villages at a similar low or marginal level of development. Often no one village stands out as a somewhat higher order place which would allow it to have more and better public and business functions. Probably some informal policy has operated to distribute a health clinic to village A. and a police station to village B. Almost no interior town has a full range of functions which would make it a natural focus for local service (Table No. 6-1)

This situation should be re-examined by those with decision-making authority and plans and investments made in selected, well-placed centers which would collect all major services appropriate to their size. This kind of scheme is advocated by the Jamaica Town and Country Planning Department and by development plans around the world, from U.S. Appalachia to Amazonas.

The Town and Country Planning Department suggests Port Antonio as the head of the Portland urban hierarchy, and Buff Bay is also designated as a sub-regional center. District Centers, which would be selected for growth are Hope Bay (middle coast), Windsor (lower Rio Grande Valley) and Spring Hill, (upper-middle Buff Bay Valley). With the notable exception of Spring Hill, little quarrel can be made with these selections.

To community function, several aspects of roads are of importance. Firstly, the inter-connectivity of the system affects the time and distance travelled in moving from one part of the region to another. Take as an example Durham (Gap) which is now located near the dead end of a none too good road system which has its outlet down the Back Swift River, the Swift River and emerges on the linking coastal highway at Hope Bay. It is still some miles to Port Antonio or to Buff Bay. For goods and services to

Table 6-1

COMMUNITY INFRASTRUCTURE AND SERVICES IN PORTLAND, 1978

Community	Population	Elevation	Water Supply	Water Problems	Electric Service	Roads	Prosperity	% Farming Employment	# of Shops	Services
Buff Bay Valley										
Wakefield	38	2500'	-	◉	No, II	A, I	-	98		Sc
Biramwood	183	1700'	-	◉	No, II		-	98		
Silver Hill	290	1200'	-	◉	No, II		-	98		
Buff Bay	2272	10'	+		Yes	A		20		H, 2sc, ph
Kildare	900	125'	+		Yes			95		Sc
White River	705	100'	+		Yes			25		
Bangor Ridge	952	1900'	-	◉	No		-	100		Sc
Mt. St. Bernard	267	2500'			No, II					
Mahoe	288					A				
Belcarres	233	1000'	+		No	A	-	100		
Cascade	351	2800'	-		No	P	-	95		
Tranquility	243	400'	-	*	Yes	G	-	100		
Coolshade	121	400'	-	*	Yes	G		100		
Rose Hill	272	400'	-	*	Yes	G				
West Coast										
Windsor Castle	1001	low	+		Yes	P	A	20		3sc, cc
Hart Hill	946	400'	+		Yes	A	A	95		sc
White River										
Mt. Vernon	127	500'	+		Yes	P	-	98	2	sc
Craigmill	272	300'	+		No,II		-	98	7	sc, po, cc
Belvedere	305	750'	-	*	No,II	A	A	98		
Spanish River										
Skibo	480	450'	-	●	Yes	P		95	5	2sc, t
Bybrook	350	145'	-	●	Yes	P		100	2	2sc
Chepstowe	488	300'	-	●	Yes	P	-	99	1	sc, cc
Ythanside	352	500'	-	◉	Yes	P	A	100	2	c
Claverty Cottage	402	2000'	-	*	No	PP		95	3	2sc, po
Swift River										
Shirley Castle	166	2000'	-	◉	Yes	PP	A	100	1	2sc
Fruitful Vale	431	500'	-		Yes	G	-	95	9	sc, po
Shrewsbury	880	250'	-		Yes	A	A	95	9	cc, c, l,
New Eden	300	800'	-	◉	Yes		A	95	2	sc
Swift River	266	200'	+		Yes	A		90	6	c, po, p. l
Durham-Coopers Hill	252	1400'	-		No	N	-	98	2	sc
Central Coast-St. Margarets Bay										
Rock Hall	542	1000'	-	*	Yes	P	A	98	5	po, sc
Black Hill	334	50'-250'	-	●	Yes	G	A	90	4	sc, cc,
Rodney Hall	475	300'	-	●	Yes	A	-	90	6	sc
Orange Bay	148	low	?		Yes	G	A	50	6	p, po, sc
Hopewell	332	low	?		Yes	G	A	50	6	p, po, sc
Hope Bay	1208	low	-	*	Yes	G		30	6	sc,l,c,po,p
Hopefield	348	low	-	*	Yes	G		80	2	
Union	376	low	-	*	Yes	G		80	2	
St. Margarets Bay	447	350'	-	*	Yes	G		50	4	2sc,po,c,
Spring Garden	92	low	-	*	Yes	A		90		box. pl.
Whydah	307	low	-	*	Yes	P		90		
Mt. Pleasant	900	1000'	-	◉	Yes	G	A	98	3	cc
Norwich	1040	210	+		Yes	A	A	50	4	sc,po
Snow Hill	871	210'	+		Yes	G	A	30	3	
Bryans Bay	156	210	+		Yes	G	A	30	1	
Red Hassel	750	low	+		Yes	G				t
Breastworks	490	low	+		Yes	G				
Drapers	762	low	+		Yes	G	+	non-agr.		sc,p,4 htls
San San Bay	35	low	+		Yes	G	+			t
Dolphin Bay	200	low	+		Yes	G	+	non-agr.		
Parkmount/Nonesuch	321	low	+		Yes	A	A	95	3	2sc,po

Key Water Supply: + = adequate, - = inadequate, 0 = undeveloped
Water Problem: ● = inadequate source, x = storage pipes inadequate, ◉ = no new source available, * = new facility planned.
Electric Service: II = planned for phase II
Roads: G = Good, A = o.k. or average, P = poor, N = none, 1 = impassable
Prosperity: + = above average, A = average, - = below average
Services: po = post office, c = clinic, cc = community center, sc = school, p = police, t = telephone, l = library, htls = hotels.

flow to Durham and for its products to find access to markets is a long system passing through many intervening nodes, but none offering any alternatives or options for Durham. However, only a few miles of roads (three to four) would link Durham to Rock Hill, Darley, St. Margaret's Bay and to Berrydale, the lower Rio Grande Valley and Port Antonio, creating shorter travel, many more options for buying and selling and a through travel route rather than a dead end. As an example, the banana grower near Durham would have three (over one previously) banana boxing plants within a travel radius of three miles. The same might be said for access to health services, shops, job opportunities.

What is equally needed is a designation of other places as local service nodes and to concentrate activities in those places. The places which are situated to service their surrounding area by virtue of location near the center of a populated district and at a road focus to give them access to their potential hinterland are relatively obvious. Windsor in the Rio Grande Valley is a good choice. It is far enough down the valley to have intercepted the existing and likely branch routes to the main valley axis, but not so far down as to lose its advantage vis-a-vis Port Antonio.

Swift River community (266 people) stands at the focus of the Swift River Valley road, the Back River (with the important and vigorous communities of Shrewsbury and Fruitful Vale) and the major road access to the Spanish River area. The community of Skibo (480 persons) shares most of the locational advantages of Swift River as its center is only one mile from the center of Swift River and given the elongate structure of Jamaican villages, they become co-extensive places. Skibo or some amalgam of Skibo-Swift River should be considered for development as a substantial infrastructure exists at Skibo, including telephone (at post office), two schools, and seven shops/bars, an unusual number for Portland villages.

A similar centrality, as for Swift River, may be noted in Chepstowe, which is at the focus of the north-south Spanish River Valley road and the east-west road which connects to the Buff Bay Valley and the Swift River Valley.

The Buff Bay Valley is a much more difficult case to analyze. The town of Buff Bay is the second urban center of Portland, and its influence extends a considerable distance up the valley. This valley is also distinct in that it continues over the mountains and to Kingston. However, the road is difficult and is not a major route. The routeway is essentially linear, no interconnecting or branching roads of any consequence or useability enter the valley between Silver Hill Gap and Tranquility, a distance of ten miles and including all the upper and much of the middle valley. Such local service roads as exist (not indicated on maps, but said to exist by reports on the area) vary from unusable to marginal for passage. The more likely potentials for service to the valley are the communities of Balcarres, Tranquility, and Rose Hill.

Tranquility is small (243 people), but has an advantage being located on the Buff Bay Valley Road at the intersection with the road to Mt. St. Bernard-Bangor Ridge (952 population) and about a mile from the intersection of the road to the Spanish River Valley which joins Buff Bay Valley at Rose Hill. Rose Hill enjoys the corollary advantages to Tranquility, and is about the same size (272). Site factors would probably determine the choice between them.

If the road from St.Bernard or Mahoe were extended the mile down the 1000' drop to the Buff Bay Valley at either Balcarres-Mullet Hall (500) or Silver Hill (290), these would be suitable centers. They are further up the Buff Bay Valley to provide better access to the upper valley residents and further from competition in the urban center of Buff Bay. Balcarres also has the largest concentration coffee co-op facilities and is the site of the co-op warehouse. Balcarres also is well situated to serve the proposed forest industry expansion for the area.

Shrewsbury (880 population) and Fruitful Vale (431) form an adjacent pair of dynamic communities along the Back River. Shrewsbury as the larger and more developed should be designated for full infrastructural development. A road should be constructed to link Rock Hall and the populous area behind it to this center and to provide greater connectivity in the road system. Reference to the chart of communities' services in Table 6-1 will attest to the considerable range of services and numbers of shops in these two communities. Also this writer and the community surveyors for the National Water Authority study sensed a vitality and progressive atmosphere here which is sure to contribute to its success as local service center.

Mt.Pleasant (800 persons) is centrally located within a populous area of approximately 4,000 persons and many small farms. Mt. Pleasant already has a community center, electricity, a few shops and good roads. This area is a good example of the need for emphasis as there are a dozen villages in the area and none has a full set of infrastructure or any higher order services.

Nonsuch (320 persons) in the hills East of Port Antonio is well situated to serve the numerous other villages in this area and already has electricity, water, two schools, post office, three shops, bars, and a tourist cave development.

Comfort Castle in the upper Rio Grande Valley (707 population and 1000 more in nearby villages) is near the head of reasonably passable roads and has considerable infrastructure, including electricity, water, health clinic, post office, school, community center and four shops/bars.

The community of Belvedere (320 persons) in the White River Valley is in the middle of the valley and of the three communities in the valley is best located for serving the region and is not too close to Buff Bay.

Each of the villages designated as a local service center should be extended all of the services normally expected in larger villages in Jamaica, such as electricity, piped water, post office, telegraph, schools up to the ninth year, community center, healtn clinic and a basic mix of small shops. In addition offices for governmental services, such as road services, agricultural extension offices, health services, credit banks and so forth, should be relocated to these designated centers. An encouragement of recreation and entertainment services should occur.

Most importantly for the farmers in the trade areas of these designated centers, services and facilities for agricultural inputs and outputs should be established. Currently no inputs are available outside Port Antonio and outputs are marketed through a generally fragmented and haphazard system. Banana boxing plants are the only regularized output facility and service outside Buff Bay, Port Antonio and Manchioneal.

For agricultural inputs, each of these designated service centers should have a store where fertilizer, other farm chemicals, seeds, feeds and tools may be purchased. The operators of such a center also could disseminate much useful information and help organize services such as plowing, spraying, and transport.

In regard to outputs, at least some minimal storage and shelter for sales transactions should be provided. Ideally, facilities for a marketing co-op, not normally available in Portland villages, and telephone service for the exchange of marketing information should be made available.

6.2.3 Agglomeration of Village Services

In the previous section, the need was expressed for agglomerating facilities' services now widely scattered at a low level among many villages. In this section we will argue that all villages, but especially those designated as growth centers, should plan and encourage the agglomeration of facilities and services within each village to locate within a small, central core. This concentration of services and residence is common to villages in most parts of the world and the advantages of efficiency and community self-identification are many.

The common pattern for Jamaican villages is to have a linear and discontinuous form which may dribble along a road for one-half to three quarters of a mile and where the topography allows these low density, discontinuities of houses, shops and other facilities may spread alongside paths and roads in several directions. The socio-historical origins of these patterns are unknown to this writer, and the implications or resistences to changing them should be considered. Gardner, in her study of the impact of forestry in the Buff Bay Valley found that fifty-five percent of her respondents were willing to relocate to an area with a better service infrastructure.*

Re-location from scattered farms into villages and from long linear, dispersed settlements towards a more clustered pattern should be encouraged. A town center should be planned and officially designated by the village community council with the aid and expertise of an outside professional agency such as the Town Planning Department. Some incentive for relocation of business and services would help foster the policy. For example, costless access to land (through exchange for currently owned business sites) in the new center would bring the dual benefit of increased land value and increased sales. Public purchase of the land at the designated center at current prices would preclude speculation and avoid unearned windfall profits by land owners without a socially useful reason for their receiving it.

Land values at the designated village center could act as a barrier or incentive to relocation. If current landowners were allowed to speculate on their land's new site value, this might block location by a small or marginal, poorly financed business. However, if the shop owners were allowed to capture the rent value of the site, it could provide major incentive to business.

If individuals choose to maintain or establish residences at a considerable distance from the designated village centers, they should of course be allowed to do so. However, there should be explicit policy regarding the distance from the center and/or density of customers which may

*Gardner, Carleen, Uplands Forestry Development Project, Socio-Economic Survey, Department of Forestry, Ministry of Agriculture, March 1978, p. 63.

receive water and electric service at the standard rate. A policy of serving houses wherever found will tend to fix the current and anti-functional pattern. Limitations on the areal extent of subsidized service will tend to cluster people into the desired pattern. Other governmental investments, such as those in housing improvement schemes, street lighting, etc., could be used to foster internal village concentration of housing and public facilities.

Water Supplies

Most communities in Portland with over 500 population (and many with much less population) have a piped and inspected water system. The annual report of the Portland Health Officer (available with Sector Team's background papers at the RDO office, Kingston) for 1977 indicates that while there are some unprotected supplies and occasional equipment malfunctions, supplies are generally of adequate quality.

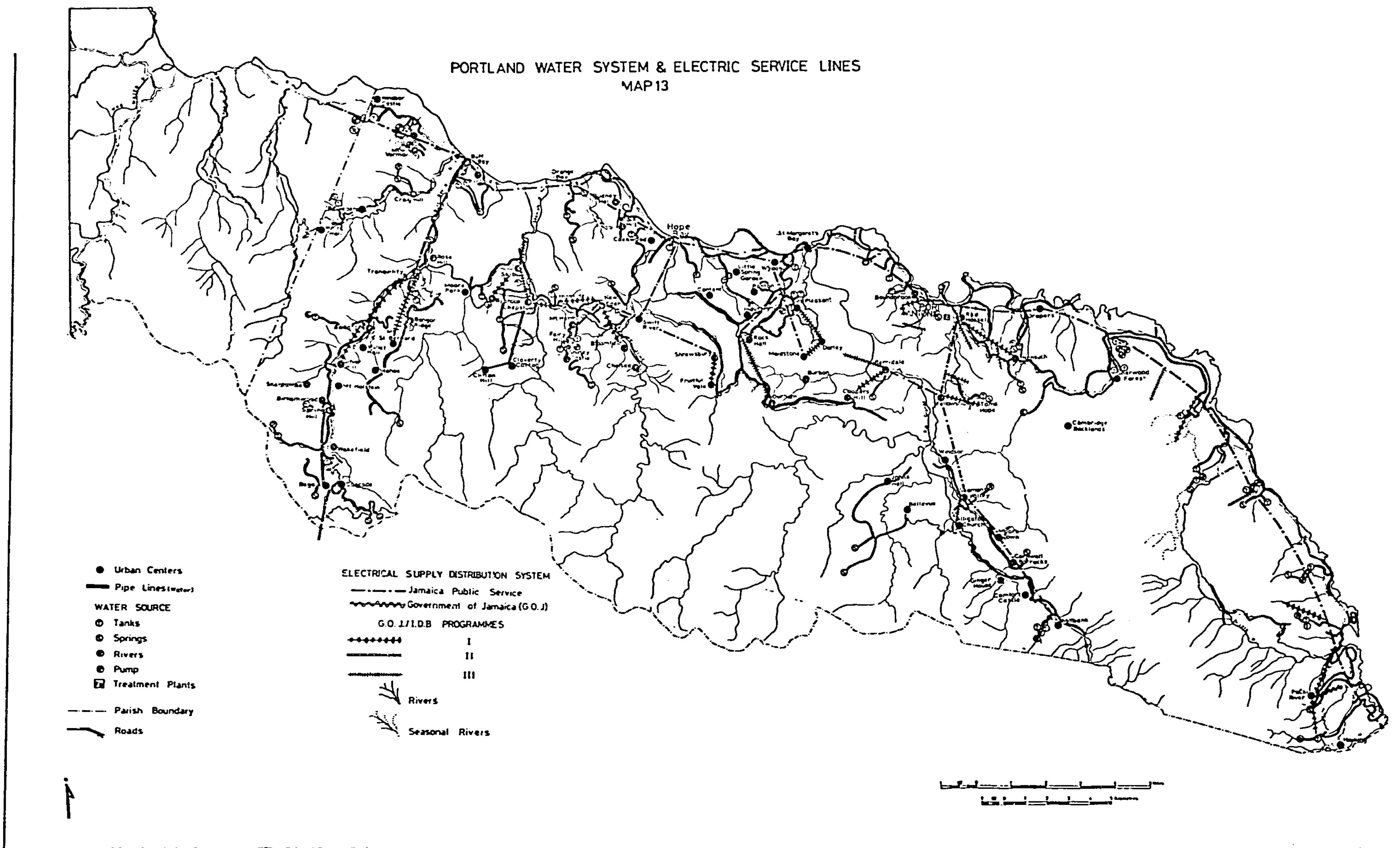
A second major source of information about Portland water systems is contained in the survey and maps compiled by the Weise-Milton Co. of Kingston in a Joint Venture with the National Water Authority. The survey covered all community water systems serving over 500 persons and was conducted in July-August of 1978. A four-page evaluation of each water system and including community economic-social characteristics was made and is available at the RDO office, Kingston. Table 6-2 is a compilation of those survey sheets and Map 13 was supplied courtesy of the Joint Venture.

Table 6-2. General Status Report of Portland Rural Water Supplies.

Total number of supplies	57
Total number of supplies treated	31
Total number of supplies untreated	26
Population receiving treated water	52,000
Population receiving untreated water	15,000
Population not served	7,000 (11%)
Population served by house connection	32,500
Population served by standpipes	34,500
Administrative Agency	
Parish Council	52
National Water Authority	2
Private	3
Sources	
Springs	49
Rivers	4
Wells	4

SOURCE: Portland Health Officer's Report, January 1978

PORTLAND WATER SYSTEM & ELECTRIC SERVICE LINES
MAP 13



A number of water problems were noted by the Joint Venture report and by the Health Officer's report. Many water systems have insufficient storage,and they become inadequate during drought periods, especially in the Western portion of the Parish. Other systems have inadequate sources and despite the seeming abundance of water, in some locales it was noted that no new sources are available. There seems to be an assumption in these comments that the rivers are not appropriate water supply sources for communities in Portland. This is unexplained but siltation and contamination may be too expensive to remove given facilities and methods generally available. Other problems include pump problems and inadequate line diameter. Some of the systems must overcome vertical distances of more than 1000 feet within the service area.

Piped water is one of the most desired amenities by all communities, and an inadequate system is a major limitation to the development of any community. For a designated development center such as Chepstowe-Skibo, upgrading of their inadequate facilities is a must.

Electric Service

The larger and coastally oriented communities of Portland have enjoyed electric service for many years. However, the smaller communities of the river valleys have largely received this service within the past year or in more remote places are scheduled to receive service within the next two years. The upper Buff Bay Valley is this year receiving service for the first time. Fruitful Vale in the Back (Swift) River Valley and Comfort Castle on the Upper Rio Grande have had electric service for just one year. Virtually all significant villages either have or are projected to soon have this service.

Investments in the expansion of electric service beyond what is planned would likely be very expensive and would have little impact on the overall situation. Future plans should concentrate on making house wiring and service hookups available to a higher proportion of those living within the served areas. Those persons now living dispersed and near areas of service should be encouraged to move to within the service zone. This same principle could be applied to water, roads and other infrastructures.

Other Services

Community centers exist in a number of the communities surveyed. Six community centers can be counted from Table 6-1 though more exist in the Eastern portion of the Parish which was not analyzed. The community center offers a place for meetings, recreation and training and these facilities and services are much needed and desired in rural Jamaica. Each of the designated growth centers should have a community center and at least some of its functions should serve the entire hinterland area, not just the central village itself.

Services such as libraries, police stations, secondary schools and health clinics seem to be apportioned randomly to various places and with no village having a full range of service. These should be relocated or added to so that the designated center may have all services available. Telephone service is scarce in Portland, as in all rural Jamaica. Port Antonio and its immediate surroundings, plus an extension to the hotel areas to San San Bay, is the major zone of service. A few, widely scattered rural Post Offices are reported to have a phone line, such as Skibo and Mooretown.

Now that electric service with its infrastructure of poles exist in most communities, the extension of telephone service along the same poles should be much faster and cheaper. Designated development villages should receive priority for service for businesses and centralized public facilities. Most communities have Post Offices and most Post Offices have telegraph service, which has substituted for telephone in the past. However, expansion of business or public service requires better communications than the telegraph.

6.2.4 Market Towns and Agricultural Inputs

Improvements in agricultural methods and of rural incomes and living conditions are likely being impeded today by the poor supply and availability of agricultural inputs. Future programs and investments would likely be frustrated by this same problem. Inputs of fertilizer, other agricultural chemicals, planting stock, seeds, feeds and equipment are generally only available in Port Antonio and Kingston or possibly Buff Bay.

The immediate problem of input supply is national in scope and not amenable to solution at the regional level. For the past year approximately, fertilizer and most other inputs have been greatly restricted in supply and often completely unavailable due to balance-of-payments induced restrictions on imports. Even governmental programs such as those for PLL and the Banana Board have not been able to supply participating farmers.

When the national problems are corrected, there will remain fundamental problems of inputs supply in Portland. To understand the problems requires a description of how the system operates. Firstly, each major export crop--coffee, banana, dasheen, coconut, cacao and the farmers on

Land Lease and Land Settlement received encouragement, advice, credit and distribution services for some (but generally not all) agricultural inputs. Thus the system is functionally fragmented into each of the above channels plus a general system for all other farmers and crops. This has the dual and doubly unfortunate aspect of creating high overhead costs per unit of throughput as well as reducing the threshhold of potential sales per area which might have induced commercial sales and services nearer to each farmer in a non-fragmented market.

Because most farmers raise a variety of crops and utilize a variety of inputs, the specialized crop specific, group specific or input specific system did not meet all of any individual needs or any area's needs. Thus the farmer still had to travel to Port Antonio or Kingston to buy fertilizer for his vegetables, even if he received fertilizer held for his banana crop. If he were able to rely on Land Lease services for fertilizer, he still had to travel for equipment or chicken feed.

The distance and expense (money and time) for a small farmer to travel from Fruitful Vale to Port Antonio cannot be less than half a day and $2.00, a significant outlay and bother. In addition the restriction of information flow is an impedence to the adoption of improved planting material and techniques.

The small farmer who makes o ly a few trips to Port Antonio for his input supplies faces a number of difficult questions. These questions include-- is the product available, where within Port Antonio, at what price, what are the conditions of the sale, what physical forms, analysis and quantities, is the product delivered, is equipment or special application technique needed, etc.? The greater the distance, difficulty and unfamiliarity between the farmer and the input source, the greater these and other questions will stand as barriers to use.

What is needed in Portland is a system of farm service/input stores, located nearer the small farmer and providing a complete range of goods and services. These stores should be located in the designated development villages. To increase the efficiency of the overall system, all of the stores in the system should cooperate in regard to bulk purchasing, delivery and possibly central management. Some alternative forms of organization for these stores may be seen in the successful inputs co-op which operates a number of stores in St.Elizabeth, or the Jamaica Agricultural Society (JAS), input store program or the Blue Mountain Coffee Co-op of the Buff Bay Valley. Whatever group operates the system would have to have the farmers' confidence and the management capability and financial backing to operate.

In order to capture a sufficient amount of business to spread their overhead costs,these input stores would likely require the cooperation of the Commodity Boards and Governmental programs, whereby a banana grower or a Land Lease farmer could receive his input material through the farm store and the store would receive and stock the special items necessary and keep records for these governmental or cooperative programs. Special credit and subsidy programs, e.g., those for Blue Mountain Coffee Co-op Members, could be handled through the farm stores also. Hopefully, the farm input store would be a place where informal advice as well as physical commodities would be available. Also additional services could be facilitated by the store, these might include contract plowing, aerial spraying, transport services and short-term labor arrangements.

6.2.5 Market Towns and Output Marketing

In much the same way as for inputs, the small farmer in Portland lacks information, facilities and capital to effectively market his crops. In addition, the current marketing system is not structured to optimally serve the farmers' needs.

One way that small farmers can be assured of an advantageous market access is to act jointly and cooperatively with other small farmers in their area. A regional marketing cooperative, possibly organized around the functional area of a designated village and possibly jointly managed with the inputs store, is proposed. Such an organization would have sufficient size to support a full-time professional manager, acting only in the farmers' collective interest. This organization could afford access to all marketing information to make the best decisions about where and when to sell and have the capability to store and transport commodities in efficient ways. A well run cooperative can also channel better information back to its membership about planting times, crop mix and future demands. Overplanting and market gluts have been major problems in Portland. The dasheen glut is the most recent example.

Previous studies have shown the superhigglers to be efficient marketers. The cooperative marketer should closely emulate the superhiggler. Local farmers and small higglers could sell through the co-op because it would offer the best price (the superhigglers get the best quality and most stable supplies by paying top dollars). If the proposed system could not out-compete the small higgler and the AMC (which have been criticized as inefficient), then it is not worth establishing.

*The "superhiggler" is the larger higgler who, with his own means of transport and with sufficient working capital, carries on a rural/urban and inter-city trade, mainly on a wholesale basis.

The co-op would buy from all farmers in normal times and periods of shortages; it would buy only from members during periods of glut. No price would be guaranteed, but the farmer would be paid what the crop returned after the groups' marketer had exercised the best option of storage, sales to distant markets, and sales to superhigglers, the AMC or whomever.

7. Bases for an Integrated Rural Development Program in the Target Area

7.1 Development Strategy and Projects for the Target Area

In Chapter 4, the principal constraints were reviewed with only incidental attention to the specific enterprises that were affected. For each constraint, possible remedial action was noted. That exercise is summarized in Table 7-1 .

7.1.1 Agricultural Potential by Enterprise

The present chapter looks at each of the principal crops thought to have a good potential and considers the constraints that particularly affect each crop or group and the interrelationships among constraints. Appropriate strategy and projects are then considered.

Farmers in our survey were asked to indicate their best chances to improve production and the principal obstacles to expansion. None of the 30-odd farmers said expansion was impossible, but only seven gave positive statements that they could expand acreage of a particular crop. Usually this would be at the expense of some other crop. One said he could only expand if he had more farm land. Seven, including five of the preceding group, said they could expand yields by increasing fertilizer use. Only four expressed interest in expanding livestock--usually calves to be grazed, pigs or hens. The crops most often mentioned included coffee, banana, red peas, and cocos. One mentioned vegetables. As reasons for not expanding, eight farmers mentioned credit; two, price; and one, labor. Scattered parcels were admitted to pose awkward management problems, but only two of fourteen responding to the question said they would trade their present holdings for a single piece of good land under

Table 7-1. Principal Constraints and Suggested Courses of Action

Constraint	SOME POSSIBLE COURSES OF ACTION																					
	Land-Use Adjustment	Farm Practices	Mechanization	Economic & Social Analysis	Farm Planning	Community Planning	Community Enterprises	Roads & Dams	Feasibility Studies	Amenities	4-H & Youth Club Work	Local Manufactures	Research & Development	Farm Group & Co-ops	Insurance	Credit Programs	Land Titles	Government Production Services	Information Services	Market Development	Marketing Institutions	Input Distribution Systems
Slope	x	x	x	x	x	x	x															
Water	x	x	x	x				x	x													
Labor			x	x	x	x			x	x	x					x						
Equipment			x	x				x	x			x	x	x	x	x						x
Capital													x	x		x	x	x				
Yield Risk		x		x									x		x							
Price Risk				x				x							x				x	x	x	
Credit													x	x	x	x	x		x			
Information				x	x																	
New Technology				x					x				x	x								
Fertilizer & Chemicals				x									x									x
Markets				x			x	x				x		x	x				x	x	x	
Tenure				x												x	x					
Land Quality	x			x		x		x								x						
Mixed Farming	x			x	x								x									

For basis of tabulation, see my report No. 3, "Production Constraints on Small Farms," October 1978.

Land-Lease. Information obtained was not sufficient to determine whether or not this attitude was related to the forms of tenure under Land-Lease. The sketchy data obtained from the survey should not be used to derive percentages of all farmers in the areas, as our interviewers did not probe deeply enough to permit that. Two generalizations, however, may be made safely: A considerable number of small farmers feel they have a chance to improve their farming, and few of them feel their position is hopeless.

Based on farmer interviews, discussion with area extension officers, and extension specialists, the following crops appear to be among those that have significant economic potential for the Target Area:

Pulses: Red peas, cow peas, broad beans, dwarf gungo pea (a new variety being introduced that is determinate in flowering and matures in four months. Old varieties took about a year.)

Vegetables: Best opportunities for root vegetables and onions are at higher elevations. Several vegetable growers are now growing vegetables in the Buff Bay Valley and irrigating with water from the river. Considerable field corn is grown for green corn in the Target Area. Hybrids and sweet corn have not done well, but two new varieties of hybrids show promise.

Roots: Yellow yams and cocos are well adapted. Dasheen does very well in the Rio Grande Valley and wet locations elsewhere.

Fruits: Banana and plantain (plantain life is about three years because of borers), mangoes, guavas (fruit fly hazard in wet areas); ackee and sweet sop do well in dry areas, soursop is adapted, but does not fruit dependably, a problem on which the Ministry of Agriculture is working; limes have promise, especially if rooted cuttings are used that require only three or four years to bearing compared with six or seven years for growth from seed.

Area extension officers suggested that the following areas have good potentials for the crops and enterprises listed:

<u>Spanish River-Bybrook</u>: Coffee, cocoa, banana, coconut, some spices. Guava, otaheite apple (some fruit processing would be possible). Grass for milk and dual purpose cattle and goats. Fish farming along the Mabess and Spanish Rivers.

<u>Hart Hill, west of Buff Bay River</u>: Coffee. A very hilly area, but some food crops possible.

<u>Orange Bay-Lennox (Swift River)</u>: Cocoa, Coconut, cassava, cocos, banana, plantain, vegetables.

<u>Kildare (Spanish River, lower elevations)</u>: Pimento, plantain, cocos, yams, corn, pumpkin, vegetables, guava.

<u>Orange Vale and Bangor Ridge (upper Buff Bay Valley)</u>: Coffee, cocoa, red peas, black pepper, yellow yam, gungo pea.

<u>Rio Grande Valley</u>: Yam, dasheen, banana, cocos, cassava. Livestock on unused lands, poultry.

7.1.2 The Production System in a Modernizing Context

Small farmers in the Target Area operate within a system that is in an introductory phase of modernization. The almost complete reliance on human labor and hand tools, dictated by the terrain, gives to agriculture a mor. primitive appearance than it really has. Most farmers are beyond the stage of "having heard about" fertilizers, pesticides, weedicides and new varieties. They have either tried them out for themselves, or have observed their use on other farms. Many of them will tell you that they know fertilizers or pesticides will pay, or that it would be profitable for them to use more than they do. They give reasons that seem rational for continuing to farm as they do.

The farming system for the Target Area, with its "community" and national economy sectors, is illustrated in Figure 1. The chart traces the principal flows of resources and products to and from small farms. An important point about the chart is that all the National Economy links shown are now in existence for some farmers in many communities, at least in rudimentary form.

The economic behavior of Jamaica smallholders, and the milieu within which they operate both have some progressive elements that do not fit the usual descriptions of the small peasant trapped in a low-level technical and economic equilibrium. But, the hypothesis of the trap still describes his position better than other theories. It is important, however, to know the constraints that are particular to his environment. The trap hypothesis is well described by R.D. Stevens:[1]

> "This hypothesis implies that traditional peasant farmers are generally good decision makers, given their knowledge and resources; hence, reallocation of their resources would not appreciably increase income. It also assumes that the economic returns to investment in peasant agriculture are low. The development strategy under this hypothesis focuses upon making economic, social, technical, and institutional changes so that more profitable economic opportunities become available to small farmers."

The equilibrium hypothesis was tested by Peterson in four areas of Jamaica. He found that with given resources, incomes in each area could be substantially increased by reallocating resources among enterprises, principally to more labor-intensive crops. He felt that more education and knowledge were the principal requirements for making such a change.[2] However, Peterson's findings indicate that a higher equilibrium

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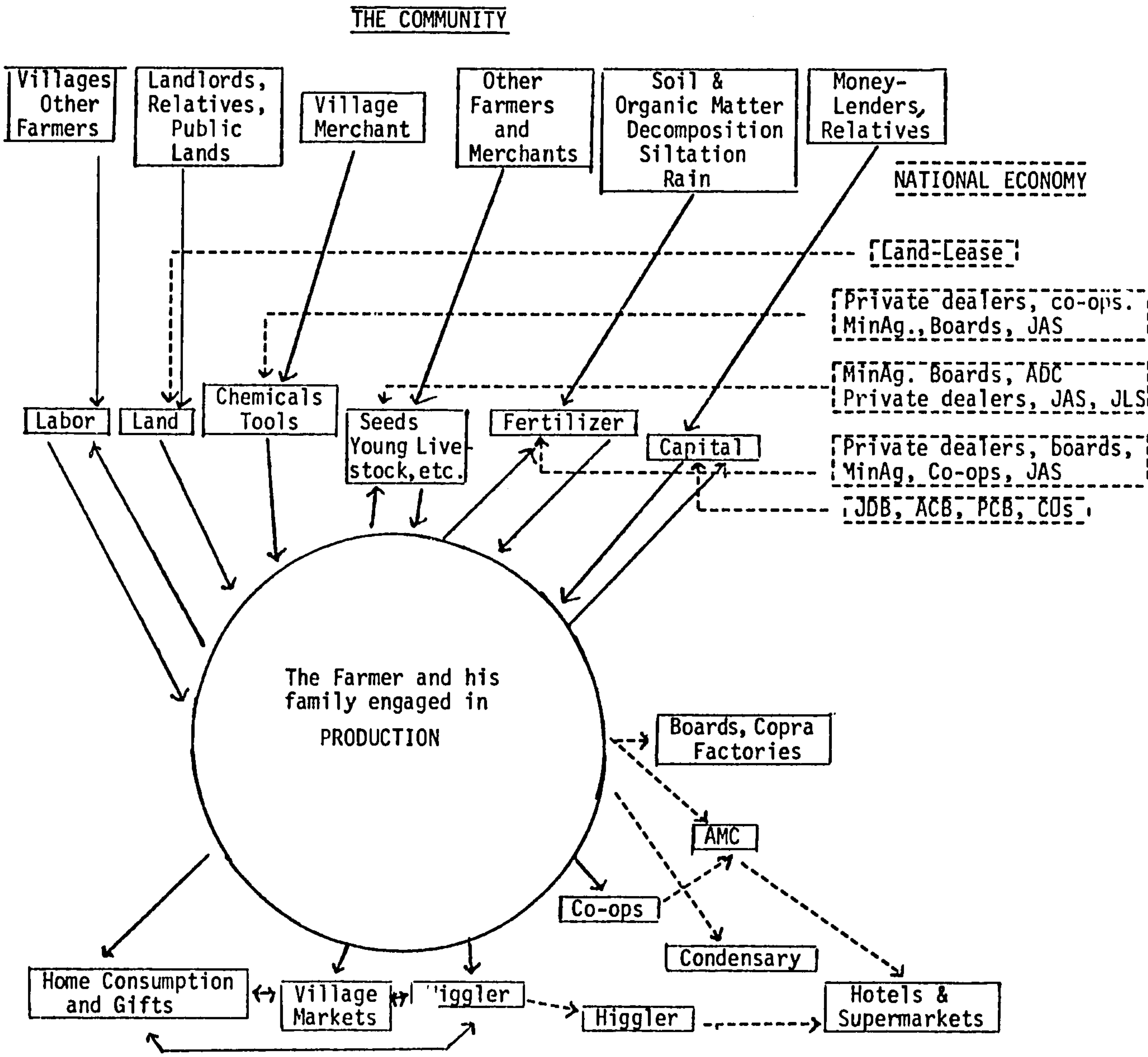
[1] Stevens, R.D. "Transformation of Traditional Agriculture" in Tradition and Dynamics in Small Farm Agriculture, ISU 1978. p. 6.

[2] Peterson, H.P. Effects of Resource Reallocation on Crop Income from Medium-Sized Farms in Jamaica. University of Florida. M.S. Thesis 1970. p. 62.

Figure 1. The Small-Holder Agricultural Production and Distribution System. Jamaica.



After a paradigm in Stevens, R.D. "Transformation of Traditional Agriculture" Ch. 1. Tradition and Dynamics in Small-Farm Agriculture. ISU. 1978, p. 14.

level could be obtained if some constraints on greater use of family labor or on shifting enterprises were reduced. Those constraints could be in the farmers' concept of risk, or his valuation of leisure, or his preference for off-farm work, as well as ignorance.

Jamaican smallholders differ among themselves, and as a group differ from smallholders elsewhere. As a group the following characteristics seem to apply to many Jamaican small farmers:

1. Tend to make economically rational decisions, given their resources, objectives and constraints.
2. Value land ownership, but willing to move away if good opportunities are available.
3. Usually prefer to stay within agriculture, but some say they would like to move into some other profession.
4. Have a strong aversion to risk and uncertainty.
5. Have a strong preference for present over future income as evidenced by their reluctance to plant tree crops.
6. Diligent and hard-working under adverse circumstances.
7. Aware of and with some experience with modern technology. Generally favorable to new technology, but with reservations based on fear of risk and some unfortunate experiences.
8. Considerable experience with assistance from government via pipe-bourne water along about all main roads, schools, extension offices, aerial spraying of bananas, Board and AMC purchases of crops, Land-Lease programs and crop liens. Usually able and willing to give objective evaluations of these programs as they affect them.
9. More than usual exposure to the outside world through personal experience in Kingston or overseas, or the experiences of friends and relatives. This factor along with several others often makes an interviewer feel that he is talking with someone from almost any disadvantaged rural community in the United States.

At several points in his book, Small Farming in Jamaica, Edwards describes the entrepreneurial traits of Jamaican farmers.[1] In

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[1] Edwards, David. An Economic Study of Small Farming in Jamaica. ISER, Kingston. 1961.

regard to income, he notes: "The objective of obtaining income was influenced by two other aims; to be accepted by the community, and to have maximum independence."[1]

Edwards found farmers to be very conscious of the competition between the farm and the home for available funds: "When cash resources were low, household expenditure because of its urgency generally had priority. Similarly, when money was put aside, it was usually reserved for emergencies and the family's domestic use, though occasionally funds were accumulated to buy land or an animal."[2]

Edwards found that many times farmers rejected the proposal of extension officers for perfectly valid reasons. The extension officers also could put forward convincing arguments for the changes proposed. But farmers and extension workers were operating on the basis of different goals and a misunderstanding of each other's position. "To a large extent the farmers were pre-occupied with their limited means and the advisors with good husbandry ends."[3] Edwards goes on to express concern over the ability of the current generation of farmers to overcome their conservatism and their lack of attention to problems of management sufficiently to take advantage of new opportunities as they arise. He concludes that efforts should be made to educate farmers in management and to supply them with facts, but that "the brightest prospects lie in training future generations . . ."[4]

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[1]Op. cit. p. 252.

[2]Ibid. p. 253.

[3]Ibid. p. 260.

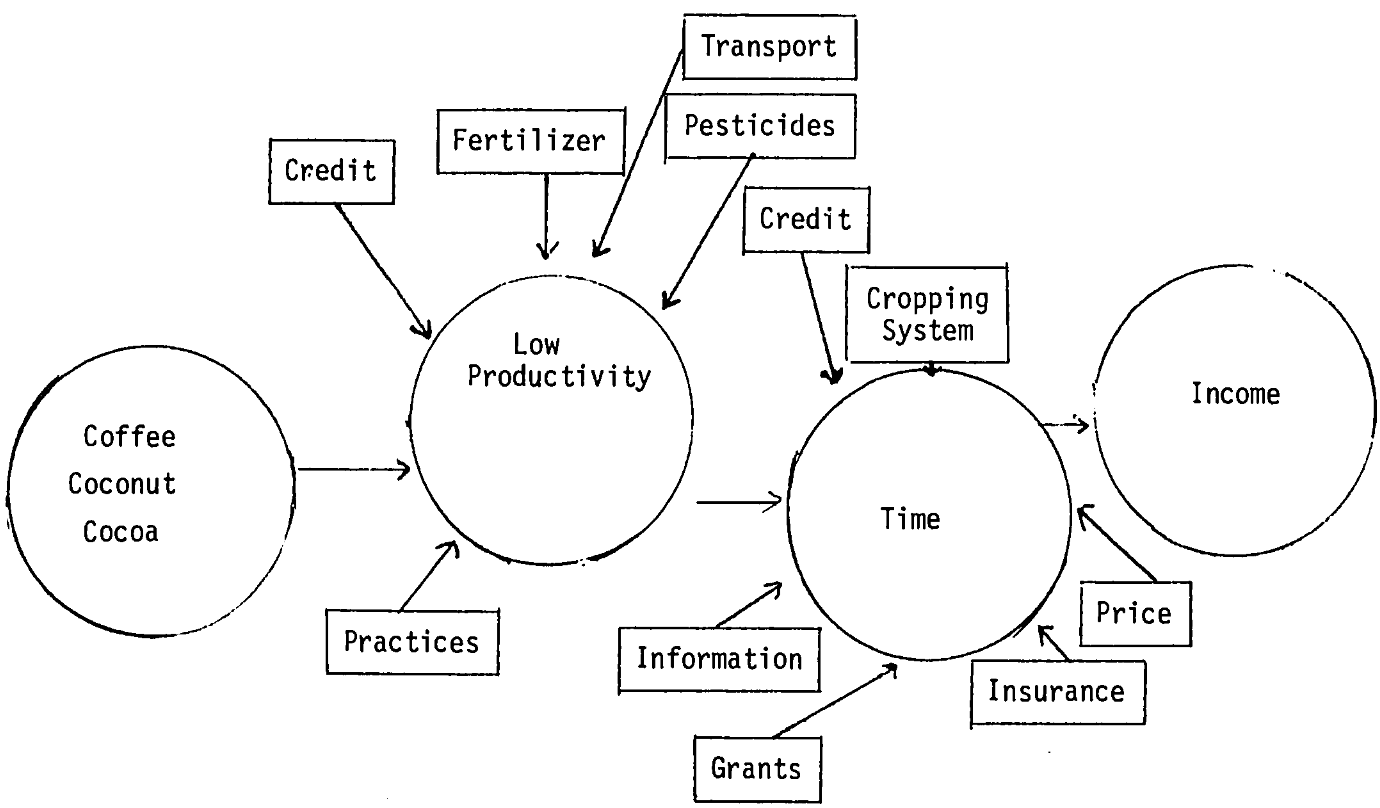
[4]Ibid. p. 265.

Based on our field interviews, Edwards' views are still valid 18 years later, although farmers have more services and are better educated. They are somewhat more willing to take moderate risks with annual crops, but still are very conservative on the tree crops, and they are somewhat older. It is still important not to neglect the future generation.

7.1.3 Constraints in Relation to Production Opportunities

Permanent Crops

Figure 2. The Tree Crop Constraint Network.



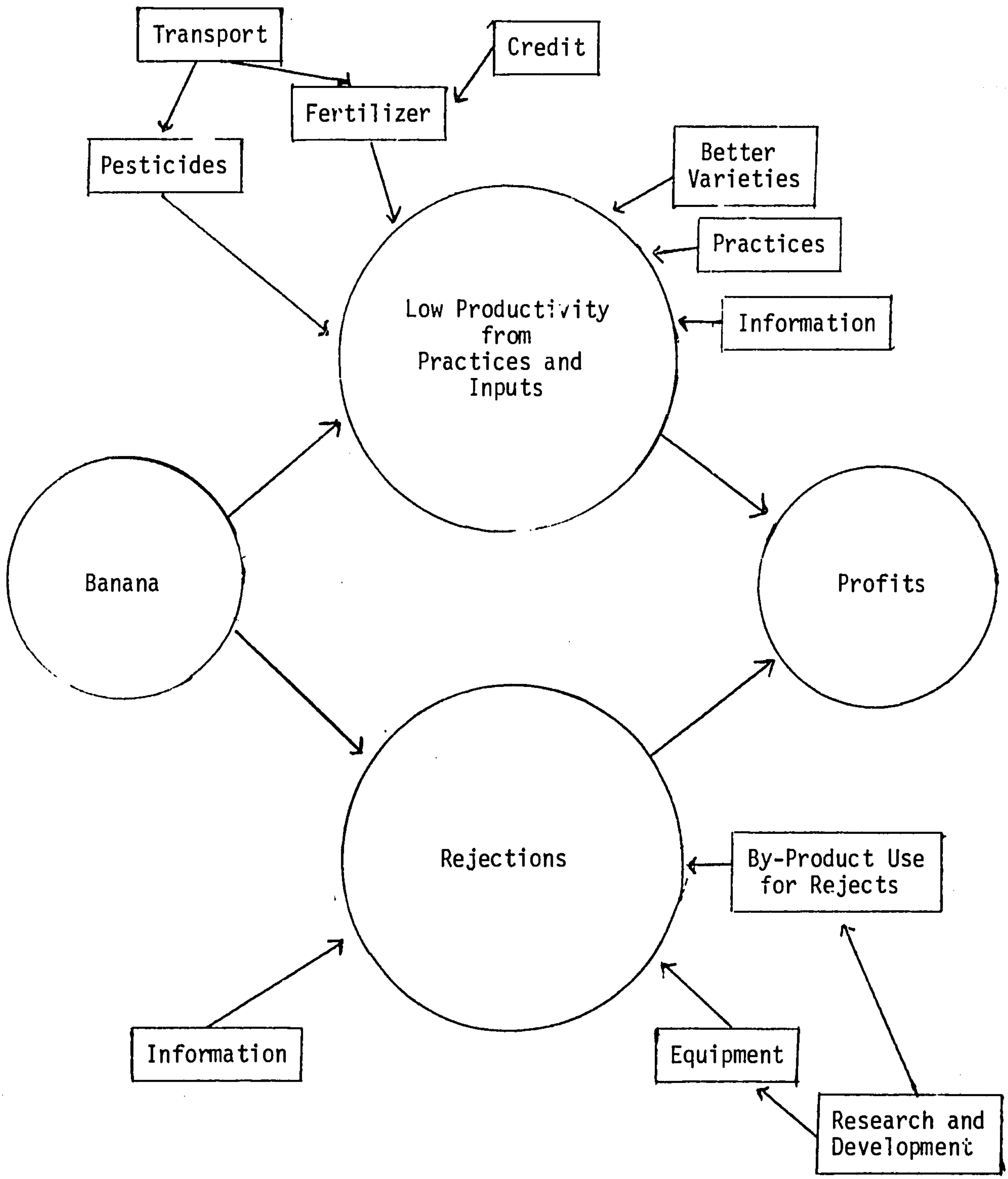
The major potential tree crops, coffee, cocoa and coconut, have good market prospects. Even though coffee world-wide has declined in price, Jamaican Blue Mountain coffee continues to have a premium market. World cocoa prices have declined somewhat, but are still favorable. Jamaica has ceased to export copra and will have a favorable import-substitution market for some years.

There are two principal sets of constraints to increased production: The first is low productivity from poor practices, and low fertilizer and pesticide use. The commodity boards have been generous in developing and supplying planting materials at nominal cost for years, and current prices should be attractive to growers, although coconut prices offered through the copra factories have not been sufficient to entice coconuts away from the higglers. A better program for delivery and financing of fertilizers and pesticides for remote small growers is needed, along with information programs. Coconuts have commonly been a semi-wild crop on small farms, and the increased technical requirements of the dwarf varieties are not fully appreciated by small farmers.

The greatest obstacle to expansion of tree crops is time. Small farmers have a high discount on the future because of the pressure on them for short-run income, and a conservative view of future prospects for agriculture. If small growers are to move into tree crops that do not give significant returns for five or six years, they will need more information on future prospects, long-term credit, attractive prices, insurance against weather losses, and probably some form of short-run income maintenance, which could come from grants, or help in improving the assured short-run income stream from short-run crops.

Bananas

Figure 3. The Banana Constraints Network

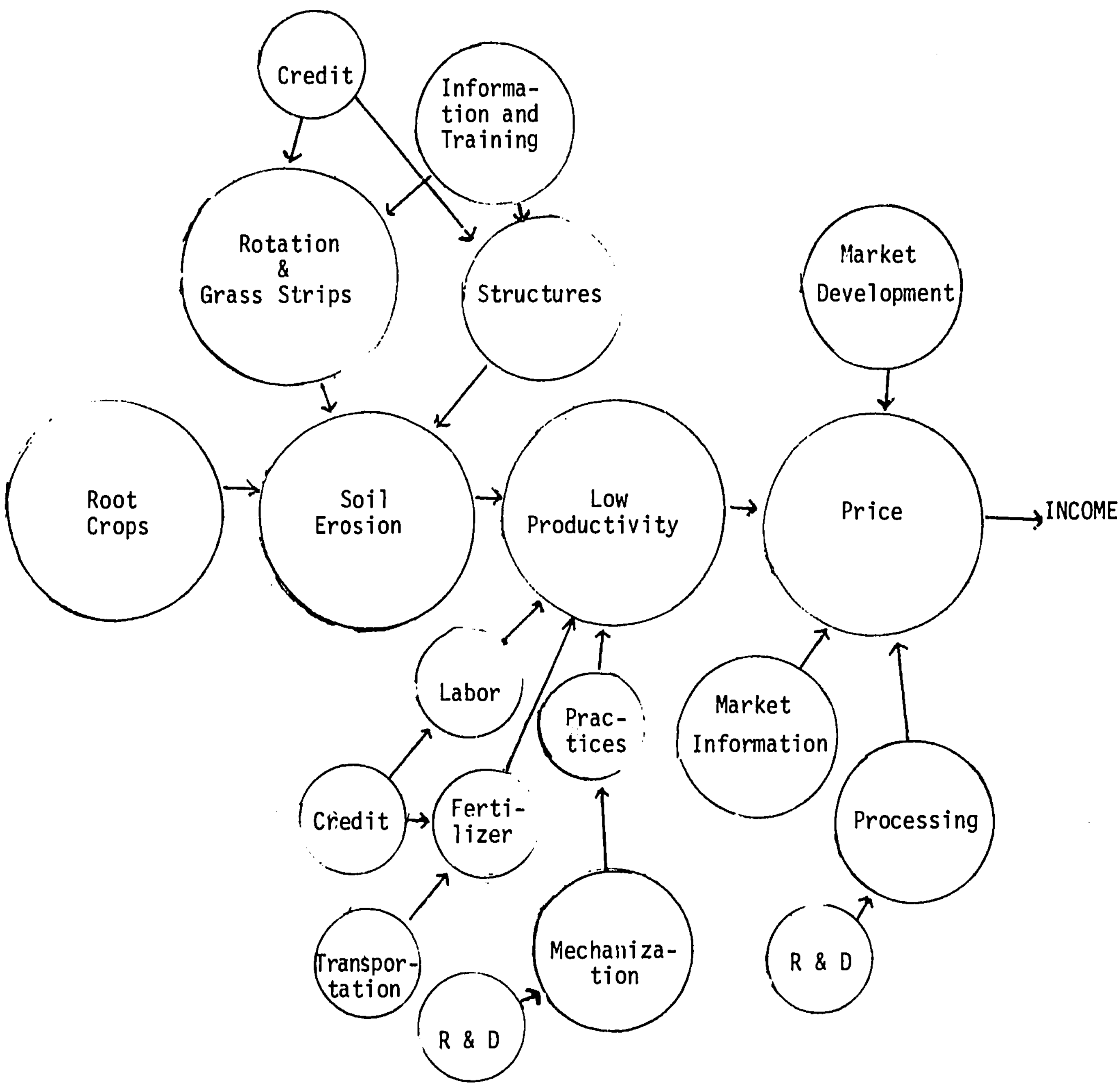


As with tree crops, Jamaican bananas have a sheltered and favorable market. The country has not been able to fill its favorable export quotas to the U.K. for some years.

Two closely linked obstacles bar the way to profits--low productivity and rejections for export. Higher productivity requires replanting of bananas every five or six years or so, more fertilizer, pest control and cultivation. For small farmers there is a special problem with varieties. The popular favorite is Lacatan, a tall variety that makes use of plastic sleeves difficult, and also makes a two-man job of banana harvest. The Banana Board hopes to be able to assist small farmers to shift to shorter Giant Cavendish varieties in the next few years. Rejections of bananas at packing sheds is a serious problem, especially for small growers for whom quality control is difficult. Attacks on the problem include educational programs, and perhaps better handling equipment. There is room for applied research here.

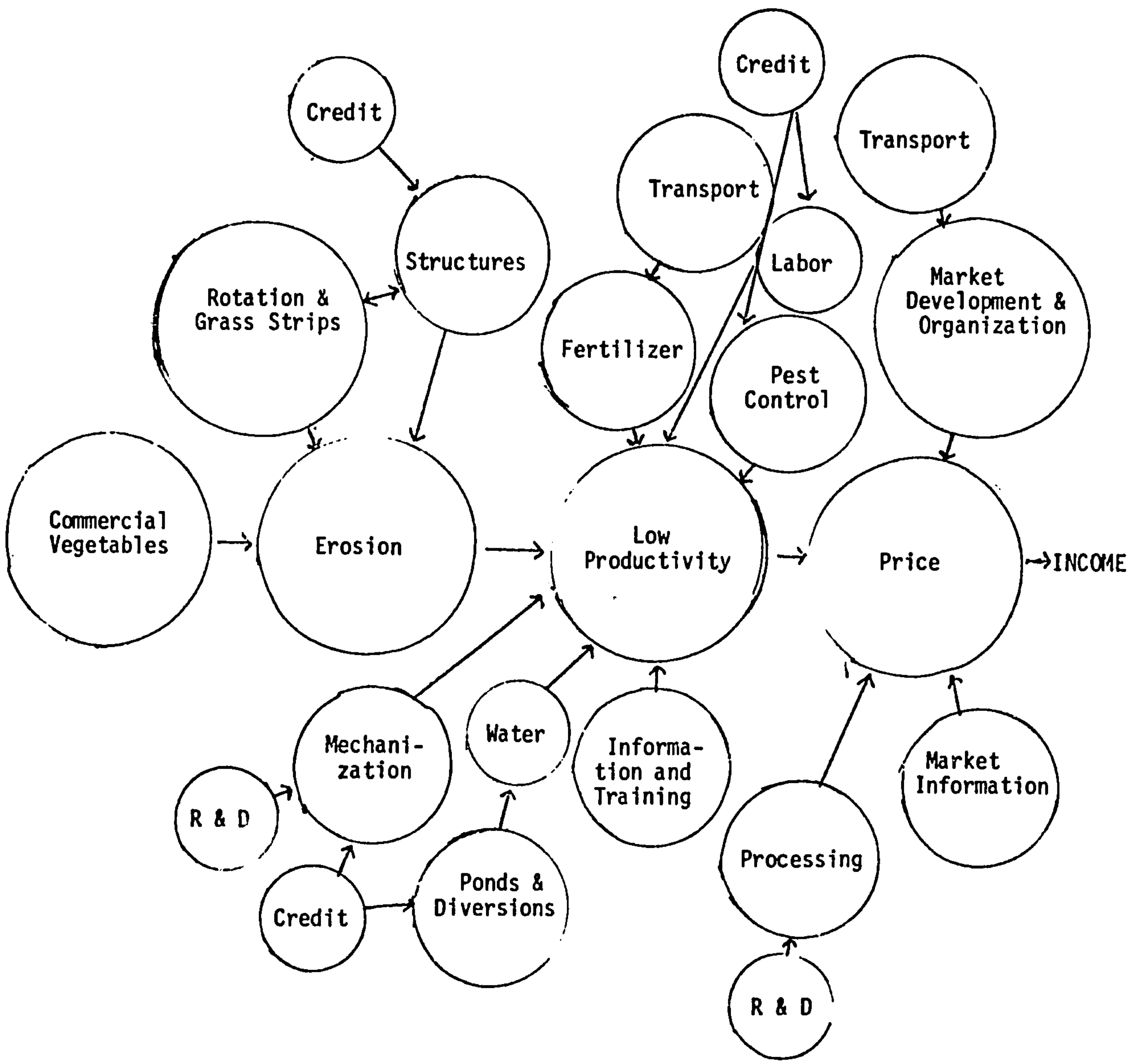
Root Crops

Figure 4. The Root Crop Constraints Network.



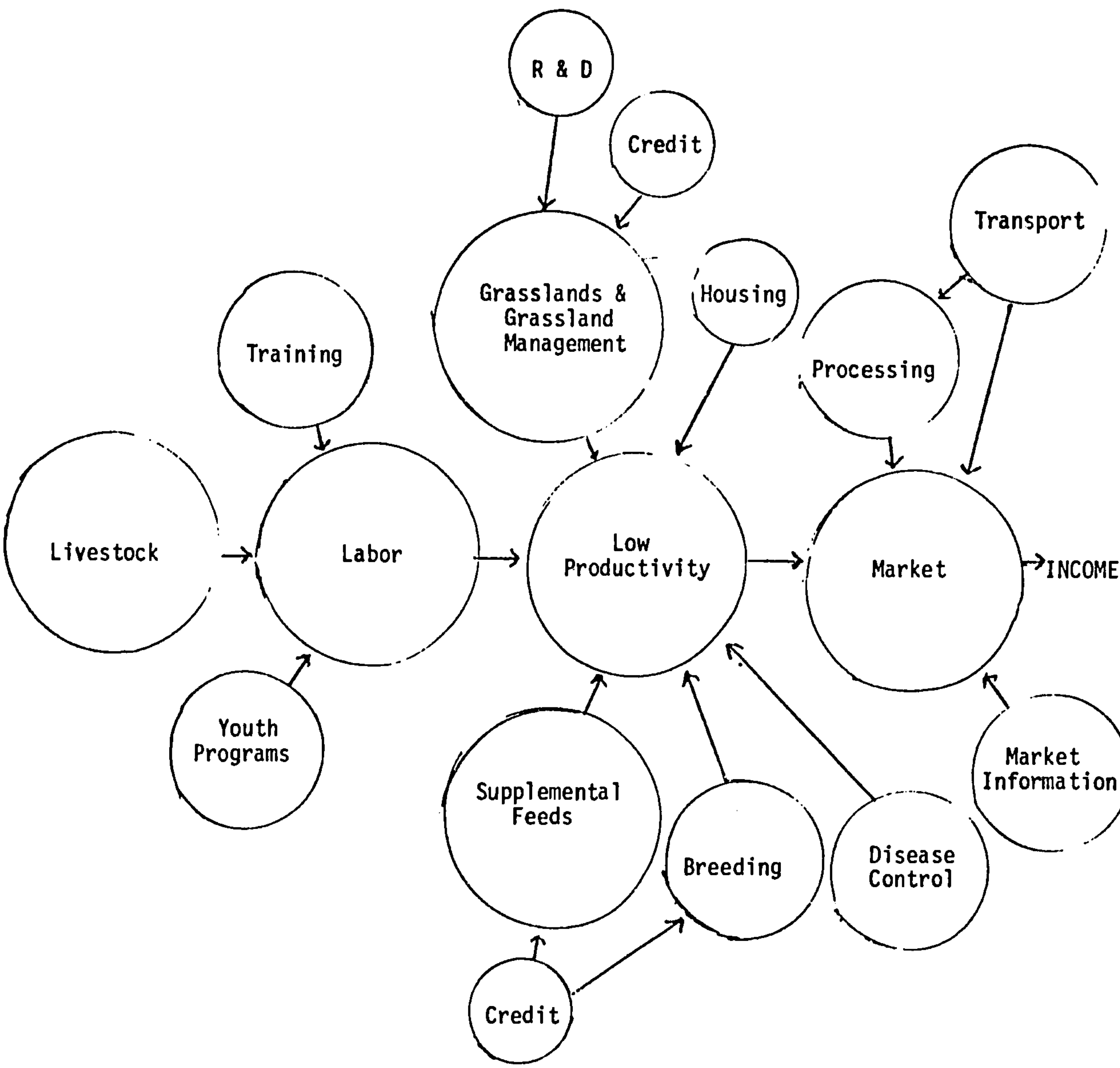
Most root crops have markets that fluctuate erratically with consumer prices varying among markets by 50 to 60 percent on any one day. Income and price demand elasticities are low. Expansion of the root crops would pose serious problems of erosion control calling for substantial adjustments in farming systems and heavy capital investments. These crops, particularly yams, require very heavy inputs of hard labor per acre. They are difficult to mechanize. If a program succeeded in expanding production, market problems would soon arise, calling for better coordination of the retail market, better market information and increased diversion of surpluses into new uses such as animal feeds, mixtures with cereal flours, and starches.

Commercial Vegetables.



Currently, most commercial vegetables enjoy a good price and could expand considerably without hurting the market because of import substitution. Except on favored sites, erosion would be a problem, but as they are high value-per-acre crops, expensive erosion control could be justified. These crops are susceptible to periods of drouth, and in most areas, some form of irrigation development would be desirable. A high level of management is essential to control insects and diseases, produce a quality product, and bring it to market at advantageous times of the year. Good information and training services would be essential. Adequate transportation facilities for inputs and product must be provided. An adequate labor supply throughout the growing season is important.

Livestock.


R & D
Credit
Transport
Grasslands & Grassland Management
Housing
Training
Processing
Livestock
Labor
Low Productivity
Market
INCOME
Youth Programs
Supplemental Feeds
Market Information
Breeding
Disease Control
Credit

Livestock is such an incidental project in the Target Area that supply of labor interested and willing to handle livestock is the prime obstacle to expansion. Information and training of interested farmers, and encouragement of profitable livestock projects for youth clubs would be desirable. Principal depressants of productivity include adequate and low-cost feed supply, better breeds of animals, especially where milk production is concerned, and disease control. Market development must proceed apace with production. Country-wide, import-substitution provides a sheltered market for milk and all meats except pigs,

7.1.4 Current Programs and Impact on Small Farms in the Target Area

Under this heading are grouped the activities of the Ministry of Agriculture Production Unit. These include extension work with farmers, Land-Lease, Crop Lien, production of planting material, crop protection, soil conservation, those land settlements that are under the Ministry of Agriculture, Pioneer Farms, and an assortment of subsidy schemes. There is coordination, but not line authority with some other programs, such as cooperatives. Financing of the major schemes under the Production Unit for Portland Parish is summarized in Table 7-2 for fiscal year 1977-78. The total amount expended or committed by the Unit was a little over $2 million. For most purposes, the unit utilized the funds allotted to it by the ministry. (Sometimes funds used exceeded funds released to the parish, but this appears to reflect delays in allotment of funds by the head office as the total budget allocation for the year was generally adequate to cover expenditures.)

Table 7-2. Production Unit. Budget Allocations and Amount Spent or Committed 1977-78, by Purpose. Portland.

Purpose	Allocation to Parish	Spent or Committed
General Administration	$ 99,875	$ 93,462
Agricultural Development	124,205	137,140
Agricultural Engineering	8,427	8,611
Farm Machinery Pool	4,800	16,002
Regional Office	80,979	96,378
Extension Service, Relief, and Miscellaneous	3,075	2,669
Plant Production (Caenwood)	312,000	344,494
Fertilizer Subsidy	14,000	10,899
Land-Lease Roads	70,000	42,777
Land-Lease Operating	165,000	124,952
Land-Lease Water Supply	1,000	--
Farm Housing Subsidy	51,100	51,115
Land Preparation	5,000	320
Special Rehabilitation & Crop Subsidy	21,250	20,450
Crop Care	20,000	17,886
Development of Land Settlements	30,000	28,779
Soil Conservation Works	59,890	54,818
Emergency Food Production, Crop Lien, & Emergency Food Loan	358,000	1,010,845
TOTAL	$1,428,601	$2,061,597

SOURCE: From Ministry of Agriculture Parish Manager's Annual Report, 1977-78. For some items, more was spent or committed than had been released by the head office. However, amounts spent were generally within the budget allocations for the whole year.

The principal activities of the Production Unit included: Crop liens; propagation of a wide variety of plants to be distributed to farmers from the Caenwood station; Land-Lease; general extension; soil conservation; and the farm housing subsidy program. No other activity included as much as $50,000.

The Crop Lien Program was started in the parish in July, 1977. Loans were granted to encourage production of specified crops. During the year, 4771 applications were received; 2413 applications were approved and loans were made to 1955 farmers for an average of $415. Loan repayments were said to be poor, but the statistics are not presented in a manner to yield meaningful figures. Nationally, crop lien revenues collected for 1977/78 are reported to be 15 percent of the projected amount[1]. In Portland, loans were made on the following crops:

red peas	yam
onion	corn
cow pea	gungo pea
cocoes	sweet potato
dasheen	cassava

Crop lien loans are approved by extension officers, with disbursements and collection handled by the People's Cooperative Banks. Loans are made only to farmers of less than five acres.

According to the parish report, problems with the program have arisen from poor markets, insufficient funds, delays in disbursement and shortage of planting materials.

The emergency food production program grouped in the table with crop lien went to assist 215 farmers who had suffered rain damage; total cost of the program was $3000.

Caenwood nursery is one of the principal plant multiplication stations of the Ministry. A variety of planting materials is provided

[1] Ministry of Agriculture National Production/Extension Report, 1977/78, p. 5.

free or at low cost for distribution to farmers by extension. Problems here involved labor unrest and some failures of mechanical equipment.

Portland has a large Land-Lease program involving 44 properties with 13,588 acres of which 8,017 are arable. Two more properties were under negotiation. The Parish Report notes that: ". . .there is not now much scope for increased acquisition."[1] During the year, 486 additional tenants were placed.

Under Project Land-Lease, the Ministry makes non-recoverable investments in such things as roads, drainage, market sheds and water supply, and also helps the farmer with land development, planting of permanent crops, and farm inputs for which the farmer is expected to pay. The value of loans made in kind to Land-Lease farmers was $64,000 in 1977/78. Of loans due and repayable ($83,000) only 24 percent had been repaid. Low repayments were said to be due to unavailability of markets, shortage of extension staff, crop failure from heavy rains and poor condition of access roads.

Soil conservation work in the parish includes four farm demonstration projects:

1. Shrewsbury: Conservation structures and land clearing, 120 farmers cooperating, 350 people participating.
2. Mt. Holstein: Mostly structure conservation, 60 farmers cooperating, 180 persons participating.
3. Brownsfield: Mostly orchard terraces, 15 farmers cooperating, 110 workers participating.
4. Cornwall Barracks: Mostly orchard terraces, 17 farmers cooperating, 120 people participating.

[1] Parish Manager's Report, Ministry of Agriculture op.cit. p. 5.

There were also two demonstration projects at schools, intended to set up model conservation farms, with students and farmers doing the work. The schools are: Fair Prospect Secondary and Happy Grove High School.

Under the Farm Housing Subsidy Program, farmers pay 15 percent toward the cost of an approximately $1800 house, and as much of the labor as they can. The parish constructed 40 houses during the year and completed some previously started. The Ministry is establishing a Pioneer Farm in Portland at Darley. This is one of four established in 1977/78. The Pioneer concept is being emphasized by the Government, and the target for the next five years is to establish 300 farms a year in Jamaica. Each farm will have 100 to 200 acres, run by 50 young men and women. There will be close supervision by a farm manager assisted by a field assistant and youth service worker. Farming will be on a cooperative basis.

Of the smaller programs, crop care is an important one. The parish had 14 spraymen who sprayed 4257 acres, some of it several times. The farmer now pays $3 toward cost of spraying. Farmers appreciate the service, but say the program is not adequate to meet their needs. The fertilizer subsidy of one-third the local cost of fertilizers is an important inducement to fertilizer use, but fertilizer shortages of recent years have lessened its effectiveness.

General extension is not set forth separately but is funded under general administration, agricultural production and other headings. In 1977/78 the parish staff included the Parish Manager, an Assistant Manager (being appointed), four divisional extension officers, 34 area officers, 34 field assistants, and several specialists including a home economist, soil conservationist, Land-Lease officer, and a number of supporting staff. Other departments of the ministry have staff persons posted at Port Antonio who maintain liaison with the Parish Manager, including officers for cooperatives, lands, livestock, and veterinary. There are livestock improvement centers at Shrewsbury and Mt. Pleasant.

In addition to the Production Unit of the Ministry of Agriculture, the Banana and Coconut Boards have programs and staff in the parish. The Coconut Board has advisory offices at Spring Garden, Caenwood, and Fair Prospect. The board buys fertilizer and stores it at the same locations. The advisory officers will have it delivered to farmers at a charge of 15 percent of its cost. Coconut Board extension staff feel that although coconut is adapted to small farms, the local small grower is not ready to treat coconuts as a crop that requires good husbandry. However, an officer interviewed in Portland said he visits about 500 growers and estimates that 60 percent of them have farms of less than five acres. The Coconut Board supplies plants to growers from nurseries at Caenwood and Spring Garden. There is no charge to those under the board replanting program; others pay a nominal sum.

The Banana Board has a regional manager in Port Antonio and a parish staff of three extension officers and five headmen. The board also contracts with an aerial sprayman and sprays virtually all banana fields for leaf spot at no charge to the growers. The board once had a fertilizer credit scheme and stored fertilizer at some boxing plants. Collections and thievery were such problems that they now provide fertilizer at the same subsidised prices as the Ministry of Agriculture and for cash. They would like to see the cooperatives now functioning at six boxing plants in the parish take increased responsibility for fertilizer distribution.

The Banana Board is concerned about the high rejection rates of bananas from small farms. They feel their extension efforts have been effective and that most growers offer a good product. The principal damage is done after the bananas leave the farm. The principal need is better roads and better handling in hauling and transporting from one conveyance to another. The Banana Board facilities for multiplication of improved planting material are limited.

The principal agencies working with small coffee growers are the Blue Mountain Coffee Cooperative and the Ministry of Agriculture extension workers. Seedlings are grown at Caenwood and sold for $1.20/100. As this is almost entirely a crop grown by small farmers, attention is focused on their needs. The Coffee Board acts as buying agent for the Coffee Co-op and assists in transport of the crop. Other direct assistance to growers includes making interest-free advances of funds to the co-op for purchase of coffee if requested. The cooperative, through its seven groups, maintains close contact with growers, advising them on maintenance of quality at harvest time and assisting with scheduling of collections and arranging with the group secretaries for delivery of fertilizers which it provides on credit from a storage depot at Balcarries.

The Cocoa Board has only one technical officer, relying upon the Ministry of Agriculture to perform that function. The Cocoa Board engages in cocoa growing in St. Mary (300 acres) and in Hanover (500 acres) and manages a farm for a cooperative in St. Mary.

Other services available to small farmers in Portland and Eastern St. Mary have been described in other papers. They include Self-Supporting Farmers Development Program operated by Jamaica Development Bank from its headquarters in Port Antonio, five Peoples Cooperative Banks, and the Portland Cooperative Credit Union Ltd., which is parish-wide with headquarters in Port Antonio. About 400 farmers belong to the Credit Union, around 17 percent of the total membership. Farmer members have savings of $15,000 and loans outstanding of $23,000. Farm loans are principally for bananas and ground provisions.

The Jamaica Agricultural Society has a retail farm-supply store in Port Antonio and is considering establishment of one in Buff Bay. The parish staff includes an organizer and a project officer. In the main, the 69 branch societies carry on the traditional educational functions of JAS, and a mutual-aid insurance scheme sponsored by JAS. About a year ago, the staff interested 16 branches in a joint JAS/AMC marketing activity whereby the branch societies would try to help AMC assemble produce from small growers. But AMC's prices were not competitive with the higglers, and the scheme has come to naught. The parish office also has been participating in the JAS pimento purchasing activity. In 1977 it purchased 172,000 pounds, but has discontinued buying this year because of storage problems. The branch is still a supplier of Irish potato seed for growers in the Cascade area.

The principal programs for rural youth are under the Social Development Commission, and include youth clubs and 4-H. These were described in Paper No. 4 on rural institutions.

A review of the agencies and programs intended to benefit small growers suggests that they are offered many programs and that most of them are being used up to the limits of their funds and staff. Principal problems and gaps appear to be:

1. No agency appears to be looking in depth at the marketing problem. So many production efforts are stymied by inadequate markets that this must be a prime area in need of assistance.

2. With so many agencies and programs with different goals, there must be considerable confusion among farmers and agricultural officers. There is need for some unifying goal to help orient programs toward the prime needs of Portland small farmers and to encourage synergism and coordination among programs.

3. The time and attention of extension officers is being diverted from demonstration and training in order to service the multitude of schemes, subsidies and services.

4. Small farmers are not doing enough to help each other, and their societies and cooperatives are not being sufficiently aggressive in identifying and training farmer-leaders and helping them establish farmer groups that can participate effectively and responsibly in economic activities.

5. Not enough attention is being given to encouraging and supporting money making projects among farm youth groups, either as group projects or on their home farms. The efforts being made are commendable, but more staff and resources are needed.

7.1.5 Strategy for a Program in the Target Area

Study of the Target Area has highlighted the great need for a program to improve the incomes of small farmers in the area. At the same time it has made abundantly clear the obstacles that will confront such a program, especially--

- steep land
- limited land area
- older farmers with limited interest in long-term farming goals
- limited family labor resources
- small financial resources
- poor transportation
- thin markets for most annual crops and some tree crops

Difficult as assistance may be, it is worth attempting in order that these farmers may contribute fully to feeding the country and remaining on the land. The alternative is continued rural stagnation and migration to Kingston.

Fortunately, there are some positive elements. Markets for bananas, coconuts, cocoa, and Blue Mountain Coffee are attractive and not likely to be spoiled by substantial expansion in Portland. It may be possible to improve markets for some other commodities. Jamaica has the technical and administrative talent to mount a meaningful production campaign, given some technical and financial help.

The strategy here outlined focuses on the key constraints and the main points are:

1. The immediate development of a production program for crops of known physical and market potential. For these, only design of a production campaign is needed--without further sector analysis and sorting of old Census Data. Any crop or livestock enterprise where the following critical elements are favorable could be included in a production campaign:

    a. Production potential,
    b. Adequate markets,
    c. Receptive farmers,
    d. Farmer skills basically adequate and capable of improvement,
    e. Agencies capable of and willing to participate in a program.

    It is believed that, in appropriate localities in the Target Area, the following crops meet the tests:[1]

    - Blue Mountain Coffee
    - Cocoa
    - Coconuts
    - Banana

    These are all crops with which farmers in the area have experience. Jamaica has a favorable position in world markets for coffee and bananas, and has a large import-substitution demand for coconuts. It should be able to compete with others in cocoa.

[1] It will be desirable to give some further attention to farmer receptivity to the tree crops. Cooperators will need to be selected with great care on this matter.

2. A simultaneous thrust to test other crops and livestock with good prospects, but where more information is needed about:

   a. The market,
   b. Production potentials, physical and economic,
   c. Farmer receptivity.

   The tests would include strengthened research inquiries, trials on farmers' fields, marketing studies, investigation of processing possibilities.

3. Continuing Research and Development to find additional enterprises and improve those activities already underway. Adaptive work on appropriate technology, market development, and introduction of new crops would be important components.

4. Strengthening of some institutions to support the program, with particular attention to cooperatives, farmers' groups and youth groups.

The proposed program embraces a family of projects. There would be three aspects, initiated simultaneously if possible, with the various sub-projects time-phased within each aspect.

Aspect I - Initial Planning and Production Campaign

A. Farm Level

1. A survey of selected extension areas in each of five river valleys stratified among high, medium, and low elevations with particular attention to coffee, cocoa, and coconut areas. Get physical, economic and human resource information and identify priority constraints in the locality.

2. Hold farm planning sessions with small groups of farmers leading to identification of cooperators. Also identify some venturesome farmers who will become Pilot Farmers who will risk some time and land to try out or expand high-potential but uncertain prospective crops in Aspect II, e.g.,

Spices	Milk and meat animals
Vegetables	Improved grassland management
Hybrid corn	Fish

3. Start a production campaign around the safest bets for production, markets and farmer acceptance (include attention to crops grown with them to strengthen short-run income). Campaign would include training and demonstrations, farm plans, farmer organization, improved input services including delivery and credit, market assembly, and youth projects.

4. Extend the above production campaigns to all areas.

B. Community Level

1. Launch a community-planning activity to involve Public Works, Social Development, JDB, and PCB, the cooperatives, local merchants, JAS, AMC, vocational agriculture teachers, and others. Aim:

   a. Inform and get support and ideas,
   b. Coordination.

2. Do specific planning with appropriate bodies to get action on roads, trucking services, public markets, produce collection points, water supplies, community forests, etc. Specific activities to be determined on basis of farmer and community needs as expressed by local people.

3. Work with key co-op groups and JAS to get some pilot co-op activities going in product collection, marketing and possibly processing, fertilizer ordering and distribution, etc.

Aspect II - Testing of Enterprises and Technologies

A. Exploratory Phase

1. Begin to work with Pilot Farmers identified in Aspect I to gather production experience on promising crops and livestock enterprises and new production and handling techniques that might make such enterprises more attractive.

2. Maintain close liaison with Aspect III Research and Development to get advantage of latest developments.

B. Production Phase

1. As new crops and new technologies become tested, introduce them into the Production Campaign as in Aspect I.

Aspect III - Research and Development

Examples are given here, but it is important that the list be kept open to respond to farmer and community needs.

A. Work with Ministry of Agriculture and Commodity Boards to initiate fields trials on such things as:

1. Improved farm tools and transportation facilities.
2. Packing of bananas closer to farmers' fields to reduce damage.
3. Low cost structures for small numbers of milking goats.

4. Portable, power driven tools for cultivation and grass cutting.
5. Input-output relationships in crop production to five response curves for fertilizer application, use of weedicides, etc.
6. Plant breeding and seed multiplication to hasten introduction; for example, of shorter banana stalks to facilitate handling on small farms, or to find varieties more amenable to small-scale mechanization.

B. Encourage the making of socio-cultural studies of farm families in the Target Area to learn more about attitudes and motivations and to discover ways of improving programs:

   a. Through adaptation of programs to existing cultural traits, and
   b. By education and incentives to improve attitudes.

C. Develop experimental crop insurance and group credit programs and test.

D. Build links with AID's project with CARDI and UWI on small farming, and with AID's applied research and development project in Equador being assisted by Cornell University.

Project Time-Phasing

Suggested time-phasing for the program is shown in Table 7-3. It is assumed here that the program would start in one extension area in each of five river valleys and be extended to the entire Target Area in the second year. The number of participating farmers would depend upon resources and willingness to cooperate. There are estimated to be 8000 small farmers in the Target Area with perhaps 24,000 acres of cropland.

The professional and material resources organized for the project are estimated to be as shown in Table 7-4. For a project involving three tours of two years each of U.S. support, inputs are:

8 - U.S. long-term professionals for a total of 30 man-years,
3 - man-years equivalent of consulting time,
16 - vehicles required for audio-visual equipment,
120 - (approximately) tons of fertilizer,
- some agricultural chemicals,
- miscellaneous farm and experimental materials,
- a small fund for making grants to UWI for graduate student research.

U.S. costs would be approximately:

Professional staff	$3,300,000
Supporting staff	660,000
Vehicles	100,000
Vehicle O & M	50,000
Audio-visual equipment	10,000
Fertilizer	25,000
Miscellaneous supplies	50,000
Graduate Student Research	20,000
Participant training degree:	
Production Economics (2)	44,000
Non-degree - 4 months	120,000
4 farm planners	
1 co-op specialist	
4 rural youth officers	
4 rural women's workers or home economicsts	
2 marketing specialists	
Subtotal	$4,379,000
Travel	100,000
Contingencies	50,000
Total	$4,529,000

Jamaican costs have not been estimated. Most of the personnel required could be shifted or seconded from other activities.

Some additional resources should be provided to strengthen some government or university programs that are highly important to the project. The research capability of the Planning and Policy Review Division of the Ministry of Agriculture to do farm management and marketing studies, is virtually non-existent. Similar gaps exist in the research programs at UWI. This and other relevant gaps in research are discussed in "Institutional Constraints to Development of Small Farms."

Several institutions need to be looked at critically to see how they might be improved. These have been mentioned elsewhere in the text and include land titles, credit institutions, market institutions, and cooperatives. If the fertilizer and agricultural supply shortages of

Table 7-3. Time-Phasing of Activities for a Development Program in the Target Area.

ACTIVITY	YEAR AND QUARTER																											
	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6				Year 7			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Aspect I - Initial Plans & Campaign																												
A. Farm Level																												
Survey	x	x			x	x																						
Farm Planning		x	x			x	x																					
Initial Campaign "dependable" crops			x	x			x	x																				
B. Community Level																												
Community Planning	x	x			x	x																						
Action Followup			x	x			x	x																				
Strengthen Co-ops	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x												
Aspect II - Second Stage Campaign (Farmer Trials)																												
A. Exploratory Phase																												
Annual Crops			x	x	x	x	x	x	x	x	x	x																
Permanent Crops			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
B. Production Phase																												
Annual Crops											x	x	x	x	x	x	x	x										
Permanent Crops																					x	x	x	x	x	x	x	
Aspect III - Research & Development																												
A. Market Studies	x	x	x	x	x	x	x	x																				
B. Field Trials		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. Socio-Cultural Study	x	x	x	x	x	x	x	x																				
D. Institutional Development & Crop Insurance			x	x	x	x	x	x	x	x																		
E. Linkage with USAID Projects at CARDI, UWI, & Ecuador	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 7-4. Professional Staff and Equipment

U.S. Position	Years	Jamaican Position	Functions	Equipment & Supplies
Project Co-Leader (Agricultural Economist or Agriculturist)	6	Project Co-Leader MinAg	Direct all aspects of project.	1 Jeep
Agricultural Economist, Farm Planning	4	1 Farm Planner for each Extension Division (4) 1 Production Economist. MinAg, Kingston	Lead farm surveys. Lead group and individual farm planning sessions. Participate in production campaigns. Work with MinAg Planning & Policy Review Division and with Ag. Economists at UWI & JSA to develop production economics & marketing studies.	5 Jeeps (1 for Agricultural Economist & each district office. Fund for graduate student research on Agricultural economic problems (for UWI & ISER), $20,000.
Tropical Agriculturist	4	2 Agriculturists (one tree crops, one food crops) 1 Regional Home Economist	Participate in planning & conduct of campaigns	1 Jeep 1 Pickup truck for each division (4) Fertilizer and & chemicals for campaign (6 demonstrations - 100 a x 6 yrs. $25,000.)
1 Rural Regional Planner	2	1 Community Planner for each division (4)	Under direction of Project Leaders, develop regional land use and resource plans and participate in action follow-up.	1 Jeep for each district & for planner (5)
Cooperative Organization & Training Specialist	4	Co-op organization & Training Specialist	Work with existing co-ops & organize new ones. Liaison with Co-op Training Center.	1 Jeep

Table 7-4 (Continued)

U.S. Position	Years	Jamaican Position	Functions	Equipment & Supplies
Sociologist or anthropologist. (experienced in programs to involve women in development.)	4	MinAg or UWI (ISER) sociologist or anthropologist. Regional or Parish Home Economist.	Study farmer and farm family attitudes and motivations & family structure to identify changes needed in programs for acceptability & more effective participation. Participate in production campaigns to enlist participation of rural women.	1 Jeep
Rural Youth Specialist	4	One rural youth officer for each division (4). Probably from SDC.	Cooperate in farm planning & in production campaigns to build youth club group and "home farm" projects - work with "Pioneer Farms" & seek participation from Peace Corps & 4-H Foundation.	1 Station Wagon
Market Development Economist (Kingston-based)	4	At least one and preferably more market economists. The Jamaicans would probably be in Ministry of Industry & Commerce & JEDCO.	Maintain continuous review of market potentials and how to improve them. Advise project leaders of most promising second state crop & livestock enterprises.	
Consultants as needed in livestock, agricultural engineering, small water systems, fisheries, agro-industries, credit, etc.	36 man-months	Consultants similar to Column One.	Specific needs cannot be foreseen. Some would be needed to work in project area but others could be assigned to Research Stations to strengthen work on specific problems.	1 Sedan under control of Project Leader.

recent years continue, these will be serious barriers to success of a productive campaign.

To attempt to deal with these multifarious problems within an Area Development Project would make it unwieldy and diffuse. It would be better to find a place for them in some other project, but not to lose sight of them. Continued decline in fertilizer imports into Jamaica can only spell disaster for any production campaign no matter how brilliantly conceived.

7.2 Market, Market Towns and Agro-Industry

7.2.1 Limitations of an Agro-Industry Base in the Target Area

The earlier sections of this report have dealt with a broad picture of the farming situation, the agro-industry situation, the efforts of the Government through various agencies and ministries, boards, and other organizations to channel technical and financial assistance to farmers in Jamaica. This portion of the report will deal with the few agro-industrial outlets at the local level, the cooperatives that exist to assist the farmer, and the problems to the small farmer in assemblying his inputs and delivering his outputs.

There are few agro-industries or related processing units in Portland Parish. The greatest concentration is in the assembly, grading, packing and shipping of bananas, coffee, and to lesser extent citrus, cocoa beans, and coconuts. The industry is composed mainly of the boxing plants, the coffee pulpery and the export facilities associated with the above. The cocoa fermenting plant is located at Richmond in St. Mary Parish. From personal observations and the limited information available through the various Government agencies, a listing of agro-industries in Portland is shown in Table 7-5. (See also Map 14.)

The Gauron Company employs 30 to 50 people full and part time and Krunche Nut employs 28 people. There are a few other firms engaged in agri-business but upon close observation they either operate part time or are defunct. There are also marketing outlets where limited cleaning and grading activities related to agro-processing are carried on, such as JAS outlet stores and AMC stores. The number of employees is very small.

There is a good nucleus of cooperatives in Portland Parish. Although most of them conduct a very limited number of services, the

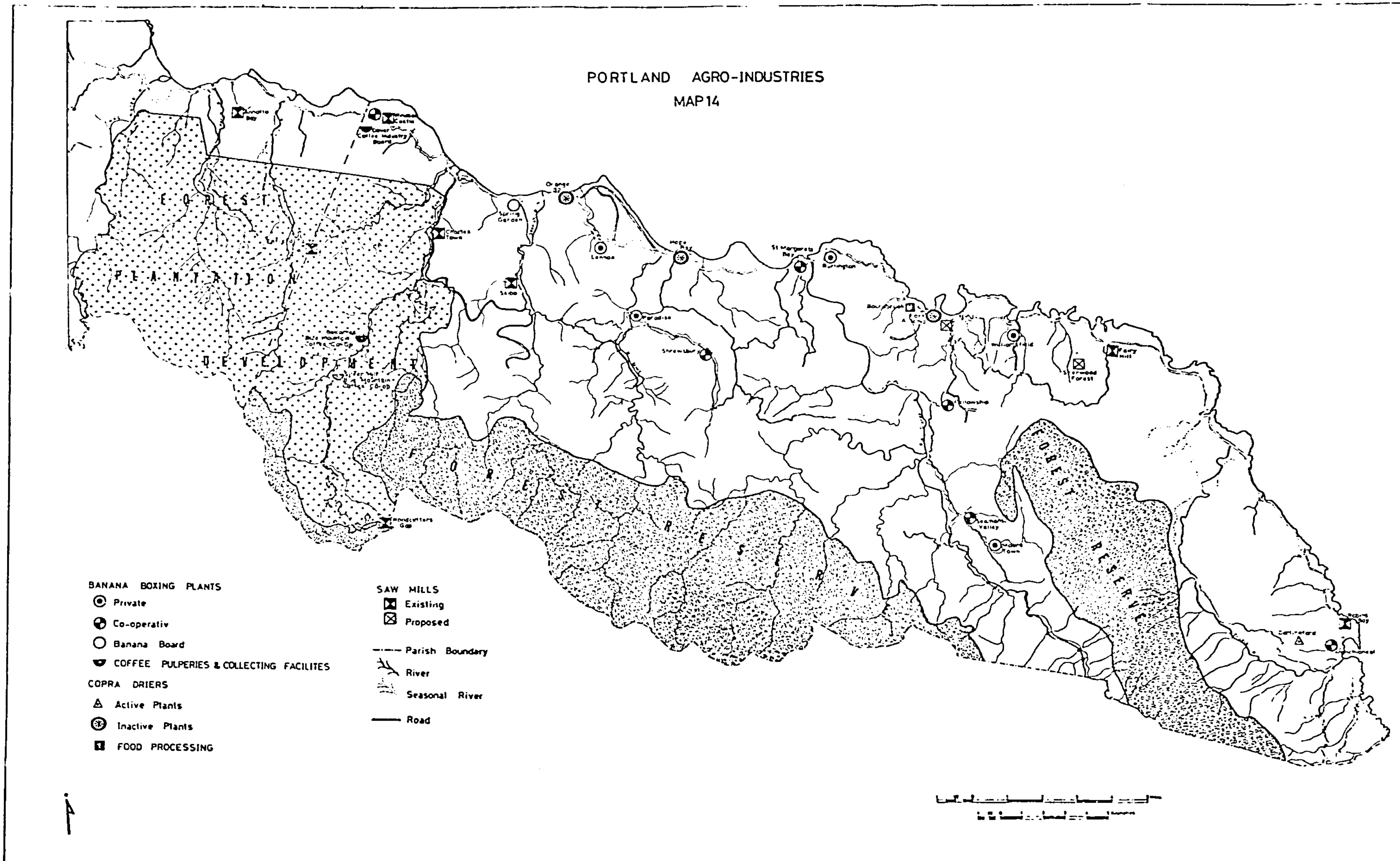

PORTLAND AGRO-INDUSTRIES
MAP 14
FOREST PLANTATION DEVELOPMENT
FOREST RESERVE
FOREST RESERVE
BANANA BOXING PLANTS
Private
Co-operativ
Banana Board
COFFEE PULPERIES & COLLECTING FACILITES
COPRA DRIERS
Active Plants
Inactive Plants
FOOD PROCESSING
SAW MILLS
Existing
Proposed
Parish Boundary
River
Seasonal River
Road

Table 7-5

Agro-Industries in Portland Parish
(Non-Cooperative)

Name of Firm	Location	Type of Processing or Manufacture
Gauron Food Products	Boundbrook, Port Antonio	Pickles, catsup, carmel fruit, coloring
Krunche Nut	Boundbrook, Port Antonio	Banana chips, banana raisins, cupcakes, candies, roasted peanuts
Banana Board Export Facilities	Port Antonio	Export
Banana Boxing Plants	9 locations in Parish	Grading and packing bananas

benefits have a great impact. The Portland Blue Mountain Coffee Cooperative with 2,000 members (where cocoa is also an "approved product") and the Portland Cocoa Growers Cooperative perform a vital role in the economic life of their members. We will discuss the operations of the Blue Mountain Coffee Cooperative in greater detail later in this report. It is difficult to obtain an accurate census of cooperatives since some appear to be a part of a federation--for example, there are seven cooperative groups that make up Portland Blue Mountain Cooperative, and 29 that comprise the Portland Cocoa Growers. There are 16 cooperatives and pre-cooperatives in Portland Parish. (Table 7-6)

There are 15 banana boxing plants in Portland. Six are cooperatives or pre-cooperatives. Banana Board representatives and others have stated that the cooperatives have a better performance record in delivering quality bananas to the export dock. Banana Board estimates are that the small grower loses on average 20 percent of his crop through rejections at the boxing plant and export dock. Information from the All-Island Banana Growers Association indicates that the cooperatives do have a better than average rate of rejections. See Table 7-7.

Farms along the rivers and in the mountains are nearly always isolated from markets and from a source of farm supplies. According to the manager of the Darlingford boxing plant, bananas are delivered in four ways, (1) by pickup truck in which one person hauls for himself and one or more neighbors, (2) by mule or donkey-drawn wagons or carts, (3) on muleback or donkey, and (4) by the farmer himself. Sometimes the farmer may carry a stem of bananas on his head, one in front, and one on his back. The Darlingford boxing plant (a cooperative) located near

Manchioneal serves an area of more favorable terrain than most areas in western Portland. The cooperative has 208 members that marketed 1,384,317 pounds of bananas in 1977. The bananas were delivered to the plant by the methods mentioned above where they were graded, boxed and delivered to the dock at Port Antonio for export. The members live within a radius of seven miles from the boxing plant. (Table 7-8)

Figure 7-1 conveys the transportation and marketing problems of a small farmer producing mixed crops in western Portland. Note that he must deliver bananas to the boxing plant at Spring Garden, vegetables to the AMC station and coffee to the collection station. In the meantime, he has the added responsibility of being near home when a higgler may come by for purchases.

From the sample, I have selected a typical farmer who produces four crops. To portray the problems he faces, I have plotted the location of the markets where he sells his crops other than bananas. Also plotted are the location of his fertilizer, spray material and other sources of supplies. Since the farmer must travel to the various locations, quite often by foot or donkey, to sell his produce and buy his supplies, the sacrifice of time and human effort comes into clear focus.

The response to these constraints is a comprehensive <u>cooperative</u> program which will increase production, develop a marketing program, and hence provide higher farm incomes. It would be best if eventually a full-service type cooperative could be organized and successfully developed to serve a multi-purpose need including field supervisory personnel, complete grading, washing, packing (or processing) facilities, provide and distribute farm supplies, credit and a direct marketing program. Such a program would enable a cooperative to serve most of the needs of a farmer within a community to save the frustration and waste that exist with such fragmentation at the present time. How can a farmer expect to substantially increase his standard of living on a very small parcel of land if he has to spend such a great portion of his time carrying his produce on foot or on a donkey to numerous markets over very poor roads? His problems are compounded when his seed supply is undependable and, furthermore, the amount of fertilizer he may need does not arrive.

Building on the structure of an existing, well-functioning cooperative will provide the surest, safest and fastest way to develop a sound marketing program. Starting with a relatively small unit (one of the groups within the Portland Blue Mountain Cooperative), growth can be orderly, since as one group becomes proficient, another group within the large organization can be developed. The secret will be in providing good management practice with intensive and effective technical and financial assistance on a timely basis. (See Manager's job description, Appendix 4). It cannot be a hit or miss situation; it must be a well planned and long range program with intentions of following through. Effective cooperative development must come from the bottom up, not from the top down. Members must understand their cooperative, support it and believe that it belongs to them. It cannot be an organization superimposed on them from the top down by a Government agency.

Table 7-6. Registered Cooperatives and Pre-Cooperatives in Portland Parish.

Name of Cooperative	Services Performed or Economic Activity	Location
Registered		
Portland Cocoa Growers	Cocoa production	c/o JAS, Port Antonio
Portland Blue Mountain Coffee Growers Co-op	Cocoa production	Buff Bay , P.A. Portland
Rio Grande Raftsmen Co-op	Rafting	Fellowship
Port Antonio Cab Drivers Co-op	Cab operation	Port Antonio
Birnamwood Land Co-op	Farming	Spring Hill
Manchioneal Fishermen's Co-op	Fishing	Manchioneal
Buff Bay/St. Georges Fishermen's Cop-op	Fishing	Buff Bay
Hope Bay Fishermen's Co-op	Fishing	Hope Bay
Portland Cooperative Credit Union	Thrift & credit	Highgate
Shrewsbury Cooperative Boxing Plant	Banana Production	Fruitful Vale, P.O.
Seaman's Valley Cooperative Boxing Plant	Banana Production	Rio Grande P.A.
Moore Town Boxing Plant	Banana Production	Moore Town P.O.
Darlingford Co-op Boxing Plant	Banana Production	Manchioneal P.O.
Pre-Cooperatives		
Fellowship Boxing Plant	Banana Production	Fellowship P.O.
Lenox Pioneer Co-op	Citrus and vegetable	Buff Bay
St. Margarets Bay Co-op	Bananas	St. Margarets Bay

SOURCE: Cooperative Development Center. For additional information on the number of cooperatives in Jamaica, membership and functions, see Appendix Tables 1, 2 and 3.

Table 7-7. Number of Members, Gross Sales and Percent of Bananas Rejected, Cooperatives in Portland Parish.

Name of Cooperative	Number of Members (Sept. 78)	Gross Sales[1] Pounds	Gross Sales[1] Dollars	Percent Rejections Boxing Plant	Percent Rejections Port
Seamans Valley	414	7,870,538	787,053	12.89	1.29
Moore Town	266	4,337,177	433,717	12.26	1.13
Darlingford[2]	203	1,384,317	138,431	6.23	0.36
Shrewsbury[2]	206	927,881	92,788	6.21	0.44
St. Margarets Bay[2]	141	1,226,884	122,688	10.79	1.18
Fellowship[2]	155	2,172,003	217,200	10.83	0.85

[1] For 1977 except for St. Margarets Bay and Fellowship that are pre-cooperatives. They have operated only since May 1978.

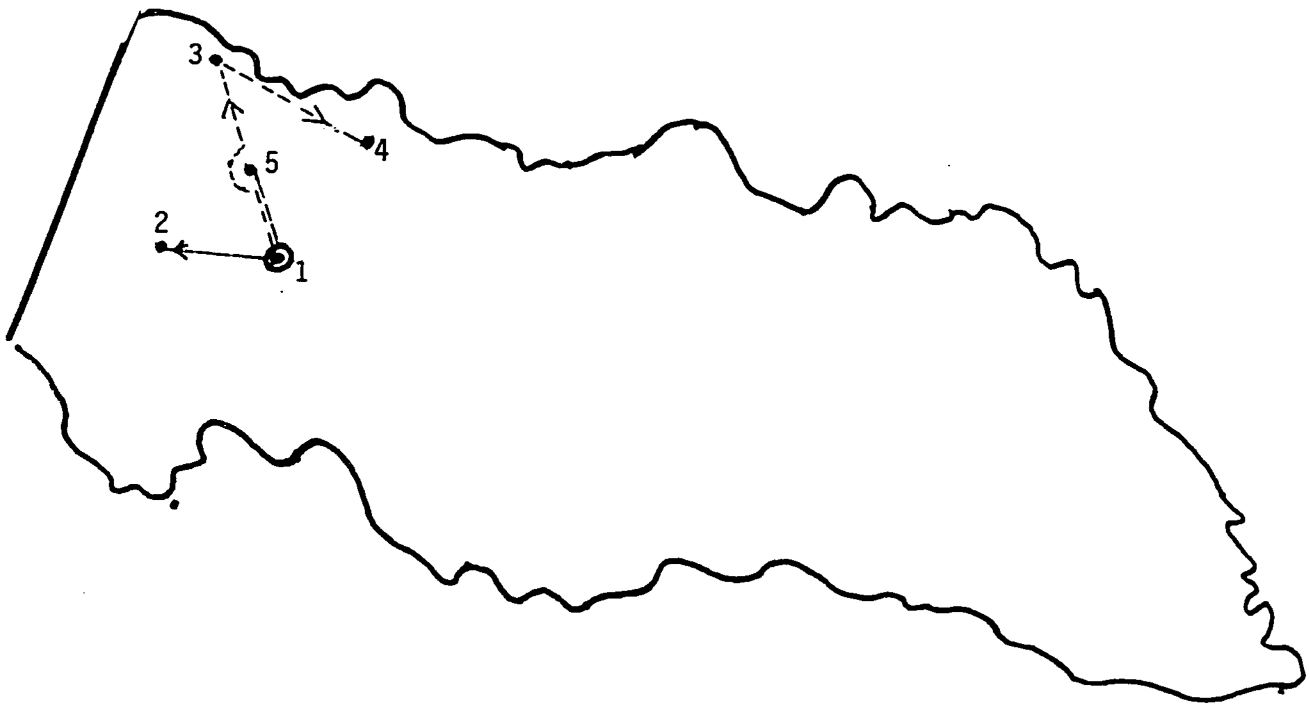
[2] Boxing plants that purchase bananas by the hand and pay farmers extra for the extra labor.

Table 7-8. Darlingford Banana Boxing Co-op: Location and Distance of 20 (of 208) Members from Boxing Plant and Method of Transport to Plant.

Farmer	Distance in Miles from Farm to Plant	How Farmer Transports His Banana Crop
1. Kensington	2.0	Mule cart
2. Kensington	2.5	Private truck
3. Grange Hill	4.5	Mule and private truck
4. Grange Hill	4.0	His own pickup truck
5. Calegon	3.0	Private truck
6. Reach	4.5	Mule
7. Reach	4.6	Private truck
8. Ecclesdown	6.5	Mule to truck
9. Windsor Forest	8.5	Private truck
10. Orange Hill	2.0	Private truck
11. Scott Runn	6.5	Private truck
12. Betty Hope	3.0	Private truck
13. Spring Valley	5.0	Private truck
14. Grantsfield	1.0	Mule
15. Haining	7.0	Private truck
16. Hartford	7.0	Private truck
17. Hope Well	2.0	Private truck
18. Hectors River	4.5	Private truck
19. Darlingford	1.0	Mule
20. Muirton Park	4.5	Private truck

Private truck - farmer brings bananas to road by hand, mule, or mule cart on a pre-determined day. He pays the truck owner for hauling his bananas to the plant.

Figure 7-1. Map Showing the Location of a Sample Farmer and the Delivery Points for the Sale of His Coffee, Bananas, Vegetables and Fruit.



PORTLAND PARISH

1. Location of farmer.
2. Coffee collection station.
3. Buff Bay - travel to Spring Garden must be taken through Buff Bay.
4. Banana boxing plant (Spring Garden).
5. AMC pickup station for fruits and vegetables.

Scale ______________________

(10 miles)

The operating requirements of the small farmers of Portland Parish must begin with their need for a dependable supply of seedlings and fertilizer, a field extension staff that works directly with them as individuals and in groups to assist with cultural practices and marketing. The extension field worker must have professional credibility, know the crop and area and stake his career on giving effective technical assistance.

7.2.2 Strategy for an Agro-Industry Program in Portland Parish

The basis for an agro-industry program is assurance of quality, reliability of supply and a competitive price. It is precisely on these three points where agro-industry has fallen short in a number of cases. This is not to say, of course, that other aspects commonly included in any feasibility analysis are not important. Rather, where the small farmers' responsibility extends--in the supply of the raw material--there is not much point in going any further unless and until these conditions can be satisfied. A business-like cooperative can assist the small farmer to meet these conditions. It should be added that small farmers' efforts to meet these conditions should be matched by equivalent efforts by the Parish and Central Government to provide the necessary roads, electricity, etc.

A. Example Utilizing an Existing Agro-Industry Related Entity (a cooperative)

The Portland Blue Mountain Cooperative Coffee Growers Ltd. has a long record of creditable service to the farmers in the Parish. It provides a service to approximately 2,000 farmers that raise coffee and cocoa. The co-op presently has seven groups in the Buff Bay Valley that produce coffee and six groups that produce cocoa. The coffee and cocoa are picked up by trucks by the Coffee Industry Board. The coffee is delivered to the pulping plant at Silver Hill, and the cocoa is hauled to Richmond Fermentery. In each case, the partially processed products are shipped to Kingston for further processing before export.

With a record of member acceptance of the cooperative, a reliable collection station network and proven management, this cooperative could extend its activities to include the assembly of inputs and the marketing of output of domestic crops. Such a proposal had been put to the Executive Committee of the cooperative. The most logical new line of products is vegetables and possibly fruit. Most of the members produce coffee and cocoa in conjunction with other cropping operations, not as a single crop. Rather than attempt to provide marketing services initially for all of the members that produce fruits and vegetables, it would be desirable to select one or two of the groups for an intensive program. The program would need to concentrate on a complete array of services from selection of seed, cultural practices, harvesting, transportation, grading and packaging. The technical assistance to assure adequate and quality production will be discussed later.

Existing trucks, or if necessary the purchase of additional ones especially adapted for hauling fruits and vegetables, can be purchased. The collection stations should be used only for off-loading and re-loading into the co-op truck(s). The grading and other preparations for market can take place at the central stations at Silver Hill when fruits or vegetables are hauled with coffee and at Richmond when hauled with cocoa. After grading and packaging at the central stations, the fruits and vegetables could be further transported along with the cocoa or coffee to markets in Kingston. Kingston should receive a concentrated marketing promotion effort because much of the island population lives there and all of the major distributors, supermarkets, and a substantial number of AMC serve the area. At a later date after experience is obtained and volume warrants, markets in Ocho Rios and Montego Bay can be explored.

Utilizing an existing cooperative such as Portland Blue Mountain will not introduce all of the variables and uncertainties that would exist if a completely new cooperative marketing organization was established.

Should the management of the Portland Blue Mountain Cooperative elect to assume these new obligations, careful consideration must be given that the additional division for domestic sales does not in any way jeopardize the sound structure of the cooperative that now exists. The new division would require that the cooperative employ additional management and employees. Perhaps additional equipment for grading and packing as well as additional trucks. The new fruit and vegetable operation should be kept entirely separate from the existing operation in regard to income, expenses and distribution of dividends, etc. To be supported by the co-op management, board of directors and the membership, an intensive educational program would be necessary. Once the initial educational program is completed, one or more of the coffee or cocoa groups (co-ops) could be selected for the initial effort. There are seven coffee groups and six cocoa groups, but essentially the same farmers. They make up the 2000 membership. Therefore, the membership of the average group would be approximately 300, probably a desirable number to start with.

In addition to the cost of additional equipment (facilities) and technical assistance, financial assistance will be necessary. Instead of introducing a new lending structure, the existing Jamaica Development Bank or the Peoples Cooperative Bank should be used, utilizing the co-op as the recipient and monitoring agency. A special loan fund would be deposited in the bank with appropriate guidelines for loan-making and servicing. The special loan program should be kept completely separate from any existing loan program that the PCB or JDB now administer.

Two diagrams showing the flow of fruits and vegetables from the farm gate to market with the supporting technical and financial assistance provided is outlined below. The following diagram is a model of the existing Portland Blue Mountain Coffee Cooperative with an expanded operation to include the marketing of domestic fruit and produce, and the sale of fertilizer, spray materials and other supplies. (Figures 7-2 and 7-3)

Figure 7-2. Model of a Cooperative's Expanded Operations to Include Domestic Produce.

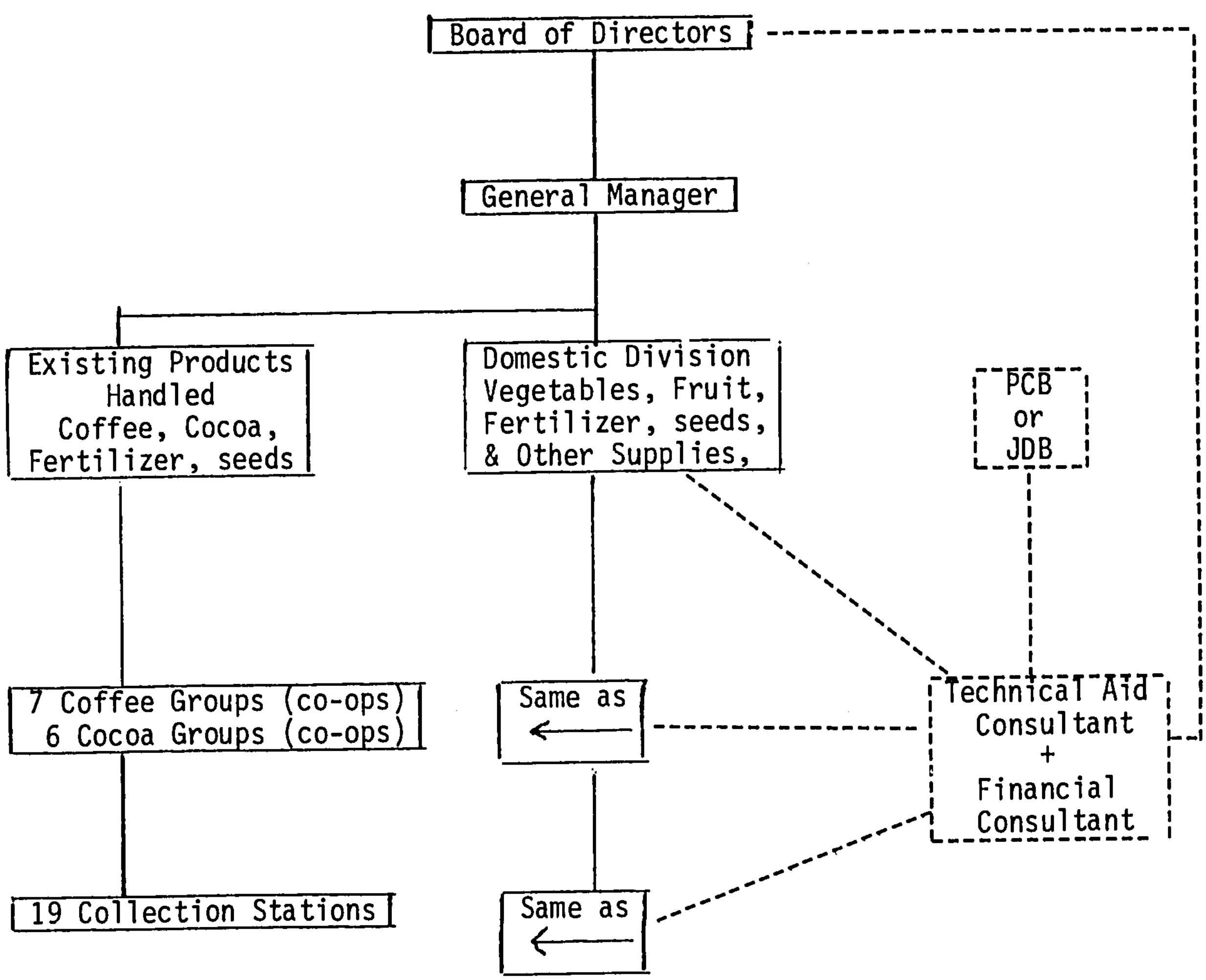
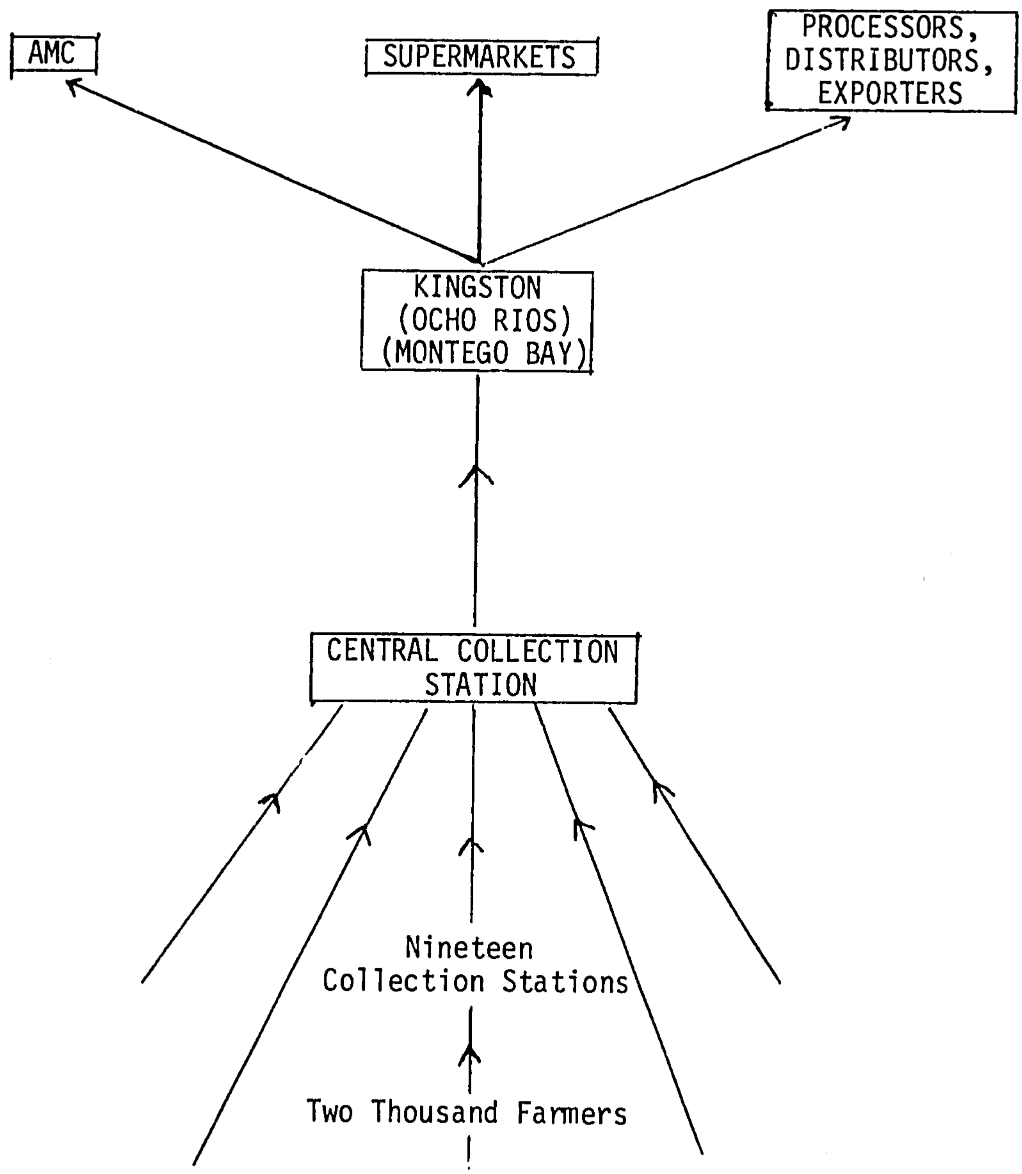


Figure 7-3

Marketing Diagram Showing Fruit and Produce Flow, Utilizing Portland Blue Mountain Coffee Cooperative. (Domestic Division)



Example of financial needs that may be necessary to implement the aforementioned program on a pilot basis utilizing about 300 farmers. Assumptions used:

1. Income for the typical farmer from fruits and vegetables produced and marketed for domestic consumption is one-half of the farmer's total yearly income. The average total income for a five-year period for the typical farmer in the Buff Bay area is $1609, based on the "model" improvement program by the Agricultural Sector Team. Therefore, the average income from the sale of fruits and vegetables for a five-year period should be $805.

2. Expenses should be calculated on the same formula as above. Total farm expenses $863. One-half for domestic fruits and vegetables would be $431.

3. Loan needs are also calculated on the basis that one-half of all farm expenses will be related to the production of fruits and vegetables for domestic sales. Utilizing the "model" mentioned in (1) above, the average amount of capital needed for production expenses for one year's crops would be $129,300. Capital needed to fund the initial one-year lending program through either PCB or JDB could be ascertained as follows;*

300 farmers x $431	=	$129,300
Additional contingency for losses, etc.	=	$ 50,000
		$179,300

4. Facility and equipment costs:

Facility (improvements)	=	$ 25,000
Equipment (grading, etc.)	=	$ 50,000
Trucks	=	$ 25,000
Subtotal		$100,000

5. Salaries for consultants:1/

Cooperative Specialist	=	$ 35,000	
Production Supervisor	=	$ 25,000	
Marketing Supervisor	=	$ 35,000	
Accountant - Bookkeeper	=	$ 25,000	
Subtotal		$120,000	
	TOTAL		$399,300

*U.S. Dollars

1/Annual salaries.

The above employees should be selected on the basis of their training in cooperatives. The costs related to the consultants' Jamaican counterparts should be borne by the Jamaican Government, perhaps selected from extension agents or cooperative agents.

6. Loan repayments. Annual crop loan to be repaid when crops are sold. Revenue for operation of the cooperative and to build reserves should be deducted as retains on the basis of a charge on each pound or box, etc. for each crop sold.

B. Example Utilizing a New Full-Service Cooperative.

If a satisfactory working relationship between the Portland Blue Mountain Cooperative and members who produce fruit and produce for domestic sales cannot be negotiated, they may want to establish a new independent full-service cooperative. By full-service, I would suggest one that would provide field supervision (with the assistance of the Extension Service) on production, quality control, packing, shipping and marketing. If this course of action is followed, the organizational structure would replicate the right column shown as the domestic marketing division in example A . The management block and the board of directors as well as the financial and technical assistance blocks of the organizational structure would remain the same. I strongly urge, however, that a maximum effort be made to utilize the Portland Blue Mountain Cooperative. The fruit and produce farmers, by using that cooperative can benefit from their experience, credibility and above all the Blue Mountain Cooperative itself needs to have a new economic injection to provide more services to their members. The new domestic division would provide that impetus.

C. Example Utilizing Contractual Marketing Arrangements.

Producers need to know if their produce can be sold, and conversely, marketing organizations need to know that they have a consistent and dependable supply of the quality and volume of produce to satisfy the consuming public.

Cooperative type organizations cover the range of sophistication from a completely integrated operation of production, assembly, processing, grading, packing, shipping and marketing to those that supply a limited number of services. One of the easier methods with little expense involved is the contractual form of cooperation. In its simplest form, the producer group selects a creditable cooperative (or organization) that is willing to formally contract with them as a co-op entity or with producers on an individual basis. If the cooperative is structured such that its only function is to act as the agent for individual members' business affairs, to establish prices and quantities the members as individuals will deliver to the contracting agent, it may have little or no overhead financial costs. On the other hand, if the members contract to the cooperative and the cooperative in turn contracts with a corporation, costs of administration and transportation would be involved.

The contract is often referred to as a marketing agreement. The agreement is a legal document that clearly outlines the type and grade of product, the quantity, the approximate delivery dates, the price to be paid the producer and the method and time of payment. Some marketing firms may want a blanket type contract or agreement in which all of the production of a certain crop or crops is committed to them. Others may restrict their commitment to a certain quantity of the crop.

If a producer is a member of a marketing cooperative, it is desirable to the cooperative and to the member to have a marketing agreement. The agreement in such an instance can be as simple as the one outlined below to a detailed and complex document.

Marketing Agreement

Contract No. ______

Membership Application and Marketing Agreement

I hereby apply for membership in, and agree to deliver to ________________ cooperative, to be marketed by the association as my agent, in its usual and customary manner, all the ________________, ______________, ______________ crops harvested by me if requested to do so by the manager of the association.

The by-laws of the association and its rules and regulations are hereby referred to and made a part thereof, and I agree to abide by them upon acceptance of this application.

____________________ (Date)

____________________ (Farmer's Signature)

____________________ (Address)

accepted this ___________ day of ____________, 19___.

(Name of Cooperative)

by ____________________ (President's Signature)

by ____________________ (Secretary's Signature)

The above contract allows the marketing organization (cooperative) the freedom of acting as the producer's agent to seek the best price obtainable without being committed to a specific volume or price. On the other hand, it does not give the producer the assurance of a confirmed price or amount. The cooperative could, if it elected to do so, contract with one firm only (another cooperative, a corporation or a marketing board, etc.). A simplified marketing contract between the cooperative and the contracting corporation, etc. is illustrated below:

Marketing agreement between ______________________ a corporation, and ___________________ a cooperative registered under the laws of Jamaica.

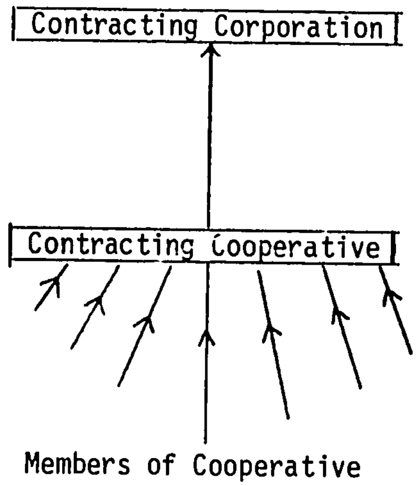
The purpose of this marketing agreement is to establish a working relationship between the above parties to insure orderly and dependable production and supply of ________________________ (Name of crops, etc.) to be produced by members of the cooperative and purchased by the corporation.

The Corporation agrees to purchase and the cooperative agrees to sell ___________________ (Pounds, tons, stems, gallons, head, etc.) of ________________ (list crop, livestock, product). The ____________________ (Names of crops, etc.) will be grown during ________________ (Month and Year) and delivered to a location prescribed by the corporation. The price(s) to be paid will be ________________ (per pound, stem, etc.) and the amount to be delivered will be ________________ (Pounds, head, etc.). Payment will be made to the cooperative ________________________ (State dates and amounts, etc.).

(Name of Cooperative)	(Name of Corporation)
by ____________ (President)	by ____________ (President)
by ____________ (Secretary)	by ____________ (Secretary)
____________ (Date)	____________ (Date)

If farmers in Portland would want to contract with a corporation on an individual basis, the arrangement between the Southern Processors Ltd. and the farmers in Bull Savannah area would be an example to follow.

Diagram showing an official contractual agreement between the members of a cooperative and between the cooperative and a corporation.



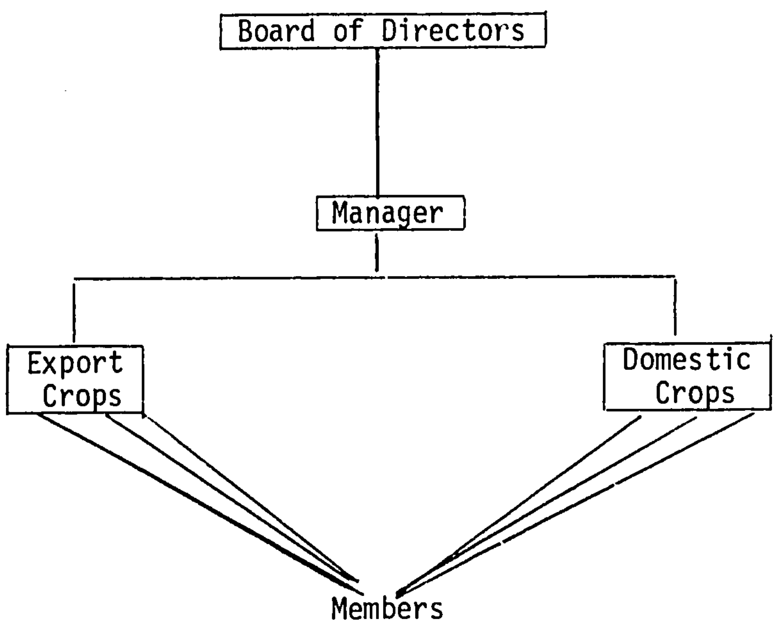
If the marketing agreement (contract) is between the member and the cooperative only, the contracting corporation could be removed.

D. <u>Example Utilizing the Format of a Banana Boxing Plant, a Produce Shed, Coffee or Cocoa Collection Station as an Effective Farmers' Cooperative.</u>

There are more than twenty Banana Board boxing plants, fishing groups and other groups that operate to varying degrees as cooperatives in Portland and Eastern St. Mary's Parish. The successful Portland Blue Mountain Coffee Co-op and the less successful Portland Cocoa Growers Co-op also operate in the area. Although most of the groups have not operated as successfully as might be expected, they have provided a vital element of perseverance, loyalty, and elementary business experience. The banana boxing plants are underutilized, being used only certain months of the year. With modification, the plants can be used for fruit and vegetable packing and shipping.

One or more of the local co-ops should be considered to be used as models for the development of agro-industry in Portland Parish. Perhaps initially three examples could be used to demonstrate the business and financial integrity of the small local co-ops. The three combinations could involve one co-op that would handle an export crop exclusively (an existing Banana Board facility), one that would handle export and domestic crops, and finally one that would handle domestic type crops only.

The organizational structure of a co-op handling the combination of export and domestic crops should be built as shown below:



In each of the suggested operations, an intensive technical assistance and supervised financial program is suggested similar to that outlined in the Portland Blue Mountain coffee, fruit and vegetable operation (in the first example in this portion of the report). To re-emphasize the production, hauling, packing, and marketing technical assistance needed, the cooperative should be fully assisted by a talented staff. Then, when the credit input needed is determined, a financial program should be established utilizing either the PCB's or the JDB's. If it is deemed that the PCB's or JDB's are not interested in participating in an innovative financing program, a simple Production Credit type cooperative financial institution could be organized (similar to the PCA's of the U.S. Farm Credit Administration).

7.2.3 Market Towns

Our goal is that of developing a properly balanced and integrated marketing system built on a foundation of mixed public, cooperative and private activity from the farm to consumer markets for domestic food crops.

The governmental role would become primarily one of guidance and support through its policies and programs of price incentives, price and supply stabilization and production direction.

The ratio of market towns to rural communities and the accessibility of market towns through the road system is a measure of the ability of an area to develop economically.

In western Portland are three coastal market towns - Port Antonio, Buff Bay and Hope Bay - which are exit points of market roads leading down river basins. The three market towns are connected by a good coastal road, the major crossroad of the Parish. Two of these three--Hope Bay especially--lack the facilities to fully play the role of market town. And even the third, Port Antonio, suffers in relation to Kingston.

The market town to rural community ratio is less favorable, particularly in the central and western part of Portland Parish, than for the nation as a whole. This is due to the above average proportion of rural population in the Parish's total population. This, in turn, is an outgrowth of the mountainous-river basin nature of the topography, the below average density of the Parish road network, a low proportion of farmable quality land and the effects of some specialization in crops for export in which public markets play no role in the marketing system--banana, coconut, coffee, and cocoa. The points of sale by growers of these crops are either rural community or open country collection points, from which the products flow directly to processing factories, or in the case of bananas, from the boxing plants to the shipping wharf. The use of market towns comes into play as a part of the marketing process for the domestic food crops and for the domestically consumed portion of bananas and coconuts.

This means that the small farmer of central and western Portland Parish is limited to one or possibly two market towns as a place to sell his products, buy his family and farm production needs, and enjoy social amenities. It also restricts his ability to learn of what price differentials, if any, exist between markets.

It is apparent that western Portland Parish is inadequately provided with accessible market centers where farm produce can be readily sold and where stores with displays of producer and consumer goods can tempt the small Portland Parish farmer to grow more.

There really is not much incentive for the western Portland Parish small farmer to expand his production for the market. His first concern is to produce enough to feed and clothe his family at the traditional level of living and his second concern is to hold at a minimum the risks involved. Since he doesn't produce much and since he diversifies to reduce and spread his risk, his marketing lots are small and varied. He thus has little incentive to adapt his production to the market wants of Kingston and other island consumers. All this combines to perpetuate an agricultural economy of low productivity.

Therefore, an important component in the strategy is to develop and expand the role of Buff Bay, Hope Bay, and Port Antonio. As much as possible, the proposed changes in the marketing system of Jamaica should be directed toward development of these towns and raising their importance in relation to that of the national capital of Kingston.

7.2.4 Jamaican Urban Centers and Spatial Arbitrage

This section explores the use of price data as a means of determining the relative efficiency of different urban centers in Jamaica with regard to marketing agricultural produce. Similar studies have been undertaken in tropical Africa by W. O. Jones,* and use is made of his work for some conceptual and methodological support. The data used here are inadequate for a full-scale study of marketing and urban centers, but they do permit an illustration of the analytical approach and some tentative results.

Marketing

The role of marketing in stimulating and facilitating agricultural development and in assuring the availability of foodstuffs to urban populations at reasonable prices is a matter of vital concern. Farmers cannot be expected to increase their production unless they have an attractive market for their products, and they cannot adopt new productive techniques unless the market functions efficiently. In this task the market town has a primary function. How efficient are the market

*Jones, O. W. "Some Economic Dimensions of Agricultural Marketing Research," pp. 303-326 in Regional Analysis, Vol. I, Economic Systems, edited by Carol A. Smith. Academic Press: New York, 1976.

towns in Jamaica? Where are the bottlenecks in distribution? How are these bottlenecks to be identified, measured, and monitored for change?

A commonly heard complaint by the farmer, the extension worker, and even the higgler is that shortage of product may appear in one market and surplus in another with waste and loss of income as a consequence to both farmer and consumer. What evidence do we have of market inefficiencies of this sort in Jamaica? Despite the numerous studies of the higgler system and of the market facilities, we have apparently no studies of market price fluctuations in relation to transportation in Jamaica. The only reference I have been able to find to such questions has been the FAO/IDB, Final Report, April 1977, "Jamaica Preparation of Parish Markets Project," where on page 24 a single reference is made.

> 2.54 Retail prices in parish markets are determined by higglers. MINAG conducts a periodic survey of prices in major parish markets for 70 commodities (See Annex 1, Table 11). They vary from market-to-market, reflecting seasonal availabilities, regional shortfalls and surpluses caused by inefficiencies in the distribution system. The 1975 parochial prices per parish vary approximately 133% for bananas, 150% for coconuts, 118% for red peas, 150% for cucumber, 260% for pumpkin, 66% for yams and 170% for sweet potatoes (see Annex I, Table 12). This clearly shows the inefficiency of the system, although it should be borne in mind that quality differences are not accounted for.

The FAO/IDB report was clearly on the track of an important aspect of marketing, and there is a considerable analytical value yet to be derived from this kind of data.

Crop specialization or the concentration on the cultivation of crops which, for ecological/economic reasons, will bring optimal returns (sometimes referred to as 'zoning'), should be the goal for the producer and for the nation. But specialization is possible only in the presence of an efficient system of intra-island trade. Expansion of a market by increased territory makes it possible to convert a subsistence agriculture into a specialized agriculture.

The degree of specialization will be a function of marketing efficiency. Efforts to increase output without effective demand will be thwarted. In summary, it may be said that a marketing system should "achieve more concentrated production and a more dispersed consumption."

The measurement of market performance as manifested by the behavior of prices is one way of determining efficiency. The data for such an analysis is apparently there in Jamaica. With the data on hand, it is possible to demonstrate some aspects of spatial arbitrage* (or the lack of it) in Jamaica as well as to point out markets that are above or below average in prices. With additional data on transportation costs it would also be possible to use the "transportation model" in linear programming to determine the most efficient means of distribution of agricultural production. With time series data it may also be possible to test the performance of arbitrage over time as well as space.

Method of Analysis

The data used in this exercise comes from Table 12 of the FAO/IDB report. In analyzing these prices further, the mean and standard deviation were calculated of the price of seven crops in 14 market towns:

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
1 Banana	23.92857	7.15181	.298882
2 Coconuts	16.35714	4.93975	.301993
3 Peas	214.64286	45.69398	.212884
4 Cucumber	24.00000	2.57501	.273959
5 Pumpkin	23.42857	6.57167	.280498
6 Yam	29.14286	5.05138	.173332
7 Sw. Potato	21.71429	4.47956	.206293

From the Coefficient of variation we learn an interesting fact. There is little variation between the seven commodities in terms of deviation from their mean prices. Coconuts have the highest coefficient with a

* Manifestation of differences in the price of a particular crop as between markets and the actions to reduce them.

30.2% variation around the mean by the standard deviation. Yams have the smallest deviation, only 17.3% variation around the mean price. To some extent we can understand why the coefficient will not show great extremes above or below average prices. In the first place, the farmer must earn something and the higgler must earn something or the good will not be sold. So there is a floor on the price. Similarly, there is a ceiling because beyond a certain price, the consumer will not buy. Staple crops that are not seasonal and can be dug up at any time, like yams, could be expected to vary least in price. Coconuts are more discretionary in the diet and might be expected to vary more in price. Just how far this line of reasoning can be extended to other crops is an open question. What the data at this stage of analysis do not reveal, however, is whether the variation, such as it is, can be brought down. It should be clear, however, that any reduction in the coefficient over time can be taken as a sign of progress in marketing efficiency because it will indicate an increase in overall spatial arbitrage. A 20 percent variation indicates (at least for 1975) that circulation of produce from one market to another was very poor in response to differential prices.

In the next step of analysis, the data were expressed in terms of standard scores. The purpose for using standard scores is to express each price in relation to its mean and standard deviation. By doing this the actual units in which the prices were expressed are cancelled out and it is possible to compare apples with oranges. (Note that the prices are in units of dozen, each, quarts, pounds.) Without converting the prices into standardized units, they cannot be meaningfully compared. The standard scores are shown in Table 7-9. The seven columns refer to the seven commodities and the 14 rows refer to the 14 urban centers in the same order as they appear in Table 7-12. For example, the standard score for Linstead in green bananas is 1.5, which indicates that for some reason when these prices were measured the Linstead market had unusually high prices (1.5 standard deviational units) above the mean.

Now the same method of calculating the mean, standard deviation, and coefficient of variation was used on these standard scores. We are now in a position to point out that the highest priced market is St. Ann's Bay with a mean price of plus .57 standard units. (Table 7-10) Bear in mind that data are for 1975 and for a duration of time not indicated and that only seven commodities and 14 markets have been represented. Also bear in mind that a more sophisticated mathematical method of weighting commodities in accordance with their importance to the consumer would also improve the model. Nevertheless, it is of some interest to map the distribution of these crude figures. Regional effects are quite evident. The western market towns in Jamaica generally have lower overall prices for agricultural produce than do the eastern market centers. This says something about supply and demand relationships and transportation needs island-wide. Interestingly, Port Antonio shows the highest coefficient of variation which may indicate that some locally grown crops sell at low prices, but that the nonlocal crops reach Port Antonio at above average prices. Again it is necessary to caution that this line of reasoning is simply an exercise based on limited data. Our main purpose has been to show how the data could be used if enough of it were available. A sample of seven commodities is simply not enough.

Table 7-9. Price Differentials of Seven Commodities and Fourteen Urban Centers Expressed as Standard Scores.

	Green Bananas	Dry Coconuts	Red Peas	Cucumber	Pumpkin	Yam	Sweet Potato
1. Linstead	1.5	-1.1	.6	-1.4	.7	1.2	-.8
2. May Pen	-.1	.7	.0	.2	.2	1.0	.7
3. St. Ann's	.0	-.3	1.6	2.1	.7	-.4	.3
4. Mandeville	.1	-.5	-1.0	.2	-.1	.2	-.4
5. Falmouth	.1	-.3	.6	.9	-.5	-1.2	-.4
6. Montego	-1.2	-.3	-.3	-.9	-.7	-1.0	-.4
7. Sav-la-Mar	.7	-.5	.7	-.6	-1.3	-1.6	-.8
8. Lucea	.0	-.5	-.8	.5	-2.0	.6	-2.4
9. Morant Bay	-.5	1.8	-1.8	-.2	1.9	1.6	.5
10. Port Antonio	-.7	-.1	-1.1	.9	-.4	1.0	.1
11. Santa Cruz	2.2	-1.3	.0	-.6	-.5	-.0	1.8
12. Port Maria	-1.5	-.9	1.6	.9	.8	.6	.7
13. Coronation	-.5	1.7	-.5	-1.4	.4	-1.0	.3
14. Cross Roads	-.1	1.7	.4	-.6	.7	-.6	.7

Note: Two items of missing data were set at the mean value for the remainder of the data--a reasonable procedure to use normal.

Source: Agricultural Sector Team

Next a bivariate correlation table was made using the standard scores. The correlation was between urban centers with respect to variation in price. This part of the analysis is even more speculative in nature because information on the transport cost of shipping agricultural produce from one urban center to another is lacking. Furthermore, the model of spatial arbitrage has not been logically thought out in detail. In his study of prices, Jones used bivariate correlation among prices to demonstrate that the urban centers in Nigeria had a weak spatial arbitrage and accordingly a poorly organized market system among certain centers.

A simple model of spatial arbitrage assumes that each urban center receives all of its supplies from its own hinterland and that no trading between centers occurs unless there are severe shortages (or gluts) because transport costs between areas are high. In this case one might expect prices in each urban center to fluctuate slightly (low coefficient) and independently of each other except when severe shortages occur. Then the prices will correlate. Overall one would expect nearest neighbor urban centers to show low positive correlations.

A well functioning spatial arbitrage usually reflects relatively low transport costs. Prices tend to move together between neighboring urban centers, and a large positive correlation occurs. For the purposes of our analysis one might crudely hypothesize that, if the correlation between neighboring centers is positive and high, the market system is efficient. (If it is negative and high, I'm not sure what is indicated.)

A table of nearest neighbors and their correlation coefficients (r) is shown below. Note that the correlation coefficients are low except for two neighbors. St. Ann's Bay and Port Maria have what is perhaps a significant correlation. If one refers back to the table of averages, he will note that in both markets the prices are above average. The arbitrage does not seem to be effective in reducing prices because in both places they are high. Apparently in this case, the arbitrage will have to extend to another part or parts of the island in order to bring the prices down. An improvement in transportation between St. Ann's Bay and Port Maria is not necessary and will not do the job anyway. (Tables 7-11 and 7-12)

The highest correlation (and this is most gratifying) is between the Coronation and Cross Roads markets both of which are located in downtown Kingston. The Coronation Market is located near the railroad station and serves, for the most part, the poorer people living close to the center of the city. The Cross Roads Market serves a predominantly lower middle class market. The high positive correlation between these two closely spaced markets is an indication that communication and transportation are good and prices fluctuate closely. (One would never have guessed this looking at the raw data alone, or at least one would not have been able to rate these two markets relative to others.) It is also interesting that the mean for the Coronation Market is -.14, or slightly below average in prices, and the mean for Cross Roads is .31, or quite high (consistent with the relatively low coefficient of variation). The reason for this seems obvious. The Coronation Market serves a lower income group and the Cross Roads Market serves a somewhat higher income group. Probably the difference is also reflected in the quality of the produce sold in these respective markets. (Table 7-10)

Table 7-10. Mean Standard Deviation and Coefficient of Variation of Standard Scores.

	Variable	Mean	Standard Deviation	Coefficient of Variation
1.	Linstead	.10000	1.17473	11.747340
2.	May Pen	.38571	.41404	1.073435
3.	St. Ann's	.57143	.95867	1.677672
4.	Mandeville	-.21429	.44508	-2.077035
5.	Falmouth	-.11429	.71047	-6.216577
6.	Montego	-.68571	.36253	-.528691
7.	Sav-la-Mar	-.48571	.89709	-1.846940
8.	Lucea	-.65714	1.17169	-1.783006
9.	Morant Bay	.40000	1.32413	3.310337
10.	Port Antonio	-.04286	.78285	-18.266545
11.	Santa Cruz	.22857	1.29192	5.652134
12.	Port Morant	.31429	1.09762	3.492416
13.	Coronation	-.14286	1.03740	-7.261772
14.	Cross Roads	.31429	.82347	2.620117

Table 7-11. Table of Correlation Coefficients (r) Between Nearest Neighbor Urban Centers.

1	Linstead	-.137
12	Port Maria	
2	May Pen	.143
4	Mandeville	
5	Falmouth	.092
6	Montego Bay	
7	Sav-la-Mar	.113
8	Lucea	
11	Santa Cruz	.123
4	Mandeville	
3	St. Ann's Bay	.632
12	Port Maria	
13	Coronation	.972
14	Cross Roads	
9	Morant Bay	.48
10	Port Antonio	

Table 7-12

RETAIL PRICES OF SELECTED CROPS IN SELECTED MARKETS, 1975

(J¢)

	Green Bananas (doz.)	Dry Coconuts (each)	Red Peas (qrts.)	Cucumber (lb.)	Pumpkin (lb.)	Yam (lb.)	Sweet Potato
Linstead	35	11	240	15	28	35	18
May Pen	23	20	215	25	25	34	25
St. Ann's Bay	24	15	290	38	28	27	23
Mandeville	25	14	170	25	23	30	20
Falmouth	25	15	240	30	20	23	20
Montego Bay	15	15	200	18	19	24	20
Sav-la-Mar	29	14	248	20	15	21	18
Lucea	24	14	180	27	10	32	11
Morant Bay	20	23	133	23	36	37	24
Port Antonio	19	-	163	30	21	34	22
Santa Cruz	40	10	-	20	20	29	30
Port Maria	13	12	288	30	29	32	25
Coronation	20	25	190	15	26	24	23
Cross Roads	23	25	233	20	28	26	25
Avg. Prices	24	16	215	24	23	29	29

Source: Agricultural Planning Unit.

Conclusions

At first approximation, it seems reasonable to say that spatial arbitrage between Jamaican urban centers is less than optimum. An inefficient system costs the customer more in the long run although at times it creates a glut on the market. To the farmer, the lack of arbitrage between centers cuts down on effective demand for his product and prevents him from specializing in a few crops. Improving overall transportation and communication will not do the job in the short run, nor is it all that is involved. Unclogging information channels might do the most in the short run and should be set up on a permanent basis.

Areas that seem to be isolated from the mainstream of agricultural production may be in the need of market improvement. On the basis of the analysis here, Port Antonio's prices are about average for the island as a whole. Communication also seems to be good with Morant Bay, but strangely, not with the Kingston markets.

It is recommended that this kind of data be further analyzed for what it can reveal about aspects of marketing in Jamaica.

7.2.5 Port Antonio: Regional Center

Port Antonio was proposed as a regional center in 1970 (National Physical Plan, revised 1978). In order to serve in this role, however, Port Antonio will need to dispose of basic infrastructure and services befitting a city of this designation. (See Table 7-13 covering the criteria for a regional, sub-regional, and district center.) In addition, other types of employment-creating industries are needed - agro-industrial, industrial, trade and services. A partial review of existing services in Port Antonio indicates that they are below the minimum required.

Despite the paucity of employment opportunities, Port Antonio showed a significant rise in population of 15.3% during the 1960-1970 decade (using constant 1970 census boundaries for both census years). This increase was more than double the increase for Portland parish as a whole (6.2%). Port Antonio's increase compared favourably with most parish capitals and even exceeded the rate of growth of Kingston (14.7) percent. During the 1960-1970 period there was a decline in population in the central areas of the town and expansion along the east-west road radiating through town. There is also a tendency for growth to occur southward on the road to Breastworks.

On the whole, economic opportunity in the Portland parish has not kept pace with population growth. Between 1960-1970, there was a net migration of 4,500 people out of Portland (6.2% of total 1970 population). The large majority of people moving out of Portland (83.2%) moved to Kingston metropolitan area, the catchment of Portland overflow. The migrants tend to be in the most productive age group - the 20 to 30 year old category which showed a 3.4% loss in growth between 1960-1970. Unfortunately for Port Antonio, the major population increases were registered in the unproductive age groups 0-14 and 65 plus years. These groups increased from 50.4% of population in 1960 to 54.1 percent in 1970. Out migration of the most productive group can be attributed almost entirely to the lack of economic opportunity in the urban center.

Approximately 35% of all the workers in Port Antonio are in the Services sector. This is followed by Agriculture, Manufacturing, and Commerce each of which accounted for 10% of employment. The total labour force in the town is about 3,660. One of the largest employers is Government. The Parish Council has a permanent staff of 200 and an intermittent staff of 50 casual laborers. The Public Works Department has over 100 permanent staff and a number of casual laborers. In 1970 there were only 8 factories employing 183 people in Port Antonio:

4 Bakeries (86 employees)

2 Block factories (37 employees)

1 Copra factory (25 employees)

1 Pickling factory (10 employees)

The Banana Board employed about 50 people. Tourism accounts for a substantial number of jobs. In 1976, 386 people were employed in visitors accommodations, a decline of 34% from 1972 when 588 people were so employed.

Port Antonio is not one of the major tourist areas of Jamaica. In 1976 it had a capacity of 242 hotel rooms while Ocho Rios had 2,308 nearly ten times as much and Montego Bay had 3,694 beds more than 15 times as much. Percent occupancy has also lagged being other resort areas. It was only 24.9% in 1976 for Port Antonio while it was 34.0% for Ocho Rios and 32.7% for Montego Bay. In 1976 Port Antonio had 6 Hotels, 2 guest houses and 85 resort cottages.

Table 7-13. Minimum Requirements of Infrastructure and Services of Regional, Sub-Regional, and District Centers.

1. Each Regional Center should have the following Facilities as a minimum in addition to those required for the Sub-Regional Centers. (Facilities beyond this listing will depend on size.)

   A. Large secondary, and where appropriate, post-secondary school
   B. General hospital, with specialized facilities where appropriate as well as Type IV clinic
   C. Main library
   D. Fire station
   E. Police station
   F. Large Multi-purpose urban-type community center
   G. Large recreation park with variety of facilities
   H. Public airstrip
   I. On the main national road system
   J. Sanitary sewer system

2. Each Sub-Regional Center should have the following minimum level of services in addition to those for the District Centers.

   A. Large secondary school
   B. General hospital (small to medium size) with Type III clinic attached
   C. Branch library
   D. Police station
   E. Fire station
   F. Recreation park
   G. Community center (size based on population)
   H. Playing fields (which could be in association with the park, community center or schools)
   I. Good paved road access to nearby district towns, regional urban center and Kingston
   J. Sanitary sewer system
   K. Industrial area
   L. Commercial agricultural loan outlet
   M. Small business loan outlet

3. Each District Center should have the following minimum level of services.

   A. Secondary school (or within walking distance of such a school)
   B. Type II clinic
   C. Community Center
   D. Playing field (which could be associated with a community center or secondary school
   E. Book Center or Bookmobile service
   F. Fire station (or within close accessibility of)
   G. Police Station (or within close accessibility of)
   H. Good paved road accessibility to nearest sub-regional and regional centers
   I. Industrial area for the development of small enterprises
   J. Small farm loan outlet
   K. Agricultural extension service office

4. The following basic infrastructure should be provided as the minimum requirements in each of the District, Sub-Regional and Regional Center selected as priority areas.

   Post Office
   Electricity
   Telephone and Telegraph Service
   Piped Water
   Paved Road Accessibility

SOURCE: Town and Country Planning Department, National Physical Plan (1970)

Fishing provides some employment. Eighty-three fishermen operate 45 boats. Only three boats are mechanized. In 1972 an estimated 43 percent of the workers earned less than J$1,000 annually.

Telephones

There are about 600 telephones in Port Antonio. Approximately 200 commercial phones and 400 homes are served by lines. The telephone company has a backlog of orders for phones. Approximately 400 additional lines could be added at this time, if available.

The service area of phones in Port Antonio extends from Boundbrook on the west to Fellowship on the south and San San on the east. Call boxes are located beyond this area at Breastworks, Boston Bay, St. Margaret's Bay and the Ken Jones airport. A call box will also be extended to Hope Bay in the near future.

The outgoing telephone calls from Port Antonio reveal something of its personal and financial connections with the rest of the island. An officer at the telephone exchange made the following estimates:

60-70 percent of calls go to Kingston
10 percent to Ocho Rios
5 percent to Montego Bay
2 percent to Mandeville

and scattered phone calls to Port Maria, High Gate, Morant Bay and a few to Annotto Bay and Buff Bay. Kingston receives the preponderance of calls, an indication of its important in the economy of Port Antonio. Many of the phone calls between Port Antonio, Ocho Rios, and Montego Bay are for the purpose of inquiring about reservations in these alternative resort areas. Mandeville is related to Port Antonio because many British derived Jamaicans live there and have friends in Port Antonio where there are also a number of people of British origin. Oracabessa, Port Maria, High Gate and Morant Bay communicate with Port Antonio because Port Antonio is the recipient of bananas from these areas. Some calls go out to Buff Bay and Annotto Bay because there are people who commute to work in these areas, but generally people will have little reason to call these urban centers.

Boundbrook Wharf

The Boundbrook Wharf is owned by the United Fruit Company of the United States. Usually every week the wharf receives a banana boat. It takes about two days to load the boat with bananas which are sent to England, a ten day trip. The banana boat also stops at Montego Bay, the only other banana port in Jamaica. The Banana Board employes three chartered ships as well as their own ship to transport bananas.

No goods are imported through this wharf, although facilities could be developed for imports. Some exports are shipped out of Jamaica by a firm called Portland Packers. There is also a company, Tropical Food Exporters Company, that ships mostly to England through Port Antonio.

The port facilities include a fishing wharf, run by Johnstown & Co., that handles fishing boats fishing in the Banks, and a railway pier, unused, near Boundbrook Wharf. Cruise ships dock on the western side of West Harbor regularly (summer 1978) on Monday morning and depart Monday evening. Every fortnight a cruise ship also docks on Wednesday. A wharf built for cruise ships at Folly is not in use because of poor currents.

Other potential export crops such as pineapples and citrus could be shiped from Port Antonio but there are no apparent plans for expansion in these directions.

Banking Facilities

Bank of Commerce has 500 to 600 checking accounts and approximately 12,000 savings accounts. Other banks are the Nova Scotia Bank, the Credit Union, the Building Society, and a Savings Committee.

Tourist Facilities

Roughly 20 percent of the economic base of Port Antonio can be attributed to tourism with approximately 400 employed directly by tourist facilities and an additional 300 or so employed partly by tourism. The major tourist accommodations are as follows:

Hotels	Beds
Dragon Bay	100
Frenchman's Cove	38
Goblin Hill	44
Trident	19
Bonnie View	32
Guest Houses	
de Montevins	15
Cottages	
approximately	35

Average occupancy rate from 1977 was 24.8% in Hotels. New arrangements are proposed for this winter. Cruise ships may dock and some passengers will remain at the Goblin Hill for a week. This is expected to increase the occupancy rate for Port Antonio.

Port Antonio has a unique interest for tourists. It is the only tourist area that is not heavily dependant on tourism as to overshadow other economic functions. Thus, the problem with Port Antonio is how to increase tourism without spoiling the attractive features about this small city.

Port Antonio Hospital

Port Antonio has a general hospital located on Nuttall Road overlooking the west Harbor. The road turns and twists around several times in a climb of about 150 ft.in less than a half mile. The hospital has a pleasant view but is difficult to reach on foot and is not served by public transportation, although there is a bus stop at the foot of the hill. The hospital serves all of eastern Portland parish from Hope Bay to Hector's River with 112 beds and 20 maternity beds. Western Portland is served by Buff Bay hospital with about 80 beds.

Port Antonio hospital has a staff of 1 full time resident, 1 full time physician with outside consultancy and 1 part time resident. There are 21 registered nurses and 31 assistant nurses and 3 midwives. The hospital is difficult to get to and the administrator claimed that often people would have enough money to reach the hospital by taxi but not have money to get transportation home. The hospital has 2 ambulances. The nurses residence on the grounds is in poor condition and requires total renewal.

For the most part the hospital serves the immediate area of Port Antonio. High transportation costs tend to discourage its use by rural population. Rural population are primarily dependent for health care on visiting doctors and public health dispensaries. The hospital has a pharmacy and there is one pharmacy in downtown Port Antonio located in the city center plaza on Harbour Street.

Police Services in Portland Parish

Praedial larcency is not reported as a major crime problem in Jamaica in terms of the amount of money involved. Table 1 shows in the 1976-7 (April 1 to May 31) year praedial larcency amounted to less than two percent of the value of property stolen. Nevertheless praedial larcency does affect agricultural production by discouraging farmers from investing in certain types of crops or livestock. This is indicated in the short note in the Daily Gleaner July 27, 1978 which states, "Because the thieves are so rampant many farmers are reluctant to rear small stock". Fear of praedial larcency also prevents farmers from making intensive use of land in areas which they cannot observe daily. It discourages farmers from living in villages and encourages them to live on the land in remote and unserviceable areas. Recovery rate for praedial larcency is only seven percent while it is nearly twenty-five percent for other forms of property crimes. This figure tends to indicate that praedial larcenists are more difficult to catch than other forms of thievery.

Data on the extent to which praedial larcency might constitute a problem in the Target Area of Portland parish was obtained from the Superintendent of Police in Port Antonio. His overall evaluation of praedial larcency was that it did not constitute a problem of serious proportions in Portland parish. During the past year or so the level of recruitment in the homeguard has risen and these men and women who were deputized and given the power of arrest had reduced the level of petty larcency including praedial larcency. The home guard constituted a group of men and women who were local residents and had volunteered to help reduce crime by supplementary police surveillance.

Portland parish is divided into ten police regions. The largest force is in Port Antonio followed by Buff Bay, Hope Bay, Manchioneal and San San (Table 7-14). The ratio of homeguard to police is fairly consistent. The rural areas seem to be adequately staffed with police and homeguard. This is indicated by the ratio of total criminal offenses reported to size of police force (Table 7-15). The police force seems high in relation to offenses in the resort areas of Port Antonio and San San. It is also low in the intermediate sized cities Buff Bay, Hope Bay and Manchioneal. The rural areas with the exception of Castle appear to be served well by police.

Agricultural larcency constitutes 5.2 percent of total offenses committed in Portland Parish. No area of Portland parish seems to be unusually subject to this form of criminal offense with the possible exception of Spring Hill. (Table 7-16)

In general praedial larcency was not mentioned by farmers as a constraint in their production in the Buff Bay Valley. Nor did agricultural extension agents seem to feel it was a serious problem. It is unlikely to be a constraint to increased coffee production since what is most commonly stolen are bananas and coconuts. The use of the homeguard and civilian surveillance can keep praedial larcency under control. However praedial larcency should be kept in mind with regard to projects which might encourage farmers to grow easily stolen crops in remote areas. Praedial larcency is also more common on Government owned land such as Caenwood near Hope Bay. Some people regard Government property as public property.

History of Port Antonio

Port Antonio has one of the few Spanish names to survive in Jamaica.

Table 7-14. Police and Homeguard Force, July 1978.

Station	Number of Police	Percent of Total in Portland	Number of Home Guard	Percent of Total in Portland
1. Port Antonio	58	54.7	111	50.9
2. Buff Bay	14	13.2	26	11.9
3. Hope Bay	6	5.7	32	14.7
4. Manchioneal	6	5.7	15	6.8
5. San San	6	5.7	8	3.7
6. Castle	4	3.7	6	2.7
7. Swift River	3	2.8	8	3.6
8. Mill Bank	3	2.8	6	2.7
9. Spring Hill	3	2.8	4	1.8
10. Orange Bay	3	2.8	2	1.0
TOTAL	106	99.9	218	99.8

Table 7-15. Ratio of Offenses Reported in a Year (1977-78) to Number of Police (July 1978).

		Ratio of Crimes to Number of Police
1.	Port Antonio	11.3
2.	Buff Bay	22.1
3.	Hope Bay	27.2
4.	Manchioneal	38.3
5.	San San	10.8
6.	Castle	39.3
7.	Swift River	9.0
8.	Mill Bank	19.7
9.	Spring Hill	17.7
10.	Orange Bay	16.0

Table 7-16. Agricultural Larceny, April 1, 1977 - March 31, 1978.

	Station	Larceny of Small Animal Stock	Praedial Larceny	Cattle Thievery	Total Agricultural Larceny	Total Offenses	Agricultural as Percent of Total
1.	Port Antonio	4	15	2	21	655	3.2
2.	Buff Bay	1	5	0	6	309	1.9
3.	Hope Bay	1	8	0	9	163	5.5
4.	Manchioneal	4	14	1	19	230	8.3
5.	San San	0	3	0	3	65	4.6
6.	Castle	3	11	1	15	157	9.6
7.	Swift River	0	2	0	2	27	7.4
8.	Mill Bank	0	3	0	3	59	5.1
9.	Spring Hill	3	7	0	10	53	18.9
10.	Orange Bay	0	3	0	3	48	6.3
	Total	16	72	4	92	1,766	5.2

SOURCE: Port Antonio Police Offices

The name appears on documents dated 1582 as Porto de Anton and is also mentioned in a document dated 1685 but refers to a port and not a town. The area was selected for settlement by the English in 1723. Settlement as a town actually began in 1733 when Fort George was built on the Titchfield Peninsula by the British as a base for soldiers who protected surrounding land from attack by Maroons and also against pirates. Titchfield peninsula was seperated from the mainland by high tide.

Fort George had 10 ft. thick masonry and 22 gun emplacements and was occupied as a military fortification until after World War 1. But it was never a military success and played no major role in defense. On Navy Island adjacent to Fort George the British built a base in the 18th Century but it soon fell into decay.

Port Antonio in 1793 was the first recipient of bread fruit and the Otaheite apples saved from Captain Bligh's ship (of Mutiny on the Bounty fame) these plants brought in to reduce Jamaican dependence on wheat were planted in the Port Antonio area where they thrived.

The history of Port Antonio as a economic center begins in 1871 when Lorenzo Dow Baker (1840-1908) a native of Cape Cod organized the first shipment of bananas and coconuts from Port Antonio to the U.S.A. By 1875 regular exports to the United States began and in 1880 the L.D. Baker Fruit Company was organized. The Fruit Company acquired 1,850 acres of plantation at Boundbrook. Later Stanton, Harcourt, Newington, Fellowship, Prospect and Windsor estates were purchased. In 1899 the company was merged and reorganized as the United Fruit Company of New Jersey. Additional land in Red Hazel and Seamans Valley was acquired, so that the company was able to control both the production and transportation and wholesaling of bananas.

As the banana shipments increased the Titchfield penninsula grew. New Englanders formed the bulk of the population. The first Titchfield hotel was built in the 1880's. A fire again destroyed it in 1932. In 1950 it was rebuilt again and Errol Flynn purchased it. After his death it was renamed the Jamaica Reef but it too was destroyed by fire in 1969 and has not been rebuilt.

The banana shipments and associated tourist trade brought growth to Port Antonio. The public market was built on West Street in 1885, the light house on Folly Point in 1888, the railroad from Kingston was completed in 1896. A population census in 1891 gave a figure of 1,784 people. Hurricanes damaged the town but it recovered and had a population of over 7,000 in 1911.

The American depression caused the tourists to decline and Panama disease wasted many of the banana plantations. Before World War II the United Fruit company shifted its headquarters to Kingston and Montego Bay became an important banana and tourist area. World War II brought numerous trade union strikes and demands for improved public standards. The hospital, cinema and public works offices were built. During and after the war remittances from servicemen and farm workers in the United States helped to maintain the economy. In 1946 Errol Flynn came to Port Antonio and bought Navy Island. His reputation brought renewed interest in Port Antonio as a resort area. After Errol Flynn died, Navy Island and the Titchfield Hotel were sold, and much of the tourist interest shifted to Montego Bay and Ocho Rios.

<u>Summary</u>

The growth and historic development of Port Antonio is principally due to its two safe deep water harbors with 24 ft. of water at the wharf.

Port Antonio next to Kingston is the best harbor in Jamaica. Secondly, Port Antonio is strategically placed with regard to the Rio Grande Valley and Buff Bay and shipments of agricultural production, particularly bananas, from Morant Bay. It has a good water supply. It was protected in its early days by a military fort and owes its prosperity to its fertile interior and its variety of mountain and seascape vistas.

Its historic economic base reflected the ups and downs of the banana industry and fluctuations of tourism. A certain degree of stability however is provided by Government work in its capacity as the parish capital.

7.2.6 Land Assessment Data for Area Planning

The use of land assessment data for planning purposes has only recently been exploited in Jamaica. The kind of information that can be supplied by the Land Valuation Office on computer printout includes:

1) assessed value of every parcel of land
2) size of parcel
3) owner of parcel and mailing address
4) location of parcel
5) tax on parcel

This detailed information can be aggregated and averaged by enclosure (usually containing several parcels), by map grid, by map number, and by parish. The entire island of Jamaica is covered by this data. The boundaries of enclosures are precisely delimited on detailed topographic maps at the scale of 1:12,500. The individual parcels can also be identified and located on separate sheets of individual enclosures where the parcels are sketched in.

Agricultural land valued above $2,000 can be taxed at lower rates by applying for derating. On these derating forms additional information appears on soils, slopes, rainfall, crop types and other items. This data for parcels greater than 50 acres in size has been computerized and is available on computer printout.

The routine activities of the assessors also bring them into contact with other data: Market values, recent sales, tax defaults, special claims, and so forth. Most of this information is not collected in a form presently useable for planning. This report utilized only data which had been computerized but had not been previously tabulated or mapped.

The Land Valuation Office was requested through its computer facilities at CDPU to produce a special tabulation summarizing data by enclosure for Portland Parish. In this report I describe the first of a series of maps that have been produced by computer mapping of this requested data. These maps use averages of map grids as data points to characterize Portland Parish as a whole. There are one hundred and one map grids in Portland, enough to provide good generalized trend maps useable for overall planning and discussion but not sufficiently detailed for purposes of analysis and on-site planning. The next series of maps to be shown will use a finer grain of detail by mapping enclosure averages. At the scale of enclosure it will be possible to analyze the features responsible for small variations in land values and parcel sizes. (There are 1,037 enclosures in Portland Parish.)

Two characteristics in the land valuation data were isolated as of special significance: 1) average land values, and 2) percent of land area in parcels of a given size.

Why Land Values are Useful Information in Planning

In a sense land values are an excellent composite index of land quality. If the question were put to a planner, "How good is that land for agricultural purposes?" or "How does this land compare with that land in terms of quality?" he would answer, "the soil has such and such limitations, the rainfall is adequate or not so adequate, slopes are, or are not, an impediment to farming, and finally, accessibility to markets or labor or community services is, or is not, adequate." One might prefer to sum it all up. Various agricultural classifications--such as grade I or grade II agricultural land often are used to provide such summaries. Usually these agricultural classifications suffer from one defect or another (most tend to neglect the importance of accessibility to basic land quality).

Land values actually are determined by a composite of physical and man made features and are a reliable index of agricultural land quality. (If the land were better it would sell for more.) Assessed land values are based on market evaluations. All sorts of public and physical features are capitalized into the value of the land and the system is economically rational--more so than any artificially constructed agricultural grading system.

Thus, a land value map enables the planner, at a glance, to identify the best and worst agricultural land in the parish. This is not to say that land cannot be improved. Knowing where poor quality land is located may raise issues as to why it has such low value. In some cases it may be physical limitations, in others it may be lack of feeder roads. The second step in planning would be to identify the precise reasons for low quality land. But the first step is to delineate the land by over-all quality--and a land value map does this.

A second reason for wanting to have a land value map is simply that valuable land is an economic asset. The small farmer that owns five acres of land valued at $600 an acre is a wealthier man that the small farmer that owns five acres valued at $100 an acre. He not only has better land which will yield a continual stream of income, but also has more collateral for an agricultural loan.

One factor which complicates the use of land value maps for planning is that size of parcel affects land value. Generally, the larger parcels of land are worth less per acre than smaller parcels. Basically, there are two reasons for this:

(1) smaller parcels are more likely to be physically better quality lands than large parcels found in the same vicinity. A large parcel may contain some unarable land and land with poor accessibility.

(2) larger parcels are more expensive than smaller parcels and therefore the market for larger parcels is more limited and the price per acre less.

It is the same principle that operates when one buys large quantities or small quantities: the cost per unit may be different. One should take care when using land values to compare land of similar size.

Four maps of land values are included in this report:

1) Land values for all lands together--useful only in a very general way,
2) Land values for land 0 - 5 acres in size,
3) Land values for land 6 - 10 acres in size,
4) Land values for land greater than 50 acres in size.

Five categories were mapped:

1) Less than $100 per acre,
2) $100 to $249
3) $250 to $499
4) $500 to $999
5) Greater than $1000 per acre.

This five-category breakdown should be adequate. However the computer program can map as many as ten classifications. The data points are used by the mapping routine to construct a chloropleth map (contour map) of values. The average value at a data point appears for reference. (Where there was no land of a certain size at the data point an M is recorded on the map--signifying a missing point and the program interpolates without that data point.) The $100 and $1,000 contour line was lined for emphasis. Note that the 0-5 acre land extends high values over a broader area than 6-10 acres, and over a still broader area than the greater-than-50-acres--a reflection of the principle that at a given location, the smaller parcel of land will usually have a higher market price per acre. (Figures 7-4 through 7-9)

The overall pattern of land values in Portland Parish is fairly obvious. Topography, at this level of generalization, is the dominant influence on variations in land values. Proximity to major urban centers Buff Bay, and particularly Port Antonio, are also important factors.

Land Size Maps

Three maps of land size distribution are also included. These maps help to identify broad areas within the Parish where small farmers predominate. The map showing percent land in parcels 0-5 acres is complicated by the inclusion of urban land. When the tabulation was requested, land parcels less than one acre in size should have been separated from land 1 to 5 acres in size, because most parcels less than one acre are urban. Nevertheless, the urban areas are easily identified and one can assume that outside of the urban centers and major towns the areas with high percents of small parcels are areas of small farmer concentration. The map of percent land in parcels greater than fifty acres in size is almost a reverse image of the map of 0-5 acres. A third map showing distribution of lands 6-10 acres in size is also included and shows the distribution in more finely graded detail than the other two maps. (The computer program will allow one to be as general or as detailed as one wishes in mapping.)

Again, it is obvious at this scale of mapping, that topography is a major influence on the distribution of the smaller farms (or rather parcels). It should be clear to the map reader what the distinction between farm and parcel is. A farm is an operating unit. It may consist of several parcels of land. Parcels are simply units of land ownership. Generally, one can assume that most parcels greater than six acres in size are also single farms since few farmers will own separated parcels that are of that size or greater. Smaller parcels--say of three or four acres in size, may be only parts of a single, somewhat larger farm.

Conclusions

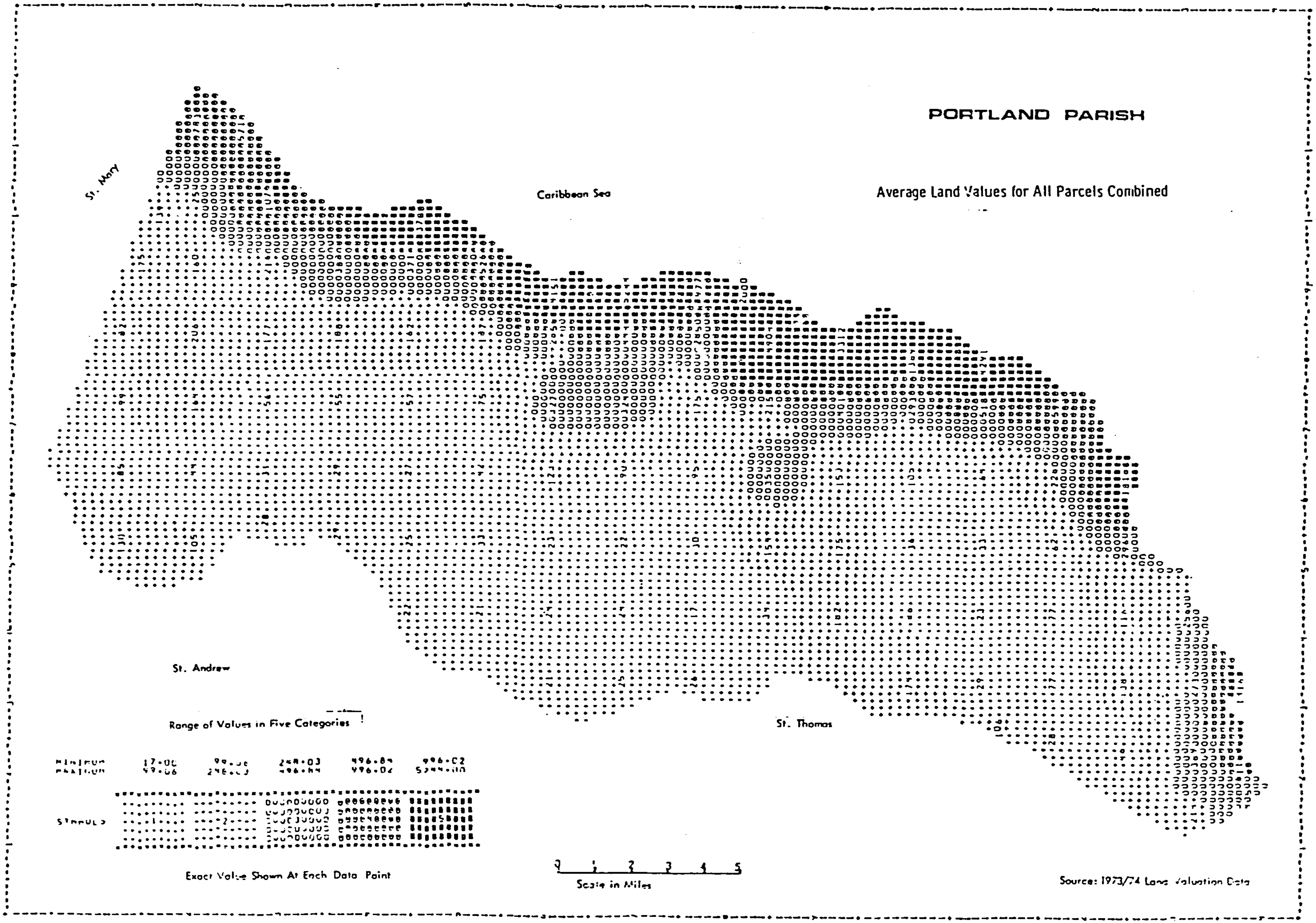
Agricultural land taxes in Jamaica are very low--so low that they are ineffective in promoting better land use. This is true especially for idle lands of a large size. But there may also be substantial underutilization of lands of a smaller size particularly where owners are absent or title is confused by family claims. Part-time farmers and inefficient farmers are able to hold onto land that is poorly managed because there are no penalties for poor land management. A substantial land tax could act as a penalty for substandard land use. People who cannot make a profit from the land would find it diffcult to retain ownership. Land values would stabilize or drop, as owners sought to unload tax liabilities. Efficient farmers would be able to purchase or rent more land at reasonable cost.

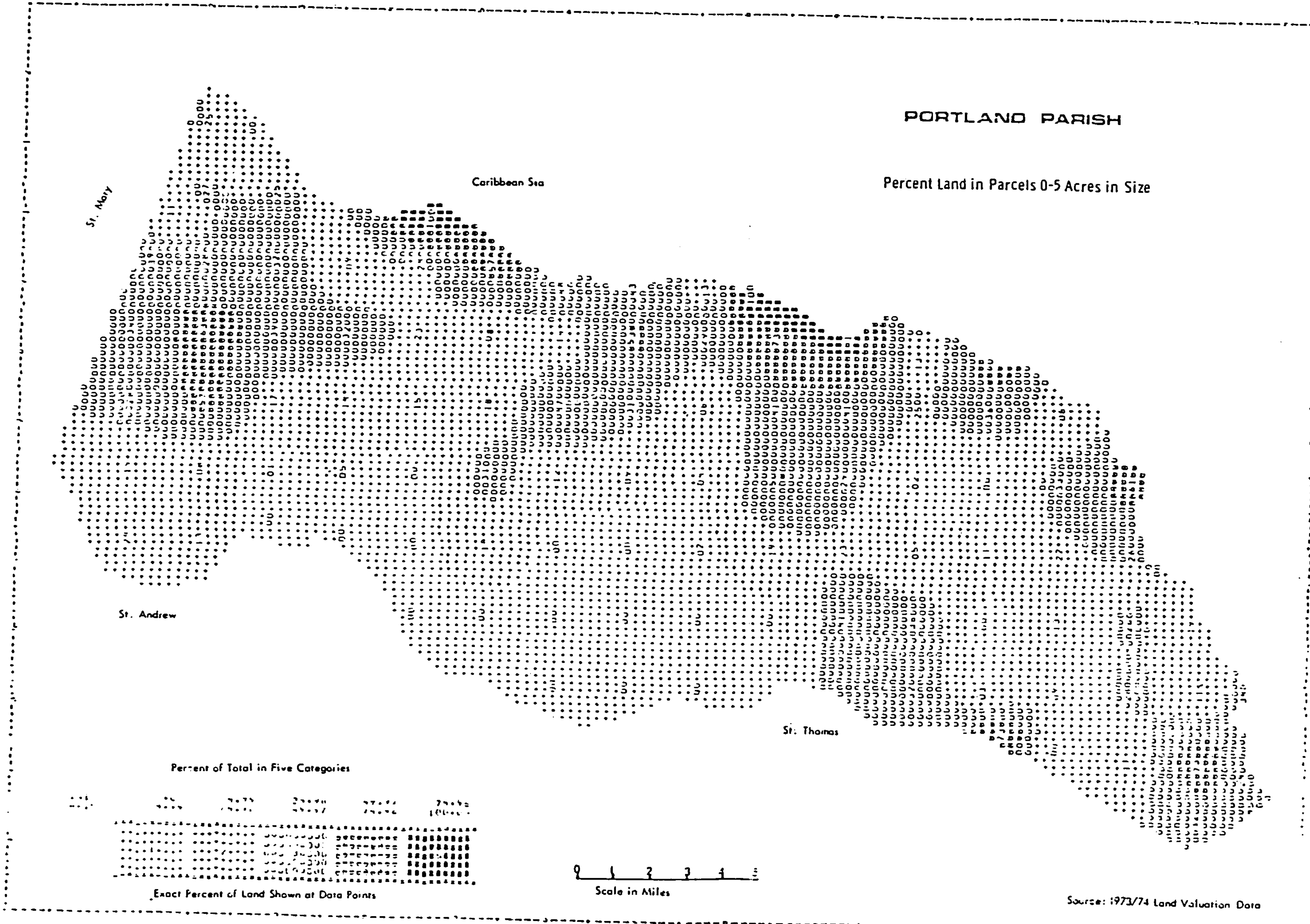
But before land taxes can be increased it will be desirable, if not essential, to learn more about the impact of taxation on land use. The Government and the people will have to have a greater sense of confidence in their present system of land valuing. The system is still relatively young and improvements should be incorporated in the second round of valuations scheduled for 1979/80.

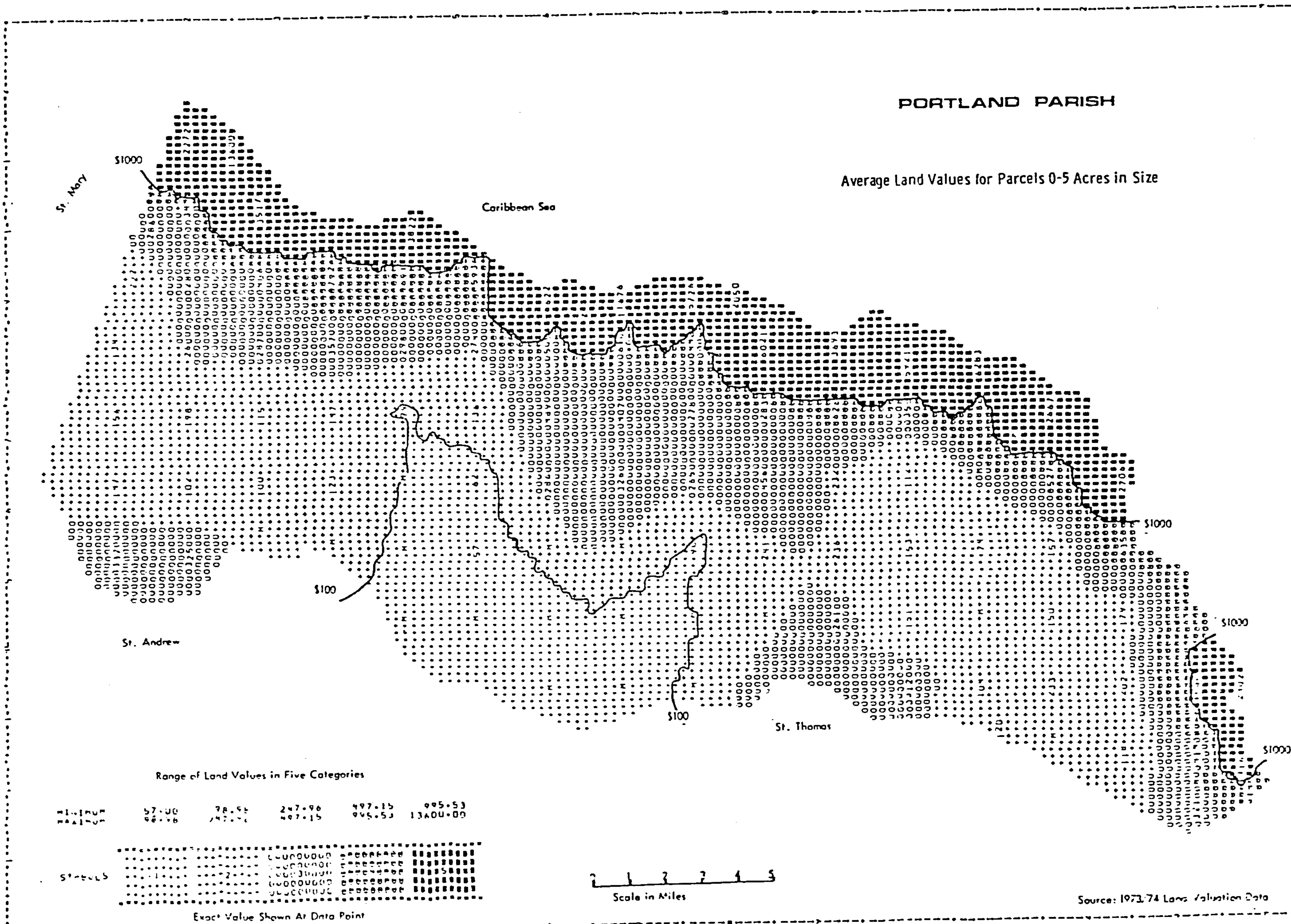
One method for improving the land assessment system is to broaden its scope so that the land valuation office also develops capabilities for supplying land use information. This information will not only improve the assessment procedures but will have the added advantage of providing Jamaica with a new source of census data at very little added expense.

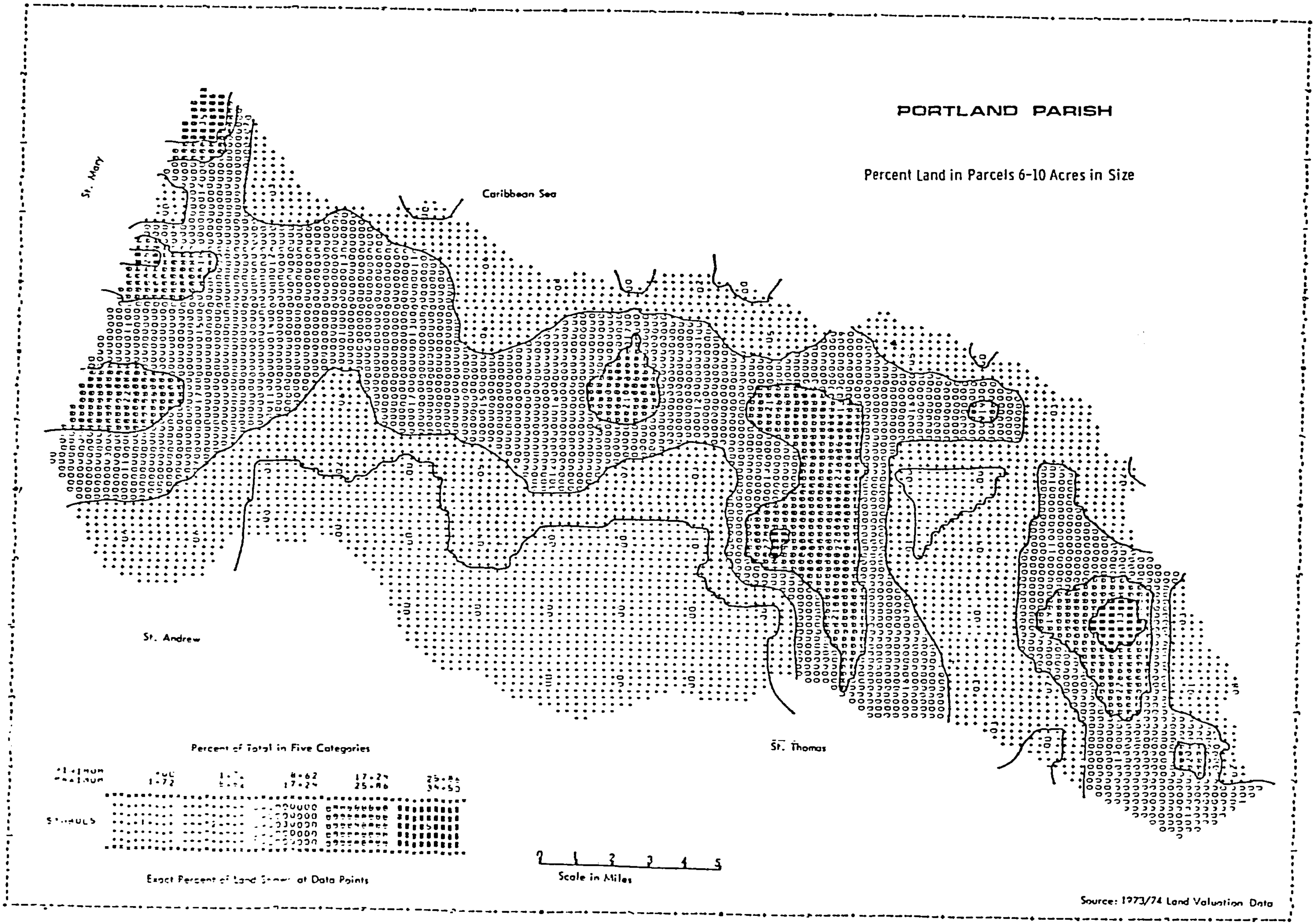
Some of the data available in the assessor's office could be used to determine degree of absentee owners--by checking tax mailing addresses. The assessor's data should be made available in a form usable by credit banks in order to check for ownership and collateral.

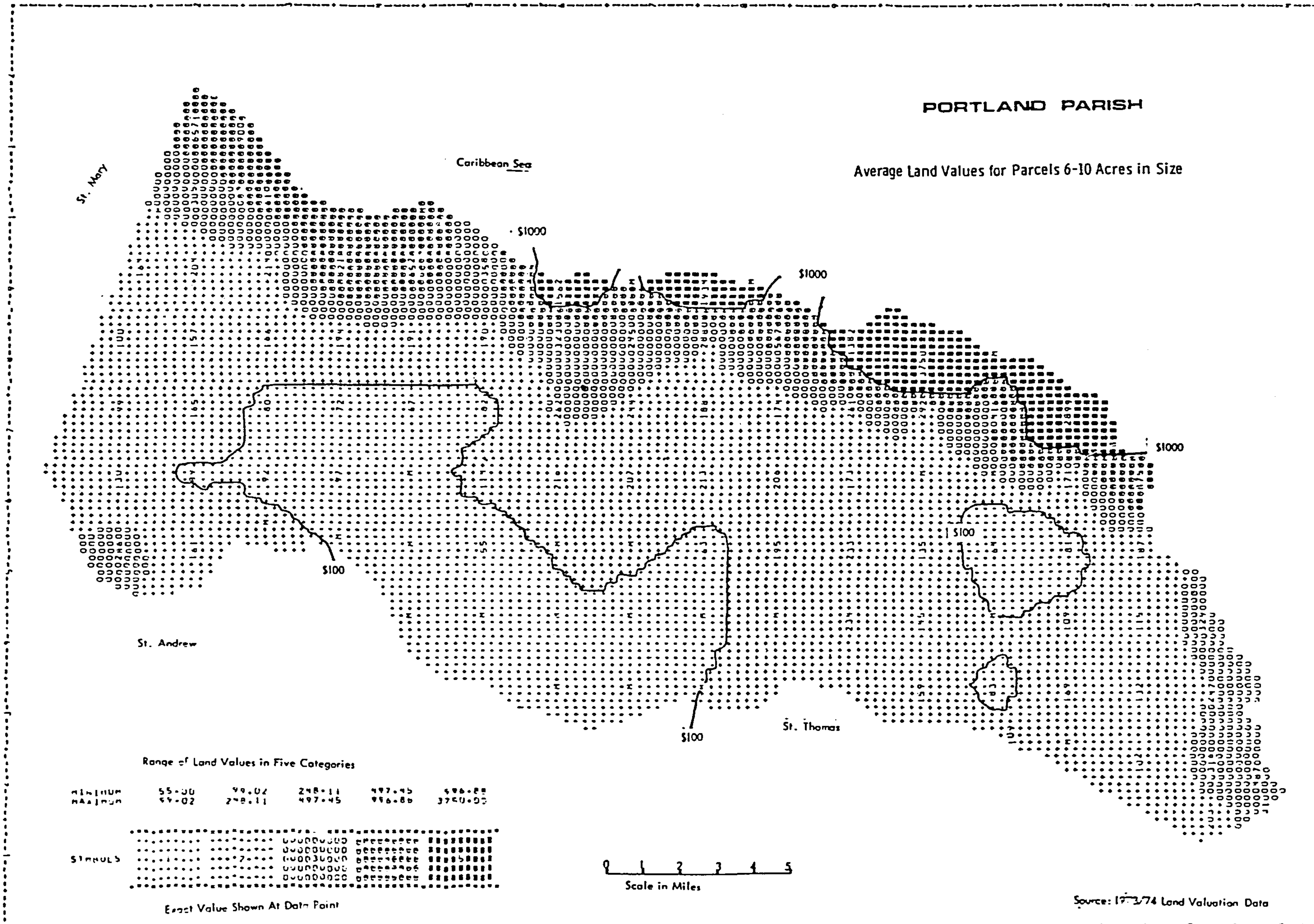
The techniques used for computer mapping of assessment data are unknown at the CDPU in Jamaica, but could be quickly learned by their programmers. This would be an opportunity to transfer technology to Jamaica. Computer maps could assist the Jamaicans in expediting an accurate revaluation in 1979/80.

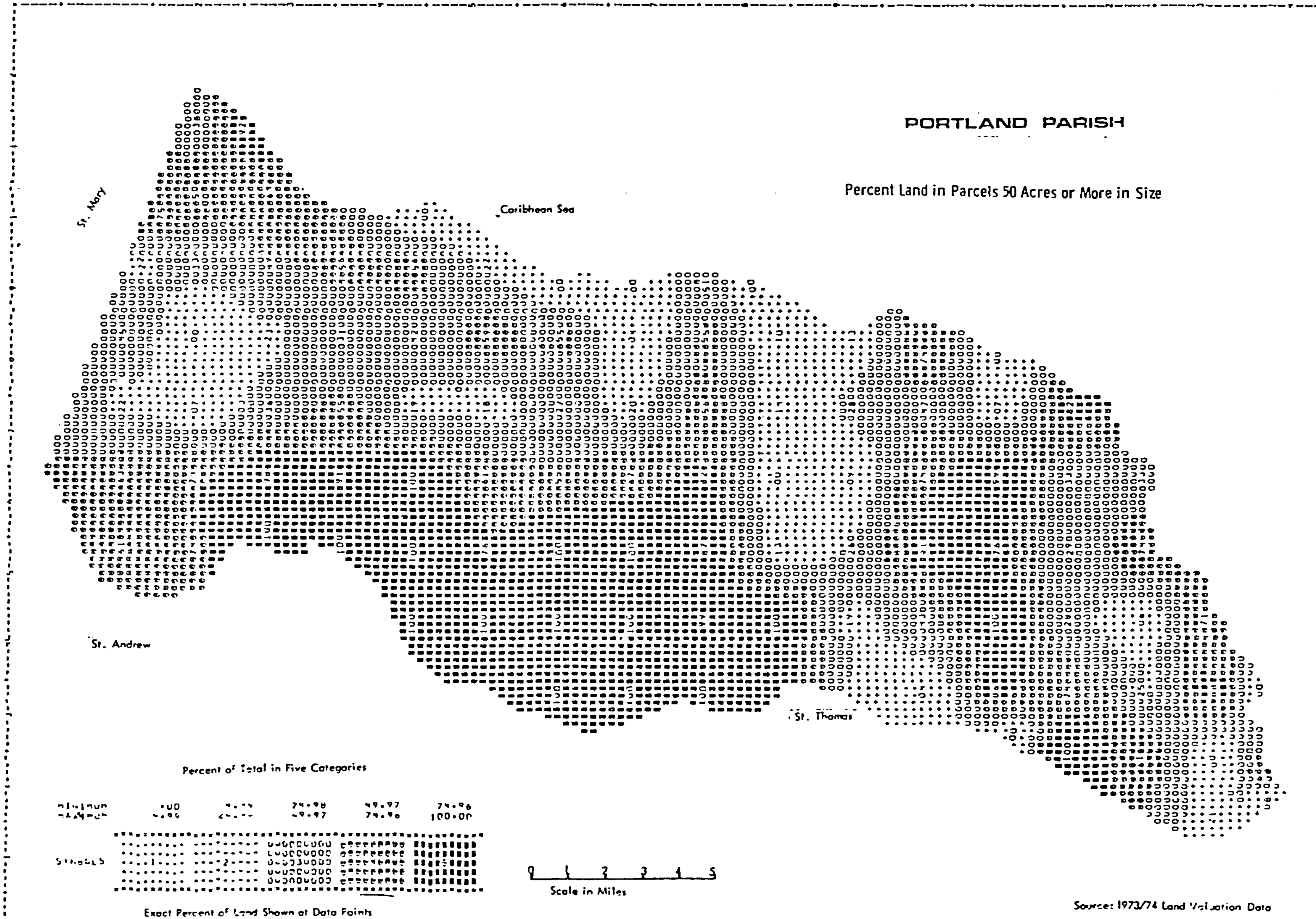

PORTLAND PARISH
Average Land Values for All Parcels Combined
Caribbean Sea
St. Mary
St. Andrew
St. Thomas
Range of Values in Five Categories
Exact Value Shown At Each Data Point
0 1 2 3 4 5
Scale in Miles
Source: 1973/74 Land Valuation Data

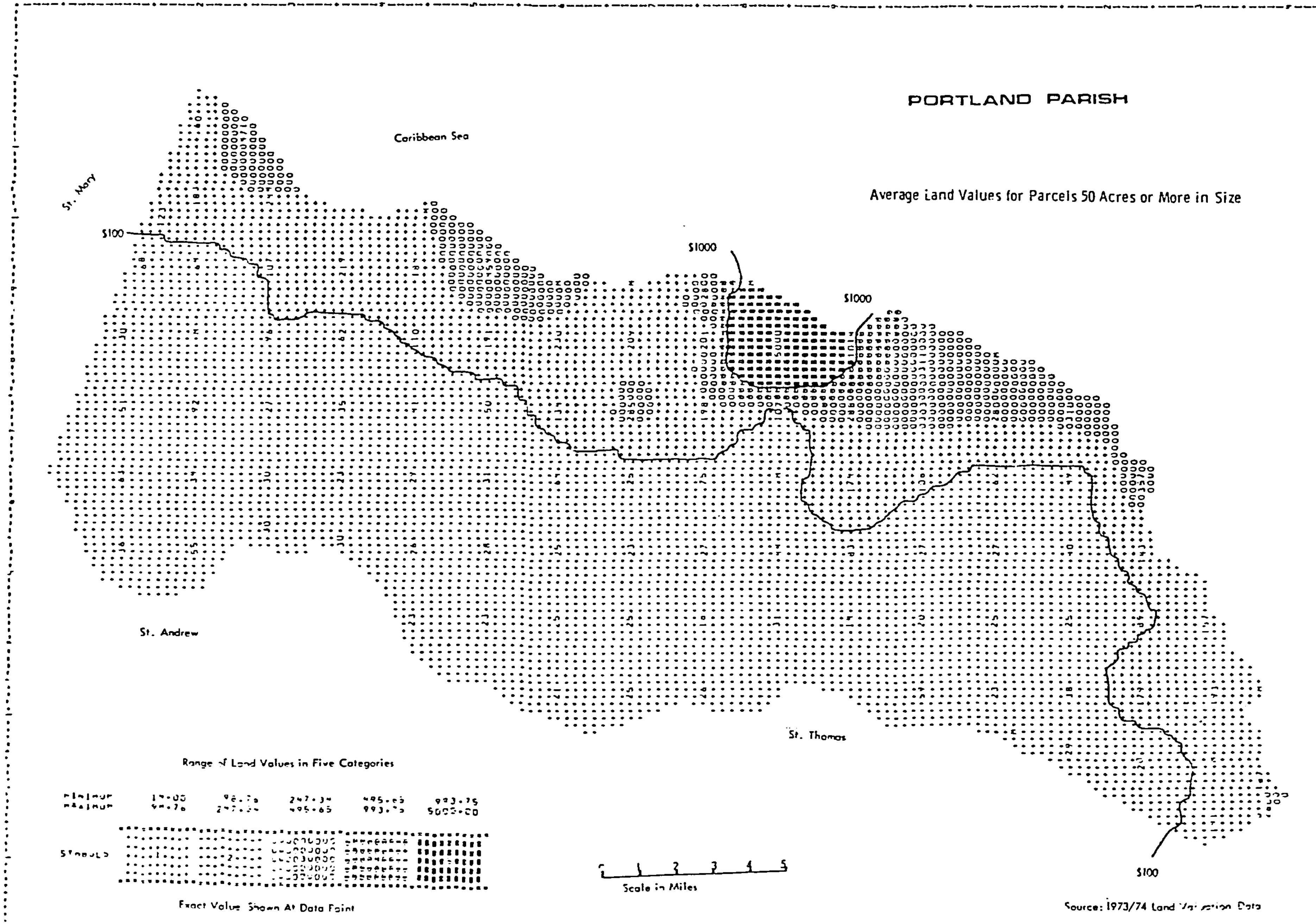

PORTLAND PARISH
Percent Land in Parcels 0-5 Acres in Size
Caribbean Sea
St. Mary
St. Andrew
St. Thomas
Percent of Total in Five Categories
Exact Percent of Land Shown at Data Points
Scale in Miles
Source: 1973/74 Land Valuation Data


PORTLAND PARISH
Average Land Values for Parcels 0-5 Acres in Size
Caribbean Sea
St. Mary
St. Andrew
St. Thomas
$1000
$1000
$1000
$1000
$100
$100
Range of Land Values in Five Categories
247.96
497.15
497.15
995.53
995.53
Exact Value Shown At Data Point
Scale in Miles
Source: 1973/74 Land Valuation Data


PORTLAND PARISH
Percent Land in Parcels 6-10 Acres in Size
Caribbean Sea
St. Mary
St. Andrew
St. Thomas
Percent of Total in Five Categories
Scale in Miles
0 1 2 3 4 5
Source: 1973/74 Land Valuation Data


PORTLAND PARISH
Average Land Values for Parcels 6-10 Acres in Size
Caribbean Sea
St. Mary
St. Andrew
St. Thomas
$1000
$1000
$1000
$100
$100
$100
Range of Land Values in Five Categories
MINIMUM 55.00 99.02 248.11 497.45 996.86
MAXIMUM 99.02 248.11 497.45 996.86 3750.00
SYMBOLS
Exact Value Shown At Data Point
0 1 2 3 4 5
Scale in Miles
Source: 1973/74 Land Valuation Data


PORTLAND PARISH
Percent Land in Parcels 50 Acres or More in Size
Caribbean Sea
St. Mary
St. Andrew
St. Thomas
Percent of Total in Five Categories
.00
25.98
49.97
74.96
49.97
74.96
100.00
Exact Percent of Land Shown at Data Points
0 1 2 3 4 5
Scale in Miles
Source: 1973/74 Land Valuation Data



PORTLAND PARISH
Caribbean Sea
Average Land Values for Parcels 50 Acres or More in Size
St. Mary
$100
$1000
$1000
St. Andrew
St. Thomas
$100
Range of Land Values in Five Categories
Exact Value Shown At Data Point
Scale in Miles
Source: 1973/74 Land Valuation Data

7.2.7 Education, Training and Economic Feasibility

This part of the report deals with a comprehensive and integrated program of member education in cooperative activity, feasibility analysis and cooperative finances. It is directed at the possible use of an existing and well-established cooperative, the Portland Blue Mountain Coffee Cooperative Society Ltd. There are also suggestions on useful techniques for development of cooperatives.

A. Education and Training

A cooperative is a group of individuals acting together and pooling their resources for mutual benefit. By forming a cooperative, members and patrons are able to obtain services which they could not economically receive as individuals.

The ownership and control of a cooperative is vested in the members. In a cooperative organized with capital stock, membership is evidenced by ownership of one or more shares of voting (or "common") stock. Laws may limit the amount of common stock held by individuals to a percentage of the total amount issued. Sometimes members are restricted to one vote in the affairs of the cooperative, no matter how many shares of common stock he or she owns. Most cooperatives use the one-member, one-vote method. The major challenge to the cooperative board of directors and management will occur when the new business operation begins. To succeed, the members must produce a quality product that must be properly handled by the cooperative. Complete and accurate documentation of income and expenses, grower use and a host of other responsibilities must be carried out.

The long-run success of a new cooperative is also affected by the organizational structure of the association and its internal operations. Each of the various components--the members, directors, managers, and employees of the co-op has a distinct role to play. Below are outlined the basic functions of each component beginning with the members.

Membership. Any cooperative exists by virtue of its members; therefore, the very nature of success of the co-op is primarily a reflection of the membership comprising it. Membership requirements are determined by the members of the cooperative and documented in the bylaws of the association. The bylaws may, for example, specify that members must be producers of agricultural products. Members must be willing to purchase shares of common stock in the association or pay a membership fee.

In some instances, the cooperative may require members to execute a marketing agreement and market all or a specified portion of their products through the co-op. Such requirements are normally spelled out in the bylaws. Other responsibilities that members have are selecting a competent board of directors, amending the bylaws, attending meetings to express their views, and voting on issues.

Farmers join cooperatives to obtain services which would be difficult to gain if they acted individually. Members can use cooperatives to process, store, and market their products and/or purchase supplies and services. A marketing co-op is designed to return to members the highest possible price for their products. If the cooperative is to handle supplies, it should provide members with production inputs at very competitive prices because it operates at cost.

Board of Directors. The board of directors is the top decision maker within the cooperative. Board members are elected from the general membership of the cooperative. The duties and responsibilities of directors are outlined in the co-op's bylaws. Some of the more important functions are:

- Serving as trustees of the cooperative,
- Establishing the co-op's goals and policies,
- Employing a competent manager,
- Evaluating financial reports,
- Distributing patron refunds.

In most agricultural cooperatives, the board of directors meets several times during the year. The results of these meetings are extremely important to the welfare of the cooperative and, therefore, should always be productive. Several factors which should be taken into consideration when planning for meetings are:

(1) Giving each member adequate notice,
(2) Developing an agenda and distributing it to members prior to meetings,
(3) Utilizing meeting time for co-op business,
(4) Beginning at the scheduled time,
(5) Keeping accurate records of all proceedings,
(6) Requiring all reports from the manager concerning financial matters to be written.

Although each member of the cooperative is eligible for board membership, care should be taken in selecting board members and deciding upon the length of the terms in office. Some of the more important characteristics board members should exhibit are:

(1) They should believe strongly in the cooperative form of business,
(2) They should work well with others,
(3) They should patronize the cooperative at every opportunity,
(4) They should be innovative and not resistant to change,
(5) They should possess strong leadership qualities,
(6) They should be accepted in the community as persons of good judgment,
(7) They should understand various financial statements.

Management. For the cooperative to succeed, there must be a good relationship between the board of directors and the manager. A sound relationship between these two components can exist only if there is a clear understanding of each one's duties and responsibilities.

The manager of a co-op is responsible for the day-to-day operations of the cooperative business. He is responsible for the efficiency and productivity of employees of the cooperative. The manager must demonstrate leadership and be able to give guidance to employees. It is his duty to motivate people. This can best be accomplished by developing a two-way flow of communication and by example. Most of all, the manager must have a sound business background and a fundamental understanding of the cooperative form of business. Aside from directing the day-to-day operations of the cooperative, the manager should provide the board of directors with information that will assist them in making decisions. The importance of his duties cannot be overstated: for in many ways, he is responsible for the success or failure of the co-op business venture.

It is the responsibility of the board of directors to recruit and hire the most competent manager. It is also their responsibility to pay competitive salaries. There are many alternative salary programs. Although most managers are paid a basic salary, some are paid a basic salary and in addition are paid a bonus, etc., based on net margins generated.

Employees. The strength of any business is its employees. Particular care must be taken in selecting a co-op staff because of its unique two-fold responsibility. Co-op employees work both with the general public and with the members. Therefore, the staff must promote a good internal as well as external image.

Personnel policy is set by the board of directors and implemented by the co-op's manager. Employees should fully understand what is expected of them at all times. This is best accomplished if the manager will develop weekly work schedules for all employees, including himself.

If each component of the co-op recognizes its duties and responsibilities and effectively carries them out, the cooperative is more likely to succeed.

B. Economic Feasibility

Survey of Producers (Farmers). To determine if the new venture is sound, a survey should be made to explore what services the present members of the cooperative may want if the cooperative is to market fruits and vegetables. Prospective markets for products or supplies must be located and the expected prices co-op members are to receive or pay determined. Since the cooperative is designed to yield monetary or other benefits to its members, a cost-benefit analysis of the venture is in order. If this indicates an economic benefit to the members, the next step should be a survey of prospective members. This task can best be accomplished by utilizing a survey questionnaire. (See Table 7-1) The purpose of the survey questionnaire is to determine the number of potential members, their location, the volume of production or services they need, and their willingness to invest capital in the cooperative.

The consultants conducting the survey should be required to attend a workshop which will familiarize them with interviewing techniques. It is extremely important that members of the survey committee obtain all of the information asked in the questionnaire because the answers will provide the basis for determining the soundness of the proposed marketing venture. Guesswork in this phase can lead to false conclusions later.

In every cooperative operation, there is a minimum volume needed for the business to be economically efficient. By estimating the amount of business each producer or individual will do with the cooperative, the consultants' committee can better determine the feasibility of the proposed venture. The survey approach by a questionnaire insures that each producer survey provides comparable data. This approach also emphasizes the potential commitment each member must be willing to make and at the same time is an excellent educational device.

If it is determined that the proposed marketing of fruits and vegetables is economically viable, a special meeting should be called of all the producers. At the meeting a report should be made to the producers and if they are in agreement, plans should be made to carry the feasibility study through to a conclusion.

By this time, the proposed operation of the fruits and vegetable division of the cooperative has been researched and a conclusion must be

Table 7-17. Producer Questionnaire

1. Name of farmer ______________________________

2. Address ______________________________

3. Farm is located ______________________________

   ____

4. Number of acres in farm ______________________________

5. List of type of crops and volume grown last year ____________,

   ________, ____________, ____________, ____________.

6. Estimated income last year (by crop) ____________, ____________,

   ____________, ____________, ____________.

7. Estimated expenses last year (by crop) ____________, ____________,

   ____________, ____________, ____________.

8. Estimated credit needs (by crop) ____________, ____________,

   ____________, ____________, ____________.

9. Distance farm is located from the nearest Blue Mountain Coffee or cocoa collection station ______________________________.

10. Name of collection station ______________________________.

11. Would you want to participate in a fruit and produce marketing program sponsored by Portland Blue Mountain Cooperative?

    ____ Yes ____ No

made whether to implement or carry out the program. The next major hurdle will be financing. It would be easy to organize and finance most cooperatives if each member could be assessed his prorata share of the total capital needs, and he had the funds to buy the stock; it would not be necessary to borrow money. Unfortunately, that never is the case and certainly not in the proposed operation.

The consultants must be prepared when the project proposed is submitted to the lender, USAID, etc. The following documents should be prepared:

(1) Projected volume of production of fruits and vegetables,
(2) Schedule of facility and equipment needs,
(3) Marketing scheme,
(4) Cash flow of the proposed operation,
(5) Operating statement,
(6) Balance sheet,
(7) Schedule of debt service,
(8) Schedule of depreciation,
(9) Financing needs.

The preparation and importance of the above documents will be discussed briefly.

The survey questionnaire will be the source document for verifying the annual volume of production for each member. In instances where the volume of production of crops varies during certain seasons or months of the year, it is particularly important to document accurately production to determine facility and equipment needs. This is sometimes referred to as product flow. The facility and equipment should be sufficient to handle members' products without buying or building excess capacity (see sample questionnaire).

Schedule of Facility and Equipment Needs. Although the narrative portion of the study will outline in detail the facility, equipment, and operating capital needs, a condensed table will convey graphically what the co-op will need to purchase, buy or lease.

Marketing Scheme. The marketing process must be thoroughly researched. Those in a position to fund the proposal will want to know that the consultants have been in contact with the markets, and will want to know their interest in purchasing the co-op's product(s), the price they are willing to pay, volume desired and where the markets are located. There isn't any need to produce if the product can't be sold.

Cash Flow of the Proposed Operation. The projected cash flow of the cooperative is perhaps the most important of all documents. While the pro forma operating statement gives a summary of what will happen in future years at yearly intervals, and the balance sheet gives a financial picture at any particular instant. The projected cash flow gives management a continuous month-by-month income and expense prediction. The key items in the final analysis are the net cash flow for the month and the accumulated cash flow. All good business people pay particular concern to the net cash flow. Does the cooperative have sufficient funds to operate and pay bills? Should more capital be injected into the operation? Will additional capital have to be borrowed, particularly for operation during heavy seasonal periods? Can controllable expenses be reduced during low income periods?

Please refer to Table 7-18 for suggested format that the financial consultant can use. The capital outlay and income received are somewhat combined and simplified.

<u>Operating Statement</u>. A good set of financial records will tell the story of the cooperative's business. Accurate records are a must.

The pro forma operating statement gives a predicted gross income as well as expenses which the co-op will incur. The key figure in this financial statement is the bottom line, for it will show any net margins for the period predicted.

In preparing for the future operations of the proposed addition to the cooperative, it may be desirable to prepare quarterly operating statements, then change to an annual operating statement after the operation is soundly established. The purpose of the operating statement is to present information to the board of directors so that key decisions can be intelligently made. See Table 7-19, a suggested simplified format.

<u>Balance Sheet</u>. To determine the net worth of a cooperative, the accountant must compile a list of all assets of value which the co-op owns and all items of value that individuals and business firms owe it. This combined list reveals the total value of the cooperative. Debts owed by the cooperative must also be listed. Then, by subtracting the total debts from the total value of all assets, you can obtain a figure that shows the current net worth of the association.

A formal presentation of the above figures is a balance sheet or a statement of assets, liabilities, and net worth. The primary objective of a balance sheet is to set forth in an orderly fashion the financial condition of a business at a particular date. See example, Table 7-20. See also Tables 7-21 and 7-22.

Table 7-18. Projected Cash Flow, Portland Blue Mountain Cooperative.
(Domestic Division: Fruits and Vegetables)

Cash Flow Item	MONTHS 1	2	3	4	5	6	7	8	9	10	11	12	Total
Capital Outlay													
Improvements (loan)													
Equipment (loan)													
Operating Capital													
Supplies Purchased													
Fruit Purchased													
Produce Purchased													
Salaries & Wages													
Lease or Rent													
Debt Service													
TOTAL OUTLAY													
			SAMPLE FORMAT										
Income Received													
Loan - Original Start-up													
Loan - Working Capital													
Loan - Improvements													
Loan - Equipment													
Member Equity Capital													
Sales:													
Fruit													
Produce													
Supplies													
TOTAL CASH RECEIPTS													
TOTAL CASH EXPENSES													
CASH FLOW													
ACCUMULATED CASH FLOW													

Table 7-19. Pro Forma Statement of Operations of Vegetable Division of Portland Blue Mountain Cooperative

Item	1978	1979	1980
Income:			
Fruit			
Vegetables (Produce)			
Supplies			
Gross Income			
Less: Per Unit Retain			
Gross Margin			
Expenses:			
Supplies Purchased			
Fruit Purchased	S A M P L E	F O R M A T	
Vegetables Purchased			
Salaries & Wages			
Operating Expenses			
Depreciation			
Procurement			
Lease or Rental Costs			
Interest			
Start-Up Capital			
Total Expenses			
Net Earnings			
Repayment Ability:			
Capital Retain			
Net Earnings			
Total			
Application of Funds:			
Principal			
Total			
NET INCREASE			

Table 7-20. Pro Forma Balance Sheet

Item	1/1/79	1/1/80	1/1/81
Current Assets:			
Cash			
Inventories			
Boxes			
Other Supplies			
Total Current Assets			
Fixed Assets:			
Improvements			
Facilities & Equipment			
Less Depreciation			
Total Fixed Assets	SAMPLE FORMAT		
Total Assets			
Current Liabilities:			
Accounts Payable			
Operating Notes			
Total Current Liabilities			
Long-Term Liabilities			
Operating Notes			
Facility & Equipment Notes			
Total Long-Term Liabilities			
Stockholder Equity			
Captial Stock			
Per Unit Capital Retains			
Net Earnings, Undistributed			
Total Stockholder Equity			
Total Liabilities & Equity			

Table 7-21. Debt Service

Loan Purpose	Length of Loan	Loan Amount	Principal & Interest First Year	Principal & Interest Second Year
			Dollars	
Organizational Startup				
Operating Capital				
Improvements in Equipment and Facilities				
Vehicles			SAMPLE FORMAT	
TOTAL				

Table 7-22. Proposed Depreciation Schedule

Asset	Cost	Life	Percent Depreciation Annually	Annual Depreciation Allowance
Facilities (Improvements)				
Vehicles and Equipment				
TOTAL				

SAMPLE FORMAT

APPENDIX I

Table

A. Yield Potentials, Annual Crop

B. Yield Potentials, Permanent and Semi-Permanent Crops

C. Present Organization, Buff Bay Example Farm

D. Present Organization, Rio Grande Example Farm

E. Improvement Program, Buff Bay Farm

F. Improvement Program, Rio Grande Farm

Labor Requirement Tables. Good Practices, Man-Days

G. Bananas, Establishment

H. Coconut, Dwarf. Pure Stand

I. Coconut, Interplanted with Banana

J. Cocoa, Under Coconut

K. Coffee, Establishment

L. Banana and Plantain, Annual Labor

M. Coconut, Annual Labor

N. Cocoa, Annual Labor

O. Coffee, Annual Labor

P. Cocos-Dasheen, Annual Labor

Q. Gungo Pea, Annual Labor

R. Red Pea, Annual Labor

S. Yellow Yam, Annual Labor

Table A. Yield Potentials and Improved Practices - Annual Crops[a]

Crop	Seed or Plants per a.	Number of Hills per a.	Fertilizer	Pesticide	Other Materials	Practices	Yield per Acre
Red pea - sole crop[a]	60#	rows 30" apart	2 cwt. 12-24-12	2 pt. chlordane 3 pt. Rogor-40 Sevin, etc.		weed 3 x spray 4 x	1000 #
Gungo pea (dwarf) sole crop[a]	16#	3' x 3' = 4800 hills		2 pt. chlordane 2 pt. Rogor-40, Sevin etc. 1 pt. Zineb		Weed 2 x Spray 4 x	1000 #
Yam: Yellow (allows for intercropping)	2 T: heads	2000 hills	6 cwt. 16-18-27		2000 stakes 50% usable 2nd year	Weed 2 x Fert. 2 x	harv. 90% of hills @ 10# = 9 T allow 2 T for yam heads = 7 T for sale
Dasheen[a]	7000 suckers @ 3¢	6000	5 cwt. 16-18-27			Weed 2 x Fert. 2 x	7 T
Cocos[a]	6000 shoots @ 3¢	5000	5 cwt. 16-18-27			Weed 2 x Fert. 2 x	7 T

a. For mixed cropping, reduce planting rates and adjust inputs and yields proportionately.

Table B. Yield Potentials and Improved Practices - Permanent and Semi-Permanent Crop

Crop	Trees per Acre	Fertilizer	Pesticide	Other Materials	Practices	Yields per Acre
Cocoa	300	(When bearing): At start of spring rains 450#-600# 16-9-18 At start of fall rains 450#-600# s/A Year 1 Start with 16-9-18 in spring(75#), and s/A in fall,(75#) Year 2 150# 16-9-18 spring 150# s/A fall Year 3 225# 16-9-18 spring 225# s/A fall Year 4 350# 16-9-18 spring 350# s/A fall Year 5 500# 16-9-18 Spring 500# s/A fall	For Black Pod spray in Aug. with 8# Kocide or Cupro vit Repeat once when needed For rats: Rattex @ 5 lb/a For fiddlers: 2# dieldrin at base of trees every 2nd year	Organic matter in holes	Prune and remove gor-mandizers	Year 4: 1/8 crop = 7 bx Year 5: 1/4 crop = 12 bx Year 6: 1/2 crop = 25 bx Year 7: 3/4 crop = 38 bx Year 8: full crop = 50 bx (wet) Board says yields on Montrose, St. Mary is expected to be 50 boxes (wet) per acre. Coconut Board says cocoa can grow under mature dward coconut at same tree density and yield as pure stand.

Table B. Yield Potentials and Improved Practices - Permanent and Semi-Permanent Crop

Crop	Trees per Acre	Fertilizer	Pesticide	Other Materials	Practices	Yields per Acre
Coffee with Plantain as Shade	540 Coffee 400 Plantain planted in year 2 and in year 5	Year 1: 2 cwt. s/A 4½ cwt. 10-5-20 Year 2: 2 cwt. s/A 4½ cwt. 10-5-20 Year 3: 10 cwt. 10-5-20 4 cwt. s/A Year 4 and after: 16 cwt. 10-5-20 4 cwt. s/A	Year 1: 1 qt. malthion 3 gal Shell white oil and every year afterward. Years 3 & 4: Apply 40# Kepone Apply 15# slug bait Years 6 & 7: Apply 40# Kepone Apply 15# slug bait	Year 1: 2 tins compost/bush 150 # coffee planting material (CPM)	Clean and treat plantain suckers with hot water	Year 1 -- Year 2 Plantain 10% = 40 stems = 800 lbs. Year 3 Plantain 95% = 380 stems @20 lb. = 7600 lbs. Coffee, 40 bx Year 4 Plantain 70% = 282 ste,s @20 lb. = 5640 lbs. Coffee 80 bx Year 5 Plantain 0 Coffee 120 bx Year 6 Plantain 380 stems = 7600 Lbs. Coffee 150 bx Year 7 Plantain 5640 lbs. Coffee continues @ 150 bx

SOURCES for Tables 2 and 3. Adapted from various published sources and estimates of extension and commodity board specialists. Published sources include: "Handbook for Credit Offices;" IICA "Short Course on Hillside Farming," Guthrie, L. E. "Red Peas Cultivation," Mimeographed leaflet, n.d.; Coconut Board "The Coconut Grower" June 1978 and other issues; Boland, D.E., "Nutrition of the Banana" Banana Board, 1974; various leaflets from the Ministry of Agriculture on annual crops.

Table B. Yield Potentials and Improved Practices - Permanent and Semi-Permanent Crop

Crop	Trees per Acre	Fertilizer	Pesticide	Other Materials	Practices	Yields per Acre
Plantain as shade crop for coffee or fruit	9' x 12' 400 plants buy 450 @ per 100	7 cwt. 12-4-28 1 cwt. s/A	Kepone 36 lb. Slug bait 12 lb.		Clean and Treat suckers with hot water	Year 1: 10% reaped = 40 stems @ 20 lb. = 800 lbs. Year 2: 95% reaped = 380 stems @ 20 lb. = 7600 lbs. Year 3: 70% reaped = 280 stems @ 20 lb. = 5600 lbs.
Coconut as main crop with banana	21 x 18 100 coconut 550 bananas	Years 1 to 4: 200 lb s/A 1300 lb. 12-4-28 Year 5 and after: 4 cwt. s/A 4 cwt. 12-8-30	Each Year 1 through 5: 1½ gal. Nemogon 45 lb. Kepone 15# slug bait Year 5 on: 5 lb. Rattex		Hand weed Remove bananas end of year 5	Year 1: 10% of 550 = 55 stems @ 30 lb. 1650# @ 75% mkt. = 1238# Year 2 through Year 4: 95% of 550 = 522 stems @ 30 lb. = 15675# @ 75%= 11756# Year 5: 60% Of 550 = 330 stems @ 30 lb. = 9900 lb. @ 75% = 7425# 1800 nuts Year 6: 3000 nuts Year 7: 4200 nuts Year 8 through Year 20: 4800 nuts
Coconut as sole crop	21 x 21 114 trees (100 bearing Trees)	Year 1: 2 applications of 50# s/A Year 2: 2 applications of 100# s/A Year 3: 2 applications of 200# s/A Year 4 and after: 1 application of 400# s/A 1 application of 12-8-30 (400#)	Year 5 - Rattex 5# around trunks	Plants tree about 10/a		Year 5 @ 20 nuts/tree = 2000 Year 6 @ 30 nuts/tree = 3000 Year 7 @ 45 nuts/tree = 4500 Year 8 to 20 @ 60 nuts/tree = 6000

Table 8. Yield Potentials and Improved Practices - Permanent or Semi-Permanent Crops.

Crop	Trees per Acre	Fertilizer	Pesticide	Other Materials	Practices	Yield per Acre
Banana as main crop.	690 planted	Year 1 through 5: 12 cwt. 12-4-28 2 cwt. s/A	2 gal/year Nemagon 60# Kepone 20# slug bait (new recommendation is to replace Nemagon and Kepone with Mocap. Apply granules every 4 months @ 30 grams per plant 85¢/lb. of 5% material.)			Year 1: 10% reaped = 69 stems @ 75% marketable = 52 stems @ 30 lb. = 1552 lbs. Year 2 through Year 4: 95% reaped = 656 stems @ 75% marketable = 492 stems @ 30 lb. = 14749 lbs. Year 5: 60% reaped = 414 stems @ 75% marketable = 310 stems @ 30 lb. = 9315 lbs. Year 6: 30% reaped = 212 stems @ 75% marketable = 155 stems @ 30 lb. = 4658 lbs.

Under small-farm conditions, reduce plant population to 550 stems and reduce yields accordingly. No change in fertilizer or pesticide.

Table C. Simplified Example of a Small Holding, Buff Bay Valley - Medium Elevation. Resources, Production and Income, 1977 Prices.

Family:	Man and woman, age 55, three children in school of which one is working age.	
Land:	Total 4 acres, 1 acre owned, 3 rented, 3 parcels.	
Crops:	Old coffee and cocos (750 planted)	1.5 a.
	Banana (300 roots), Gungo Pea (1/3 a.) Coco (500 planted)	1.0 a.
	Red peas	0.5 a.
	Ruinate	1.0 a.
		4.0 a.
Livestock:	One calf bought each year, sold second year. Ten hens.	

Table D. Example of a Small Holding. Rio Grande Valley, Low Elevations. Resources, Production and Income, 1977 Prices.

Family:	Man and woman, age 55, three children in school of which one is working age.	
Land:	Total 4 acres, 1 owned, 3 rented, 3 parcels.	
Crops:	Coconut, with banana and cocos	1.75 a.
	Coconut 70 trees	
	Banana 400 roots	
	Coco 375 hills, planted in fall	
	Yellow Yam with Dasheen	.25 a.
	Yams, 400 hills	
	Banana with Gungo Pea 250 roots	1.00 a.
	Ruinate	1.00 a.
Livestock:	2 pigs bought as 30 lb. piglets, fed on reject bananas and mixed feed, sold at end of year @ 190 lbs. 10 hens producing 800 eggs	

Table E. Results of an Improvement Program for the Buff Bay "Example" Farm.

Item	1977	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yrs. 6-8[c]	Yr. 9
Income								
Coffee	$ 480	$ 320	$ 320	$ 720	$ 800	$1,200	$2,300	$4,500
Cocos	240	176	176	176	176	176	176	176
Banana[b]	281	238	196	154	112	--	675	882
Red Pea	28	308	308	308	308	308	308	308
Gungo Pea	110	110	110	110	110	110	110	110
Livestock	202	202	202	202	202	202	202	202
Total	$1,341	$1,354	$1,312	$1,670	$1,708	$1,996	$3,771	$6,178
Expense								
Fertilizer	$ 16	$ 44	$ 44	$ 72	$ 160	$ 250	$ 320	$ 360
Seeds	42	72	72	72	72	92	72	72
Banana Hauling	67	57	47	37	27	60[a]	88	88
Pesticides	10	26	26	26	40	65	65	65
Coffee Planting Mixture	--	23	--	--	46	--	--	--
Compost	--	60	--	--	120	--	--	--
Coffee Seedlings	--	4	--	--	7	--	--	--
Labor Hired	154	168	175	140	399	602	259	273
Tax and Rent	36	36	36	36	36	36	36	36
Cattle Bought	75	75	75	75	75	75	75	75
Miscellaneous @ 10%	40	57	48	46	98	118	92	97
Interest on Working Capital @ 8%	35	49	42	50	86	104	81	91
Total Cash Expense	$ 475	$ 671	$ 515	$ 554	$1,166	$1,410	$1,088	$1,141
Net Cash Return	$ 866	$ 683	$ 797	$1,116	$ 542	$ 586	$2,683	$5,037

[a]Banana Suckers @ $10/100.

[b]Yields from the old banana stand assumed to decline 15% per year.

[c]Years 7 and 8 not calculated. Costs and income would gradually rise to levels in year 9.

Table F. Results of an Improvement Program for the Rio Grande "Example" Farm.

Item	1977	YEAR 1	2	3	4	5	6	7	8
Income									
Coconuts	$ 148	$ 133	$ 120	$ 108	$ 89	$ 169	$ 359	$ 494	$ 630
Cocoa					59	152	315	478	630
Bananas	634	7	682	682	682	423	7	682	682
Cocos	152	--	--	--	--	--	--	--	--
Dasheen	22	292	292	292	292	292	292	292	292
Yams (yellow)	418	1,506	1,506	1,506	1,506	1,506	1,506	1,506	1,506
Pigs	222	222	222	222	222	222	222	222	222
Total	$1,596	$2,279	$2,822	$2,810	$2,850	$2,764	$2,701	$3,674	$3,962
Expense									
Pesticides	$ 28	$ 36	$ 36	$ 36	$ 36	$ 78	$ 78	$ 78	$ 78
Fertilizers	6	162	188	222	316	304	352	352	352
Banana Hauling	151	10	114	114	114	70	10	114	114
Coconut Hauling	25	23	22	20	18	44	60	82	105
Seeds, Suckers & Plants	57	112	42	42	42	42	112	42	42
Yam Stakes	60	150	150	150	150	150	150	150	150
Compost for Cocoa	--	30	--	--	--	--	--	--	--
Labor (hand)	49	1,029	--	--	35	49	651	98	189
Purchase Pigs	60	60	60	60	60	60	60	60	60
Pig Feed	128	128	128	128	128	128	128	128	128
Tax and Rent	36	36	36	36	36	36	36	36	36
Miscellaneous @ 10%	60	178	78	81	94	96	163	114	126
Subtotal	$ 660	$1,954	$ 854	$ 889	$1,029	$1,057	$1,800	$1,254	$1,380
Interest on Working Capital	53	156	68	72	82	84	144	101	110
Total	$ 713	$2,110	$ 922	$ 961	$1,111	$1,141	$1,944	$1,355	$1,490
Net Cash Return	$ 883	$ 169	$1,900	$1,849	$1,739	$1,623	$ 757	$2,319	$2,472

Table G. Establishment, Bananas Pure Stand, Labor Requirements in Man-Days, No Tractor.

(690 plants per acre)

Operation	MONTH												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
Bill & fork	15	15										12	42
Cut trenches	5	5											10
Cut pegs & lines		3											3
Transport plants, clean & treat		2											2
Dig holes for planting			8										8
Head & drop suckers			2										2
Plant & cover			3										3
Supplying				2	1								3
Transport fertilizer				1									1
Apply fertilizer 3 x				1		1				1			3
Hand weed 4 x	1	1	2	2	2	2	2	2	2	2	1	1	20
Prune & field sanitation 4 x		.5			.5			.5			.5		2
Apply kepone & bait									1				1
Pre-harvest bunch care			1										1
Reap (10% 1st year)			1										1
Head from field			1										1
Field de-hand & wrap				1									1
Transport to boxing plant				1									1
Total	21	26.5	18	8	3.5	3	2	2.5	3	3	1.5	13	105

SOURCE: Adapted from JDB Crop Husbandry Guide and Field Survey, and IICA "Short Course on Hillside Farming."

For 550 stems, reduce reaping by 20%.

Table H. Establishment Labor Requirement for Coconut (Dwarf). Good Practices. Trees 21' x 21' = 114 trees/acre.

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
	MONTHS												
Clear land	7	4										5	16.0
Contour trenches	5	5											10.0
Cut pegs & line		1											1.0
Transport plants		.5											0.5
Dig holes for planting		2											2.0
Head & drop plants			.5										0.5
Plant & cover		.5											0.5
Supplying				.5									0.5
Fertilize 2 x				1									1.0
Interrow billing					1	1.5	1.5	1	1	1.5	1.5	1	10.0
Apply rat-control material(with billing)													
Pick, husk & carry to road ½-day/unit													
Haul to factory													
Total, pre-harvest	12	13	.5	1.5	1	1.5	1.5	1	1	1.5	1.5	1	42.0

Based on JDB Crop Handbook and other sources. The Coconut Grower. 9(2) June 1978, pp 1 & 2.

Table I. Establishment Labor Requirement, Coconut Interplanted with Banana. Good Practices. Coconuts 18' x 21' = 115 trees
Banana 9' x 7' = 575 trees

Operation	MONTH												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
Billing & fork	20	7										15	42
Cut trenches, 20 chns.		10											10
Cut pegs & line			3										3
Clean & treat banana plants			2										2
Dig holes for planting		7											7
Head & drop suckers and plants			2										2
Plant & cover			3										3
Supplying				1	1								2
Apply fertilizer 2 x				1.5						1.5			3
Weed 2 x					2	3					2	3	10
or apply weedicide					(1.5)						(1.5)		(3)
Pruning & field sanitation					1		1						2
Clear trenches										4	3		7
Borer & slug control		1											1
Pre-harvest bunch care												1	1
Harvest banana & wrap												1	1
Transport to boxing plant												1	1
Total (with hand weeding)	20	25	10	2.5	4	3	1	-	-	5.5	5	21	97

SOURCE: Adapted from JDB Crop Husbandry Guide.

Table J. Cocoa Establishment under Coconut Labor Requirement in Man-Days with Good Practices.

(300 trees per acre)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
	MONTH												
Light tilling						4.0	4.0						8
Line holes						1.0	1.0						2
Dig holes 1.5'						6.0	6.0						12
Add organic matter						1.0	1.5	.5					3
Plant seedlings & tie to stake								1.0	2.0				3
Fertilize 1 x								.3	.7				1
Spray for fiddler with dieldrin											.5	.5	1
Total	-	-	-	-	-	12.0	12.5	1.8	2.7	-	.5	.5	30

SOURCE: IICA "Short Course on Hill Farming;" interview with Cocoa Industry Board officials.

Table K. Coffee Interplanted to Plantain or Under Shade Trees, Establishment Labor Requirements, Man-Days - No Tractor, Good Practices.[a]

(540 Coffee and 403 Plantain per Acre)

Operation	MONTHS J	F	M	A	M	J	J	A	S	O	N	D	Total
Clear land					2	4	2						8
Cut pegs and lines						2							2
Dig holes						9	9						18
Spread Compost							4						4
Apply coffee planting material							4						4
Transport seedlings								1					1
Plant seedlings									3				3
Apply ammonia sulphate											1		1
(Apply weedicide 2 x)			(1)							(1)			(2)
Apply kepone[b]											1		1
Apply insecticide			1										1
Hand weed (no weedicide)	2	2	2	2	2	2	2	2	2	2	2	2	24
Hand weed (with weedicide)					(1)						(1)		(2)
Apply 10-5-20			1										1
Dig holes for plantain[b]								11					11
Tend & stake coffee					4								4
Treat & plant plantain suckers[b]									4				4
Total Pre-Harvest													
Without weedicide	2	2	4	2	8	17	21	14	9	2	5	2	88
With weedicide	-	-	3	-	7	15	19	12	7	1	4	-	68
Harvest Distribute annual rates shown among months marked "x"													
Coffee	x	x	x							x	x	x	2 bx/day
Plantain	x	x	x	x	x	x	x	x	x	x	x	x	100 plants/day
Coffee with 100 Shade Trees (without plantain)													
Coffee, hand cultivate	2	2	4	2	8	18	23	4	5	2	3	2	75
Coffee w/weedicide	-	-	3	-	7	16	21	2	3	1	2	-	55

(a) Based on J.D.B. Handbook and other sources.
(b) In second year.
(c) In third year.
(d) Excluding harvest.

Table L. Banana and Plantain Requirements, Pure Stand, Mature, Good Practices. No Tractor, Yield 10,000 Pounds, Year 2 through Year 4.

(690 Plants/Acre)

Operation	MONTHS J	F	M	A	M	J	J	A	S	O	N	D	Total
Transport fertilizer	1												1
Apply fertilizer 3 x		1			1				1				3
Hand weed 4 x			1	1	1	1	1	1	1	1	1	1	10
Pruning and field sanitation 4 x	.5			.5			.5			.5			2
Clear trenches		1		1				1			1		4
Apply Kepone & slug bait 2 x	1						1						2
Pre-harvest bunch care													(2)
Reap													(5)
Head from field	1	1	1	2	2	2	2	2	2	2	2	1	(6)
Field de-hand and wrap													(5)
Transport to road													(2)
													20
	3.5	3	2	4.5	4	3	4.5	4	4	3.5	4	2	42
Note: Plantain the same, except harvest is 6 days													
TOTAL	3.5	2.5	1.5	2.5	2.5	1.5	2.5	3.5	2.5	1.5	2.5	1.5	28

SOURCE: Adapted from JDB Crop Husbandry Guide and Field Survey.

Table M. Coconut Annual Labor Requirements, Established Field, Good Practice.

(115 trees per acre - 60 nuts per tree)

Operation	MONTH J	F	M	A	M	J	J	A	S	O	N	D	Total
Apply fertilizer 2 x				1.5						1.5			3.0
Weed circles & rattex 1 x (chemical)					2.0								2.0
or hand, 2 x					1.5	1.5					1.5	1.5	6.0
Clean trenches										4	3		7.0
Pick, husk & carry	1	1	1	1	1	1	1	1	1	1	1	1	12.0
Total with chemical weeding	1	1	1	2.5	3	1	1	1	1	6.5	4	1	24.0
Total with hand weed	1	1	1	2.5	2.5	2.5	1	1	1	6.5	5.5	2.5	28.0

SOURCE: Adapted from JDB Crop Husbandry Guide, and Coconut Industry Board, "Labour Requirements for Bearing Coconuts," the Coconut Grower, Vol. 3, No. 1, 1972.

Table N. Cocoa, Annual Labor Requirement in Man-Days per Acre, Good Practices.

(300 trees per acre - yield = 50 bx. net)

Operation	MONTH J	F	M	A	M	J	J	A	S	O	N	D	Total
Pruning 2 x	.5					1.0	.5					1.0	3.0
Fertilize 2 x			1.0						1.0				2.0
Weed 2 x		.5	.5				.5	.5					2.0
Spray 2 x (black pod)					1.0			1.0					2.0
Spray for fiddler beetle (watering pot)													
Apply Rattex 1 x		1.0											1.0
Pre-harvest total	.5	1.5	1.5	-	1.0	1.0	1.0	1.5	1.0	-	-	-	10.0
Harvest & transport @ 1 day/6 bx.			1.0	1.0	1.0				1.5	2.0	1.5		8.0

Age of trees and Production:

Year 3 - begin to bear = 3 bx
Year 4 - = 8 bx
Year 5 - ¼ crop = 12 bx
Year 6 - ½ crop = 25 bx
Year 7 - 3/4 crop = 38 bx
Year 8 - full crop = 50 bx

Table O. Coffee Annual Labor Requirement, Good Practices. No Tractor, Mature Stand.

(Yields from 100 boxes to 200 boxes per Acre)

Operation	MONTHS J	F	M	A	M	J	J	A	S	O	N	D	Total
Apply weedicide 2 x			1						1				2
Apply insecticide 2 x				1						1			2
Apply 10-5-20 2 x	1							1					2
TOTAL, pre-harvest	1		1	1				1	1	1			6
Reap @ 1day/2boxes (about evenly in months marked)	x	x	x							x	x	x	

SOURCE: Adapted from JDB Crop Husbandry Guide, IICA Short Course on Hillside Farming and field survey.

Table P. Cocos and Dasheen Labor Requirement by Operation. Man-Days, Good Practices.

(Yield 7 T.)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Land clearing ruinate	10												10
Land forked	5	20											25
Holes dug (6000)		20	20	20									60
Planting			3	2									5
Weeding & Moulding				4	4	4	4	4					20
Reaping 7 T.										6	6		12
Transport 7 T.										2	2		4
Total	15	40	23	26	4	4	4	4	-	8	8	-	136

SOURCE: Adapted from JDB Crop Husbandry Guide and Field Survey.

There are two crops planted a year, but crop matures in about seven months. Cycle for an additional crop would be the same and dates could be shifted over the year depending on condition of the soil and rainfall.

Dasheen usually is planted September-March or April in Portland. Cocos can be planted at any season and they can be stored in the ground for awhile. Propagation is by bits or suckers. Suckers are better for wet season planting as they are not as likely to rot.

Table Q. Gungo Peas Labor Requirements, Good Practices. Man-Days per Acre, No Tractor.

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Land Preparation				13									13
Digging Holes					3								3
Seeding					4								4
Apply Rogor 5 x	1	1				1			1		1		5
Weed 4 x	2	2				2	2		2	2	2	2	16
Reap[a]			9	8									17
Thresh				1									1
Total	3	3	9	22	7	3	2	-	3	2	3	2	59

(a) First year yield = 1200 lbs., second year yield = 800 lb.

SOURCE: JDB Crop Husbandry Guide and MOA Planning Division Data.

Can be planted Jan.-June or Aug.-Oct. in Portland. Older varieties quite indeterminate in flowering and seeds mature over long period. Ties up the land for a year. New UWI dwarf varieites mature in four months, can be planted in May to mature in October (95% determinate).

APPENDIX II

Estimated man-day labor requirements per month for usual practices on small farms appear on the following tables. Figures are on a "pure stand" basis. In using the tables for mixed cropping, adjustments should be made in plant populations, yields and cultural practices. Land clearing and preparation, for example, would require more labor for the principal crop than for accompanying ones.

Table	Subject
A.	Bananas
B.	Coconut
C.	Coffee
D.	Gungo Pea
E.	Red Pea
F.	Cocos and Dasheen
G.	Yellow Yam

Table R. Labor Requirement for Red Peas, Pure Stand, Two Crops. No Tractor, Good Practices. Yield: 1000/crop.

Operation	MONTH J	F	M	A	M	J	J	A	S	O	N	D	Total
Forking & clearing & land preparation 2 x	15					5	15					5	40
Seeding & covering 2 x		12						12					24
Spraying, elilordone 2 x			1						1				2
Spraying, rogor 8 x				2	2					2	2		8
Weeding		2	4	4				2	4	4			20
Reaping & drying					5						5		10
Shelling & sifting					4						4		8
Total	15	14	5	6	11	5	15	14	5	6	11	5	112

SOURCE: JDB Crop Husbandry Guide and Field Survey.

For one crop, take half and adjust planting periods. Usual plantings in Portland are: August-September; December-January; and April-May.

Table S. Yellow Yams, Good Practices, Labor Requirements, Man-Days. (2000 mounds - Reap 1800 @ 10 lb. less 2 lb.seed = 7.2 T net)

Operation	MONTH J	F	M	A	M	J	J	A	S	O	N	D	Total
Clear Land	8.0	6.0										4.0	18
Dig hills	12.0	15.0	20.0	8.0									55
Prepare & dig holes		2.0	4.0	3.0									9
Plant		3.0	10.0	7.0									20
Prepare stakes & stake		3.0	4.0	7.0	8.0								22
Tend & wrap vines					5.0	6.0	5.0	4.0					20
Fertilize 2 x					1.0	1.0	1.0	1.0					4
Weed 2 x			2.0	3.0	4.0	3.0	3.0	3.0	2.0				20
Reap & store	3.5	1.0	1.0	1.0					2.0	3.5	3.0	3.0	18
Strip vines			.4	.4	.4						.4	.4	2
Total	23.5	30.0	41.4	29.4	18.4	10.0	9.0	8.0	4.0	3.5	3.4	7.4	188

SOURCE: Adapted from FAO "Small Hillside Farmers in the Lucea-Cabaretta Watershed Complex" 1970, p. 16.
J.D.B. "Handbook for Credit Officers" and other sources.

Table A. Labor Requirements Usual Practice Established Field Bananas.
(Average Yield, 6300 lbs.)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Hand weed 2 x	1		1		1		1		1		1		6
Pruning & Field Sanitation						1							1
Apply Bait		1											1
Reap & Transport		.5	.5	.5		.5		.5		.5	.5	.5	4
TOTAL	1	1.5	1.5	.5	1	1.5	1	.5	1	.5	1.5	.5	12

SOURCE: Adapted from JDB "Crop Husbandry Guide."

Table B. Coconut. Annual Labor Requirements, Established Stand, Usual Practices. (40 trees per acre, 25 nuts per tree)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Apply Fertilizer 1x & rat control			1.5						.5				2.0
Weed circles (by hand) 1x					3.0								3.0
Clean trenches											2.0	2.0	4.0
Pick, husk and Carry	.5	.5	.5	.5	.5	.5	.4	.4	.5	.5	.5	.5	5.8
TOTAL	.5	.5	2.0	.5	3.5	.5	.4	.4	1.0	.5	2.5	2.5	14.8

SOURCE: Coconut Industry Board, "Labour Requirements for Bearing Coconuts," The Coconut Grower, Vol. 3 (1) 1972, and JDB, "Crop Husbandry Guide, Adjusted for small farm conditions.

Table C. Labor Requirements Usual Practices Old Coffee Stands.
(Yield = 20 boxes)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Apply 10-5-20 1x 100					1								1
Hand Weed 1x	1	1	1	1	1	1	1	1	1	1	1	1	12
Reap Coffee[a]	3	3	3							3	4	4	20
TOTAL	4	4	4	1	2	1	1	1	1	4	5	5	33

SOURCE: Adapted from JDB "Crop Husbandry Guide."

(a) Assume 1 day per box on low producing areas.

Table D. Labor Requirements Usual Practice Congo Pea.
(Estimated yield 500 lbs.)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Land Preparation			3	7									10
Dig Holes					3								3
Seeding					2								2
Weed 2x	2		2					2			2		8
Reap			4	4									8
Thresh				1									1
TOTAL	2		8	8	5			2			2		27

SOURCE: Adapted from JDB "Crop Husbandry Guide."

Table E. Red Pea Labor Requirement, Usual Practice.
(Estimated yield 300 lbs./crop, 2 crops)*

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Forking and Clearing Land 2x	7					3	7					3	20
Seeding and Covering 2x		7						7					14
Weeding		1	2	2				1	2	2			10
Reaping and Drying					3						3		6
Shelling and Sifting					2						2		4
TOTAL	7	8	2	2	5	3	7	8	2	2	5	3	54

SOURCE: Adapted from JDB "Crop Husbandry Guide."
*Not on same land.

Table F. Cocos and Dasheen Labor Requirements by Operation and Months, Customary Practices. (1.6 tons/1600 plants harvested)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Land Clearing	8												8
Land Forked	5	10	5										20
Holes dug, 2000		6	10	4									20
Planting			2	2									4
Weeding & Moulding				2	2	2	2	2					10
Reaping											2	2	4
Transporting												1	1
	13	16	17	8	2	2	2	2		2	3		67
If in mixed stand reduce land preparation to	3	4	3										10
TOTAL	3	10	15	8	2	2	2	2		2	3		49

SOURCE: Adapted from JDB "Crop Husbandry Guide."

Table G. Yellow Yam Labor Requirement, Usual Practices.
(1500 hills, reap 1200 hills @ 8.3 lbs. (less 2 lbs. seed) = 3.8 T Net)

Operation	J	F	M	A	M	J	J	A	S	O	N	D	Total
Clear land	8	6										4	18
Dig hills	10	12	14	6									42
Prepare and drop heads		1	5	2									8
Plant		2	10	4									16
Prepare stakes & stake		2	4	7	7								20
Fork between hills and tend				5	6	5	4						20
Wrap vines					3								3
Fertilize 1x					2								2
Weed				2	2	3	2	2	3				14
Reap and carry	3	4	2	1					½	½	1½	2½	15
Strip vines					½	½					½	½	2
TOTAL	21	27	35	27	20½	8½	6	2	3½	½	2	7	160

SOURCE: Derived from various sources including:
FAO "Small Hillside Farmers in the Lucea-Cabaretta Watershed Complex, 1970, p. 16.
JDB Handbook for Credit Officers, and other sources.

For good practices, assume 2000 hills, 1800 reaped, at 9 lb/hill, less 2 lb seed = 6.3 T produced above seed requirement. Add one more weeding and one more fertilizing, add 40% to reaping labor.

Appendix III

Portland Parish: Constraints from the Viewpoint of Extension Agents

KILDARE

Mr. Brown

Land settlement with most of the farmers at present leasing or renting these lands from absentee owners. Permanent crops such as coconut, soursop, and small amount of vegetables are the main cropping pattern present. Small acreages of grassland are found on which a few cattle are raised. Recently a Land Lease at Plum Valley was acquired, which contained cocoa. Pimento is the major crop on this project, but there is potential for plantain, coco, yams on the acreages without.

Crops such as corn, pumpkin, can be increased in acreages quite easily. Vegetable would do quite well. Guava would perform quite well throughout the settlement and surrounding areas, in addition it would utilize marginal land.

Bad roads, inadequate and irregular water supply, restricted mobility of extension personnel, shortage of spraying equipment are the major constraints.

Action Needed

Regular supply of fertilizer, availability of transport in the various areas; subsidized fertilizer and seeds, increased research on the local level, improved extension teaching aids, e.g., slides, colour pictures; expansion of black pepper on the Buff Bay River property, and guava plantings could be encouraged.

Gentle slope; limestone area; increase coconut, cocoa (in valleys); vegetable crops feasible.

80 percent farmers' income derived locally.

Average rainfall 80"/year.

SPANISH RIVER: BYBROOK AREA

N. Laidley

Present Situation

Bybrook Extension Area serves the communities of Bybrook, Chepstowe, Skibo, Claverty, Berwick Spring and Martinique.

The farmers all do mixed farming with the following crops:

Banana

Coffee

Cocoa

Coconut

Root crops Yam, Coco, dasheen, seasonal vegetables, red pea Congo Peas, Cabbage

Livestock

Some: Cattle, Pigs, Goats, Chicken.

Rainfall average 90" per annual.

Land

The area has thousands of acres of good agricultural land; 75 percent are steep slope and erosive, but very fertile. Distribution is the main problem--35 percent is owned by absentee owners. There are also some very large unused land, Crown Lands and privately owned. The soil is suitable for coffee, cocoa, banana, and coconut.

Labour

Unemployment is the main problem among the younger people. They would like to do farming, but do not have the capital and land.

Constraints

Roads, capital, land, cropping system, marketing of domestic crops.

Production Level Could be Increased by 100 percent within the next four years if the following steps are taken:

Coffee 3 time in 4 years

4 time in 5 years

1. To improve yield on present farms by making farm input available and within the area and at the time they need it. To make capital available to maintain permanent crop.
2. Make loan available to farmers at low interest rate to purchase animal and feed lots and to establish grass as a part of the soil conservation programme. To have up-graded breeding stock at the local level to provide sire service. Milking and dual purpose goats should be introduced.
3. To set up co-op farms and some of these large unused farm. These farms could be operated on the Community Enterprise Organization basis. These co-op or Community Farms should produce mainly coffee, cocoa, spice, guava, apple, and other fruits. Some of these fruits could be processed by the community.
4. To establish a factory to process guava and other fruit.
5. To improve transportation to and from Buff Bay for children going to school and the general travelling public.

Roads

To make all Parish Council roads driveable, namely:

Bybrook to Berwick Spring

Bybrook to Rose Hill

Bybrook to Clifton Hill

The road which goes into Top Moore Park

To establish animal path within farms

Electricity

This should be extended to serve Carlton, Martinique, Annsdelight, Berwick Spring.

Fish Farm

Establish fish ponds along the Mabess and Spanish River and have them seeded with African perch, mulletts.

Farm Group

The Jamaica Agricultural Society should be restructured to provide better organization among farmers. This would help with some of our marketing problems.

Soil Conservation

A massive soil conservation project and the establishment of of permanent tree crop.

Distance to farm:

Port Antonio - 26 miles

Kingston - 42 miles

What the market possibility for recommended crop.

Coffee has good market with the Blue Mountain Co-op; price is good for cocoa.

Relationship between export crop and domestic-- 60 percent to 40 percent.

RIO GRANDE VALLEY: AVENUE OF IMPROVEMENTS IN AGRICULTURE

E.K. Miller

Education

Farmers within the area are more or less accustomed to the primitive method of agriculture, but they are very slow in taking on some of the more modern method of farm practices that are now being implemented for improving farmers' production.

I also think the farmer could be benefited greatly from an educational drive by the use of more film shows and farmers training courses at some of the training centres. These farmers could also increase their output annually by introducing a unused type of agriculture. This is by introducing livestock and poultry on these holdings. This would help to increase the protein supply within the area--major crops being: banana, dasheen, cocoa, plantain, cassava.

Constraints

Roads

One of the most visible setback in agriculture is this basic infrastructural input. The farmers within the area almost find it impossible to transport inputs to field and the transportation of his products from the field to the markets.

Because of the poor condition of the roads, the farmers' produce reaches the markets in a deplorable condition.

Transportation

This problem is another great one because the farmers are almost always in need of transportation to take their crops from the field and also to take their inputs to the fields.

Input Supply

This topic is also another sore point because the farmers are always in need of additional inputs such as fertilizer, seeds, etc. would be a great boost to the farmers' production within the area.

Cropping Pattern

From experience it is being seen that these farmers could be greatly benefited if they should modify their cropping pattern in the line of tree crops along the slopes and vegetable on the lower steep slope, with their bananas and food crops in pure stand plots on the lesser steep ground. With some soil conservation practices he can do a great expansion on his lot with these crops.

Marketing

It is of paramount importance that a good marketing system is made available to the farmers for their food crops such as dasheen, yams, cocoes, and cassavas. Their bananas are readily marketed on the export market.

Of the crops, about 70 percent of the farmers' income is got from bananas and 30 percent from the food crops. A small percentage of the food crops are export marketed.

Coupled with this also is the institution of agro-industries in crop such as dasheen-chips from dasheen, cassavas, etc.

I am of the opinion and from experience we have seen that the topography and soil types of the area lends itself to expansion along these lines of agriculture if all the other factors such as rainfall and atmospheric changes are concerned.

These farmers could double their banana output within two years from the banana plantations, increase their food crop by 75 percent.

Proximity to Inputs

The closest source of supply is about seven miles away from the farming community.

SUGGESTION TO INCREASE PRODUCTION IN THE HART HILL AREA

N. Lindo

The Hart Hill area is an ideal vegetable area at present. Vegetable is grown on a seasonal basis. The main ones being carrots and onions.

The area also has a lot of potential for coconuts, corn and food crops.

Some of the major constraints facing the small farmers are:

1. Lack of mechanical equipment for land preparation.
2. Inadequate supply of fertilizers and planting material at the required time.
3. Lack of irrigation facilities.
4. Poor condition of existing roads.

If significant improvement is made in the above mentioned area, I am of the opinion that production of vegetables could be increased by 75 percent in two years.

To take care of the increased production, adequate facilities for processing will be necessary. There is an existing factory in the area which could be used for processing vegetables and other agricultural commodities.

Special Project

There is at present over 300 acres of swamp land interspersed with three ponds in this area which can be developed into a viable rice project. This swamp at present lies idle and is a health hazard to the community because of the amount of mosquitos that breed up in it.

A feasibility study was recently done on this area. It showed that rice and fish farming could be done if the proper infrastructure is put in. The farmers in the area are organized and ready to go once financing for this project is obtained. The major work would involve drainage and construction of a few mini-ponds.

If this project is implemented, it would eliminate the present health hazard and provide adequate economic returns to the people of this area.

SPRING HILL AREA

N. Lindo

This area is situated in the upper part of the Buff Bay River Valley. It consists mainly of steep slopes. The rainfall pattern is medium to high.

The major crops in the area are rice, peas, coffee, bananas, food crops. Because of the clear cultivation necessary for growing red peas, a significant portion of the soil is lost due to erosion. To alleviate this problem, major soil conservation work is imperative. This should consist mainly of terraces and individual basic crops like red peas, food crop and pineapple could be grown on the terraces with coffee planted in between.

Significant improvement will have to be made in terms of availability of major inputs like fertilizer and planting materials.

A coffee food crop demonstration plot should be set up midway up the valley to serve as a motivating factor in getting farmers to cultivate their land properly.

Most of the roads will need improvement as well as the construction of a few feeder roads.

If there is improvement in these areas coupled with a major coffee resuscitation programme, I am of the opinion that coffee production could double in four years and food crop production increased by 50 percent in two years.

Farm income derived from export crops is 30 percent from coffee.

Availability of inputs (fertilizer, etc.) is poor. Nearest farm store is in Port Antonio, over 20 miles away.

ORANGE VALE and BANGOR RIDGE

1. Permanent crops with subsistence farming, mainly red peas predominates.
2. Resuscitation - coffee, cocoa, new plantings.
3. Bad roads - inadequate transport.
4. Black pepper perform well; coffee, cocoa and red peas need to be encouraged. This would take the form of regular and dependable fertilizer and chemical supply along with availability of planting material. Roads need to be improved immediately. Yam, e.g., yellow, perform quite good in the Bangor Ridge area, also Gungo peas. Increase in number of farm houses necessary. Increase in the number of extension agent is important.

Steep slopes; increase coffee, cocoa, black pepper, red peas production feasible; 60 percent farmers' income local crops. Soil type 46 predominates. Access to planting materials and other inputs poses transport problems. Average rainfall 100"/year.

Availability of transport could increase production in the areas by 40 percent; by increasing pest control, fertilizer availability and dissemination of information from trained people. This could occur within one year, within two years another 75 percent.

ORANGE BAY/LENNOX

N. Lindo

This area consists of thousands of acres of fertile lands. It consists of fairly level to gentle sloping lands which can be easily irrigated by the Spanish River.

It has great potential for cocoa, coconuts, coco, banana, plantain and vegetables.

Notes

1. 98 percent of the farmers' income is derived from domestic food crop.
2. Availability of supplies is poor. Nearest store is 15 to 18 miles away.
3. Soil is mainly #95 and #24, very fertile.

With a major coconut and cocoa planting programme and adequate irrigation facilities, vegetable production could be increased by 100 percent in two years. Cocoa and coconut production could be quadrupled in seven years.

APPENDIX --COOPERATIVE GENERAL MANAGER'S JOB DESCRIPTION

The most vital decision a cooperative board of directors makes is in its choice of a manager and its relationship with the manager in delegating job responsibilities.

Success takes a lot of help. The board is the single most important source of help to a good manager. Boards of directors set policy. Managers implement or carry out policy decisions set by the board.

The manager has specific responsibility in planning, organizing, directing, coordinating, and controlling the operations of the cooperative. For the board of directors to function effectively, it must agree on specific jobs that the manager must do from a short, day-to-day basis to a long-range implementation of policy.

By following a set plan or job description, both the board and the manager have guidelines to measure the duties and performance of the manager.

The cooperative's membership have delegated to the board of directors the responsibility of conducting all business operations. The board, in turn, expects a manager to carry on the day-to-day business within the policy guidelines set. The board looks to the manager to have an effective operation that produces set net earnings, to maintain members' savings, to provide assistance and leadership for the board of directors, and to develop set growth in sales and volume.

To attain this objective, the following specific manager's duties are outlined.

Planning

1. Make policy recommendations to the board in all areas of management.

2. Analyze and make recommendations on each commodity or service that the cooperative will handle.

3. Prepare capital requirement budget to enable the board to arrange for enough financing for the organization.

4. Develop a program of manager and personnel assistance needs with job description for each specific area of employment.

Organizing Work

1. Submit monthly reports and other special reports as needed, provide general information and recommendations to the board of directors, assist the board in formulating policies, and provide all available facts and information that can be useful in making board policy.

2. Set performance standards in conformance with job description outlines, general employee policies, objectives, and goals established.

3. Select employees according to job requirements stated in outline and on their potential for development.

4. Develop employees for advancement so that they will be able to advance within the organization and to serve as a temporary manager if the need arises.

5. Conduct membership meetings.

6. Promote membership through publicity and other means, including personal contacts.

Directing the Business of the Cooperative

1. Carry out board policy.

2. Carry sales/production promotions on all products if planned in budget.

3. Assign representatives, sales goals, duties, and responsibilities of each employee.

4. Direct and supervise all employees.

5. Train employees and develop their skills if required to improve their performance.

6. Develop production, promotion, and technical expertise among employees. Assist them in becoming proficient in their work areas.

7. Hold employee meetings to give pertinent information, get employee advice, and develop group interest and enthusiasm for various current programs of importance to the group.

8. Encourage self development of employees and assist in encouraging self development by personal interest.

9. Create and maintain an atmosphere in which employees willingly produce at maximum capacity.

10. Provide good housekeeping throughout entire facility.

11. Provide for adequate maintenance for all equipment and facilities.

12. Enforce facility regulations and develop safe work habits for employees.

13. Enforce the policies of the cooperative as set down by the board.

14. Direct the day-to-day activities and establish procedures to carry them out by delegating all responsibilities within established regulations.

Coordination

1. Arrange for assistance from the board and utilize group when required.

2. Constantly strive for self development by:

   a. Attending manager, staff, and other management training meetings.

   b. Attend community and promotional meetings when possible.

   c. Keep up-to-date on new trends in management, financing, and marketing.

3. Carry on community relations activities.

4. Develop to the utmost a sound working relationship with other cooperatives and within the business community whenever feasible.

5. Personally and officially represent the cooperative by participating in community affairs.

6. Develop the image of the cooperative as an economic institution in the community.

Fiscal Controls

1. Make yearly operating, financial, and budget projections for board of directors and submit to the board showing periodic breakdowns. Make operating reports and budget estimates and compare to the same period in prior years.

2. Maintain desirable gross margins.

3. Maintain desirable expense ratios.

4. Maintain desirable inventory controls.

5. Appraise and evaluate each employee annually based upon his performance as outlined in his job description.

6. Replace employees who cannot measure up to job requirements or who willfully violate company policies.

7. Assist the board in selecting complete auditing services that include provision for a spot audit at the discretion of the board or the audit services. The auditor reports to the board.

8. Make monthly or periodic reports to lenders in accordance with agreements.

9. Arrange for board to review/receive insurance coverage annually.

Appendix V-The Small Farmer as a Single, Small, Producing and Selling Unit and an Alternative

The small farmer finds himself in a one-to-one encounter with a large number of organizations. Some of these are considerably bigger than he is. These encounters are found in the fields of production, transport, pricing, wholesaling and retailing. They are found equally in the areas of domestic food crops and export crops. In many of these encounters, he finds himself, or feels that he finds himself, at a relative disadvantage.

Where domestic food crops are concerned, the AMC has been competing with the higglers in going to the farmer (or in providing buying stations) to bring in his crops. This has undoubtedly been helpful to the small farmers, and particularly to those having difficulty in moving their crops long distances. On the other hand, it preserves the exisiting system of the one-to-one encounter between the small seller and the bigger buyer. The point is not that the AMC is necessarily taking monopsonistic advantage of the small farmer (although that claim has been made as a result of some of the 'floor' prices); rather it is that it is part of a marketing system in which the small farmer works alone and sells alone. Credit (when it's been available) is handled much the same way, on an individual basis. The relative absence of research on behalf of the small farmer reflects the general attitude that he is alone and 'individualistic' and not counted among those who are capable of being mobilized for meeting a particular purpose or target.

An alternative to this is for the small farmer to be assisted technically and financially as part of a group, for him to feel his strength as a producer as part of a community, for him to offer his crops on the market as part of an organization. The relative success of the Christiana Potato Growers Cooperative and a couple of other cases is instructive in this respect.

The situation is varied where export crops is concerned, but the element described above continues to exist. In the case of bananas, despite the existence of cooperative boxing plants, the participation of the small grower in the affairs of the organization is minimal. In the case of coffee, the cooperative element is somewhat stronger in that the small farmer is represented by a cooperative through which he has been able to obtain limited quantities of fertilizer and credit for its purchase.

For cocoa and coconuts, the situation is similar. While there is a record of some assistance to the small farmer, he must speak up alone vis-a-vis these organizations.

The small farmer is thus on a one-to-one basis with one or another commodity board where the export crops are concerned, and with one or another higgler and with the AMC where domestic food crops are concerned. He faces a shifting marketing and production situation alone in the sense that, whatever the merit or results of advice and counsel from his extension agent, the risk continues to be his, and his alone.

The alternative to this would be for him and his fellow farmers to be supported with marketing and production data and judgments with respect to these on a group basis. "Someone' in addition to the small farmer is needed to think ahead about a number of marketing and production decisions: what can be done if the price of coffee should turn down (how many farmers are 'locked into' this crop and what would this mean to their annual income?); what marketing outlets for what crops and for what quantities and prices can be counted on for the next season? What inputs can be counted on, etc. This sort of thing, of course, is being done all the time on a 'grapevine' basis, by word of mouth from one farmer to another. But the matter is complex enough for a straightforward, formal and serious approach. It is justified by the large number of small farmers and the agricultural potential that exists. The bigger farmers (or their organizations) do this as a matter of course.