ROOTCROPS IN BARBADOS

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Introduction

Locally grown root crops make a very substantial contribution to the Barbados diet. In fact, they provide some 18,000 million Calories per year out of a total input of 185,000 million Calories, that is, almost 10 per cent, and are the most important single item in this respect after wheat flour (35,000 million Calories) and sugar (43,000 million Calories). An estimated area of about 6,000 acres is planted annually to root crops, of which 5,200 is on sugar estates of 10 acres and over, and 800 on small holdings. The annual value at 4 cents per pound ex-field totals well over $2 million, and even at this price a reasonable profit is made by the grower.

Production and Acreage

Most of the root crops produced in Barbados are produced under a system that is uncommon, possibly unique. When the last cane ratoon is cut in March or April the land is ploughed and harrowed, and ridged, or in some cases cane-holed, for the next planting of cane, but this is not until about November. So the land—known as preparation land—could lie fallow for about six months. In fact, on the great majority of this acreage, food crops are planted early in the rainy season, that is May, June and July; indeed the Law requires a minimum of 10½ per cent of all arable land on sugar estates to be used in this way. In practice this figure is substantially exceeded, while root crops normally account for about 75 per cent of the total acreage of preparation land planted in food. In addition the Law demands that 1½ per cent of the arable land be kept out of cane each year and be planted in sweet potatoes for harvest during the early months of the following year. Since sweet potatoes planted in June to August are harvested between September and December, yams planted in May and June are harvested between December and February (and keep for 5 to 7 months after harvest), and potatoes planted in October and November are harvested in February to June, the Law ensures that locally grown food crops are available for most of the year.

Including both "spring" and "fall" planted sweet potatoes, estimated total acreages and tonnages of the main root crops are as follows :

	(acres)	(tons)
Yams	3,200	15,000
Sweet potatoes	2,200	8,000
Cassava	260	800
Eddoes	400	1,200

In the last two or three years a small quantity of English potatoes has been grown but this is still only on an experimental basis.

Marketing

These quantities represent all that the market, as at present organised, can absorb. It is important to recognise this : the profitability to the farmer may be substantially greater than that of cane,[1] and the uninitiated often express surprise that sugar cane is still grown while these more lucrative crops occupy so little land. The answer is, of course, that a market does exist for cane, but for root crops the market is strictly limited. Indeed there is some reason to believe that the market is diminishing, and that English potatoes which are easier and quicker to prepare in the home, and have a certain "snob" value, are gradually taking over the place of yams and sweet potatoes in the Barbadian diet. Further, although yams and sweet potatoes are produced and sold cheaply ex-field (usually, as already mentioned, at 4 cents per pound to hucksters), there has been a recent tendency for the hucksters to sell them at 12 to 14 cents per pound, at which price imported English potatoes at the controlled price of 12 cents are competitive. It should be noted, however, that while hucksters get these high prices the Barbados Marketing Corporation retails yams and sweet potatoes at 8-10 cents per pound.

A further problem is the difficulty of getting the crop lifted. The customary procedure was for virtually all the sweet potatoes and much of the yam crop to be sold in the field to hucksters who themselves carried out the harvesting. A portion of the yam crop was lifted by estate labour and stored on the estate for later sale. Hucksters are dwinding in number and increasing difficulty is being found in getting sweet potato crops sold; at the same time estate labour forces are shrinking with a resulting adverse effect upon the lifting of the yams.

The high retail prices which are rather too frequently charged by hucksters have already been mentioned. Some growers have felt that the differential between the 12 or 14 cents retail price and the 4 cents per pound ex-field price to hucksters was too great, and raised their ex-field price for sweet potatoes to 5 or even 6 cents per pound. In view of the relative profitability of sweet potatoes (compared with cane) and the fact that only a few years ago ex-field prices were controlled at 2 cents per pound, this seems an unfortunate and unwise reaction. Sugar estates are always liable to be the target of politics, and any action smacking of excessive charging can hardly avoid Governmental notice; it would be sad if the Government were forced to re-impose controlled prices.

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[1] Gooding, E.G.B., 'Root Crops in the Barbadian Economy', **Proceedings of the First International Symposium on Tropical Root Crops, U.W.I., Trinidad, 1969**

Attempts are being made to increase outlets for root crops. A considerable amount of effort has gone into developing an export market for yams, and currently some 1,500 tons, worth about $360,000.00 are sent from Barbados to the British and United States market. There is also a demand for sweet potatoes for export, but the storage life is too short and not enough is known about the effects of variety on storage behaviour. Further, outlets are being sought and a joint project has recently started between the Barbados Sugar Producers' Association and The University of the West Indies, to develop yams and sweet potatoes in dehydrated "convenience" form which we hope will be suitable for the export market both inside and outside Carifta, and perhaps for caterers on the home front.

Research Into New Techniques

We are witnessing considerable changes in the technique of root crop production. In the past few years agronomic research has shown that yams, sweet potatoes and eddoes can be grown at very much higher densities per acre than previously[1] with large increases in yield per acre. Typical experimental results for yams and sweet potatoes are shown in Tables 1 and 2. In fact, however, at the highest densities too high a proportion of unsaleably small tubers was produced and later work has suggested that the maximum practicable densities were about 5,200 plants per acre for yams (2' 6" x 3' 10") and 8,700 for sweet potatoes. It must be recognised, however, that these results are not final, as they relate to only two cultivars (White Lisbon and Coconut Lisbon) for yams and a single cultivar, B 62-07, in the case of sweet potato. In actual commercial practice, however, closer spacings than formerly are becoming common and it has been calculated that if these new spacings were universally adopted the same quantity of root crops as were produced four years ago with the older spacings would be produced on 1,500 acres less land. Since, as already emphasised, the present market for root crops is limited, this means that 1,500 acres of land could be freed for some other food crop.

New Patterns In Rootcrop Production

The inevitable progress of the sugar industry towards complete mechanisation will also affect the pattern of root crop production.

Two new situations can be visualised. The first is that for various reasons outside the scope of this paper, when sugar cane is mechanised there are certain advantages in "forcing back" the land into cane immediately after harvesting, that is, planting in April or May, not waiting until November. In such a case there would be no "preparation land" to grow the food crops. We think that in the Barbadian climate forcing back will be possible only in the wetter parts of the Island. However, wherever it is practised, food crops will have to be grown on land set aside for them—and the Law will no doubt continue to demand the production of food crops on sugar estates.

Setting land aside especially for food crops at once raises the question of costs. In preparation land food crops could be quite profitable, even though sold cheaply, largely because the preparation of the land, weeding, and general overheads, are all costs necessarily incurred on behalf of the subsequent crop of cane and are therefore charged to the cane, not to the food crop.

The situation with food crops grown in a one-year, two-year or longer rotation with cane, or on land permanently set aside for them, is quite different. These crops must now attract all costs. However, they are not restricted to planting on ridges 5' 6" apart made for the subsequent crop of cane; they can be treated as crops in their own right, and may therefore be expected to perform better. Experiments to examine the costs of growing crops in this way were started in 1967 and have shown that, in fact, root crops grown under these conditions do yield considerably more than when grown in the normal way in preparation land, and that this increase in yield does offset the higher costs incurred (Table 3). The figures for costs given in this table are actual costs obtained on the field scale (several acres at a time) except for those in the third column which were from plots of one-third to one-half acre — still large enough for the figures to be meaningful. Yields are approximations to commercial yields quoted by estates except where the yield is the rounded off average of six one-third to one-half acre plots (Table 3, Column 3).

The second situation appears when for some reason (likely to be lower annual rainfall) land cannot be forced back into cane during the dry season (April) but has to be planted at the end of the wet season (November), as at present. Sweet potatoes planted in June or July will normally have been harvested in the previous few weeks and will offer no problem to mechanical cane planters passing through the field. Yams, however, at this time of the year have about 100 per cent ground cover with a heavy tangle of stems and leaves. When planting of cane is done by hand the yam vines are pushed aside and the cane planted. Up to now it has been found impossible to do this satisfactorily by machine — the machine becomes choked by the vines and the vines are severely damaged by the machine. Prior destruction of the vines is out of the question as the tubers are developing rapidly at this stage and maintenance of leaf area is essential. So far we have no satisfactory solution. One partial solution that has been put forward is to plant the rest of the preparation land by machine, but plant the yam area by hand. Another is to plant yams (but not the other food crops) in land taken out of cane for the purpose—but even if this land were only 3 per cent of the arable acreage and the estate were to continue harvesting 80 per cent of its acreage as cane each year, it would involve carrying cane to an extra ratoon which might be quite uneconomic in some areas.

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1 Gooding, E.G.B., and Hoad, R.M., 'Problems of Yam Production', **Proceedings of the First International Symposium on Tropical Root Crops, U.W.I., Trinidad, 1969**

Mechanisation

Mechanisation of the root crops themselves is now receiving some thought. It has already been mentioned that a shortage of labour for harvesting is developing, whether huckster or estate worker, and it seems that if we are to continue to grow these relatively cheap food crops we shall have to mechanise their production. Planting them in pure stands (that is, not in the usual 6-monthly rotation with sugar cane on preparation land), will make mechanisation easier, and it has already been demonstrated that yams can be planted mechanically while sweet potatoes and close-planted Coconut Lisbon yams can be lifted by certain types of English potato harvesters. Trials will shortly be undertaken with a root crop harvester specially designed by The University of the West Indies for these large tubers. In preparation land there is less possibility for mechanical harvesting as the ridges are broken down by the operation—though, with the new types of cultivation required for mechanised cane production, this may be acceptable.

Miscellaneous Rootcrops

I have said litte about Cassava and the edible Aroids (Eddoes, Nut Eddoes and Tannias), because they are at present of little economic importance compared with yams and sweet potatoes. The total acreages grown are small, as indicated earlier; and again are limited by the demand. There is said to be some possibility for export of eddoes, but this has so far attracted little enthusiasm among growers. English potatoes I have mentioned as being of some importance: in 1966, the latest year for which I have figures, a total of over 4,500 tons was imported, valued at $667,000.00. A considerable amount of experimental work has been done in recent years by the Sugar Producers' Association, the Ministry of Agriculture, and The University of the West Indies, in testing cultivars and cultural methods. Some success has been achieved and a few farmers have planted commercial areas, with varying results: in a few cases high yields (8-11 tons) have been obtained, but more often yields have been disappointing. Disease problems have been severe and, with no plant pathologist working in the Island, so far remain unsolved. The cost of production using manual labour has been worked out (Table 4); mechanisation of planting and harvesting will reduce this somewhat, but the cost of imported seed is bound to remain high, and, of course, the danger of virus outbreaks make the idea of seed production in a small area like Barbados improbable in the present state of our knowledge.

Carrots, beetroots, turnips and radishes are technically root crops and can provide quite a good return per acre to a few small growers. They represent only a very small part of our food, however, and a small part of the national income, so I do not propose to consider them further.

Conclusion

We have then the situation in Barbados where locally grown rootcrops provide a substantial part of the dietary energy and about 85 per cent of the total rootcrops consumed. The ex-field or farm store price is normally low, 4-5 cents per pound, and yet contributes a substantial total revenue to growers (estimated at $2-2½ million per year), and quite reasonable returns per acre. The internal market for locally grown root crops seems to be static, and possibly is declining in the face of imported English potatoes, but new markets are being sought abroad by direct sales and by way of processed products now under development in conjunction with The University of the West Indies.

Table 1 *Yields of Yams at Different Spacings : Barbados, 1965/66 and 1966/67*

1965/66[a]

Spacing	Plants per Acre	Yield
	(number)	(pounds per acre)
2' 6" x 2' 0"	8,700	23,400
5' 0" x 2' 0"	4,360	17,300
5' 0" x 3' 0"	2,900	14,540
5' 0" x 4' $"	2,200	14,700
5' 0" x 5' 0"	1,742	12,960
5' 0" x 6' 0"	1,450	10,850

[a] Averages from five estates

1966/67[b]

Spacing	Yield	
	Coconut Lisbon	White Lisbon
	(..... pounds per acre .....)	
5' 0" x 2' 6"	11,535	14,822
5' 0" x 5' 0"	6,816	10,455
5' 6" x 2' 6"	12,157	12,485
5' 6" x 5' 0"	8,170	9,317

[b] Averages from seven estates

Table 2 *Yields of Sweet Potatoes at Different Spacings : Barbados, 1965/66 and 1966/67*

1965/66[a]

Spacing	Plants per Acre	Yield
	(number)	(pounds per acre)
2' 6" x 8"	25,000	13,300
2' 6" x 1' 4"	13,900	12,000
2' 6" x 2' 0"	8,700	10,100
2' 6" x 2' 8"	6,500	9,200
2' 6" x 3' 0"	5,300	8,000
2' 6" x 4' 0"	4,350	7,300

[a] Averages from six estates

1966/67[b]

Plants per acre	Yield
(number)	(pounds per acre)
5,226	8,670
10,452	10,560

[b] Averages from five estates

Table 3 *Cost of Production of Yams under Different Systems of Cultivation : Barbados*

	Yams planted on "Preparation Land" on banks 5' 6" apart[1]		Yams planted on banks 2' 9" apart[2]
	5' 0" spacing	2' 6" spacing	3' 0" spacing
	(.....dollars.....)		
Overheads			90
Harrowing			20
Subsoiling			3.5
Furrowing			14.5
Cost of yam plants	27	54	100
Labour for planting[3]	17	34	45
Cost of fertiliser)			
Application of fertiliser)	14	25	22.5
Weeding			5
Estimated cane loss	39	52	40
	97	165	340.5
Harvest, transport, cleaning, etc.[4]	90	120	180
Total Cost of Production	187	285	520
Revenue[5]	450	600	900
Profit	263	315	379

Notes :

1 When planting is in "preparation land", overhead costs, land preparation and weeding are essential for the cane crop and are not attracted by the food crop. (In all cases the labour costs include 6 per cent for holidays with pay.)

2 The land has been specially tilled for the food crop and carries **all** costs, except for a proportion of subsoiling and Rome harrowing which will be carried over 5 years whether the land goes into cane or not after the first year.

3 Includes digging holes, cutting, carting, loading and chopping the plants, and filling in holes after lifting the mature yams.

4 Estimated crops of saleable yams :

5'6"	x	5'0"	—	9,000	pounds per acre
5'6"	x	2'6"	—	12,000	,, ,, ,,
2'9"	x	3'0"	—	18,000	,, ,, ,,

Cost of lifting, etc. — 1 cent per pound.

5 Revenue based on selling price ex store of 5 cents per pound.

Table 4 *Cost of Production of English Potatoes : Barbados*

Operation	Cost per Acre
	(dollars)
Rome Harrowing	3.00
Discing	10.00
Ridging at 2' 6"	12.00
Cost of seed potatoes	300.00
Cutting and dipping seed potatoes	5.00
Planting	85.00
Weeding	32.00
Fertilising	60.00
Irrigation	48.00
Spraying (fungicide and pesticide)	42.00
Holidays with pay at 6% of labour cost	12.00
Plantation overheads	45.00
	654.00
Harvesting : say 16,000 pounds @ 30c. per 100 pounds	48.00
Boxes (returnable)	5.00
Total cost	707.00
Revenue : 16,000 pounds @ 8c. per pound	1,280.00
Profit :	573.00

Note :
The crop is mature in about 100 days : Rome harrowing is calculated to destroy cane stumps with the cost spread over 5 years; plantation overheads on a half year basis.