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CARIBBEAN FOOD CROPS SOCIETY

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Potato (*Solanum Tuberosum*) Variety and Cost Production Trial at Mount Wilton, Barbados

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The potaro originared in Peru and was used by the Incas. Ir was taken by Spanish explorers to Europe about 1540, where it became the major food in Ireland from 1600 ro 1845. The potato is the only vegetable among the five principal world food crops (Splirtstoesser, 1982). Most commercial potato crops belong ro the species *Solanum tuberosum*. The tuber can he considered as part of the stem adapted to food srorage and reproduction.

The potato is not commonly cultivared in mid-elevarion and lowland tropics, two regions where approximarely one-rhird of the world's popularion is concentrated. Experimental crops grown in these regions have yielded up to 30 r/ha in 90 days (Midmore, 1983). The range of maturity for genotypes thar initiare rubers under hor tropical conditions varies between 60 and 110 days (Midmore, CIP).

In Barbados, work in potato research and production began in the late 1960's and was scatrered rhrough 1977. It was limited to variety screening rrials, employing ruber seeds rather than botanical seeds as planting materials. As a result of rhe variery trials, 'Patronnes,' because of its good quality size ruber and high yielding potential, has been recommended to farmers for commercial production. Yields as high as 12 t/ha have been obtained by farmers. Francis Chandler, in 1978, obrained 15 t/ha under experimental conditions with the seeding rate of 2.5 r/ha.

However, in warm tropical lowland areas such as in Peru, where research in all possible areas has been advanced and where highly developed agronomic techniques have been employed, yields averaging 24 t/ha, planted from botanical seed, have been obtained commercially. Also at La Romana and San Rafael del Yuma in the Dominican Republic (50m) potaroes are grown commercially. They are usually planted in November and December. This could be considered to be a major breakthrough, and offers much encouragemenr to countries like Barbados which have similar climatic conditions.

Low yields and the high cosr of production, seed cost being the major factor, have halted potaro production in Barbados. There are ar present no commercial plantings. This could also have been due ro the lack of a more adaprable culrivar.

The importation of poratoes into Barbados has increased over the past five years. Table 1 shows the comparative import figures of potato, fruits and vegetables between 1980 and 1983, and the projected figure for 1984.

In December 1983, a variery trial involving ten varieties was conducted at Mount Wilron, Barbados. The main objecrives of rhis rrial were:

1. To evaluare the perfornance of rhese varieries under local climatic condirions; and
2. To carry our a cost analysis of potato production in order ro support the government's efforts in promoting non-sugar, agricultural diversification in Barbados.

TABLE 1. Potato imports classified by percent of total imports of fruits and vegetables - Barbados.

YEAR	POTATO IMPORTS $	FRUIT AND VEGETABLE IMPORTS $	%
1980	5,074.550	26,074.882	19.46
1981	5,200.166	28,546.715	18.22
1982	5,323.777	25,285.186	21.05
1983	5,627.900	22,971.479	23.31
1984	5,529.555	24,148.098	22.90

P= Projected

MATERIALS AND METHODS

The trial was located at Mount Wilron, St. Thomas, Barbados, wirh an elevation of approximately 300 m. This area is considered to be in the high rainfall area of Barbados, wirh an average around 1500mm/yr. The trial was planted December 28, 1983, and harvested 100 days larer on April 6, 1984. Rainfall during that period amounted ro 227mm. The land classified as "Red Soils of Barbados," on which the trial was carried our, was owned by Mr. Vernon Nicholls.

The varieties planred from tuber seed screened were: 'Maris Piper,' 'Desiree,' 'Kerrs Pink,' 'Penrland Crown,' 'Pentland Hawk,' 'Maris Peer,' 'Arran Banner,' 'Arran Consul,' 'Home Guard,' and 'King Edward.' This material was generously supplied by Wallace Porato (UK) Ltd., imporred from Northern Ireland, and was in satisfacrory condition when planted.

The experimenral design was a completely randomised block with three replicarions. The size of each plor was 7.5m × 4.5m. The poratoes were planted by hand, on ridges, with a spacing of 75cm between rows and 45cm within the row, at a depth of 7cm.

The land was disced, harrowed and the ferriliser 12:12:17-2 was applied at the rare of 1250 kg/ha and incorporated by furrowing. A rop dressing of urea at 125 kg/ha was broadcasr in rwo doses at around four and seven weeks after planting. The potato tuber seed was planted in two rows per bed on the furrow.

Weed Control

Gramoxone and Dacthal were applied at the rate of 2.35 kg/ha and 11.2 kg/ha respecrively, preemergence. Two hand weedings and moldings (hillings) were carried out simultaneously at week four and eight.

Pest and Disease Control

Captan was used as a seed dip before planring. Rogor, Benlare and Kocide 605 were applied every 10-15 days up ro three weeks before harvesting. In Table 6 are rhe rares and unir cosrs/ha.

TABLE 6. Potato: Cost of production at Mount Wilton (ha).

OPERATION	RATE	UNIT COST	TOTAL COSTS ($) /ha	$/ha	%
A. LAND PREPARATION					
- DISCING	1	$80/Acre	197.68		
- FURROWING	1	$60/Acre	148.26		
- HARROWING	1	$80/Acre	197.68	543.02	9.41
B. PLANTING AND PROPAGATION					
- SEED	2525Kg/ha	$0.79/Kg	1976.80		
- LABOUR	71h	$3.88/hr	273.5	2250.30	38.94
C. FERTILIZING					
- 12:12:17:2	1250Kg/ha	$0.92/Kg	1129.26		
- UREA	125Kg/ha	$0.96/Kg	118.52		
- LABOUR	2.5h	$3.88	9.59	1257.37	21.76
D. WEED CONTROL					
- GRAMOXONE	2.351t/ha	$14.98/lt	35.20		
- WEEDING & HILLING LABOUR	94h		364.72		
- DACTHAL	11.20Kg/ha	$29/Kg	324.80	724.72	12.54
E. PEST & DISEASE CONTROL					
- ROGOR	7.041t/ha	$19.2/lt	135.17		
- BENLATE	3.36Kg/ha	$62.5/lt	210.00		
- KOCIDE 605	5.261t/ha	$19.40/lt	102.04		
- CAPTAN	1.67Kg/ha	$61.50/Kg	102.48	549.69	9.51
F. HARVESTING					
- Labour	10308Kg/ha	$0.044/Kg	453.55	453.55	7.85
H. TOTAL COSTS				5779.45	
I. TOTAL MARKETABLE PRODUCTION		9215Kg/ha			
J. COST PER Kg				$0.63/Kg	
				$0.29/lb	

FIG. 1. Rainfall distribution pattern in Barbados.

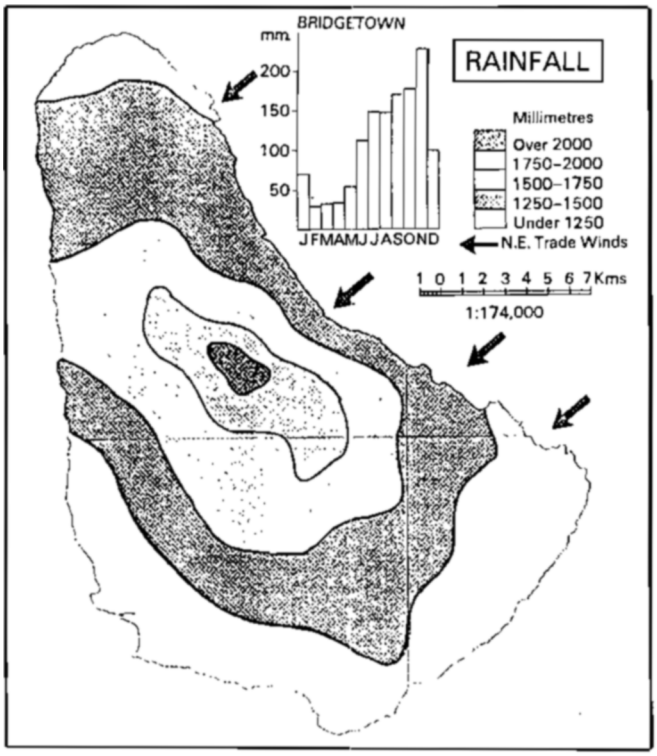
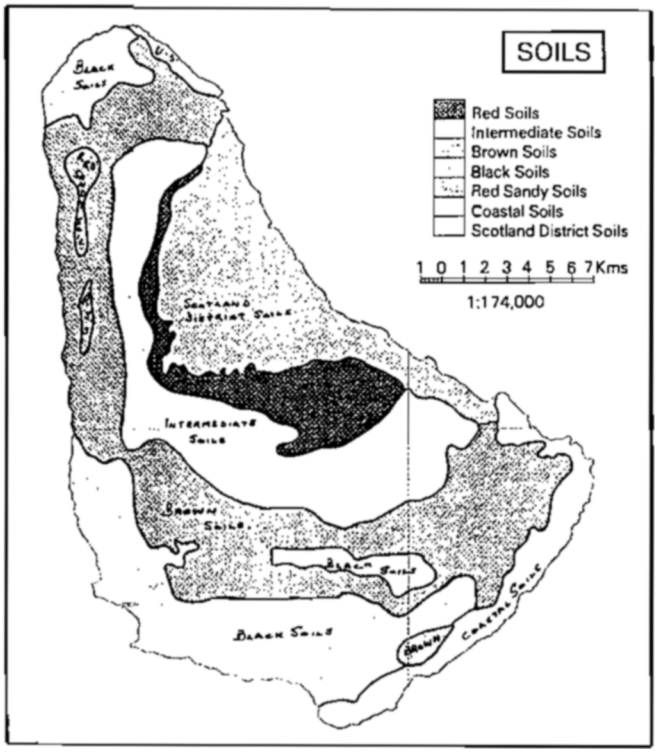


FIG. 2. Soil types in Barbados.



Harvesting and grading were done manually. The gradings used in this experiment are recorded in Appendix 1. Information on the cost of inputs was recorded during the trial.

Figure 1 refers to the rainfall distribution pattern of Barbados. Figure 2 shows the soil types in Barbados.

DISCUSSION

The original values of the experimental data are recorded in Table 2. The analysis of variance indicated no significant differences between blocks. However, significant differences between treatments were established (Table 3).

The most promising varieties resulting from the experiment were 'Maris Piper,' yielding 10,308 kg/ha and 'Desiree' yielding 7,834 kg/ha. When the Duncan Test was performed, there was, however, no significant difference between 'Desiree' and 'Maris Piper'; but they were significantly different from other varieties. (Table 4.) From the results, the group of 'promising varieties,' 'Kerrs Pink,' 'Pentland Crown,' 'Arran Banner,' 'Home Guard' and 'Maris Peer,' showed no significant differences between themselves or with 'Desiree.' The yields ranged from 6,417 kg/ha to 4,475 kg/ha. The remainder of the varieties yielded less than 3,500 kg/ha, which is considered to be uneconomical for large scale commercial production.

During the trial there were no significant levels of disease or pest infestation that could have affected the results. The rainfall was unusually low, although plantings were in the high rainfall area. Planting was delayed from November, when there is usually rain, to December which is the beginning of the dry season.

Table 5 indicates the marketable production of the trial. 'Desiree' and 'Maris Piper' showed 15.3% and 10.5% damaged tubers respectively, although yielding the highest returns per hectare. This was due to rotten tubers in the field as a result of the late harvesting operations for these varieties. Midmore, in an expetiment in Yurimaguas (180m, 5°S), obtained yields of 16.46 t/ha from the variety 'Desiree' when harvested at an earlier period of 75 days. Hence, it is assumed that a greater yield could have been obtained by the earlier harvesting of 'Desiree.'

Table 6 shows the cost of production of the experiment. All the activities carried out were recommended by the Minisrty of Agriculture. Planting and fertilising accounted for about 60% of the total cost of $5,779.45/ha. Considering the total yield of 'Matis Pipet,' 10,308 kg/ha, with marketable production of 9,215 kg/ha, the cost of production amounted to $0.63/kg, or $0.29/lb.

The Conttol of Prices (General Amendment No. 10) Regulations, 1984, states that the wholesale price of potatoes should not be greater than $0.99/kg (Appendix 2). This clearly indicates a difference of $0.36/kg between cost of production and wholesale price on which the farmer can capitalise if the cost of production remains static and the yield/ha increases. Thus, there is a good opportunity for the rapid development of the potato sector in Barbados.

CONCLUSION

From this preliminary trial it is recommended to continue investigative research on 'Maris Piper' (producing 10,308 kg/ha) and 'Desiree' (producing 7,834 kg/ha), which have appeared to be the most promising varieties tested under Barbadian conditions.

The results also indicate that the second group of varieties, 'Keers Pink,' 'Pentland Crown,' 'Arran Banner,' 'Home Guard' and 'Maris Peer,' which had significantly different yields than the first group, but showed no significant difference within the same group, should not be discarded, but could be considered for further trials.

Further experimentation on the first and second group of varieties should involve mulching, spacing, fertiliser and

TABLE 2. Potato variety trial Mount Wilton total yield (kg) experimental data (original values).

TREATMENT	Block 1	Block 2	Block 3	Means
Arran Consul	10.050	13.670	10.200	11.307
Desiree	30.160	23.770	25.390	26.440
Maris Piper	40.900	42.830	20.640	34.790
Kerrs Pink	23.030	22.630	19.320	21.660
Arran Banner	17.340	13.900	15.640	15.627
Home Guard	15.020	9.990	21.450	15.487
Pentland Cr	20.950	15.810	14.800	17.187
Maris Peer	20.430	.000	24.910	15.113
King Edward	4.860	2.520	2.290	3.223
Pentland Ha	5.670	12.510	8.680	8.953

TABLE 3. Analysis of variance, random, blocks.

SOURCE	S.S.	D.F.	M.S	F.
Blocks	53.643	2.000	26.822	.634
Treatments	2166.116	9.000	240.680	5.692*
Exp. Error	761.173	18.000	42.287	
TOTAL	2980.932	29.000		

*Significantly different

TABLE 4. Duncan test: Potato variety trials at Mount Wilton.

		Kg/ha
1.	MARIS PIPER	10308
2.	DESIREE	7834
3.	KERRS PINK	6417
4.	PENTLAND CROWN	5092
5.	ARRAN BANNER	4630
6.	HOME GUARD	4588
7.	MARIS PEER	4475
8.	ARRAN CONSUL	3350
9.	PENTLAND HAWK	2653
10.	KING EDWARD	955

TABLE 5. Potato marketable production with Grade A and B damaged in percentage

VARIETY	% GRADE A	% GRADE B	% DAMAGED
Arran Consul	60.40	33.30	6.30
Desiree	71.50	13.20	15.30
Maris Piper	54.20	35.20	10.60
Kerrs Pink	60.70	29.60	9.70
Arran Banner	59.80	27.90	12.20
Home Guard	67.50	24.10	8.40
Pentland Crown	66.60	25.50	7.90
Maris Peer	54.00	31.20	14.80
King Edward	10.70	83.40	5.90
Pentland Hawk	51.30	38.50	10.20

moisture requirement trials, together with the continued screening of the second 'promising group' of varieties.

The production cost per hectare amounted to $5,779.00. Considering the highest yield ('Maris Piper'), the cost of production per kg was calculated to be $0.63/kg or $0.29/lb. With the new governmenr regulated prices, it is hoped that farmers will find potato growing a viable economic venture, provided that production costs remain at rhe same rate and yields are increased.

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APPENDIX 1. Methodology used for grading potatoes at Mount Wilton Trial.

Methodology used for Grading Potatoes at Mount Wilton Trial.

GRADE A:	Healthy tubers greater than 30 grams, Uniform in shape Non-sprouting
GRADE B:	Healthy tubers Small tubers between 15 and 30 grams.
GRADE C:	Damaged, rotting and less than 15 grams NO COMMERCIAL USE .

APPENDIX 2.

GOVERNMENT NOTICE

Attention is drawn to the Control of Prices (General) (Amendment) (No. 10) Regulations, 1984 made by the Minister on the 2nd day of October, 1984 and published as a supplement to the Official Gazette of Thursday 4th October, 1984. S.I. 1984 No.

The Miscellaneous Controls Act

Cap. 329

THE CONTROL OF PRICES (GENERAL) (AMENDMENT) (NO. 10) REGULATIONS, 1984

The minister in exercise of the powers conferred on him by section 3 of the Miscellaneous Controls Act, makes the following regulations:

1. These regulations may be cited as the Control of Prices (General) (Amendment) (No. 10) Regulations 1984.

2. The Schedule to the Control of Prices (General) Regulations, 1983 is amended.

S.I. 1983
No. 29

(a) by deleting the Article "POTATOES (not sweet)" and all the words appearing opposite thereto in the columns marked, "WHOLESALE PRICE" and "RETAIL PRICE" and substituting the Article set out in PART I of the Schedule to these regulations together with the WHOLESALE and RETAIL PRICES set out in respect of that Article;

(b) by deleting the Article "CORNMEAL" and all the words appearing opposite thereto in the columns marked "WHOLESALE PRICE" and "RETAIL PRICE" and substituting the Article set out in PART II of the Schedule to these regulations together with the WHOLESALE AND RETAIL PRICES set out in respect of that Article;

(c) by deleting the Article "FISH-SALTED" and all the words appearing opposite thereto in the columns marked "WHOLESALE PRICE" and "RETAIL PRICE" and substituting the Article set out in PART III of the Schedule to these regulations together with the WHOLESALE and RETAIL PRICES set out in respect of that Article; and

(d) by deleting the Article "POULTRY" and all the words appearing opposite thereto in the columns marked "WHOLESALE PRICE" and "RETAIL PRICE" and substituting the Article set out in PART IV of the Schedule to these regulations together with the WHOLESALE and RETAIL PRICES set out in respect of that Article.

SCHEDULE

PART I

(Regulation 2)

ARTICLE	WHOLESALE PRICE (not greater than)	RETAIL PRICE (not greater than)
Potatoes (not sweet)	$0.99 per kg $0.45 per lb.	$1.23 per kg $0.56 per lb.