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FERTILIZER TRIALS ON SELECTED ROOT CROPS IN ST. VINCENT

Catherine M. ORBAN+ and Walter MATADIAL*

+ Research Associate,
Small Islands Research Group
University of Calgary,
Alberta, Canada

* Contry Officer
CARDATS
St. Vincent

ABSTRACT

Fertilizer trials were conducted on four different root crops ; (two spices, turmeric and ginger, and two food crops, eddoes and sweet potatoes) in a variety of agro-climatic ecozones and soil types in St. Vincent. A single crop was planted in each of the 20"x20' crop demonstration plots, which were divided into four 10"x10' sub-plots. The sub-plots were treated with the following N:P:K dressings : 18:18:5, 16:18:24, and 16:8:24. The fourth sub-plot received no fertilizer. In each demonstration plot, a pre-planting composite soil sample was tested for pH and the following nutrients : nitrogen, phosphorus, potassium, calcium, and magnesium. Post-harvest soil samples were taken from each separate sub-plot, and underwent the same testing procedures as the composite samples. Results indicated that one of the fertilizer blends consistently produced the greatest yields for any single crop or soil type. However, the sub-plot with no fertilizer produced the poorest yields in most cases. The second round of fertilizer trials is due to begin in May, 1989, and will include the same root crops and fertilizer blends on a greater variety of demonstration plots.

RESUME

ESSAIS DE FERTILISATION SUR DES CULTURES DE TUBERCULES
SELECTIONNES A SAINT VINCENT

Des essais de fertilisation ont été conduits sur quatre cultures de tubercules

différents (deux épices, safran des Indes et gingembre, et deux cultures vivrières «madère» et patate douce), dans diverses zones agro-climatiques et sur divers types de sols de Saint Vincent. Chaque plante a été implantée sur une parcelle de démonstration de 20 x 20 pieds, elle-même subdivisée en quatre sous-parcelles de 10 x 10 pieds. Les sous-parcelles ont reçu les traitements N,P,K suivants : 18:18:5, 16:18:24, et 16:8:24. La quatrième sous-parcelle n'a pas reçu de fertilisation. Dans chaque parcelle de démonstration, un échantillon moyen de sol a été prélevé avant plantation pour analyser le pH et les éléments nutritifs suivants : azote, phosphore, potassium, calcium et magnésium. Des échantillons de sols ont été prélevés dans les différentes sous-parcelles, et ont subi les mêmes analyses que les échantillons moyens. Les résultats indiquent qu'aucun des traitements fertilisants ne permet d'aboutir à un rendement significativement plus élevé, quelle que soit la plante ou le type de sol. Cependant, la sous-parcelle non fertilisée fournit le rendement le plus faible dans beaucoup de cas. La seconde campagne d'essais de fertilisation doit commencer en mai 1989, et doit concerner les mêmes plantes et les mêmes traitements de fertilisation, sur une plus grande variété de parcelles de démonstration.

I- INTRODUCTION

In recent years, there has been increased emphasis on both intensification and diversification in the agricultural sector of St. Vincent and the Grenadines. Because arable land is limited in this small island nation, farmers are under increasing pressure to make their small plots of land more consistently productive. According to an agricultural study completed by CARDI in 1981, small farmers (those with farms of less than 2 hectares) accounted for 87 % of the farms, and 24 % of the area farmed in St. Vincent. (CARDI, 1981). In April, 1988, the University of Calgary, Small Island Research Group (U of C, SIRG), and St. Vincent's Organisation for Rural Development (ORD) launched a 3-year Agronomy Training Program, (ATP) sponsored by the Canadian International Development Agency, (CIDA). The primary objective of this joint project is to help small farmers more effectively monitor their farm management practices, and therefore increase small farm efficiency. Ten of ORD's field workers each identified five ORD farmers to participate as «model farmers» in the ATP. A key component of the ATP has been the establishment of Crop Demonstration Plots (CDPs) throughout the island.

The primary objective in the design and implementation of the CDPs is to assess and demonstrate agronomic practices through the use of small, carefully controlled plots that utilize and exemplify technology appropriate in the local context. As the program progresses, agronomic practices associated

with the plots will be varied according to farmer needs and requests, as well as experimental objectives.

A secondary objective is to determine, through an appropriate, participatory and highly visible system of agricultural research, which growing conditions are most suitable for given crops in given locations. Farmers in St. Vincent are faced with steep, rugged terrain, a variety of micro-climates and soil types, (Watson et al, 1958) and a limited selection of fertilizer blends and types. This research is intended to help these farmers determine the most productive combinations of the above factors in their respective locations. This objective may be extended to include test studies to determine the potential for new crops considered for introduction in given areas in St. Vincent and the Grenadines.

The first round of fertilizer trials in the CDPs was a pilot study that has produced results ; both in terms of raw data, based on the different fertilizer blends, and also administrative information that will be used to modify management criteria for the CDPs in succeeding rounds. Future CDPs may be designed to test other agricultural practices such as plant spacing, land preparation and weed control.

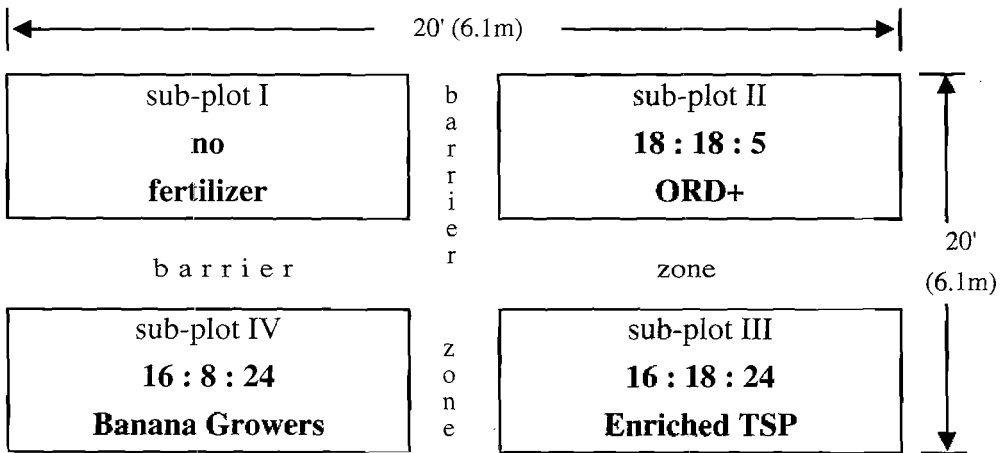
II - MATERIALS AND METHODS

CDPs were established at seven sites throughout St. Vincent in June and July, 1988. The sites included a variety of soil types (Watson et al, 1958) and agro-climatic ecozones (CARDI, n.d.). Each of the CDPs was set up on farmers' holdings currently under cultivation. (See Table 1). At each site, one to four CDPs was established, depending on which of the four crops designated for demonstration (turmeric, eddoes, ginger and/or sweet potatoes) were to be studied at that site. A central maintenance team was designated to work under the direct supervision of program coordinators in order to ensure that each of the CDPs was maintained in a standardized manner.

General site descriptions; including location, agro-climatic ecozone, average annual rainfall, and soil type for the Round # 1 CDPs may be found in Table 1.

Each of the 20' x 20' (6.1 m x 6.1 m) CDPs had nine evenly spaced rows, and was divided into 4 equal quarters, measuring 10" x 10" (3.05 m x 3.05m), each having 4 rows. (The fifth row was a barrier between the sub-plots). The quarters contained sub-plots, approximately 9" x 9' (2.75 m x 2.75 m) that were separated from adjacent sub-plots, within the same CDPs, by barrier zones which received no fertilizer. (See Figure # 1 -). Calculations for each

Figure #1 : Crop demonstration plots layout and fertilizers*



* all fertilizer blends are N : P : K.

+ Fertilizer sources are indicated after blends

Table # 1 : Crop demonstration plots - site information

Farmer & Area	Map Reference	Agroclimatic Ecozone ≠	Annual PPTN+	Soil type	Site # & Crop
A. Mackie Georgetown	13°17'00"N 61°07'15"W	IVa	<85"	Soufrière Cindery Gravelly Loamy Sand	1a. Eddoes b Turmeric
W. Young Langely Park	13°17'30"N 61°07'50"W	IVa	<85"	Soufrière Cindery Gravelly Sandy Loam	2a Sweet Potatoes
T. Campbell Mt. Bentick	13°17'30"N 61°08'10"W	IVa	<85"	Soufrière Cindery Gravelly Sandy Loam	3a. Ginger
S. Young Brighton	13°07'50"N 61°10'40"W	I	<85"	Chaffleur Clay Loam &Clay	4a. Eddoes
Marriaqua Secondary School Marriaqua	13°10'40"N 61°10'20"W	III	85" - 100"	Montreal Clay Loam &Clay	5a. Eddoes b Turmeric c. Ginger d. Sweet Potatoes
O. Trimminghar Argyle	13°10'15"N 61°09'00"W	II	75" 85"	Akers Sandy Loam	6a. Eddoes b. Turmeric c. Ginger d. Sweet Potatoes
J. Clarke Pembroke	13°11'30"N 61°15'30"W	V	<85"	York Sandy Loam & Sandy Clay Loam	7. Eddoes b Turmeric c. Ginger d. Sweet Potatoes

* See Appendix I - Classification of Agro-climatic Ecozones of St Vincent (CARDI, n.d)

+ pptn = precipitation

sub-plot were based on sub-plot areas of 80 ft² (7.45 m²), while calculations for the total CDP areas were based on 320 ft² (29.7 m²).

The CDPs were situated on level to nearly level plots of land in order to avoid complications arising from hillslope erosion and leaching of fertilizers and other nutrients. When the area surrounding the CDP was level to nearly level, the farmers were asked to create a buffer zone by not using any fertilizers or other chemicals within five feet of the CDP. When the surrounding lands were sloped, the buffer zone was extended to ten feet.

Eddoes, ginger, sweet potatoes and turmeric were chosen as demonstration crops for the following reasons : # 1. They are all root crops, which makes it easier to design a common plot size and land preparation system. # 2. Each of these crops is being produced currently in commercial quantities in St. Vincent and any information obtained will be useful immediately. #3. Each of these crops has been produced successfully in St. Vincent ; thus there is already a knowledge of basic production practices.

Planting materials were selected from a common source. The materials then were prepared and planted using standardized procedures. Furrows and ridges (spaced at approximately 24") were prepared using cutlasses and hoes. The first fertilizer dressings were applied at planting ; the eddoes, turmeric and ginger received their second dressings at their second weedings, 8-10 weeks after planting. (Table 2).

At each CDP composite soil samples were taken at planting. They were tested for pH and the following nutrients : nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, phosphorus, potassium, calcium, and magnesium. Post-harvest soil samples were taken from each sub-plot within each CDP, during or shortly after harvest. (Due to time constraints brought on by the timing of the CDP harvests, the results of the post-harvest soil tests were not available in time to be included in this paper). During growth, the CDPs were monitored once every 1-2 weeks. Weeding and other maintenance was performed as needed, but growth and performance were not measured.

The CDPs were harvested using forks, cutlasses and shovels. Produce was allowed to dry for up to one week, then cleaned, sorted and weighed. The results for each sub-plot were recorded separately. (Table 3).

TABLE# 2 -CROP DEMONSTRATION PLOTS FERTILIZER APPLICATIONS*

SITE#	CROP	APPLICATION	APPLICATION PATTERN
		DATE (S)	
1a.	Eddoes	1. 88-07-20 2. 88-10-05	semi-circle around each plant
1b	Turmeric	1. 88-07-20 2. 88-09-13	continuous narrow trench on ridges behind rows of plants
2a	Sweet Potatoes	1. 88-07-20	semi-circle around each plant
3a	Ginger	1. 88-07-22 2. 88-10-29	semi-circle around each plant
4a	Eddoes	1. 88-07-18 2. 8-10-14	semi-circle around each plant
5a	Eddoes	1. 88-07-18 2. 88-10-22	semi-circle around each plant
5b	Turmeric	1. 88-07-06 2. 88-10-22	continuous narrow trench on ridges behind rows of plants
5c	Ginger+	1. 88-07-15	semi-circle around each plant
5d	Sweet Potatoes	1. 88-07-15	semi-circle around each plant
6a	Eddoes	1. 88-07-06 2. 88-09-19	semi-circle around each plant
6b	Turmeric	1. 88-07-07 2. 88-09-21	continuous narrow trench on ridges behind rows of plants
6c	Ginger	1. 88-07-07 2. 88-09-21	semi-circle around each plant
6d	Sweet Potatoes	1. 88-07-11	semi-circle around each plant
7a	Eddoes	1. 88-07-18 2.88-10-10	semi-circle around each plant
7b	Turmeric	1. 88-07-18 2.88-10-10	continuous narrow trench on ridges behind rows of plants
7c	Ginger+	1. 88-07-18	semi-circle around each plant
7d	Sweet Potatoes	1. 88-07-18	semi-circle around each plant

* - All fertilizer was placed in shallow, v-shaped grooves then covered with soil.

- All fertilizers used were N:P:K (N:P2O5:K2O)

- In each CDP, the following N:P:K blends were applied : sub-plot I no fertilizer

II 18:18:5 (obtained from ORD)

III 16:18:24 (combined specifically for the ATP using 16:8:24+2Mgo and TSP ratio 1:5 [20lb TSP -to -100lb 16:8:24])

IV 16:8:24+2Mgo (obtained from the Banana Growers' Association)

- In each sub plot that reached maturity, a total of 32 oz (907g) of fertilizer was applied. This application amount is based upo approximately 1000 lb/acre (1125 kg/ha).

+ These CDPs were abandoned for various reasons (sec VI - Results) before they received their second fertilizer dressings.

III RESULTS

Originally, 17 CDPs were established. Six of them had to be abandoned prior to harvest for the following reasons :

2 CDPs abandoned due to animal destruction.

2 CDPs abandoned due to erosion.

2 CDPs abandoned due to overgrowth of weeds while the plants were still young

Total :6 CDPs abandoned during growth of crops.

The remaining 11 CDPs : four turmeric, four eddoes, two sweet potatoes and one ginger plot were harvested. One of the sweet potato plots (Site # 5d) was the target of praedial larceny. Although the remaining sweet potatoes were harvested, the results from this plot are necessarily inconclusive. In order to prevent similar episodes of praedial larceny, eddoes from the adjacent CDP (Site # 5a) were harvested approximately 2 weeks before they were anticipated to be mature. As a result of these and similar problems, a number of modifications have been planned for the second cropping season, beginning in May, 1989 :

1. Monitoring schedules will include more frequent site inspections by project coordinators and field workers.
2. More information will be posted at the sites in an effort to create public awareness of the tests, and help deter thieves and vandals.
3. Stricter animal control measures will be taken, including fencing as needed.
4. A central maintenance team has been designated to help with weeding, harvesting and maintenance of the CDPs on a regular basis.

Results for the 11 plots that reached maturity during CDP Round # 1 can be found in Table 3.

The best overall yield was produced at Georgetown, site # 1a, with young, very coarse-textured soil, and relatively low rainfall. This particular plot was sheltered from sea spray, but had no shade, and some exposure to the wind.

Eddoe production at Brighton, site # 4a, placed a close second. Again, rainfall is relatively low, and while the plot is sheltered from sea spray, it is exposed to the sun and some wind. Unlike the best plot, # 4a has fine textured soil.

The third best site of eddoo production was Argyle, a very dry hilltop location, site # 6a, close to the sea on the windward side. Although this CDP was

TABLE# 3- CROP DEMONSTRATION PLOTS HARVEST INFORMATION

A) EDDOES

1. CDP Site Production

Rank	Farmer, site# Area, Agro-climatic Zone av. Rainfall, soil, Crop Age	Total Weight:	
		per CDP	per ac per ha
1	Angella Mackie, # 1a Georgetown, A/C Zone IV, <85" Soufrière Cindery Gravelly Gravelly Loamy Sand, 6.5 mos	80,8 lb 36,7kg	10,997 lb 12,372 kg
2	Samuel Young, #4a Brighton, A/C Zone I, <85" Chaffleur Clay Loam & Clay, 6 mos	77.2 lb 35.0 kg	10,507 lb 11,820 kg
3	Owen Trimmingham, #6a Argyle, A/C Zone II, 75"-85" Akers Sandy Loam 6 mos	63.9 lb 29.0 kg	8,697 lb 9,784 kg
4	Marriaqua SecondarySchool #5a Marriaqua, A/C Zone III, 85"-100" Montreal Clay Loam & Clay, 5 mos	45.6 lb 20.7 kg	6,206 lb 6,982 kg

*Spacing for eddoes : 24" x 24" (61 cm x 61cm)

Plant Population for eddoes : 13,613/acre (33,624/ha)

TABLE #3 (cont'd A)**2. CDP Sub-Plot production**

+ Rank	farmer - Area - Site # Sub-Plot & Fertilizer (NPK)	Sub-plots Weight *			
		1b	kg	1b / ac	kg / ha
	A. Mackie - Georgetown -# 1a				
9	I - no fertilizer (4)~	15,5	7	8,44	9,495
4	II - 18:18:5 (2)	21,5	9,8	11,707	13,171
5	III - 16:18:24 (3)	20	9,1	10,89	12,252
2	IV - 16:8:24 (1)	23,8	10,8	12,959	14,579
	S. Young - Brighton -# 4a				
12	I - no fertilizer (4)	13,4	6,1	7,296	8,208
3	II - 18:18:5 (1)	23,6	10,7	12,85	14,457
6	III - 16:18:24 (3)	18,7	8,5	10,182	11,455
4	IV - 16:8:24 (2)	21,5	9,8	11,707	13,171
	O. Trimminghan -Argyle -#6a				
15	I - no fertilizer (4)	5,8	2,6	3,158	3,553
1	II - 18:18:5 (1)	26,4	12	14,375	16,172
10	III - 16:18:24 (3)	14,7	6,7	8,004	9,005
7	IV - 16:8:24 (2)	17	7,7	9,257	10,414
	M'qua School - M'qua - # 5a				
14	I - no fertilizer (4)	6,4	2,9	3,485	3,921
13	II - 18 : 18 : 5 (3)	9,3	4,2	5,064	5,697
11	III - 16 : 18 : 24 (2)	13,7	6,2	7,46	8,393
8	IV - 16 : 8 : 24 (1)	16,2	7,3	8,821	9,924

* Spacing for eddoes : 24" x 24" (61 cm x 61 cm)

Plant Population for eddoes : 13,613/acre (33,624/ha)

+ Rank among all CDP sub-plots of eddoes

~ Rank within each CDP

TABLE# 3- (cont'd) - CDPs - HARVEST INFORMATION

B) TURMERIC*

1. CDP Site Production

Rank	Farmer, site# Area, Agro-climatic Zone av. Rainfall, soil, Crop Age	Total Weight:	
		per CDP	per ac per ha
1	Marriaqua Secondary School, # 5b #5B Marriaqua, A/C Zone III, 85"-100" Montreal Clay Loam & Clay, 10 mos	207,5 lb 94,1 kg	28,241 lb 31,771 kg
2	JAMES CLARKE, # 7b Pembroke, A/C Zone V, <85" York Sandy Loam & Sandy clay Loam, 10 mos	96,5 lb 43,8 kg	13,134 lb 14,776 kg
3	Angella Mackie, # 1b Georgetown, A/C Zone IVa, <85" Soufrière Cindery Gravelly Loamy Sand, 10 mos	58,5 lb 26,5 kg	7,962 lb 8,957 kg
4	Owen Trimmingham, #6b Argyle, A/C Zone II, 75"-85" Akers Sandy Loam 10.5 mos	35,0 lb 15,9 kg	4,764 lb 5,359 kg

*Spacing for turmeric : 9" x 24" (23 cm x 61cm)

Plant Population for turmeric : 28,314/acre (69,396/ha)

TABLE # 3 (cont'd B)**2. CDP Sub-Plot production**

+ Rank	farmer - Area - Site # Sub-Plot & Fertilizer (NPK)	Sub-plots Weight *			
		1b	kg	1b / ac	kg / ha
	M'qua School - M'qua - # 5b				
4	I - no fertilizer (4)~	32,5	14,7	17,696	19,909
1	II - 18 : 18 : 5 (1)	70	31,8	38,115	42,879
2	III - 16 : 18 : 24 (2)	64	29	34,848	39,204
3	IV - 16 : 8 : 24 (3)	41	18,6	22,325	25,115
	J. Clarke - Pembroke - #7b				
8	I - no fertilizer (4)	17,5	7,9	9,529	10,72
5	II - 18:18:5 (1)	30,5	13,8	16,607	18,683
6	III - 16:18:24 (2)	25	11,3	13,613	15,315
7	IV - 16:8:24 (3)	23,5	10,7	12,796	14,396
	A. Mackie - Georgetown - # 1b				
11	I - no fertilizer (3)	12	5,4	6,534	7,351
10	II - 18:18:5 (2)	15	6,8	8,168	9,189
9	III - 16:18:24 (1)	16,5	7,5	8,985	10,009
10	IV - 16:8:24 (2)	15	6,8	8,169	9,189
	O. Trimminghan -Argyle -#6b				
12	I - no fertilizer (1)	11	5	3,485	6,739
15	II - 18:18:5 (4)	6,5	3	5,064	3,982
14	III - 16:18:24 (3)	8,5	3,9	7,46	5,207
13	IV - 16:8:24 (2)	9	4,1	8,821	5,514

* Spacing for turmeric : 9" x 24" (23 cm x 61 cm)

Plant Population for turmeric : 28,314/acre (69,936/ha)

+ Rank among all CDP sub-plots of turmeric

~ Rank within each CDP

TABLE# 3- (cont'd) - CDPS - HARVEST INFORMATION

C) SWEET POTATOES*

1. CDP Site Production

Rank	Farmer, site# Area, Agro-climatic Zone av. Rainfall, soil, Crop Age	Total Weight:	
		per CDP	per ac per ha
1	Welford Young, #2a Langley Park, A/C Zone IVa, <85" Soufrière Cindery Gravelly Gravelly Loamy Sand, 5 mos	41,2 lb	5,607 lb
		18,7 kg	6,308 kg
2	Marriaqua Secondary School #5a Marriaqua, A/C Zone III, 85"-100" Montreal Clay Loam & Clay, 5 mos	15,8 LB	2,150 LB
		7,2 KG	2,419 KG

*Spacing for sweet potatoes : 24" x 24" (61 cm x 61cm)

Plant Population for sweet potatoes : 13,613/acre (33,624/ha)

2. CDP Sub-Plot production

+ Rank	farmer - Area - Site # Sub-Plot & Fertilizer (NPK)	Sub-plot Weight *			
		lb	kg	lb / ac	kg / ha
	W. Young - L'ley Park - #2a				
1	I - no fertilizer (1)~	11,8	5,4	6,425	7,228
1	II - 18:18:5 (1)	11,8	5,4	6,425	7,228
2	III - 16:18:24 (2)	11,1	5	6,044	6,799
4	IV - 16:8:24 (3)	6,5	2,9	3,539	3,982
	M'qua School - M'qua - # 5a				
6	I - no fertilizer (4)	0,7	0,3	381	429
4	II - 18 : 18 : 5 (2)	6,5	2,9	3,539	3,982
3	III - 16 : 18 : 24 (1)	6,6	3	3,594	4,043
5	IV - 16 : 8 : 24 (3)	2	0,9	1,089	1,225

* Spacing for sweet potatoes : 24" x 24" (61 cm x 61 cm)

Plant Population for sweet potatoes : 13,613/acre (33,624/ha)

+ Rank among all CDP sub-plots of sweet potatoes

~ Rank within each CDP

TABLE# 3- (cont'd) - CDPS - HARVEST INFORMATION

D) GINGER*

1. CDP Site Production

Rank	Farmer, site# Area, Agro-climatic Zone av. Rainfall, soil, Crop Age	Total Weight:	
		per CDP	per ac per ha
n/a	Tom Campbell, #3a Mt. Bentick, A/C Zone IVa, <85" Soufrière Cindery Gravelly Sandy Loam, 9 mos	42,1 lb 19,1 kg	5,730 lb 6,446 kg

2. CDP Sub-Plot production

+ Rank	farmer - Area - Site # Sub-Plot & Fertilizer (NPK)	Sub-plot Weight *			
		lb	kg	lb / ac	kg / ha
	T. Campbell- Mt. Bentick				
4	I - no fertilzer (4)~	5,3	2,4	2,886	3,247
2	II - 18 : 18 : 5 (2)	13,2	6	7,187	8,086
1	III - 16 : 18 : 24 (1)	13,6	6,2	7,405	8,331
3	IV - 16 : 8 : 24 (3)	10	4,5	5,445	6,126

* Spacing for ginger : 12" x 24" (30 cm x 61 cm)

Plant Population for ginger : 21,780/acre (53,797/ha)

+ Rank among all CDP sub-plots of ginger - (n/a)

~ Rank within each CDP

subjected to sea spray, sun and constant winds, a reasonably good crop of eddoes was grown. This success likely is due, at least in part, to the loamy textured soil.

The lowest overall yield of eddoes came from the interior of St. Vincent, the Marriaqua valley, site # 5a. This CDP was exposed to wind and sun and situated on fairly old, fine-textured soils in an area of relatively high rainfall.

The greatest single sub-plot yield of eddoes was produced on the 18:18:5 quadrant of the (3rd place overall) site # 6a at Argyle, with dry, windy conditions and loamy soil. The best sub-plot results on sites # 1a (coarse soil, low rainfall) and # 5a (fine soil, high rainfall) were found with the banana growers' fertilizer, 16:8:24. Other high yields for single sub-plots were distributed throughout the CDPs.

Overall, site # 5a, Marriaqua was the poorest site of eddoe production. Here, sub-plots fertilized with 18:18:5 and 16:8:24 produced yields less than, or close to, sub-plots that received no fertilizer at sites # 1a and # 4a. However, it must be noted that the eddoes at Marriaqua were harvested before they were fully mature in order to prevent praedial larceny.

The best overall yield, by a substantial margin, was produced at Marriaqua, site #5b, with fairly old, fine textured soil, and relatively high rainfall. This particular plot was at an inland location, sheltered from the wind, with plenty of shade. It is important to note that grub activity was observed only at this particular turmeric CDP.

Far behind, in second place for turmeric, was site #7b at Pembroke. This CDP was situated on fine-textured alluvial soil, in a low rainfall area with no shade. Sea spray and wind may have had a small effect on this site.

Site #1b at Georgetown produced the third best crop of turmeric. The CDP was protected from sea spray and wind, but was not shaded, and has relatively low rainfall. The coarse-textured soil was expected to produce better results, but weeds were a factor throughout the growth and development of this crop, and the turmeric appeared to be over-mature at the time of harvest.

Site #6b at Argyle produced, by far, the poorest yield of turmeric - about one-sixth of that produced at Marriaqua. Constant exposure to wind, sea spray and sun, combined with low rainfall led to exceptionally dry soil conditions. Although the loamy soil produced reasonably good quality eddoes (site #6a), there did not seem to be enough moisture

for the turmeric ; many fingers had shrivelled in the ground. As well, this turmeric was over-mature when it was harvested.

The highest yield for a single sub-plot of turmeric was found at site #5b, Marriaqua, with 18:18:5 fertilizer, with high rainfall, and relatively old, fine-textured soil. This NPK mixture produced the greatest yields at sites #7b (Pembroke), with low rainfall and fine-textured soil, and at #1b (Georgetown), with low rainfall and coarse-textured soil. At the fourth site, #6b (Argyle), where the lowest overall yield of turmeric was found, the quadrant with no fertilizer produced the highest yield, while the 18:18:5 blend, which was so productive at the other sites, produced the lowest yield.

While environmental conditions appear to be best suited for turmeric at Marriaqua, 18:18:5 (NPK) seems to be the most effective fertilizer, regardless of site (with the exception of Argyle, which produced yields so low, that they may eventually be proven anomalous as further rounds are completed).

Unlike the eddoes, where high yields for single sub-plots were distributed throughout the CDPs, high yields for single sub-plots of eddoes were only found in those CDPs that had good results overall, ie. the top 4 results were from the 4 sub-plots at site #5b, the first overall site. Results #5,6,7 & 8 came from site #7b, the second place overall site. Results #9, 10, 11, & 12 came from #1b, the third place turmeric CDP, and the last four results came from #6b, Argyle, with the poorest overall record. This pattern may indicate that turmeric is a crop that requires a very specific set of environmental circumstances to grow in St. Vincent. However, while evidence from four different site types is not sufficient to draw any firm conclusions, it is enough to suggest that further CDP trials with turmeric in St. Vincent should be designed to determine whether or not turmeric is such a site-specific crop.

Although the results in Table #3 show that site #2a at Langley Park clearly produced a higher yield of sweet potatoes than site #5d at Marriaqua, the figures are not entirely accurate. Site #5d was the victim of praedial larceny, and unfortunately, the thieves' efforts were not distributed evenly throughout the CDP. Perhaps the only reliable information that may be derived from the results for site #5d is that the sweet potatoes were of sufficient size and quality to be attractive to thieves and rats.

Two sub-plots at site #2a, Langley Park tied for first place in sweet potato production. It is interesting to note that one of those sub-plots received no fertilizer, while the other was treated with 18:18:5. Enriched TSP, 16:18:24 placed a close second, while the blend, 16:8:24 produced very distant last place results.

This CDP, at Langley Park, is located in a low rainfall area, and is not shaded, or sheltered from the wind, although it apparently was not affected by sea spray. The soil is young, very coarse-textured, and especially shallow at this site. Leaching, exacerbated by thin, gravelly soil may have caused the fertilizers virtually to be ineffective ; but further research is needed to explore this hypothesis.

Unfortunately, only one of the original four ginger CDPs was harvested, so comparisons between areas cannot be made. However, the results for Mt. Bentick, site #3a will provide a basis for further studies of ginger CDPs.

Enriched TSP, 16:18:24 produced the greatest yield of ginger, at Mt. Bentick, which is fairly close to site #1b, (turmeric, Georgetown), where 16:18:24 also produced the greatest subplot yield of turmeric. (The Georgetown site was the only location where 16:18:24 produced the best sub-plot results for turmeric). Again, at both sites, the 18:18:5 dressing, another phosphorus-rich fertilizer, produced the second best yields. Both sites have young, very coarse-textured soils, no shade, relatively low rainfall, with little or no sea spray. These results may indicate that ginger and turmeric both need heavy dressings of phosphorous in areas with gravelly soils. This hypothesis will be addressed in the second cropping season of the CDPs.

IV- DISCUSSION

As expected, it was found that none of the fertilizer blends proved to be the best dressing for any crop over a variety of environmental conditions. This finding reinforces the point made in the introduction ; that the variety in soil types, and agro-climatic conditions make it very difficult to extrapolate agricultural test results from one area of the island to another. A need for highly localized CDPs has been demonstrated clearly in the results of this pilot study. In the second cropping season, beginning May, 1989, there will be an increase in the total number and variety of CDPs. One important development will be the addition of hillside CDPs in those areas where most of the farmland is not flat. The sub-plot configuration will be designed to ensure that all sub-plots are subjected to the same set of hillside effects.

A tight schedule for completion of this paper was imposed by the timing of the turmeric harvest, and the deadline for papers to be presented at the 25th Annual General Meeting of the Caribbean Food Crop Society (Guadeloupe, July 2-8, 1989). Unfortunately, this schedule did not allow for time to : 1. Complete post-harvest soil test results. 2. Complete statistical analyses of the data and test results. Therefore, the results of this pilot study have been

Appendix I : Summary of agro-climatic ecozones in St. Vincent*

Ecozone	Annual rainfall	No. of dry months	Altitude (Ft Asl)	Soil type	Examples
I	<85"	2 - 3	<300'	Shoals	Brighton Buccament Campden Park Layou
II	75" - 85"	2 - 3	300' - 600'	Low Level Yellow Earths	Chateau-belair Belleisle Biadou Argyle
III	85" - 100"	1	>600'	High Level Yellow Earths	Dumbarton Rose Hall Marriaqua Greggs
IVa	<85"	3 - 6	<600'	Recent Volcanic Ash	Langley Park Georgetown Mt Bentick Fancy
IVb	85" - 100"	1	>600'	Recent Volcanic Ash	Richmond Vale Locust Valley
V	<85"	2 - 4	<200'	Alluvium	Diamond Pembroke Clare Valley
VI	>100"	nil	>1,000'	High Level Yellow Earths	Montreal Dalaway Soufriere

Source : CARDI, St. Vincent ; n.d., n.p.

presented in raw form with simple, descriptive interpretations. A complete series of soil tests and statistical analyses have been included in the design for the second cropping season of the CDPs.

Farmers already have begun to make use of the results from the first cropping season of the CDPs. Although few farmers had access to exact figures and harvest results, information obtained by looking at the growth patterns in the CDP sub-plots have helped some farmers to make decisions for planting and fertilizing their crops in the upcoming planting season. A number of farmers have contacted project coordinators and field workers, expressing interest in having CDPs located on their plots in the second cropping season. Some of them want to try different fertilizers on crops they traditionally have grown, while others are eager to try crops with which they have little or no previous experience. The ultimate objective is to provide a training ground for farmers and field workers to learn how to design and manage demonstration plots suited to their individual needs.

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