Collection, Selection and Agronomic Studies On Edible Yams *(Dioscorea* Spp) in Cameroon*

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Abstract

This study, initiated to guide farmers, resulted in a local collection of 114 'types' within nine yam species from which, using the classification characters of Lawton (1967) for species and Martin (1973) for cultivars, 68 cultivars including 10 elites adapted to different agricultural zones, were selected.

Agronomic work contains information on optimum planting density, set weight, on the advantage of staking (for *D. rotundata* and *D. cayenensis*) responses to fertilizers (N-2 and K-2) and the effect of seedbed.

Economically, a yield of 10.87 t/ha was necessary to break even. Labor inputs were 390 mandays plus 24 tractor hours per hectare with harvesting (32%) and handhoe weeding (30.8%) as the main components.

Introduction

The United Republic of Cameroon is an agricultural country since most of its revenue (over 75%) is derived from the sales of agricultural products and the majority of the population is engaged in agricultural activity.

Due to the country's relief and geographical location, many distinct agricultural zones favorable for tropical, sub-tropical, semi-arid and temperate crops exist making Cameroon "Africa in miniature."

Table 1 below lists out production tonnages of the most important food crops grown and the percentage annual increases projected by the current 5-year Development Plan of the country.

As can be seen on Table 1, roots and tubers are important crops in Cameroon. Also significant is the emphasis given on the projected annual increase in yam production of 19.5%, higher than any other crop except rice and solanum potatoes. One of the reasons for this is to make Cameroon self-sufficient in yams and stop importation (mainly from Nigeria) which exceeded 10,000 tons annually during the post independence decade.

This study aimed to provide a practical and technical package to yam growers and initiate the availability of improved planting materials in support of a Government-sponsored Yam Production Scheme.

To achieve these goals, the necessity for systematic broad-based research on yams was realized. These investigations took six years (1969-1974) and covered the research programme summarized below:

i. The collection of local yam cultivars and importation of good varieties; the study of their performance in different ecological zones; simple and rough classification of local types; multilocational yield trials of promising cultivars and the determination of their nutritional composition; selection of elites and production of clones for multiplication and distribution to growers.
ii. Studies of the following yam culture techniques – seedbed preparation, optimum population density, size of planting material, time of planting, yam staking and topping and intercropping.
iii. The effect and the economics of the use of fertilizers.
iv. The study of the economics of yam production; tuber storage; weeds, diseases and pests associated with yam production.

This paper merely summarizes the findings of the various trials and does not try to give any details.

Materials and Methods

Collection and Selection of Edible Yams

A nationwide collection of local yam cultivars and 'types' was made between 1969 and 1974 in addition to importing good clones from Nigeria and Guadaloupe in West Indies.

A total of 114 'types' (19 imported) within nine species were studied at Mfonta (Bambui) Station and later at Ekona and Santchou. Classification of these yams followed the system adopted by Lawton (1967) in respect to species but involved 10 characters instead of Lawton's 9 and that of Martin (1973) with regard to varieties involving 55 characters instead of Martin's 83.

A standard data collection form using these characters was designed.

The following notation was used in registering cultivars and types: The first letter denotes that of the specie (A = alata). The next figure is the chronological order of collection and the last two figures denote the year of collection. For example, A 10 72 is alata cultivar No. 10 collected in 1972.

A preliminary selection of 26 promising cultivars of the species *Dioscorea bulbifera* (5 cultivars), *D. cayenensis* (4 cultivars), *D. dumentorum* (10 cultivars), and *D. rotundata* (7 cultivars) was made and multilocational statistical yield trials of these were carried out on material from Bambui, the main research station.

The locations were:

– Bambui, 1330 meters altitude with volcanic humid soils.
– Babungo, 1100 meters altitude with Entric cambisols.
– Santchou, 720 meters with Entric gleysols.

The various operations of land preparation, clearing, plowing, harrowing and ridging, were carried out mechanically, using a Massey Ferguson 156 Tractor and implements.

The experimental design was blocks of Fisher (randomized blocks) with replications ranging from 5 to 8.

Studies on yam cultural techniques. Land preparation for all trials was done mechanically and planting took place between early February and the middle of March.

The spacing used was one meter along ridges spaced one meter apart. This gave a population density of 10,000 plants per hectare. Except in fertilizer trials, mixed fertilizers were used at the rate of 80 units of nitrogen (N_2) + 50 units of phosphorus (P_2O_5) + 120 units of potash (K_2O) per hectare. The phosphatic component was applied during planting and the nitrogenous and potassic ones were split equally into two and applied 60 and 120 days after planting.

Yams had wooden stakes about 3 meters high, each stake supporting four stands (2 from each of the neighboring ridges).

The following agronomic trials were undertaken between 1971 and 1974:

- Seedbed preparation (flat versus ridges).
- Optimum weight, and type of planting material.
- Height and types of yam stakes (supports).
- Intercropping yams with other crops.
- Making of yams (single and two harvests).
- Spacing and fertilization of yams.

The economic aspects of the above practices and other inputs in yam cultivation were investigated, resulting in production costs per hectare of yams.

Results and Discussions

Collection and Selection Studies

Within nine species, a total of 114 'types' including 19 imported cultivars were collected and studied.

The main morphological characters of the species (excluding tubers) are listed in Table 2. It is worthy to note that 4 of the 9 species, *D. esculenta, D. alata, D. liebrechtsiana* and *D. trifida* did not produce only male flowers. The other 4 species that flowered were monoecious. *D. bulbifera* did not promature capsules although female flowers were scantily produced. Viable capsules were obtained from *D. schimperiana, D. rotundata* and *D. dumetorum* which therefore, have exhibited natural prospects for breeding work.

Table 3 gives the number of 'types' and the cultivars and elites selected. From the 114 'types' collected, emerged 68 cultivars, 10 of which were finally selected as elites. Further work on production of good clones was carried out at the main station (Bambui) in the highland zone on three of these elites, Batibo (*D. cayenensis*), Jakiri (*D. dumetorum*), cultivars which performed well in both ecological zones. *D. cayenensis* did well only in highland between 700 to 1300 meters. All *D. alata* cultivars were attacked by scoth die-back disease in all zones which stopped further work on this specie pending its control.

Table 4 shows the yield of *D. dumetorum* cultivars. This specie is an important food item in rural areas. It has the problem of immediate tuber hardening after harvest which is now under investigation.

The cultivar Jakiri is a good elite.

More information on the selected elite cultivars on which further agronomic work was based is given below.

Dioscorea cayenensis – Batibo (C 169) for the highlands
Yield average = 20 tons per hecta
Crude Protein % (dry matter) = 7.

Dioscorea dumetorum – Jakiri (D 564) for both highlands and lowlands
Yield average = 22 tons per hectar
Crude Protein % (dry matter) = 8.2

- Mbot (R 569) for the highlands
  Yield average 19 tons per hectare
- Bonakanda (R 971) has been selected for the lowlands. Average yield is 20 tons per hectare
- Ogoja (R 690) from Nigeria has shown promise in the lowlands

Agronomic studies

1. **Seed-bed preparation.** The yields of white yam *D. rotundata* on ridges (1 metric wide) and flat seedbed were compared for 3 years. The average yield of 17.02 tons per hectare on flat beds against 15.7 tons for ridges were not significantly different. After deducting a loss of 1.09 tons from the former treatment as a result of greening and rots (6.4% of yield) and deducting an equivalent weight of 0.24 tons as cost of ridging for the latter treatment, the net yields of 15.93 tons for flat bed and 15.43 tons for ridges were without significant difference.

   It is worthy to note that 20% of the flat bed treatment had poor tuber shape which reduced their marketable value.

   There was no interaction in the response of either treatment to mix NPK fertilizer application.

2. **Optimum weight, and type of yam planting materials on the yield of white yam** *(D. rotundata).* The yield of 100-gram planting material of 30.6 tons per hectare was 30.2%, 75.8%, 108.2% and 277.7% over the yields of 500, 375 and 125 gram set weight, respectively. Multiplication of planting, however, increased with reduction in sett weight indicating that better economic returns could be obtained with smaller planting materials. The results suggested that 125 grams seed material is best suited to seed production and 375-500 grams weight should be used for the production of ware (food) yams. Setts from the tops of tubers are better than those from the 'middle and bottom' of tubers.

   Similar results were obtained in the case of Batiko yam (*D. cayenensis*) and Jakiri yam (*D. dumetorum*) as shown in Table 5.

3. **Optimum time of planting yams.** In Bambui, Station, planting white yam in December was better than planting later. The yields of 31.0 tons and 25.8 tons per hectare for 'tops' and 'rest' of tubers, respectively, in the December planting decreased by 15.8% in February, then sharply by 40.4% in March, 75.4% in April and by 81.8% by the end of May.

   Mulching seemed to help 'tops' planting material more than the 'rest.' There was no significant interaction.

4. **Staking of yams.** Staking of yams significantly increased yields of *D. dumetorum* which has a different morphology from others. Height of stakes was an advantage only when wooden stakes were used. Wire lines proved more expensive than wooden stakes.

5. **Topping or 'milking of yams.** Topping or 'milking' of yams as a means of enhancing the production of seed material showed that more whole-seed-yams could be produced by this practice but the total amount of material produced was not increased. Topped yams, harvested prematurely especially at eight weeks before maturity, did not store well. This present practice has little commercial prospect.

6. **Intercropping yams with maize and groundnuts.** Intercropping yams with

maize and groundnuts showed that maize shaded yams and cause a significant yield depression on yams. The yield of yams in the full stand as a sole crop averaged 12.2 tons per hectare as against a yam yield of 7.4 tons for the treatment yam full stand plus maize full stand. These yields represented decreases of 39% and 57.3%, respectively. Yield depressions on the total yield of the intercrop for the yam full stand plus maize full stand plus maize full stand (9.4 tons/ha) and yam full stand plus maize half stand (11.1 tons/ha) treatments were 23% and 9% respectively. Yams did better when intercropped with groundnuts.

7. **Fertilizers on yams.** Yams showed positive responses to nitrogen and potassium but not to phosphorus.

The higher level of nitrogen (200 units per hectare) increased yields of *D. cayenensis* by 18%, of *D. dumetorum* by 25% and of *D. rotundata* by 21%.

Urea, split-applied early, 3 and 6 months after planting, showed that the middle treatment which coincided with the period of active growth and development produced the most beneficial economic results on white yams (Table 6).

Potash at 120 and 240 units of K_2O per hectare increased yields of Oshie white yam (*D. rotundata*) by 13.4% and 22.5%, respectively when it was applied twice in early May and late June. The other two cultivars did not show response to potash, possibly because it was applied only once at planting time. In the case of Oshie yam, N x K interactions were positively significant but not on *D. cayenensis* or *D. dumetorum.*

Fertilizer use proved very economical especially at the low levels of nitrogen and potash application where, in all species, extra return/extra fertilizer cost ratios of between 4.8 and 7.6 were obtained even in treatments which were statistically not significant.

It was also found that applying nitrogenous fertilizer in July, the period of rapid leaf area development and tuber initiation, was better than application in April or in October.

It is considered necessary to link future fertilizer work with growth studies in order to understand better the mechanisms responsible for greater yields.

The rising cost of fertilizers is a serious limitation to their use by peasant farmers.

8. **Weeds, diseases and pests.** Weeds are a serious problem in yam cultivation. This study showed that weeding constituted over 10.5% of the total cost of inputs per hectare and 30.8% of labor inputs per hectare coming only second to harvesting. Forty-one weeds were identified in the various yam fields. Of these, only a few were difficult to eradicate. These were a sedge, *Cyperus rotundus* L., spear-grass (*Imperata cylindrica* Beauv.) and 'Black Jack' (*Bidens pilosa* Linn.).

Anthracnose mainly on *D. rotundata* caused by the fungus *Glomerella cingulata* (Stonem) Spauld and Schrenk was the most important disease. Spraying with 4½ kilograms of 80% 'Manesan' proved more effective as a control rather than a curative measure.

In 1972, a virus was observed on *D. rotundata.* It caused chlorosis, vein banding, leaf distortion, bushiness and stunting of plants. The inci-

dence reached its peak at 15% infection in 1973. No control measure was adopted.

Die-back disease was also observed on *D. alata* causing black scorching and nearly wiping out this specie in Bambui in 1974.

Tuber rots caused by *Botryodiplodia theobromae* Pat. were serious during storage of *D. rotundata* and *D. cayenensis.*

The only serious pest of yams was the greater yam beetle *Heteroligus meles* (Billb) at Babungo and Befang.

The economics of yam production. These investigations show that it cost 227.8 thousand francs CFA to grow one hectare of *D. rotundata.* Cost of seed material constituted 36.6% of the cost of production and the highest input. This was followed by the cost of fertilizer, 11.4% and of harvesting, 11.2%. The cost of weed and of land preparation was 10.5% each and of staking, 7%.

Labor inputs per hectare amounted to 390 mandays plus 24 tractor hours. The major components of labor were harvesting which was 32%, weeding 30.8% and staking 14.4% as shown in Table 7.

A yield of 10.87 tons of fresh tubers per hectare was required to break even when yam was selling at 22 francs CFA per kilogram allowing 5% damage losses.

The recorded yield of 17.48 tons per hectare, gave a gross profit margin of 60.4% after deducting 5% damage losses. This was considered highly economic under the conditions of this study.

Conclusions

This study, has shown that production of yam is expensive. Yam does not compete well with other tropical root and tuber crops, let alone cereals and leguminous crops. As a result, production of these crops, especially cassava (*Manihot esculenta*) is expanding at the expense of yam.

This fact has led to some Governments in the yam-growing belt of West Africa to discourage yam cultivation in favor of the more cheaply produced commodities.

Unfortunately for these anti-yam campaigns, the eating patterns of people and the socio-religious attachment to yam cultivation change very slowly especially as the campaigns lack of component to educate and conditions consumers towards change.

The rationale ought to be based on research to reduce high cost of production and to breed a yam capable of competition instead of abandoning yam cultivation altogether.

To be able to compete, the yam of tomorrow must convert sunlight energy more efficiently without propping (staking), must reproduce more efficiently and cheaply must have a tuber amenable to mechanical handling, and withstand rampant diseases and pests before and after harvest.

The Government of Cameroon has decided to pursue this rationale, hence the sponsoring of this study, which has attracted more funds to produce improved planting materials and a technical package to assist growers.

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Table 1. Food production and projected annual increases in Cameroon (in metric tons)

	1967/1968	1974/1975	Projected 1980/1981	% Annual Increase
Millet and Sorghum	480.000	306.900	500.000	8.5
Maize	258.000	307.200	500.000	8.5
Rice (paddy)	17.000	24.000	100.000	30.0
Wheat	–	–	30.000	–
Cassava	668.000	746.000	1.000.000	5.0
Cocoyams *(xanthosoma* spp and *colocasia* spp)	380.000	705.000	900.000	4.25
Yams	167.200	454.700	1.324.000	19.5
Sweet Potatoes	60.000	74.000	296.000	9.2
Solanum Potatoes	16.590	62.326	200.000	21.5
Banana Plantains	954.000	1.143.000	2.600.000	14.7
Beans	53.460	80.000	90.900	1.86
Local Vegetables	108.160	238.000	276.000	2.65
Imported Vegetables	18.000	50.400	120 800	15.6
Gourds (melon, pumpkins, etc.)	–	45.800	76.000	8.8
Groundnuts not exported	–	129.000	173.000	5.0

Table 2. The main morphological characters of nine edible yams *(Dioscorea* species studied in Cameroon (1969-74) (x = character exhibited)

Section and Species	CHARACTERS												
	Cordate leaves, Extending lobes	Leaves digitate (3-5) lobed	Leaves hairy (on one or both sides)	Thorny stem (throughout of near base)	Stem winged or winged stem	Stem and leaves mottled, brownish red especially at young stage	Bulbils present	Bulbils spiny or spiny bulbils	Inflorescence	Fruits reflexed (bent backwards or inwards)	Fruits longer than broad	Seeds winged or winged shade at one or both ends	Seeds winged (winged seed) all round
Asterotricha (D)* *Dioscorea schimperiana* Hoehst	x	–	x	–	–	–	x	–	x (Mo)	x	–	–	x
Cambilium (S)** *Dioscorea esculenta* (Lour) Burk,	x	–	–	x	–	–	–	–	–	–	–	–	–
Enantiophyllum (D) *D. alata* L.	x	–	–	–	x	x	x	–	–	–	–	–	–
D. cayenensis L.	x	–	–	x	–	–	–	–	x(DiM)	–	–	–	–
D. liebrechtsiana de Wild	x	–	–	x	–	–	–	–	–	–	–	–	–
D. rotundata Poir	x	–	–	x	–	–	–	–	x(Mo)	–	–	–	x
Lasiophyton (S) *D. dumetorum* (Kunth) Pax.	–	x	x	x	–	–	x	x	x(Mo)	x	x	x	x
Macrogynodium (S) *D. trifida* L.	–	x	x		x	x	–	–	–	–	–	–	–
Opsophyton (S) *D. bulbifera* L.	x	–	–	–	–	–	x	–	x(Mo)	–	–	–	–

*(D) = Dextrose (Twining to the right); **(S) = Sinistrorse (Twining to the left); (Mo) =Monoecious; (Di) = Dioecious; (M) = Male.

Table 3. Yam types studied and identified into cultivars and elites

Species	No. of types			No. of cultivars identified (all locations)	Selected elite cultivars
	Bambui (1330m) 1970-74	Ekona (600m) 1973-74	Santchou (700m) 1973-74		
D. alata	23(6)	19(4)	10	5	None
D. bulbifera	10	10	6	7	None
D. cayenensis	23(4)	23(4)	11	17	1:(C 169) Batibo
D. dumetorum	18	16	9	13	1:(D 569) Jakiri
D. esculenta	2	2	0	2	2: E272, E 273
D. liebrechtsiana	2	2	0	2	None
D. rotundata	15	12	11	11	4 : R 871 Oshie R 569 Mbot (for highlands) R 971 Bona-kanda R 670 Ogoja (for lowlands)
D. schimperiana	6	6	0	3	None
D. trifida	9(9)	7(7)	6(6)	8	2: T 372 INRA 25 T 872 IRAT 29
Unclassified	6	0	0	–	–
TOTALS	114	97	53	68	10

Note : Brackets denote imported cultivars which are inclusive in the totals.

Table 4. Multilocational yield trials of trifoliate yam *(Dioscorea dumetorum* (Kunth) Pax. cultivars, 1971-1973

Cultivar	Bambui Plain (1330m) 1971 1972 combined		Babungo (1176m) 1973		Befang (605m) 1972				
	Yield Metric Tons/ha	Palatability and Acceptance rating (Max 10)	Yield Metric tons/ha**	Palatability and Acceptance rating (Max 10)	Yield Metric tons/ha**	Palatability and Acceptance rating (Max 10)	Average Palatability Acceptance rating Max 10)	Reduction in maturity Bambui-Befang (Days)	Crude Protein % (Dry Weight) Average of 2 analyses
Jakiri	36.4a	7.3	39.4ab	3.6	30.1a	6	5.6	5.1	9.4
45 Dschang	28.0b	6.7	43.1a	6.8	23.9b	7	6.8	15	7.5
57 Dschang	28.5b	3.1	36.3b	2.9	18.8c	5	3.7	15	7.1
47 Dschang	27.1b	5.3	42.4a	7.0	17.3cd	2	4.8	30	8.2
Bambili *	22.4c	5.0	35.8bc	6.0	17.0cd	4	5.0	3	9.2
Bafut (Hairy)	16.9cd	5.3	34.2bc	4.0	12.5ef	4	4.4	13	–
Bambui local	15.7c	7.0	37.9ab	5.0	19.3c	4	5.3	10	10.2
Bafut (Smooth)	10.5e	6.6	18.4de	7.3	8.1g	6	6.6	32	–
40 Dschang	–	–	30.9c	5.0	12.0f	6	5.5	17	–
69 Dschang	–	–	23.7d	4.0	14.8de	5	4.5	20	–
General Mean	23.2		34.2		17.38				
Coefficient of Variability	14.7%		11.8%		21.5%				
Standard Error	1.9		1.65		1.62				

*Tested only in 1971 at Bambui Plain

**Duncan's test of significance is used. There is no significance between yields with the same letter or sharing a letter.

Table 5. The effects of weight and types of planting materials on the performance of Batibo yellow yam *(D. cayenensis)* and Jakiri trifoliate yam *(D. dumetorum)*

Main treatment	*D. cayenensis* (tons/ha)			*D. dumetorum* (tons/ha)		
	Tops B1	Middle & Bottom B2	Mean	Tops B1	Middle & Bottom B2	Mean
A5.1000 grams	35.1	28.4	31.8a	44.5	44.7	44.6a
A4. 500 grams	31.5	24.5	28.0b	37.9*	26.9	32.4b
A3. 375 grams	25.5	19.9	22.7c	29.9	22.3	26.2c
A2. 250 grams	21.8	16.4	19.1d	23.9	19.0	21.5d
A1. 125 grams	19.8	12.4	16.1d	16.0	11.9	14.0e
Mean	26.7a	20.3b	23.5	30.4a	25.0b	27.7
Standard Error A	1.07 tons			1.48 tons		
Standard Error B	0.65 tons			0.72 tons		
Coefficient of Variability	12.33			11.6		
Effect of A	Significant			Significant		
Effect of B	Significant			Significant		
AxB Interaction	Not significant			Significant		

*In interaction A x B, A4: B1 vs B2 is significant Duncan's test is used on means. There is significant difference between yields with different letters.

Table 6. The effect of Urea on the yield and economic returns of Oshie white yams *(D. rotundata)*

Treatment Code Units of N_2 Applied in April/ July/October	Yield t/ha	Percentage over control	Cost of fertilizer per hectare (1000 francs CFA)	Fertilizer transport and applications cost/ha (1000 francs CFA)	Total Extra Fertilizer cost/ha (1000 francs CFA)	Extra yield t/ha	Extra value (returns) /ha (1000 francs CFA)	Extra value/cost value
9.0/200/0	19.0*	126.7	15.4	1.1	16.5	4.0	100.0	6.1
2.50/50/0	18.1*	120.7	7.7	1.5	9.2	3.1	77.5	8.4
6.0/50/50	17.9*	119.3	7.7	1.5	9.2	2.9	72.5	7.9
4.0/100/0	17.5	116.7	7.7	0.9	8.6	2.5	62.5	7.3
7.50/100/50	17.1	114.0	15.4	2.3	17.7	2.1	52.5	3.0
11.100/100/0	15.9	106.0	15.4	1.7	17.1	0.9	22.5	1.3
12.0/100/100	15.3	102.0	15.4	1.7	17.1	0.3	7.5	0.4
1.0/0/0 control	15.0	100.0	0.0	0.0	0.0	0	0	0
3.100/0/0	14. 4	96.0	7.7	0.9	8.6	-0.6	- 15.0	–
10.0/0/200	14.4	96.0	15.4	1.1	16.5	-0.6	- 15.0	–
8 200/0/0	14.0	93.3	15.4	1.1	16.5	-1.0	- 25.0	–
5.0/0/100	13.2	88.0	7.7	0.9	8.6	-1.8	- 45.0	–
General Mean	15.98	–	–	–	–	–	–	–
C.V.	16.2%	–	–	–	–	–	–	–
S.E.	1.05 t/ha	–	–	–	–	–	–	–
L.S.D. at 5%	2.9 t/ha	–	–	–	–	–	–	–

*5% significance over control

Table 7. Inputs and costings of growing one hectare of Oshie White Yam *(D. rotundata)* as a sole crop ($1 US = 207.0 Francs CFA)

Input (or operation)	Mandays/ha No.	% Mandays	Total Cost 1000 (CFA Francs)	%of Cost (descending order)
Land clearing and cultivation	20 tractor Hours	–	24.0	10.5/4th
Cost and preparation of planting materials (setts)	4	1.0	83.3	36.6 (1st)
Pegging and planting	10	2.6	2.0	0.9 (9th)
Fertilizer (cost and applications)	9	2.3	26.0	11.4 (2nd)
Staking (supports) (cost, installing, training and removal)	56 (+4 tractor Hours)	14.4	15.9	7.0 (7th)
Weeding (3 times by hand hoe)	120	30.8	24.0	10.5 (4th)
Disease and pest control	6	1.5	8.0	3.5 (8th)
Remoulding of ridges	10	2.6	2.0	0.9 (9th)
Hand Harvesting (+ weighing and packing)	125	32.0	25.6	11.2 (3rd)
Supervision charges (Headman watchman) 1/5 of their time)	50	12.8	17.0	7.5 (6th)
TOTAL	390 (+ 24 tractor Hours	100.0	227.8	100.0

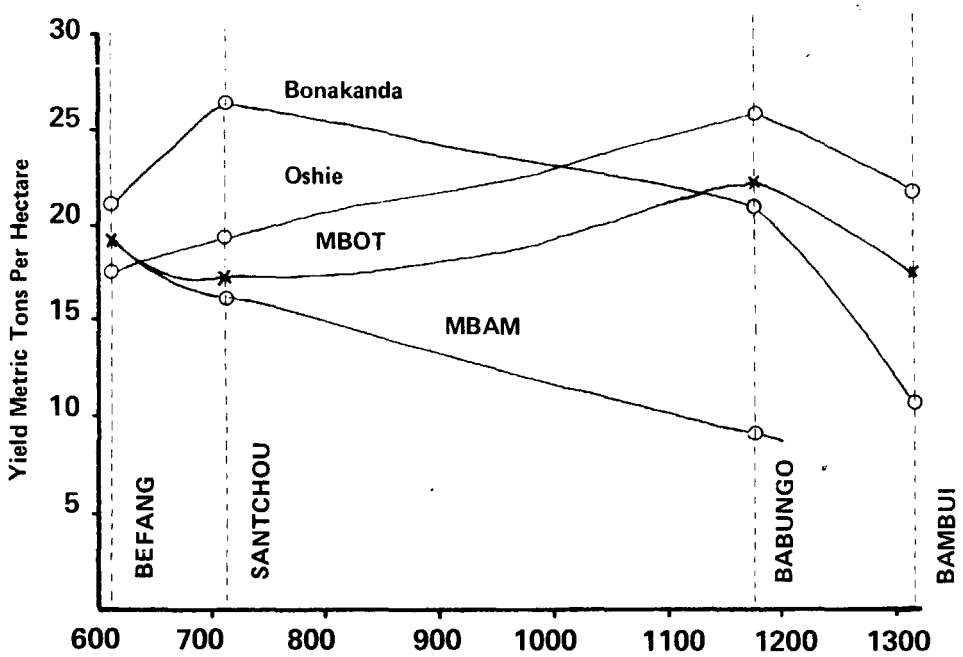

Fig. 1. The Effect of Ecological Zones (mainly altitude) on the Yield of Four Cultivars of White Yam (1971 and 1972)

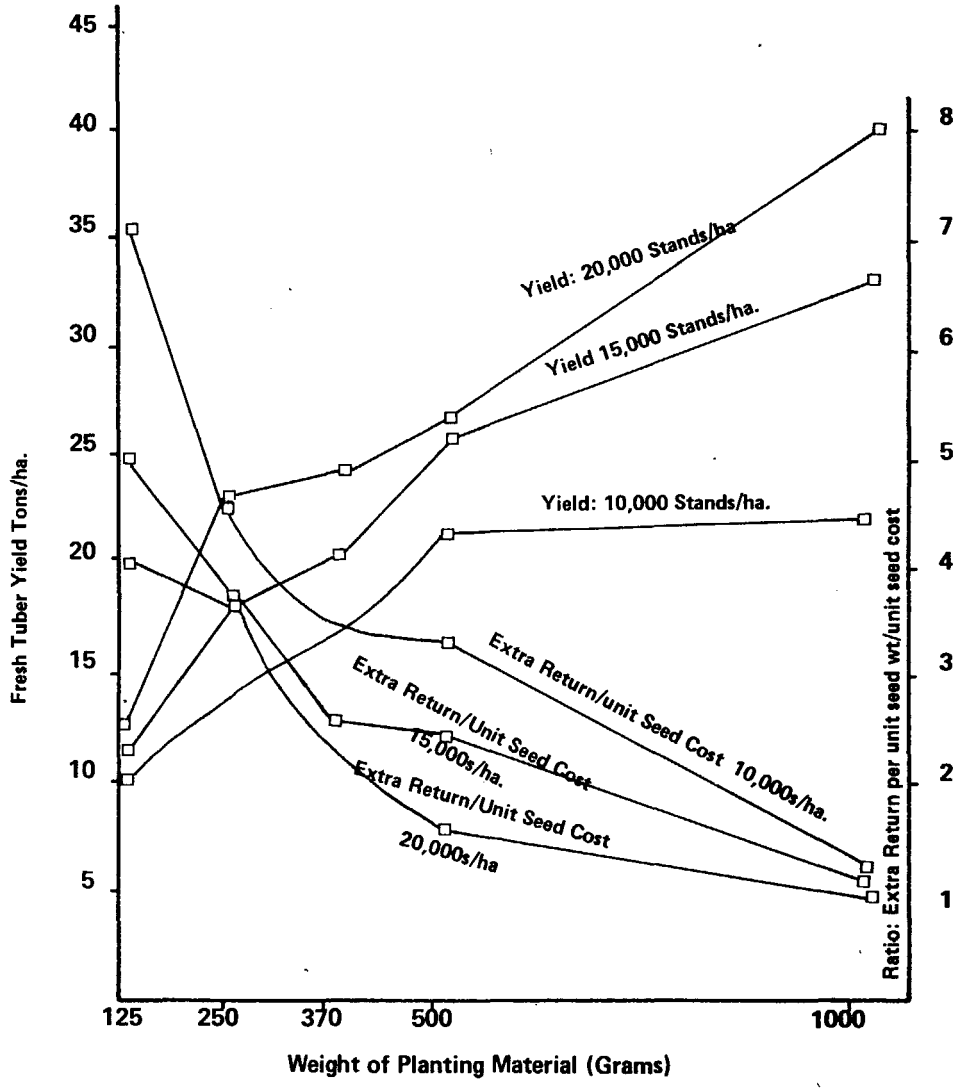

Fig. 2. **The yield and economic returns of five sett weights and three spacings of Oshie White Yam (*D. Rotundata*)**