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Economics of cassava production and processing

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Abstract

The three common varieties of cassava *Manihot esculenta* Cranz, IITA, IAR&T and local Odongbo, were grown in Ife agro-climatic zone to find out if there were significant differences in varietal yield and mean weight of cassava components. The mean weight of unpeeled tubers, peeled tubers, peels (bark) pressed flour, shaft and mean weight of gari were taken. All weights are per stand. The processing was done at the University farm labour rate. Cash budgeting and production, trading, profit and loss accounts of the enterprise were also prepared. Results showed that there were no significant differences in the yield parameters among the three varieties. The statistics also indicated that agricultural production of cassava is profitable but the processing of cassava tubers into gari is not economical under the present technology, thus a more efficient processing method is highly desirable.

Introduction

Cassava, manioc, tapioca, mandioca and yuca are common regional names of the shrubby perennial tropical root crop *Manihot esculenta* Crantz. The various local names of cassava in Nigeria are: Ege, Paki, Akpu or Rogo. Cassava is thought to have originated in tropical Brazil, from where it spread to other parts of Latin America and in post-Columbian times, to other regions of the tropics (Smith, 1968). It has become widely known and important along the West Coast of Africa as far back as 18th century when its roots were being eaten either raw, boiled or roasted. The two main types widely grown in Nigeria are the sweet cassava and the bitter cassava, differentiated by the degree of concentration of cyanic acid which is higher in bitter cassava.

Cassava is successfully grown today in zones ranging from latitude 30° North to latitude 30° South of the equator, and at elevations of up to 2,000m. It is tolerant of soils with a pH range of 5 – 9 (Rogers and Appon, 1972), rainfall of 50–500mm and temperatures of 18 – 35°C (Jones, 1959). Nigeria falls within this ecological zone or "Cassava Belt" which coincides

roughtly with many FAO Economic Class 2 for less developed countries, thus Nigeria has the potential for high level production of cassava and cassava products.

Cassava has some versatile features. One such feature is ease of propagation. Cassava propagation does not require the use of seeds, roots or any edible part of the plant. Propagation is by cassava stem cuttings which shows that in terms of net yield it is relatively more productive than grains and many other root crops which require withholding a portion of the harvest for future planting. Secondly, it is relatively high yielding. It does not require an elaborate structure to support its edible portion. 63 -- 85% of dry weight of cassava is edible, compared with 36% for wheat (Coursey and Haynes, 1970). Cassava production amounts to 57% of tropical root and tuber production (FAO, 1972). It is also relatively inexpensive to produce. This derives from the fact that the crop is not strictly season bound. Cassava stem cuttings could be planted any time during the rainy season as long as they are given enough time to establish. Weeding is required before the formation of the canopy, and harvesting could be done at any time of the year. This flexibility in periods of carrying out operation on cassava farm makes labour to be obtained and used during off-season of other crops and at labour's cheapest periods. Oluwasanmi and Fayemi (1964) indicated that labour requirements for cassava production are just about half those needed for yam cultivation for the same farm size. Cassava is relatively resistant to adverse climatic conditions particularly drought, pest and diseases compared with other tropical crops. The hydrocyanic acid (HCN) makes the animals and insect attacks to be minimal and it has the ability of growing in soils that are considered unproductive for other crops. Cassava is a reliable staple and excellent source of carbohydrate. Coursey and Haynes (1970) calculated the production of kcal per hectare per day of some major crops to be viz: cassava 250; maize 200; rice 136, sorghum 114 and wheat 110.

There are three distinct markets for cassava and each market is associated with its use. These are the human food market, the industrial starch market and the animal feed market. Of these markets only the human food market could be said to be in existence in Nigeria, the other two are not organized or well developed.

Coursey and Haynes (1970) noted that cassava is the staple food of approximately 200 million people in the tropics. Gusten (1968) remarked that cassava was the single most important food item consumed in the Western Region of Nigeria. Galleti et al (1956) observed that cassava consumption in whatever form accounted for 51.3% of calorie intakes in the Ijebu/Egba areas of Nigeria in the 1950s and this increased to as much as 61.1% in 1963/64.

Cassava could be processed into various food items such as gari, lafun (cassava flour), fufu, starch and cassava leaf soup. Since the only exist-

ing market for cassava in Nigeria at present is the human food market and with most of the farmers becoming market oriented and with more commercial food farms in existence it becomes necessary to study the economics of production and processing of our major food crops in which cassava is a reliable candidate. The most important and nation-wide food into which cassava is processed is gari and the three most important varieties of cassava grown are IITA, IAR & T and Odongbo, the local aaviety, thus this study will concentrate on the economics of agricultural production and processing of the three varieties of cassava.

Material and Methods

The experiment was undertaken to study the yields of three varieties of cassava in Ife agro-climatic zone. The varieties were IITA, IAR&T and Odongbo. The cassava varieties were mono-cropped. The experimental design was a randomized complete block (Steel and Torrie ID 60). There were four replications. The size of a plot was 20m x 20m with a 1m x 1m plant spacing. There were 400 plants or stands per plot. Within each plot 30 plants were randomly selected. Consequently each observation reported is a mean of 120 plants or stands.

The same cultural and agronomic practices were carried out on the three varieties. These practices include land preparation, planting, fertilizer application, weeding, harvesting and processing. The crops were harvested when they were about 15 months old and processed immediately.

The variables studied and on which records were taken include establishment count, cost of carrying out each farm activity, number of tubers per stand.

The production, trading, profit and loss accounts for the production and processing of one hectare of cassava farm were prepared to show the profitability or otherwise of agricultural production into gari. Cash flow budget was also carried out to show the amount and the time when cash is needed for the enterprise. The current market prices of inputs and outputs were used.

Results

The IAR&T variety had the highest mean number of tubers per stand (9.43) with local Odongbo having the least mean number (6.77). the mean weight of unpeeled tubers per stand varies from 4.868kg to about 5.593 kg. with the IAR&T having the highest and IITA the least (Table 1). Local Odongbo had the highest mean weight of pressed flour per stand and the highest mean weight of gari per stand. Thus local Odongbo gave the highest mean weight of gari per hectare of cassava farm (Table 1).

Table 1: YIELDS OF CASSAVA AND CASSAVA PRODUCT IN KILOGRAMS

Varieties	Mean Number of Tubers/ stand	Mean weight of a tuber	Mean weight of un-peeled tubers/ stand	Mean weight of peeled tubers/ stand	Mean weight of peel/ stand	Mean weight of pressed flour/ stand	Mean weight of shaft per stand	Mean weight of gari/ stand	Mean weight of gari/ ha.
IITA	8.67	0.562	4.87	3.08	1.79	1.86	0.051	0.65	5850
IAR & T	9.43	0.593	5.59	3.32	2.24	1.95	2.026	0.62	5580
Local Odongbo	6.77	0.742	5.02	3.55	1.46	2.09	0.059	0.68	6120

Source: Computed from Survey Data, 1985–86

The statistical student's t test showed that there was no statistical significant differences in the yield of the three varieties. The IAR&T variety has the highest weight sample variance of the three varieties showing that the yields per stand were spread farther away from the mean more than other varieties (Table 2).

Table 3 shows the monthly cash requirement for the enterprise. This enterprise requires farm equipment like cutlasses, hoes, axes etc. for carrying out farm operations, these were estimated to cost about ₦100.00 and were purchased in March before the planting season commenced Land clearing, land preparation, purchase and transportation of cassava cuttings were done in April all costing ₦595.00. The cassava cutting were planted in May and fertilizers were purchased also in that month. The first weeding which was done manually was in July and fertilizer application followed immediately with the costs of the two activities being ₦140.00. The next two weedings were done in October that year and April of the following year each costing ₦120.00. Interest charges of about ₦150.00 was assumed to be paid in June since the farmer is assumed to obtain loan of ₦1 500.00 at 10% interest rate for the operation of the farm.

Harvesting activity required cash of about ₦540.00 in June and processing followed immediately costing ₦2,150.00. Thus the total cash required for cultivation, harvesting and processing of one hectare of cassava farm into gari is about ₦4,135.00.

The production, trading, profit and loss accounts (Table 4) showed that the agricultural production of cassava was profitable at a Net Profit of about ₦735.00 per hectare, so also harvesting with an additional profit of about ₦67.00 per hectare. The processing was at a loss of about ₦572.00 per hectare.

Table 2: SELECTED STATISTICAL MEASURES FOR THE YIELDS OF THE THREE VARIETIES OF CASSAVA

Varieties	Student's tc	Remarks
IITA X IAR & T	0.785	N.S
IITA X Odongbo	0.198	N.S
IAR & T X Odongbo	0.569	N.S

NS = Not Significant

Source: Computed from survey data, 1985–86.

Table 3: CASH OUTFLOW BUDGET FOR THE AGRICULTURAL PRODUCTION OF CASSAVA AND PROCESSING OF CASSAVA TO GARI

Months	Mar. ₦	April ₦	May ₦	July ₦	Oct. ₦	April ₦	June ₦	Total ₦
Equipment	100.00	-	–	–	–	–	–	100.00
Land clearing	–	200.00	–	–	–	–	–	200.00
Land preparation	–	125.00	–	–	–	–	–	125.00
Cuttings	–	220.00	–	–	–	–	–	220.00
Transportation	–	50.00	–	–	–	–	–	50.00
Planting	–	–	80.00	–	–	–	–	80.00
Fertilizer purchase	–	–	40.00	–	–	–	–	40.00
Weeding	–	–	–	120.00	120.00	120.00	–	360.00
Fertilizer application	–	–	–	20.00	-	–	–	20.00
Interest payment	–	–	–	–	–	–	150.00	150.00
Miscellaneous	–	–	50.00	–	–	–	50.00	100.00
								₦1,445.00
Harvesting materials	–	–	–	–	–	–	90.00	90.00
Harvesting	–	–	–	–	–	–	450.00	450.00
								₦1,985.00
Processing equip.	–	–	–	–	–	–	500.00	500.00
Peeling 90 m.d.	-	-	-	-	-	-	450.00	450.00
Grating/pressing m.d. 90 m.d.	–	–	–	–	–	–	450.00	450.00
Frying 100 m.d	–	–	–	–	–	–	500.00	500.00
Fuel	–	–	–	–	–	–	100.00	100.00
Miscellaneous	–	–	–	–	–	–	150.00	150.00
Total	100.00	595.00	170.00	140.00	120.00	120.00	2890.00	₦4,135.00

Source: Computed from Survey data, 1985–1986

Table 4: PRODUCTION, TRADING, PROFIT AND LOSS ACCOUNTS FOR AGRICULTURAL PRODUCTION OF CASSAVA AND PROCESSING OF CASSAVA TO GARI

Items	Production	Harvesting	Processing
Sales (₦40/200 stands (₦40/ton) 50k/kg of Gari)	₦1,800.00	₦2,437.20	₦2,925.00
Land preparation (ploughing and harrowing	125.00	–	–
Transportation (cassava cuttings)	50.00	–	–
Planting	80.00	–	–
Fertilizer:			
– material	40.00	–	–
– application	20.00	–	–
Weeding	360.00	–	–
Interest on loans	150.00	–	–
Depreciation:			
– Land clearing ₦40.00)			
– Equipment ₦50.00)	140.00	–	–
– Cuttings ₦50.00)			
Miscellaneous	100.00	–	–
Production cost of cassava crop	1,065.00	–	–
Net profit	735.00	–	–
Production cost of cassava crop b/d	–	1,065.00	–
Harvesting (tubers)	–	450.00	–
Harvesting (materials)		130.00	–
Production cost of cassava tubers	–	1,635.00	–
Net profit		802.20	–
Production cost of cassava tubers b/d	–	–	1,635.00
Processing:			
– Peeling 90 man-days	–	–	450.00
– Grating/pressing 85 man-days	–	–	425.00
– Frying 120 man-days	–	–	600.00
– Fuel	–	–	100.00
Depreciation: Processing equipment	–	–	167.00
Miscellaneous	–	–	120.00
Production cost of gari	–	–	3,497.00
Net loss	–	–	572.00

Source: Computed from Survey Data 1985–1986.

Discussion:

The non-significant difference in the mean yields of the three varieties of cassava at 1% and 5% levels of significance implies that in terms of yield one variety is as good as the other, and farmers should not show much preference. IAR&T variety has the statistically highest mean yield and may be preferred even though it is not better than the others.

The monthly cash requirement for the enterprise showed that the production of one hectare of matured cassava plant requires an outlay of between ₦775.00 and ₦1,445.00. The range is wide because of certain expenses which an existing farm or farmer may not incur. Some of these are land clearing which is not compulsory because cassava does not require virgin land since it can thrive in a relatively poor soil most especially when supplemented with fertilizer. An established cassava farmer does not have to buy cassava stem cuttings. With good planting distance weeding could be done twice instead of the budgeted three times since no weeding is required after the formation of the canopy. Harvesting the cassava tubers increased cash requirement by about ₦540.00 while processing the cassava tubers to gari requires an additional cash of about ₦2,150.00. The inclusion of each production stage by a farmer then depends on availability of cash to pay for labour and the management of the farmer. A new cassava farmer has to spend about ₦865.00 while an existing cassava farmer will require only about ₦295.00 during the first three months of operation (March, April and May) which accounted for 60% and 38% of the total costs of agricultural production respectively. Other expenses remaining after these are for weeding before the maturity of cassava plant. Cassava cultivation at the present technology is labour intensive. Labour cost was about ₦560.00 for an existing cassava farmer and about ₦760.00 for a new cassava farmer which is 72.25% and 52.39% of the total costs respectively. Most of the costs incurred after this stage are labour costs. Harvesting which was done manually and in June amounted to ₦540.00. Processing followed immediately costing about ₦2,150.00 out of which 72.09% was labour cost. Cassava tubers once harvested are highly perishable as such processing should follow harvesting immediately. This necessitates the urgent need for cash to pay labour and buy frying equipment which amounted to about ₦2,150.00 for processing in June. The timeliness and availability of cash and/or labour at this stage is much more important than at any other stage since delay can cause the loss of the entire cassava tubers. Any loan recovery programme should come up at this stage since farmer would start realizing revenue from the sale of gari.

The analysis of production, trading, profit and loss accounts shows that the farmer made a net profit of ₦735.00 on agricultural production on cassava which is about 41% of sales revenue. On combining harvesting fun-

ction with it the farmer made a net profit of ₦802.00, an increase of ₦67.20 in net profit. The business made a net loss of ₦572.00 on the addition of processing function. A processor that engages in this business will make a net loss of about ₦1,374.20 since he has to buy harvested cassava tubers at the market price of ₦2,437.20 per hectare. This shows that the agricultural production of cassava and harvesting are profitable but not the processing to gari. For the entire business (agricultural production – harvesting – processing) to breakeven, gari has to be sold at 60k/kg and for the processing function alone to breakeven gari has to be sold at 73.50k/kg which currently are far above the market price of gari of 50k/kg. This shows that the current technology of processing cassava to gari is not economically efficient.

Summary and Conclusion

There is no statistical significant difference in the mean yields of the three varieties (IITA, IAR&T and Odongbo) thus farmers should be indifferent to the variety grown concerning yield.

Cash out-flow budget analysis shows that an existing cassava farmer requires just about half of the cash needed by a new cassava farmer. A new cassava farmer has to incur 60% of the total costs of agricultural production of cassava during the first three months while an old farmer needs to incur only 38%. Labour costs accounted for a high proportion of the total costs of production ranging from about 53% for a new farmer to about 72.25% for an existing cassava farmer. Harvesting and processing costs are essentially labour cost. Labour cost is about 83% of total harvesting cost and about 72% of the processing costs. Cash should be readily available for immediate processing after harvesting to prevent loss of cassava tubers.

Agricultural production and harvesting of cassava are profitable but not the processing of cassava to gari. Therefore, a technically more efficient agricultural production and harvesting method needs to be found to reduce cost of raw tubers or a technically more efficient processing method be evolved to reduce processing cost or both. Also other cassava markets such as the industrial starch market and the animal feed market should be explored and developed to increase demand for cassava.

In conclusion the price of gari is too low to make processing a profitable activity for the farmer. The farmer may just as well stop at production of cassava tubers for the gari processors.

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