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Analysis of Processing Methods, Marketing Channels and Profitability Determinants of Selected Cassava Products in Kogi State, Nigeria

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Abstract

The study is an analysis of processing methods, marketing channels, and profitability determinants of selected cassava products in Kogi state, Nigeria. The study was carried out in Kogi East senatorial District of the state. A multi-stage sampling technique was employed in the selection of 120 respondents from whom information were collected and analyzed. The data used for the study were collected using structured questionnaire and analyzed using descriptive statistics and profit function analysis. The study showed that there are three processing methods and three marketing channels for each of the cassava products selected. The study also showed that the variable costs and fixed costs were both significant in profit determination. The study concluded that processing and marketing activities of cassava products are prominent are profitable in the study area. It was recommended that the capital base of the respondents be boosted so that they can use modern processing and packaging techniques.

1. Introduction

Cassava (Manihot spp) is believed to have originated from Brazil and was introduced into West African countries by the Portuguese (Antonio, 2002). Benue and Kogi States in the north central zone of Nigeria are the largest producers of cassava in the country (IITA, 2004). Cassava's comparative advantage compared with other food crops lies in its efficient production of cheap food energy. In addition, cassava is available all year round as well as tolerant to extreme conditions. These qualities contribute in alleviating African food crises (Nweke, Dixon, Asiedu and Folayan, 1994). This accounts for why Philip (2005) referred to cassava as the "famine security crop".

Studies have shown that cassava contains substances known as cyanogenic glucosides, which break down into hydrocyanic acid (HCN) after the crop must have been harvested. This acid makes raw cassava very poisonous for human consumption. Processing is therefore important as a means of removing this poison by reducing its toxicity and increasing its palatability (Adegeye, 1999). After harvest, cassava roots are processed to stop physiological and microbial spoilage, reduce the cyanogenic glucosides content and convert the roots to other products that are more acceptable (Asiedu, 1989). Major products derived from cassava are cassava flour (alibo), fufu, garri, starch, tapioca, sliced cassava chips (abacha) and other cassava-based products.

Rural based cassava processing activities offer opportunities in terms of employment. It is estimated that 60 percent of the labour force in Sub-Saharan Africa are gainfully employed in small-scale food processing enterprises and majority are women (ITDG, 2005). Cassava may in fact hold the key to fully land use intensification in Africa (Enete, 1995). This is because population increase is often accompanied by switch to crops previously thought to be inferior due to protein, essential minerals and vitamins content but with higher yield as is the case with Africa where cassava has ousted the traditional yam (Griggs, 1980).

The market for cassava can be divided into two categories, the traditional food-oriented market and the new emerging market for industrially processed cassava. The vast majority of the cassava grown in Nigeria is processed and sold through the traditional market channels which are fairly well known. In 2002, cassava suddenly gained national prominence following the pronouncement of a presidential initiative. The intent of the initiative was to use cassava as the engine of growth in Nigeria. To put Nigeria in the global context for competition, the country needs to upgrade the use of cassava in primary industrial manufacturing of starch, ethanol, chips and flour in order to provide an industrial base for further diversification of its national economy. Cassava can be used to improve rural and urban income and development in Nigeria if investments in the downstream sector or the industry are made more effective through value addition. The value chain describes the full range of activities which are required to bring products from conception, through different phases of processing involving a combination of physical transformation and the input of various producers, before delivery to the final consumers and final disposal after use (Kaplinsky and Moris, 2000). Most of the processors prefer to offer the commodity to the market without bearing the cost involved in value adding because of the uncertainty in the market. The continuous fluctuation of prices of final goods in the market poses a serious problem to processors who are interested in adding value to their products. This study therefore examines the different processing methods, marketing channels adopted by the processors of cassava in the study areas well as the input factors that influence profit in the cassava processing and marketing enterprises.

2. Materials and Methods

The study area is Kogi East in Kogi State and comprises of nine (9) local government areas. Located on latitudes 7^0 02^1 N and 8^0 00^1 N and longitudes 6^0 45^1 E and 7^0 42^1 E (KSADP, 1995), Kogi East has a population of 1,449,091 people almost 50% of Kogi State's population of 3,278,487 people. With a total land mass of 13, 937 sqkm; the area has common boundaries with river Benue on the North, river Niger on the West, Anambra and Enugu States on the South and Benue State on the East. Kogi East are divided for administrative purposes into two (2) agricultural zones namely:- Zone "B", and Zone "D". Zone "B" comprises of Ankpa, Bassa, Dekina, Olamoboro and Omala Local Government with Anyigba as the head quarters. Zone "D", comprises of Ibaji, Idah, Igala-Mela Odolu and Ofu, Local Government Area with Aloma as its head quarters A Multi-stage purposive random sampling techniques was employed in selecting respondents. This is because the study area is contiguous in terms of cassava processing and marketing. First, two (2) local government areas were purposely selected from each of the two agricultural zones giving rise to four (4) Local Government Areas. Secondly, three (3) communities were randomly selected from each local government to give twelve communities. Thirdly, two (2) villages were randomly selected from each community to make up twenty four villages. Fourthly, five (5) cassava processors and marketers were randomly selected from each village counting to a total of one hundred and twenty (120) respondents from whom relevant information were collected for analysis using a well structured questionnaire.

Descriptive statistics such as mean, frequency distribution, and percentages were used to determine the methods of processing and channels of marketing used in the study area while Profit function analysis was applied to estimate the relationship between input and output prices used by the firm and its profit level.

The generalized profit function model is given as follows:

$$\pi^* = \pi^* (Py, P_1, P_2, P_3, Z_1, Z_2)$$

Where : π^* = amount of maximum profit ₦

Py = price of output of cassava products ₦

P_1 = per unit price of water ₦

P_2 = per unit price of transportation ₦

P_3 = Per unit price of storage ₦

Z_1 = land rent ₦

Z_2 = depreciated value of basins, knives, bags and sieves ₦

Note: ₦is the sign for Naira, the currency used in Nigeria.

3. Results and Discussion

3.1 Techniques for Gari Processing

The results of the study showed that, there are three distinct processing channels or different stages in transforming cassava to gari product in the research area. The first channel is depicted thus, Peeling-Washing-Grating-Dehydration-Fermentation-Frying. While the second channel is depicted as Peeling-Washing-Grating-Dehydration-Fermentation-Oiling-Frying and the third channel is Peeling-Washing-Grating-Dehydration-Frying. The frequency distribution of respondents according to their channels of processing cassava into gari is shown in Table 1. The result shows that majority (58%) of the respondents adopted channel '1' of the processing stages in the transformation of fresh cassava to gari. Meanwhile, 38% of the respondents adopted channel '2' in their processing of cassava to gari while 4% of the respondents adopted channel '3' in the transformation processes.

Table 1. Distributions of Respondents According Processing Techniques in three cassava products

	Frequency	Percentage
Distributions of Respondents According to Gari Processing Techniques.		
Processing channel 1	69	58
Processing channel 2	46	38
Processing channel 3	5	4
Distribution of Respondents According to Cassava Flour Processing Techniques		
Processing channel 1	84	70
Processing channel 2	34	28
Processing channel 3	2	2
Distribution of Respondents According to Fufu Processing Techniques		
Processing channel 1	106	88
Processing channel 2	10	8
Processing channel 3	4	4
TOTAL	120	100

These implied that the majority of the respondents preferred processing channel '1' probably due to the demand for fermented gari, because of its taste and the cost implication of adding oil to their gari during processing period. The channel '2' has more respondents than channel '3' due to its nutritional value of vitamin 'A' contents in oil palm. This channel was better in terms of value addition in the processing stages.

3.2 Techniques for Cassava Flour Processing

The results of this study show that, there are three major processing channels in transforming cassava to flour product in the study area. The first channel is depicted thus Peeling-Washing-Soaking-Sifting-Dewatering-Molding-Drying. While the second channel is depicted as Peeling-Washing-Soaking-Sifting-Dewatering-Molding- Drying-Milling and the third channel is Peeling-Washing-Soaking-Sifting-Dewatering-Drying- Milling.

Table 1 shows that majority (70%) of the respondents adopted processing channel '1' stages as their major practice in the study area. The implication of this was that, most of the respondents do not mill their dried molded cassava, before taking it to the market in order to ease transportation hence reduced cost of transportation, occupy little space and reduced white dusty powder. Meanwhile, 28% of the respondents adopted channel '2' while 2% of the respondents adopted channel '3' in the transformation of fresh cassava to cassava flour.

3.3 Techniques for Fufu Processing

The results of the study showed that there are three distinct processing channels of different stages in transforming cassava to fufu product in the study area. The first channel is depicted thus, Peeling-Washing-Soaking-Fermentation-Sifting-Dewatering-Boiling-Molding. While the second channel is depicted as Peeling-Washing-Soaking-Fermentation-Sifting-Dewatering-Molding-Boiling and the third channel is Peeling-Washing-Soaking-Sifting-Dewatering-Molding-Boiling.

The frequency distribution of respondents according to their cassava to fufu processing channels is shown also in the Table 1. The study showed that 88% of the respondents adopted processing channel '1' as the major channel of transforming fresh cassava tubers into fufu. Meanwhile 8% of the respondents adopted processing channel '2' in transforming the fresh cassava tubers into fufu, whereas, 4% of the respondents adopted processing channel '3'. The implication of the above results was due to lack of fermentation in the processing channel '3' hence reduction in the popular demand by the respondents because fermentation in the cassava processing channel reduce or eliminate cyanide contents in fresh cassava tubers.

3.4 Channels for Gari Marketing

The result of the study showed that there are three distinct marketing channels in moving the gari products to the final consumers. The first channel is Packaging-Transportation-Wholesaling-Retailing-Final Consumers. While the second channel is depicted as Packaging-Wholesaling-Retailing-Final Consumer and the third channel is Packaging-Retailing-Final Consumers.

The frequency distribution of respondents according to their gari marketing channels is shown in figure 1. This result showed that, 60% (majority) of the respondents adopted marketing channel '1' in the marketing of gari product. Meanwhile, 37% of the respondents adopted the marketing channel '2' while 3% of the respondents adopted marketing channel '3' and this implies that most of the respondents transported their gari products to the market and sold to larger outlets comprising of wholesaling-retailing and final consumers hence more profit, unlike in fufu marketing channels which adopted marketing channel

'3' that involved selling the product directly to the retailers and final consumers only, without involving wholesalers and the need to transport their products to the market as a result of bulkiness and low profit.

3.5 Channels for Cassava Flour Marketing

The results of the study showed that, there are three major marketing channels of different stages in moving the cassava flour products to the final consumers. The first channel is Packaging-Transportation-Wholesaling-Retailing-Final Consumers. While the second channel is depicted as Packaging -Wholesaling-Retailing-Final Consumers and third channel is Packaging-Retailing-Final Consumers. The frequency distribution of respondents according to their cassava flour marketing channels is shown in figure 2. This indicated that, 53% of the respondents adopted marketing channel '1' in the marketing of cassava flour product. Meanwhile, 36% of the respondents adopted the marketing channel '2' while 11% of the respondents adopted the marketing channel '3' and this implied that some of the respondents are not involved in selling their cassava flour product at home to retailers and final consumers but rather preferred transporting the cassava flour to the market where they can sell their products to wholesalers, retailers and final consumers in order to make more profit via sale to larger 'buyers.

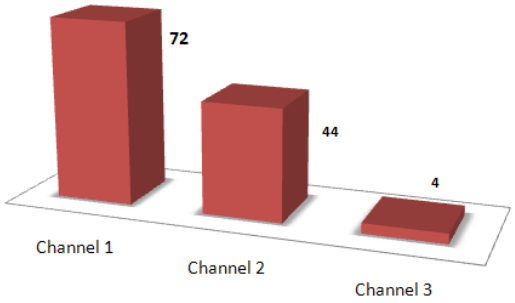

Figure 1. Channels for Garri Marketing

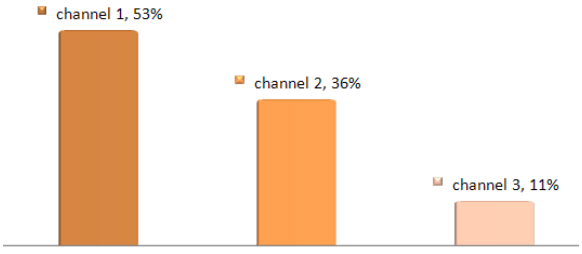

Figure 2. Channels for cassava flour marketing

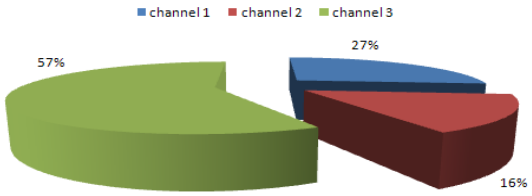

Figure 3. Distribution of respondents according to fufu marketing techniques

3.6 Channels for Fufu Marketing

The results of the study showed that, there are three distinct marketing channels of different stages in moving the fufu products to the final consumers. The first channel is Packaging-Transportation-Wholesaling-Retailing-Final Consumers. While the second channel is depicted as Packaging-Wholesaling-Retailing-Final Consumers and third channel is Packaging-Retailing-Final Consumers. The frequency distribution of respondents according to their fufu marketing channels is shown in figure 3. This indicated that, 27% of the respondents adopted marketing channel '1' in marketing fufu product. Meanwhile, 16% of the respondents adopted marketing channel '2' while 57% of the respondents adopted marketing channel '3' and this implied that most of the respondents do not like transporting the bulky wet fufu to the market with little profit hence preferred to sell their fufu products at home to retailers and final consumers which account for the 57% of the respondents hence maximizing their profit. Majority of the respondents don't like transporting their fufu products to the market due to the offensive odour which also repel some buyers.

3.7 Factors that influence profitability in gari processing/Marketing

In the gari enterprise, the combined effects of all the variable and fixed inputs in the profit function explained 78.9% of the variation in the maximum variable profit. The t–values revealed that all the variable costs were significant in influencing profit except unit cost of water, and storage that were insignificant.

Transportation: The transportation was one of the variable input that contributes positively to gari product output and was significant at 5% level of probability. This positive relationship was in agreement with Ibrahim 2009, as transportation facilitates the movement of gari products to the market for sales.

Basin:- Basin was one of the fixed input that contributes positively to output of gari products and was significant at 5% level of probability. This positive relationship was in agreement with a priori expectation because, more basins will increase more output.

Sieves: This was one of the fixed input which contributes positively to gari product output and was significant at 5% level of probability. This positive relationship was in agreement with a priori expectation because sieves help in adding value to the gari products hence more quality output and income. However, the results suggest that gari product enterprises were operating within the rational area of the profit function using the cost items and the significant output prices.

3.8 The Factors that Influence Profitability in Cassava Flour Processing/ Marketing.

Table 3 evaluates the factors that influence profitability in cassava flour processing/marketing enterprises in the study area showing the variables unstandardized and standardized coefficients, standard error and its level of significant. The resultant model for flour product showed that in the cassava flour product enterprise, the combined influence of all the variables and fixed inputs in the profit function explained 80.1% of the variation in the maximum variable profit. The t-value showed that all the variable costs were significant in affecting profit except cost of water and storage that were insignificant. Their positive relationship was as expected. The t– statistics also showed that fixed cost items that were significant at 5% level of probability were depreciated expense of basin, knives and sieves while depreciated expense of bags only was insignificant.

Transportation: - This transportation was among the variable input that contributes positively to cassava flour product output and was significant at 5% level of probability. This positive relationship was in agreement with a priori expectation. The transportation aids the movements of the cassava products to the final consumers in order to achieve the aim of marketing processes.

Basin: Basin was among the fixed input that contributed positively to the output of cassava flour product and was significant at 5% level of probability. This positive relationship was in agreement with a priori expectation because the basin adds value to the processing/marketing activities hence more output.

Knives: This was also one of the fixed items which contributes positively to cassava flour product output and was significant at 5% level of probability. This positive relationship agrees with a priori expectation because knives help in the value addition process of transforming cassava tubers into cassava flour product hence more quality output.

Sieves: The sieves as a fixed input, it contributes positively to cassava flour product output and was significant at 5% level of probability. This positive relationship is in agreement with a priori expectation because sieves aid value addition in the processing and conversion of cassava tubers into cassava flour hence more quality output.

From the above, the results showed that cassava flour product enterprises were operating within the rational area of the profit function using the cost items and the significant output prices.

3.9 The Factors that Influence Profitability in Fufu Processing/Marketing.

Table 4 evaluate the factors that influence profitability in fufu processing/marketing enterprises in the study area showing the variables unstandardized and standardized coefficients, standard error and its level of significant. The resultant model for fufu product showed that in the fufu processing enterprise, the combined effect of all the variables and fixed inputs in the profit function explained 84.4% of the variation in the maximum variable profit. The t – values showed that all the variable costs were significant in influencing profit except cost of water and storage that were insignificant. Their positive relationship was as expected. The t- statistics also revealed that fixed cost items that were significant at 5% level of probability were depreciated expense of basin, knives and sieves while depreciated expense of bags was insignificant.

Transportation: The transportation as a variable input, contributes positively to cassava fufu product output and was significant at 5% level of probability. This positive relationship was in agreement with a priori expectation because this transportation aid output of those processors/marketers through the movement of the cassava product fufu to the final consumer.

Basin: Basin as a fixed input, contributes positively to the output of cassava flour product and was significant at 5% level of probability. This positive relationship was in agreement with a priori expectation because basin aid processing activities via value addition, this help to increase output.

Knives: This was one of the fixed input which contributes positively to cassava fufu product output and was significant at 5% level of probability. This positive relationship agrees with a priori expectation because knives are used in processing the cassava roots into edible and sellable products hence more output.

Sieves: Sieves as fixed input, contributes positively to cassava fufu product output and was significant at 5% level of probability. This positive relationship is in agreement with a priori expectation because sieves help in the process of value addition to the quality of cassava fufu output.The results showed that, fufu product enterprises were operating

within the rational area of the profit function using the cost items and the significant output prices.

Table 2. Profit function analysis for Gari

Model	Unstandardized coefficient		Standardized coefficients	T	Sig
	B	Std. Error	Beta		
1 (const	2.729	.136	7.086	7.222	.000
Per unit price of water	.092	.460	.033	.201	.841
Per unit of transportation	1.544	1.908	.187	2.999**	.036
Per unit of storage	.388	1.480	.137	.262	.794
Land rent	.121	.361	.068	.334	.739
Depreciated value of basin, knives, bags and sieves	1.360	.267	-.222	2.560**	.044

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
1	0.933[a]	0.789	0.539	0.04110

Model	Sum of square	df	Mean square	F	Sig
Regression	11.710	11	1.065	12.831	.000[a]
Residual	15.584	100	.156		
Total	27.294	111			

Table 3. Profit Function Analysis for cassava flour

Model	Unstandardized coefficient		Standardized coefficients	T	Sig
	B	Std. Error	Beta		
1 (constant)	2.729	.136	8.245	6.640	..001
Per unit price of water	.092	.460	.033	.201	.841
Per unit of transportation	1.544	1.908	.187	2.999**	.036
Per unit of storage	.388	1.480	.137	.262	.794
Land rent	.121	.361	.068	.334	.739
Depreciated value of basin, knives, bags and sieves	1.360	.267	-.222	2.560**	.044

Mode l	R	R square	Adjusted R Square	Std. Error of the Estimate
1	.973[a]	.801	.609	.01110

Model	Sum of square	df	Mean square	F	Sig
Regression	1.710	11	1.065	14.14	.011[a]
residual	15.584	100	.156		
total	27.294	111			

Table 4. Profit Function Analysis for fufu

Model	Unstandardized coefficient		Standardized coefficients	T	Sig
	B	Std. Error	Beta		
1 (constant)	2.444	.136	9.034	4.999	.009
Per unit price of water	.092	.460	.033	.201	.841
Per unit of transportation	1.544	1.908	.187	2.999**	.036
Per unit of storage	.388	1.480	.137	.262	.794
Land rent	.121	.361	.068	.334	.739
Depreciated value of basin, knives, bags and sieves	1.360	.267	-.222	2.360**	.044

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
1	.98[a]	.84	.67	.011

Model		Sum of square	df	Mean square	F	Sig
1	Regression	11.710	11	1.065	14.91	.011[a]
	Residual	15.584	100	.156		
	Total	27.294	111			

4. Conclusion and Recommendations

Cassava products handling in the form of processing and marketing are prominent activities in the study area. Each of processing and marketing are profitable in the study area. However, it was noted that the strategies were still not fully automated. Using sophisticated machines for processing and better packaging will increase the profit margins for the respondents. It is therefore recommended that the respondents be empowered by increasing their capital base so to increase their productivity and hence their profit margin.

References

1. Adegeye, A. J. (1999). Issues and Options in Expanding the Cassava Industry (Production and Processing) in Nigeria. Report submitted to International Fund for Agricultural Development (IFAD).

2. Antonio, C. A. (2002). Cassava Biology, Production and Utilization: The Origin and Taxonomy of Cassava. CABI Publishing; Brazil. Pp. 1-343.

3. Asiedu, J. J. (1989). Processing Tropical Crops – A Technical Approach . Macmillan Press Ltd. London and Basingstock. Pp 15 – 16.

4. Enete, A. A. (1995). Trends in Food Crops yield under Demographic pressure conditions in Sub-Sahara Africa: The case of cassava in South East Nigeria, (Unpublished M.Sc thesis, Department of Agricultural Economics, University of Nigeria, Nsukka. P. 30.

5. Griggs, D. (1980). Population Growth and Agrarian Change: A Historical perspective, Winrock International Pub. USA. Pp. 75-77.

6. Ibrahim M. K. (2009). An Economic study of cassava processing in Kogi State". Unpublished M.Sc. Thesis, Department of Agricultural Economics University of Nigeria Nsukka.

7. International Institute of Tropical Agriculture (IITA). (2004). "Nigeria's Cassava Industry" Statistical Handbook.

8. ITDG. (2005). Agro-processing; Practical Answers to Poverty. Retrieved August, 2007 from www.itdg.org/agroprocessing

9. Kaplinsky, R and Moris, M. (2000). A Hand book for Value Chain Research. Prepared for theIDRC. Retrieved March 2008 from http://www.ids.ac.uk/ids/global/odfs/vchNov01odf.

10. KSADP (Kogi State Agricultural Development Projects). (1995). A colossus in Agricultural Transformation. In: Agric Digest, A publication of the Ministry of Agriculture, Kogi State, 5(1): 5-6.

11. Nweke, F. I., Dixion, A. G., Asiedu, R and Folayan, S. A. (1994). Cassava Varietal Needs of Farmers and the Potential for Production Growth in Africa. COSCAWorking paper No10. Pp 11-12.

12. Phillip, D. O. A. (2005). The Potentials of Cassava in the Nigeria Economy: The Case of Ogun

State. Paper presented at the Second Quarterly Buisness Forum, in Ota, Ogun state.