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Value Chain Addition of Cassava Processing into Edible Starch and Local Cassava Cake (Kpokpo-Garri) in Isoko North Local Government Area of Delta State, Nigeria.

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ABSTRACT

The need to bridge the wide gap between inadequate food supply and increasing population rate in developing countries calls for addition of values to agricultural products by way of processing to avert huge amount of wastes in seasonal production. This had prompted this study on the value chain addition of cassava processing into edible starch and local cassava cake in Isoko north local government area of Delta state, Nigeria. Cross sectional data were collected using purposive and simple random sampling techniques with the aid of well-structured questionnaire for the 2012 processing season. Purposive sampling technique was used to select six towns from the study area based on their involvements in cassava processing activities. Thereafter ten (10) respondents were randomly selected from each of the towns making a total sample size of sixty (60) respondents. Data were analyzed using simple descriptive statistics such as mean, frequencies percentages and inferential statistics including gross margin and regression analysis. The results showed that all the respondents were females, the highest proportion (38%) of the respondents were of the age group of 50 years and above and 90% were illiterates, 75% of the respondents were widowed and 58% had household size within the range of 5>8 persons, 66% of them were into cassava processing on part-time basis, while 33% had 11 > 15 years of processing experience and about 90% used family labour. The estimated annual total revenue was ₦450,000, total variable costs was ₦310,000 and the gross margin was ₦140,000 per annum per respondent which represented 45.16% of the total variable cost of production. The implication was that for every one naira invested in the processing of cassava, the farmer gained 45 kobo. The result of the regression analysis revealed that 77% of the variability of the estimated revenue per annum (Y) was being accounted for by the independent variables in the specified model. Inadequate capital, lack of improved technology, inadequate processing and storage facilities, small sized enterprises with low earnings, poor markets characterized by low pricing of products were the major constraints encountered by the processors in the industry. It was

therefore recommended that credit facilities should be channeled to processors through the micro-credit scheme of the Delta State Government, Government policies should be modified to include the provision of training programme to disseminate scientific knowledge to cassava processors, the Research-Extension Farmer linkage should be strengthened to furnish the processors with modern processing techniques, Processors should form co-operative association to establish edible starch and local cassava cake added value centres for improved and modern weighing and packaging methods, Government and non-governmental organizations/agencies should assist in educating the cassava processing farmers through effective extension system on improved cassava processing technology, to bring about improved production, marketing and profitability; and in doing so, improves livelihood, income, and food security of the people.

Keywords: Cassava Processing, Value Chain, Gross margin, Regression analysis, Delta State, Nigeria.

Introduction

Cassava (*manihot esculenta crants*) is well known as a staple root crop for over 80 million people around the world; (Food and Agricultural Organisation, 1996). It plays a food security role in Africa where annual production feeds over 80million people annually; (Nweke and Eneta, 1999). World cassava production by 2005 was projected to increase to 209 million tonnes (fresh weight) or by 2.2%, reflecting both yield improvement and area expansion; (F.A.O. 1996). Nigeria is currently the largest producer of cassava in the world with annual production of over 34 million tonnes of tuberous roots; (Federal Ministry of Agriculture and Natural Resources (FMANR), (1997). Global cassava production is expected to show continued growth over the next five years with Africa leading the way. Five countries; Brazil, the Democratic Republic of Congo, Indonesia, Nigeria and Thailand account for almost 79% of the world's cassava production, (Spore, 2001). F.A.O. (1996) predicted that from 1996 to 2050, cassava production had to rise by more than 700% in the 21st centuries in West Africa, Central and East Africa. Cassava production in Nigeria is increasing at 3% every year but Nigeria continues to import starch, flour, sweeteners that can be made from cassava. This paradox is due to how cassava is produced, processed, marketed, and consumed in Nigeria in a largely subsistence to semi commercial manner. To fully exploit cassava's immense potential, especially as a replacement of imported raw materials and as an export commodity, there is a need to change how cassava is grown, processed and traded in the country using a value-chain development approach. Nigerian cassava-based industrial products are just a

fraction of imports, and the growth potential is huge. On this background a cassava transformation projects that builds upon previous efforts has been embarked upon under the Agricultural Transformation Program of President Goodluck Jonathan and implementation by the Honorable Minister of Agriculture, Dr Akin Adesina. The cassava transformation seek to create a new generation of cassava farmers, oriented towards commercial production and farming as a business, and to link them up to reliable demand, either from processors or a guaranteed minimum price scheme of the government. The overall strategy of the cassava transformation is to turn the cassava sub-sector in Nigeria economy into a major player in local and international Starch, Sweeteners, Ethanol, and dried Chips industries by adopting improved production and processing technologies, and organizing producers and processors into efficient value-added chains. Implementation of the value-added chain activities will be driven by the private sector with support from the public sector. A Cassava Market and Trade Development Corporation (CMTDC) was to be established as the primary vehicle for implementation of value-added chain activities. Primary activities of CMTDC are market development, including advocacy with potential users of cassava-based products and policy makers, to ensure reliable demand. From the public sector, the Federal, State, Local governments, and NGOs would organize and train farmers in modern production methods, and disseminate to them improved varieties and inputs required to grow them. Experience from around the world has shown that crop campaigns to raise productivity require a close partnership with research and development of enabling technologies. The transformation plan would invest significantly in the development of improved production methods, new varieties, disease and pest diagnostic surveys, and the development of novel cassava products. The transformation plan would support the production of high starch and early varieties, 8-10 month crop, and varieties with increased nutrition to enhance health status, especially children of consumers.

Systematic interventions in the cassava sector began in the early 1980s with the introduction of high yielding, early bulking varieties, resistant to the cassava mosaic disease (CMD) and cassava bacterial blight (CBB), produced at the International Institute for Tropical Agriculture (IITA) in the 70s', and the establishment of small-scale processing facilities. These two key interventions increased profit margin for producers and processors alike and drove down prices of cassava food products for the rural and urban consumers. "The cassava transformation", as the rapid increase in production and marketing has been termed, spun an entire food Industry and transformed the crop from a rural subsistence crop to a cash crop and urban staple food (Nweke *et al.* 2001).

Cassava can be processed into edible starch and cassava cake using the following pattern from harvesting to storage: Harvest → Peeling-→ Washing--→Grating/Milling--→Shifting and washing→Pressing-→Sedimentation of starch--→Spreading of cassava paste on local tray → Sun-drying /Frying →Cooling→Packaging--→Storing in a cool/dry place of cassava cakes. Harvested cassava tubers are peeled and washed thoroughly, taken to the privately owned milling machine for milling, the milled cassava paste is then washed in large quantity of water inside a jute bag, this process is repeated several times until the washed water is clean. This indicates that most of the starch is removed. The washed cassava paste is spread on local mat tray and sun dried. The washed starch mixture is allowed to sediment overnight and packed with plantain leaves for marketing. The sun dried cassava cake (kpokpo-garri) is packed in jute bags for marketing. The edible starch is usually prepared into firm paste and eaten with banga soup, owo soup or pepper soup. These are some of the highly cherished meals by the Urhobos, Ijaws, Itsekiris, and Isokos of Delta Central and Delta South Senatorial Districts. The cassava cake is eaten with fried groundnut, coconut, dried crayfish, sardine, cornered beef, bonga fish, fried edible worm, fried pork meat, etc. The cassava cake has high content of crude fibre and is a highly nutritionally- aid -food for good digestion. Cassava is a leading staple food for over 90 millions people living in the rural and urban areas and it is a key component of urban worker diets of Nigerians (IITA, 1988). Aside from its use as human food, it can be used for the production of flour for confectioneries, formulation of animal feeds and the production of industrial starch, industrial alcohol, adhesive and gums; (Balogun, 2003).

Therefore, Cassava is considered as the most productive crop and source of food energy in the tropics. Worldwide, fifteen countries produce in excess of one million tonnes per annum of these; brazil, Indonesiia, Nigeria, Thailand and Zaire are the highest producers and together account for 63 percent of the world's output (Omorjire, 2005). According to Nweke (1996), Africa, Asia and Latin America/Caribeans produce 48%, 32% and 28% respectively of world cassava (FAO STAT 2005). Nigeria also accounted for 23.1% of world production in 2000 when the production increased to 147 million per annum with Nigeria contributing 34 million tonnes; (Kalu, 2003). Cassava is the most widely cultivated crop in Sub-saharan Africa because of its tolerance to extreme ecological stress conditions and poor soil condition. Cassava is one of the most important root crops in the tropics and has been considered a preferred crop for resource use for poor farmers in most Sub-saharan Africa (IITA, 1990). Sequel to the reduction of cassava production in the country, the Federal Government of Nigeria and International Fund for Agricultural Development

(IFAD) jointly initiated the Cassava Multiplication Programme (CMP) with the aim of promoting cassava utilization as a commodity based approach against food insecurity (Adeniji & Jimoh, 2000). Cassava (Manihot esculenta or Manihot utilissima) is believed to have originated from Brazil and introduced to West Africa by the Portuguese. It is considered as the most productive crop and source of food energy in the tropics worldwide. Fifteen countries produce in excess of one million tonnes per annum; of these Brazil, Indonesia, Nigeria, Thailand and Zaire are the highest producers and together account for 63% of the world's output (Omorjire, 2005) According to Austin (1985), processing involves transformation and preservation through physical or chemical alteration, storage, packaging and distribution. The nature of the processing and the degree of transformation can vary tremendously, ranging from the cleaning, grading and boxing of apples to the milling of rice to the cooking, mixing and chemical alteration that create a textured vegetable snack food. Raw food and fibre are transformed into edible and useable products, to increase storagibility, to obtain a more easily or economically transportable form, and to enhance palatability, nutritional value and consumer convenience. The term value chain refers to the full range of activities that are required to bring a product (a service) from conception through the different phases of production to delivery to final consumers and disposal after use. A value chain exists when all of the actors in the chain operate in a way that maximizes the generation of value along the chain in a narrow perspective; a value chain includes the range of activities performed within a firm to produce a certain output. This might include the conception and design stage, the processing of acquisition of inputs, the production, the marketing and distribution activities, and the performance of after sales services. All of these activities constitute the "chain" which link producers to consumers and each activity adds value to the final product. For example in agribusiness enterprises, an appropriate system of processing and preserving fresh raw materials (e.g. fresh cassava tubers) would positively impact on the quality of the final product and consequently increases its value.

Despite the enormous potentials of edible starch and cassava cake in improving the economic activities of the predominantly female processors who are very critical to the economic base of the individual family unit (Egharevba, 1992), all is not well. This is because producers of edible starch and cassava cake are perennially plagued with the age longed problem of seasonal variations in product prices, a phenomenon that has been identified as "cyclic effect" in previous studies (Obinne and Anyanwu, (1991); RTEP, (2001); Emokaro and Erhabor, (2006)). Consequently, processors in the study area are unduly cautious enough to ensure that edible starch and cassava cake are not produced on a large scale in order to prevent any glut in the market. In line with this

development, can one say that edible starch and cassava cake producers are operating profitably in the region? Although, several works has been done in the area of cassava production, processing and marketing, not much information is available on edible starch and cassava cake processing and production, particularly in Isoko North Local Government Area of Delta State. Thus, the main objective of this work, therefore, was the value chain addition of cassava processing into edible starch and cassava cake in Isoko North Local Government Area of Delta State, Nigeria. To achieve this objective, the study examined the socio-economic characteristics of cassava processors, determined the cost and revenue structures of processing cassava into product of edible starch and cassava cakes, ascertained the relationship that exists between the revenue and the major independent variables affecting it and also identified the major constraints faced by processors in cassava processing in the study area.

Methodology

The study was carried out in Isoko North Local Government Area of Delta State, Nigeria. Delta State is located in the southern part of Nigeria within latitude 6°6′ and 6°′ N; and longitude 6°13′ and 6°25′ E, with annual mean rainfall and temperature of 2000-23000mm and 28-30°C respectively (Nwajei, 1993). Its elevation above sea level is about 150m (Nwajei, 1993). The River Niger runs through the lower part of the eastern boundary. Two geographical seasons are identified in the state; the rainy season which is from late March to the end of October and dry season which is from November to early March. Isoko North Local Government Area of Delta State was selected to study based on prevalent activities of production and processing of cassava in Nigeria. It was created out of the defunct Isoko Local Government Area on 27th August 1991. It is bordered on the North by Ndwokwa West, on the East by Ndokwa East, on the South by Isoko South and on the west by Ughelli North Local Government Areas respectively. The population figure of the local government was 144,155 by the last national population census conducted in 2006 (Delta Beckons, 2011). There are eight (8) clans within the local government area, comprising of about forty-three communities. These clans include; Ozoro , Iyede , Owhe , Emevor , Ofagbe , Okpe-Isoko , Ellu , and Oyede, (Delta Beckons, 2011). The Local Government Area has very rich potential for agriculture and is suitable for food crop farming, tree crop farming, fish farming and livestock farming. The major occupation of the people in the area is farming and the crops commonly cultivated include cassava, rubber, oil palm and fishing occasionally. The study used both primary and secondary data. Cross sectional data were collected using purposive and simple random sampling techniques with the use of well-structured questionnaire. A purposive method of sampling was used in selecting

the market to be used for the study, because there are clusters of small scale garri processors in localities of the local government area. The local government area has contributed substantially and is still contributing to the total garri production in Delta State. Purposive sampling technique was used to select six towns from the study area based on their involvements in cassava processing activities; the selected towns were: Ozoro, Ovrode-Ellu, Oto-owhe, Akiewe, Emevon and Ellu. Thereafter, ten (10) respondents were randomly selected from each of the towns making a total sample size of sixty (60) respondents. Descriptive statistics such as frequency distributions, mean and percentages were used to analyze the socio-economic characteristics of the cassava processors in the area.

Gross Margin analysis was used to determine the costs, returns and profitability of cassava processing in the study area. Objective was achieved by the use of Gross Margin as a statistical tool which is relevant in this study because most respondents were rural small scale producers with enterprise holdings of less than one tonne of processed edible starch and cassava cake per processing activity. According to Upton (1972), these groups of farmers/processors hardly have over head capital investment. They depend mainly on customized services for their value added livelihood practices. Depreciation of capital assets does not pose a problem in this type of analysis at all. The model for Gross Margin analysis states that:

TEP= (TER-TEC) (Upton 1972)

Where TEP= Enterprise Total Profit

TER= Enterprise Total Revenue

TEC= Enterprise Operational Total Cost

While

$TEP=\sum^{n}_{ij=I}(TER-TEC)$ = Total Farm Profit (TFP)

TFP is the sum of each enterprise profit for all enterprises embarked upon by the farmers.

Regression analysis was used to find the relationship between the dependent and independent variables. The implicit function relating to the processors profit can be expressed thus:

$Y = f (b_o + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + e)$ (Adapted from Olayide and Heady, 1982)

Where

Y = Estimated revenue per annum

b_o = Constant

b_1 - b_6 = Coefficients of multiple regression

x_1 = Labour costs

x_2 = Processing costs
x_3 = Selling price
x_4 = Quantities of tubers processed costs
x_5 = Miscellaneous costs
x_6 = Packaging costs

Results and Discussion

Socio-Economic Characteristics of Respondents

Table 1 shows the socio-economic characteristics of the respondents. The results showed that 100% of the respondents were females. This could be attributed to the fact that the processing of food is believed to be the responsibility of women in the society. This corroborates the findings of Erhabor et al (2004), which showed an ageing population among cassava processors in Edo State with a predominantly female population (90%). The results also showed that the highest proportion (38%) of the respondents were of the age of 50 years and above, 90% were illiterate, 75% of the respondents were widowed and 58% had household size within the range of 5>8 persons, 66% of them were into cassava processing on part-time basis, while 33% had 11 > 15 years of processing experience and about 90% used family labour. Most of the socio economic features showed that the cassava processors are illiterates with large family size and of older age range which showed that some accommodate their grand children and used then as family labour to contribute to economic activities within the household.

TABLE 1

Variable	Category	Frequency	Percentage (%)
Sex	Female	60	100.0
	Male	0	0.0
Age Group (Years)	<30	7	11.7
	30>40	7	11.7
	40>50	17	28.3
	>50	26	48.3
Educational Level	No formal education	54	90.0
	Primary	06	10.0
	Secondary	00	00.0
	Tertiary	00	00.0
Marital Status	Single	7	11.7
	Married	8	13.3
	Widowed	45	75.0
Household Size	<5	12	20
	5>8	35	58.3
	9>12	13	21.7
Farming Status	Part-Time	40	66.7
	Full-Time	20	33.3
Farming Experience (years)	<5	6	10.0
	6>10	8	13.3
	11>15	20	33.3
	16>20	10	16.7
	>20	16	26.7
Source of Labour	Family labour	54	90.0
	Hired labour	06	10.0

Source: Field Survey Data, 2012

Estimated Annual Variable Cost Per Respondent.

Table 2 shows the estimated annual variable cost per respondent. The cost of purchase of fresh cassava tubers was N219,400 which accounted for 71% of the total variable cost of production of one metric tonne of edible starch and cassava cake. The cost of fresh cassava tubers accounted for the largest total variable cost which indicates that fresh cassava tuber is a significant variable in edible starch and cassava cake production. Labour cost was N36,250 which was

12.0% of the total variable cost. The costs of grating/milling, sun drying/firewood-drying, packaging and miscellaneous were N21, 450 (7.0%), N17,500(6.0%), N6,650 (2.0%), and N17,750 (6.0%) respectively of the total variable costs.

Table 2: Estimated Average Annual Variable Cost Per Respondent.

Item	**Cost Per Tonne (₦)**	**Percentage**
Fresh tubers	219,400	71
Grating/Milling	21,450	7.0
Pressing/frying	8,500	3.0
Labour	36,250	12.0
Packaging	6,650	**2.0**
Other Miscellaneous	17,750	**6.0**
Total Variable Cost	**310,000**	**100**

Source: Computed from Field Survey Data 2012

Gross Margin Analysis

Table 3 shows the estimated annual total revenue of N450,000, total variable costs of N310,000 and the determined gross margin was N140,000 per annum per respondent which represent 45.16% of the total variable cost of production. The implication is that for every one naira invested in the processing of cassava, the farmer gained 45 kobo. This finding is in consonant with the findings of Emokaro et al (2008) who obtained gross margin values of N211,275 in one month in the peak season with the clause that if he gets regular supply of raw cassava tubers and a ready market for the product. This result also compares favourably with the findings of Erhabor et al (2004), who obtained gross margin values of N12,900 and a return per naira invested of N1.08 for garri and starch production in Oredo with higher values of N17,250 and N1.56 respectively in Egor. These findings show that the processing of cassava to and edible starch in Egor and Oredo Local Government Area of Edo State was a profitable venture. In the same vein, it could also be inferred that cassava processing is a profitable venture in Isoko North Local Government of Delta State.

Table 3: Estimated Annual Total Revenue and Gross Margin of Respondent in the Study Area.

Variable	**Amount (₦)**
Total Revenue	450,000
Total variable cost	310,000
Gross Margin	140,000

Sources: Computed from Field Survey Data, 2012

Regression Result of Returns to Cassava Processing.

Table 4 shows that the independent variables; labour cost (0.717), processing costs (0.173), selling price (0.132) and quantities of tubers processed (0.420); all have positive values of their coefficients and had significant effects in determining the farmer's income. On the other hand, it is also shown on the table that packaging costs (0.024) and miscellaneous costs (0.162) had no significant impact in determining the farmers' income. Since the Fcal (5.711) is greater than Ftab (3.123) and the adjusted R squared was (0.767), it implies that there is significant relationship between the processing input costs of the processors and their income levels. The adjusted R^2 =77% (0.767) shows that the variation in income levels of processors is accounted for by the variations in all the variables put together. This also implies that the independent variables explain the behavior of the dependent variable at 5% level of confidence.

Table 4: Determinants of Income of Cassava Processor

Processing	**(Multiple Regression)**		**Probability Level**
	B	**T**	
Constant	28.465	2.727	0.013
Labour costs	0.717	1.672	0.081
Processing costs	0.173	2.403	0.023
Selling price/bag	0.132	2.538	0.001
Quantities of Tubers Processed	0.420	4.667	0.000
Miscellaneous	0.162	0.385	0.701
Packaging costs	0.024	0.234	0.815

Significant at 5% level ($p<0.050$)

F=5.711 ($p<0.050$), adjusted R squared=0.767

Processing Constraints: Table 5 shows the constraints encountered by cassava processors in the study area. Respondents of cassava processing enterprise were required to state freely and clearly the obvious constraints encountered

from the point of procurement of cassava tubers through processing to the final distribution stage. Based on the feedback from the respondents, five items were ranked on a Likert-type scale in order to measure relevant variables that were major constraints to cassava processing in the study area. These were

- Inadequate capital and fund
- Lack of improved technology
- Inadequate processing and storage facilities
- Small sized enterprises with low earnings
- Poor markets characterized by low pricing of products.

Ranking of these constraints revealed that inadequate capital and fund as the most serious with 2.18 mean score. This rating was followed by lack of improved technology with mean score of 2.02, inadequate processing and storage facilities with mean score of 1.82, small sized enterprises with low earnings mean score of 1.77, Poor markets characterized by low pricing of products with mean value of 1.37

Table 5: Processing Constraints Faced by Respondents

Processing Constraints	**Mean**	**Standard Deviation**
Inadequate capital	2.18	1st
Lack of improved technology	2.02	2nd
inadequate processing and storage facilities	1.82	3rd
Small sized enterprises with low earnings	1.77	4th
Poor markets characterized by low pricing of products	1.37	5th

Source: Computed from Field Survey Data 2012

Conclusion and Recommendations

The findings of this study established the fact that cassava processing into edible starch and cassava cake is a profitable venture in the study area with the estimated annual total revenue of N450,000, total variable costs of N310,000 and the gross margin was N140,000 per annum per respondent. It could therefore be concluded that processing cassava into edible starch and cassava cake is not only a source of livelihood to the individual processor but also a source of wealth to the nation if properly harnessed and funded. Based on the findings of this study, the following recommendations were advanced towards

alleviating the constraints encountered by cassava processors in order to increase their profitability. Credit facilities should be channeled to processors through the current micro-credit scheme of the Delta State Government to enable producers strengthen their enterprises by acquiring processing inputs which they claim are currently beyond their reach. Government should create Institutions to increase productivity through the demonstration and adoption of improved processing technologies by clusters of processors and the establishment of a network of agro dealers to supply the needed inputs of: milling machines, processing vats and trays, modern packaging materials and storage facilities. Government policies should be modified to improve on the provision of training programme to disseminate scientific knowledge to cassava processors to enable them use the available resources efficiently and increase productivity. The Research-Extension Farmer linkage should be strengthened to furnish the processors with modern processing techniques that would enhance their productivity and profitability. Processors should form co-operative associations to establish edible starch and cassava cake added value centres for improved weighing and packaging methods. This would enhance the market value of their products and help in commanding stable market prices. Government and non-governmental organizations/agencies should assist in educating the cassava processing farmers through effective extension system on improved cassava processing technology. Therefore, extension needs of cassava processing should be given special and urgent attention. Thus the situation can be improved through the action research on crops processing systems to bring about improved processing, marketing and in doing so, improves livelihood, income and food security of the people.

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