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RESEARCH ARTICLE

Economics Assessment of *Garri* Processing in Rivers state, Nigeria

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Abstract

The study focused on economics assessment of *garri* processing in Rivers state, Nigeria. A purposive sampling procedure were used to select 120 respondents for this study. Primary source of data were collected with the use of structures questionnaire, and analyzed using mean, frequency and percentage, Gross Margin and Return on Investment. The findings revealed that 78.3% of the garri processors in Rivers State were female, while 21.7% are male. The average age of the garri processors were 45.5 years, with mean years in formal education of 9.9 years, and average years of experience in garri processing of 19.8 years. Furthermore, the results revealed that Gross Margin in processing 1338.84kg (the average processed cassava in the study area) of cassava roots into garri in Rivers State was N 10,561.60. While, the return on investment was N1.23, implying that for every one naira (₦1.00) invested in processing 1338.84kg of cassava roots into garri in the study area, a profit of ₦0.23k were realized, indicating 23% returns. Likewise, the results revealed that lack of funds; lack of improved garri processing equipment; health challenges; middlemen exploitation; lack of storage facilities; spoilage of cassava; and poor market linkages were the major constraints in garri processing business in Rivers State. Therefore, the study suggested that improved garri processing, and storage equipment developed by Nigerian Stored Products Research Institute (NSPRI) should be made available to garri processors in Rivers State by the government or NGOs in order to reduce waste in the system and increase returns. Also, adequate credit facilities should be made available to the garri processors in Rivers State.

Keywords: Garri processors; Economics; Assessment; Gross Margin; Rivers State.

1. Introduction

Cassava (*Manihot esculenta*), is majorly a starch root crop (Sanni *et al.*, 2009; Aminu, *et al.*, 2017). The starch content of fresh cassava is about 30%, and gives the highest yield of starch per unit area among other crops (Okuduwor, *et al.*, 2023), while the protein content ranges from 1 -3%, which is extremely low compared with other food crops. (Salcedo *et al.*, 2010; Okuduwor, *et al.*, 2023). Likewise, cassava contains significant amounts of micro-nutrients such as Iron, Phosphorus, Calcium, and vitamin C (Enidiok *et al.*, 2008; Okuduwor, *et al.*, 2023). Cassava is mostly use as food staples, it is a major source of food and industrial crop in most Africa countries (Sanni *et al.*, 2009; Aminu, *et al.*, 2017). Apart from its use as a staple food for humans, it can be use in animal feed formulation, and also for agro-industrial uses (for examples: ethanol, starch, adhesive, fructose/glucose syrup) (Iyagba, 2010; Okuduwor, *et al.*, 2023). The tuber of cassava is also used as raw-materials in the garment, bakery, food and pharmaceutical industries (IITA, 2011; Fakir *et al.*, 2012; Okuduwor, *et al.*, 2023). Cassava is considered as the cheapest source of

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calories for both human and animal consumption, thereby playing a major role in achieving food security in Nigeria (Adesope *et al.,* 2020). Cassava is very resistance to drought and diseases, and has a very flexible cultivation cycle (Sanni *et al.,* 2009). It is widely cultivated in Nigeria, and majorly grown by small-holder farmers, and Nigeria is ranked as the largest producer of cassava in the world (Adesope *et al.,* 2020). It is a known fact that cassava production and processing is playing a great role in food security of most households within Nigeria by providing employment opportunities and income for the populace (Oluwatusin, 2017).

Cassava as a root crop is usually processed into storage form after harvest in order to prolong its shelf life. Thus, various processing methods such as fermenting, soaking, grating, boiling, roasting of whole or fragmented roots, and sun drying are used to reduce the cyanide content of the cassava (Dziedzoave *et al*., 2010; Adeniyi and Akande, 2015; Adesope *et al.,* 2020). The processing of cassava is usually done in order to increase the shelf life of the cassava and reduce post-harvest losses. Eseokwea *et al*. (2019), noted that postharvest loss creates a gap between what farmers actually produce for the market, and the quantity that was actually supplied to the market. According to them, the gap has been increasing for roots and tubers like cassava that is highly communed by people. This is so because cassava production, processing and marketing is done under rudimentary conditions whereby product standardization and specification are not taken into consideration (FAO, 2010; IFPRI, 2013; Eseokwea *et al*., 2019). Cassava is mostly consumed in the form of a roasted and fermented product called *Garri*, and also in the form of boiled fermented products called *fufu*. *Garri* is processed from cassava roots and it is highly rich in carbohydrates and consumed by millio**n**s of people in Nigeria (Ozigbo *et al*., 2020). Garri comes in granular form but once mixed in hot water, it turns into smooth solid paste called *eba* in native language, which can be eaten with soup. *Garri* can also be eaten with sugar, and milk after mixing it with cold water as snack. Ozigbo *et al*. (2020), reported that about 148 million people eat garri across the country, which made up of about 74% different tribes of people in Nigeria.

Rivers state of Nigeria is among the major producers of cassava in the country due to favorable weather and soil conditions suitable for cassava production (Elemasho *et al.,* 2023). It is noted by Elemasho *et al*. (2023) that Rivers state is among the top 5 cassava producing states which led to the establishment of 450 metric tons cassava processing plant at Afam in Oyigbo Local Government Area of Rivers State in May 28, 2021, though it was not adopted by the majority of the processors. The aim of establishing the plant is to enhance value addition and increase the profitability of the cassava business. Given the fact that the government of Rivers State is making efforts to make the business of cassava and its derivatives a profitable venture in Rivers State, there is a need to undertake a study to ascertain if processing of cassava into garri is profitable in Rivers State.

Problem Statement

Cassava root is highly perishable in nature once it is harvested (*Naziri et al.,* 2014). The rapid deterioration that occurs in cassava after harvesting, usually restricts its storage potential to two to three days (Iyer *et al.*, 2010; *Naziri et al.,* 2014). As storage of the cassava roots is very rare in Nigeria, and elsewhere, the most common and sensible way to minimize losses after cassava harvest is to consume or process them as soon as possible. Unfortunately, cassava production, and processing are mostly done in a traditional methods by small holder farmers, and processors who dominated the area using traditional technologies (AfDB, 2015; Elo-Oghene *et al.,* 2022). This often leads to economic losses in the system. Aminu *et al.* (2017), noted that garri processing using the traditional methods is tasking, ineffective, time- consuming and also inefficient. Though cassava is processed into different products like cassava chips, *fufu*, *garri*,

flour, among others in order to prolong its shelf life, but little or nothing is known about the economic viability of the process especially that of processing cassava into *garri.* As noted by Heike Ostermann (2013), about 8% of cassava are lose during on-farm processing of garri, while about 14.4 per cent are lose during commercial processing of garri, which signifies some economic lost in the process. Therefore, the farmers or processors who processes cassava into *garri* incurs different costs (fixed or variable cost), and loses in order to get the process done. These incurred costs and losses has a way of reducing the economic returns of the farmers or processors if the price of the processed products is not big enough to off-set the incurred costs due to seasonal variations in garri prices. Thus, leading to unprofitability of the entire process. Many studies on cassava has concentrated on its productions, value chain analysis, post-harvest technological needs, and post-harvest management (Oluwatusin, 2017; Okuduwor *et al.*, 2023; Elemasho *et al.*, 2023; Anyoha *et al.*, 2023). Given the fact that the government of Rivers State is making efforts to make the business of cassava and its derivatives profitable in Rivers State, coupled with the deficient researches on economics of garri processing in Rivers State. This study intend to fill the gap by assessing the economics of cassava processing into *garri* in Rivers State with a view of knowing if it is economically viable or not. Thus, this work intend to find answers to the following research questions:-

- What is the socio-economic profile of garri processors in Rivers State?
- Is garri processing in Rivers State profitable?
- What are the challenges associated with garri processing in Rivers State?

Objective of the work

The main purpose of this research work is to assess the economics of garri processing in Rivers State, Nigeria. While the specifics objectives are to:

- describe the socio-economics profiles of garri processors in Rivers, State,
- estimate the profitability of garri processing, and
- Identify the challenges associated with garri processing in Rivers, State.

2. Methodology

The study was carried out in Rivers State. Rivers State was created on 27th May, 1967. The State lies between Latitude 4.7500^{0}N and Longitudes 6.8333^{0}E (Elemasho *et al.,* 2023), with a total land area of about 50,000 square kilometer. The State is made up of 23 local government areas, while about 7 Local Government Areas are into agricultural production. The State is made up of 10 different ethnic groups with the dominant ethnic groups as Ijaw, Ikwere, Khana, Kalahbari and Ogoni, with total population of about 6.9 million people (Nigeria Poverty Map (NPM), 2022). The major crops produced in Rivers State are Maize, cassava, plantain, banana, and leafy vegetables.

A purposive sampling procedure were used to select the respondents for this study. First, three (3) Local Government Areas (LGAs) were purposively selected from the twenty seven (27) LGAs that made up the State. The three selected LGAs are Eche, Abuoa/Odua and Ikwere. The reason for their selection was that cassava production and garri processing is high in those areas. Second, two communities each from the 3 Local Government Areas were purposively selected, giving a total of 6 communities selected for the study. Lastly, snow ball sampling technique was used to select 20 garri processors from each of the selected communities to give a total of 120 garri processors selected for the study. Primary source of data collected with the aid of interview and structured questionnaire were used for the study. The collected data were analyzed using descriptive and inferential statistics. Thus, objective one, and three were analyzed using descriptive statistics such as

mean, frequency, and percentage. While, objective two were analyzed using gross margin analysis, and return on investment.

2.1. Model specification

2.1.1. Gross Margin Model

Gross margin model is expressed as follows:-

GM = TR – TVC…… (1)

Where:

GM = Gross margin,

TR = Total revenue made by the garri processor,

TVC = Total variable cost incurred by the garri processor.

2.1.2. Return on investment (ROI) model

Returns on investment (ROI) = $\frac{TR}{TC}$ …… (2)

Where ROI = Returns on investment,

TR = Total revenue realized by the garri processors in Naira, and

TC = Total cost of processing the garri in Naira.

3. Results and Discussion

3.1. Socio-economic characteristics of the garri processors in Rivers State

The results of the socio-economic profile of the garri processors in Rivers State are presented in Table 1. The included variables are age of the garri processors, sex, educational level attained by the garri processors, household size, marital status, and experience in garri processing, and extension contact.

Table 1. Socio-economic Variables of the Respondents

Variables	Frequency	Percentage	Mean
Age (Years)			
21-30	15	12.5	
31-40	33	27.5	
41-50	31	25.8	45.5
51-60	34	28.3	
61-70	3	2.5	
71 -80	4	3.3	
Sex			
Female	94	78.3	
Male	26	21.7	
Years of formal Education			
0 years			
1 – 6	8	6.7	
7 – 12	40	33.3	9.9
13 - 18	62	51.7	
	10	8.3	
Household Size			
1-5	85	70.83	8
6 10	25	20.83	
11 - 15	10	8.33	
Marital Status			
Single	16	13.3	
Married	85	70.8	
Widowed	5	4.2	
Divorced	14	11.7	
Years of Experience			
1-15	53	44.2	19.8
16 -30	48	40.0	
31 - 45	17	14.2	
46-60	2	1.6	
Extension contact			
Yes	16	13.3	
No	104	86.7	

Source: Field Survey 2023.

The results in Table 1 revealed that most (54.1%) of the garri processors in Rivers State are within the age range of 41 - 60 years. While, the least (3.3%) of them falls within the age range of 71 – 80. The mean age of the garri processors in Rivers State were 45.5 years. This shows that most of the garri processors in Rivers State are within their economic active and productive age. This validate Aminu *et al.* (2017), and Okuduwor *et al.* (2023). Most (78.3%) of the garri processors in Rivers State as showed in Table 1 were female, while about 21.7% of the garri processors are male. This implies that garri processing in Rivers State is mostly a women's affair as stated by Muhammad-Lawal *et al.* (2012). Education is a vital socio-economic factor that influence decision making, and also influences people's awareness, and adoption of innovative ideals that can bring about increase in profitability. The results in Table 1 reveals that most (51.7%) of the garri processors in Rivers State spent between 7 – 12 years in formal education, while least (6.7%) of the garri processors had no formal education. The average years spent in formal education by the garri processors in Rivers State were 9.9 years. This implies that the garri processors are literate, and can be able to make good decision for their business. This correlate with the study of Aminu *et al.* (2017). Also, household size is a vital socio-economic variable in any agricultural operation. The significance of household size in agriculture is that there is likelihood of reduced cost of labour, as a result of adequate family labour made available for both farming, and processing operations. Results in Table 1 showed that majority (70.83%) of the garri processors in Rivers State had family size of between 1 – 5 persons, while minority (8.33%) of them had household size of between 11 – 15 persons. The average household size of the garri processors in Rivers State was 8. This implies that the garri processors has good family labour for their processing operation. This validate Adesope *et al*. (2020). The results reveals that most (70.8%) of the sampled garri processors are married while only about 13.1% of them are single, while minority (4.2%) of them are widowed. The marital status of the garri processors is the reason for the large household size of the garri processors. Experience in garri processing is important in knowing how efficient they are in the business, because the more experience the processors are, the more efficient they tends to be. Results in Table 1 revealed that majority (84.2%) of the garri processors had between 1 – 30 years of experience in the garri processing business, while least (1.6%) had garri processing experience of above 45 years. The mean years of experience in garri processing by the sampled garri processors were 19.8. This means that the garri processors in Rivers State are well experienced, and have adequate knowledge of the garri processing operations. This validate the work of Aminu *et al.* (2017). Extension is very vital in passing information to the audience. It is through extension that agricultural value chain actors are informed about innovations that can aid in the agricultural operations. The results showed that about 13.3% of the garri processors had contact with the extension agents while about 87.7% of them were never visited by the extension agents. The inability of majority of the garri processors to have access to extension services through extension agents may result in low level of adoption of improved processing practices especially if they do not have other sources of information on the benefits of such practices and how it works.

3.2. Profitability of Garri processing in Rivers State

Gross Margin and Return on Investment were used to analyze the profitability of garri processing in Rivers State. The results of the findings are presented in Table 2.

Table 2. Profitability of Garri Processors in Rivers State

Variables	Average quantity (kg)	Price (₦)	%TVC
Quantity of raw cassava processed in the study area	1338.84		
Cost of the cassava roots		24, 916.67	55.32
Cost of peeling, and washing of the cassava		4, 134.17	9.18
Cost of grating/milling		1600.41	3.55
Cost of sieving and frying of garri		5,169.30	11.48
Cost of hiring equipment used in garri processing.		1,535.42	3.41
Cost of firewood		5,000.10	11.10
Cost of transportation to the market for sales		2,687.08	5.97
Total Variable Cost (TVC)		45,043.15	100
Quantity of garri sold (Q)	128.37	433.16/kg	
Total Revenue (TR) = Q x Price		55,604.75	
Gross Margin (Total Revenue - Total variable cost)		10,561.60	
Gross profit ratio (gross margin/total revenue*100)		18.99%	
Return on Investment (total revenue/ total variable cost)		1.23	

Source: Field Survey 2023.

The results in Table 2 revealed that the average quantity of cassava roots processed into garri in the study area by the sampled garri processors were 1338.84kg, and it costs about N24, 916.67 averagely to purchase this quantity of cassava roots, which accounted for 55.32% of the total variable cost. Likewise, the results in Table 2 revealed that the cost of peeling, and washing of the cassava was N 4, 134.17, it accounted for about 9.18% of the total variable cost. While, cost of sieving and frying of garri, and cost of firewood used in the garri frying costs about N 5,169.30, and N 5,000.10 respectively, and accounted for 11.48%, and 11.10% of the total variable cost respectively. The least cost incurred in the processing of 1338.84kg of cassava roots into garri in the study area was cost of hiring equipment used in garri processing (N 1,535.42), and it accounted for 3.41% of the total variable cost. The analysis also revealed that the total cost of processing 1338.84kg of cassava into garri in the study area was N 45,043.15, while the total quantity of garri gotten from the 1338.84kg of cassava roots was 128.37kg, which was sold at. N 433.16/kg to give a total revenue of N 55,604.75. The results in Table 2 revealed that the Gross Margin in garri processing in Rivers State was N 10,561.60. This shows that garri processing is profitable in the study area. This is in agreement with Aminu *et al.* (2017). Likewise, the results revealed that return on investment was N1.23. This implies that for every one naira (₦1.00) invested in processing 1338.84kg of cassava roots into garri in the study area, a profit of ₦0.23k were realized, indicating 23% return. Thus, it can be concluded that garri processing in the study area is economically viable. This is in line with Okuduwor *etal.* (2023), and Ani *et al.* (2019). Also, the results in Table 2 revealed that the gross profit ratio which measures the solvency and performance of garri processing business was found to be 18.99%. This shows that garri processing business in the study area is not performing optimally, but has about19% performance. This implies that inefficiency of the garri processors should be minimize in order to increases the gross income, and reduce the total cost.

3.3. Constraint in Garri Processing in Rivers State

A number of constraints were enumerated by garri processors in Rivers State. Results of the analysis of the constraints encountered by the sampled garri processors are presented in Table 3

Table 3. Constraints faced by Garri Processors in Rivers State

Constraints	Frequency	Percentage	rank
Lack of funds	119	99.2	First
Lack of improved garri processing equipment	118	98.3	second
Health challenges	115	95.8	third
Middlemen exploitation	104	86.7	4th
Lack of storage facilities	100	83.3	5th
Spoilage of cassava	99	82.5	6th
Poor market linkages	98	81.7	7th

Source: Field Survey, 2023.

The result presented in Table 3 showed that lack of funds for the garri business constituted 99.2% and ranked first amongst the constraint faced by the garri processors in the study area. This is so because enough funds are needed to purchase the cassava roots, buy or hire equipment, and transport the garri to the market, being that the garri processors does not have control over prices of all these item. This is in line with Muhammad-Lawal *et al*. (2012) and Ani *et al.* (2019). Lack of improved garri processing equipment constituted 98.3%, and ranked 2nd amongst the other constraint. Most of the garri equipment used in the study area is primitive that requires manual efforts to use them and they are time consuming. The enumeration of lack of improved garri processing equipment as constraint by the processors conforms the baseline information. Also, it validate the work of Muhammad-Lawal *et al*. (2012), and also in line with Ani *et al.* (2019), the garri processors in Rivers State passionately solicited modern garri processing equipment to ease their stress. Another major constraint enumerated by the garri processors in Rivers State was health challenges they faced as a result of their traditional way of processing garri, and the equipment used in processing garri. The constraint constituted 95.8%, and ranked 3rd amongst the other constraints. As observed by the study and baseline information, most of the equipment use for garri processing in Rivers State are primitive especially those ones use for frying the garri. These equipment exposes the processors to smoke and high heat, thereby resulting to a lot of health challenges especially eye problem. Also, the results in Table 3 revealed that Middlemen exploitation constituted 86.7% and ranked fourth amongst the constraint faced by the garri processors in the study area. It was observed that most of the processors give out their produces to the middlemen to sell, and these middlemen do exploit the processors by giving little returns from the produces. This exploitation from the middlemen tends to reduce the profit of the garri processors in Rivers State greatly. Other constraints enumerated by the garri processors in Rivers State are lack of storage facilities; problem of spoilage of cassava due to poor preservation techniques; and poor market linkages. These listed constraints by the processors were also what was observed during the preliminary study. There is a problem of storage facilities because the available ones were not affordable due to its high cost, resulting into much postharvest losses through cassava spoilage, being that the processors does not have direct market linkage.

This correlate with Muhammad-Lawal *et al*. (2012). These constraints were ranked as the 5th, 6th, and 7th most faced constraints respectively by the garri processors in Rivers State.

4. Conclusion and Recommendation

One of the major global challenges is how to ensure food security for the growing population of the world while ensuring sustainable development. This study centered on the economics assessment of processing cassava into garri in Rivers State, established that the Gross Margin in processing 1338.84kg (the average quantity of processed cassava) of cassava roots into garri in Rivers State was N 10,561.60. While, the return on investment was N1.23. The study therefore concluded that garri processing in Rivers State is profitable based on the gross margin and return on investment realized from garri processing business. Meanwhile, the study noted that lack of funds; lack of improved garri processing equipment; health challenges; middlemen exploitation; lack of storage facilities; spoilage of cassava; and poor market linkages were the major constraints in garri processing business in Rivers State. Therefore, the study suggested that improved garri processing, and storage equipment of high efficiency developed by Nigeria Stored Products Research Institute (NSPRI) should be made available to garri processors in Rivers State by the government or NGOs to improve their profit.

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The authors disclosed no conflict of interest.

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