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Analysis of Resources Utilization for Cassava Flake (Garri) Processing in Ogbomoso ADP Zone, Oyo State Nigeria

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ABSTRACT

Background and Objective: Garri is purely made of cassava (*Manihot esculenta*) and its processing remains an essential local economic activity that promotes food security and inclusive market development through the employment of primary resources. This study analyzed the key resources used for cassava flake (garri) processing in the Ogbomoso ADP Zone, Oyo State Nigeria. **Materials and Methods:** Eighty-three respondents were sampled by a two-stage sampling technique and cross-sectional data were collected through a questionnaire supplemented with an interview schedule for illiterates among the respondents. Descriptive statistics, including frequency, percentage, mean and standard deviation (at 95% confidence interval), were used to measure socio-economic/demographic characteristics. **Results:** The results of descriptive statistics showed that 86.75% of the processors were female meaning that the firm is a female-dominated venture. The mean age of the respondents was about 48 years. Around 64% were married and they had a household size of about 5 persons. Energy, processing stand/equipment, cassava tubers, labor, water resources and credit constituted the major resources used in garri processing. The regression analysis ascertained that business experience, processing equipment owner, labor wage, fuel energy, water resources and quantity of cassava tubers were significant variables with an adjusted R^2 of 75.23%. **Conclusion:** It recommends that more emphasis should be placed on processing skills and equipment, provision of labor, fuel energy and raw cassava tubers particularly in densely populated areas like Nigeria, to increase cassava product production levels and reduce food insecurity.

KEYWORDS

Resource utilization, cassava flake (garri), socio-economic, demographic characteristics, fuel energy, raw cassava tubers

INTRODUCTION

Cassava farming continues to gain prominence among farmers due to increasing demand for meeting the challenge of daily food intake by the masses[1] coupled with the present hike in the food prices caused by fuel subsidy removal. In other words, the cultivation of food crops like cassava among other arable crops

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has a promising contribution to the Nigerian economy and Sustainable Development Goals (SDGs) because an increasing food availability, affordability and sustainability signifies a resolution to alleviating the problems of poverty, food security, hunger and malnutrition[1]. Moreover, cassava value web or addition is now a top research area in agriculture and food sciences[2].

Cassava (*Manihot esculenta*) is a staple crop originally from South America. It is thought to have been brought to Nigeria by Portuguese explorers and colonizers during the transatlantic slave trade in the 16th century. Known for its drought tolerance, cassava is a perennial woody shrub widely grown across Africa, including Nigeria[3].

According to Ikuemonisan *et al*.[4] the growth performance of cassava has been based on the intense planting of high-yield cassava stems that is rapid spread of improved varieties instead of sole cropping on expanded area.

Substantively, cassava has become one of the most important staple food crops in Sub-Saharan Africa (SSA) including Nigeria which serves as the largest producer in the world[5,6] and an increase in production of cassava to sustain the world food security needs improved machinery to allow its continuous cultivation and processing. Worldwide, in 2020 the growth of cassava crop reached about 302.66 million metric tonnes irrespective of the cultivars and cultural practices. Srivastava *et al*.[6] generally viewed that Nigeria has high potential to increase the current cassava yield levels through farm interventions emphasizing nutrient and soil health management and irrigation schemes in areas characterized by a short rainy season.

Cassava as a viable economic crop has numerous uses and by-products. Commonly in rural areas, a high proportion of cassava roots are converted into roasted granules or flake (garri) which serves as a means of livelihood among households in Nigeria, in addition to other various products such as cassava flour (lafun), cassava dough (fufu/akpu) and starch. In essence, one of the most significant cassava processed foodstuffs is garri, simply because garri is a fast alternative to drinking and swallowing food items, which makes it more relished by many people across the world as an energy food. Furthermore, cassava processing is one of the most important sources of income and means of supplying food for the ever-increasing population in Nigeria, especially in rural communities. Its processing remains an essential local economic activity that promotes food security and inclusive market development through the employment of primary resources. Kolawole *et al*.[7] affirmed that cassava has potential contributions in rural and urban economic performance as an exchange or cash crop, food crop and industrial raw material.

However, the method of processing adopted by garri processors has not been substantially able to keep pace with the level of farm production[7], it deserves significant improvement to upgrade to the efficient level of processing. In addition, the fact that fleshy harvested cassava tubers have a very short shelf life and again processing procedures are aimed at reducing cyanide which is toxic to consume, improving storability and providing convenience and palatability considerably make the present study genuine. The recognition of these, therefore, unfailingly supports cassava processing into different products.

Garri processing is a labor-intensive, small-scale business primarily run by women, aiming for profit maximization with limited resources. Despite its importance in the Ogbomoso ADP Zone, Oyo State, there is a lack of studies on the key resources affecting garri production in the region. This study aimed to analyze the socio-economic characteristics of garri processors, identify the resources used and examine the relationship between these resources and the amount of garri produced.

MATERIALS AND METHODS

Study area and sampling procedure: The study was carried out in the Ogbomoso ADP Zone, Oyo State among cassava flake processors between January, 2023 and February, 2024. Ogbomoso Zone, located in Oyo State, consists of five Local Government Areas: Oriire, Ogo-Oluwa, Surulere, Ogbomoso North and Ogbomoso South. The area, with fertile soil and a climate conducive to agriculture, is predominantly agricultural, growing crops like maize, yam, cassava and tree crops such as cashew and mango. The population includes mainly Yorubas, with smaller groups of Igbos, Hausas and Uhobo and the study focused on garri processors in the region.

A two-stage sampling technique was used to select the respondents. The first procedure involves a random selection of the Ogbomoso ADP Zone out of four ADP divisions made of the state. The second stage was done by random selection of three Local Government Areas (viz; Oriire, Ogo-Oluwa, Surulere) from the five Local Government Areas combined to form the zone. Thereafter, 83 respondents were sampled from the list of registered cassava processors in the three selected LGAs with probability proportionate to the size of each processing community.

Data source and analytical techniques: Primary data were collected through a structured questionnaire and interview schedule. Several different relevant information like socio-economic/demographic characteristics, processing equipment/stand, sources of raw cassava tubers, water resources, fuel energy, labor and capital were solicited from the respondents. The data were analyzed using descriptive analysis and multiple regression analysis.

Descriptive statistics: Descriptive statistics such as frequency, percentage, mean and standard deviation (at 95% confidence interval) were employed as a measure of socio-economic/demographic characteristics as well as some vital resources used in cassava flake processing across the study area.

Multiple regression analysis: The regression model was fitted to determine the effect of changes in the independent variables on the dependent variable this study estimated the nexus between the resources (material inputs) and quantity of cassava flake (garri) processed with multiple regression model as previously analysed[5,8]. The multiple regression model is explicitly specified as follows[9,10]:

$$Y = \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\mu$$

where, Y is cassava flake (garri) output (kg) which is the dependent variable measured in kilograms while X_1 is processing experience (year), X_2 is ownership of processing stand/equipment (dummy), X_3 is labor use (wage in N), X_4 is sources of cassava tubers (count), X_5 is fuel energy (N), X_6 is water resource (liters), X_7 is transportation cost (N) and X_8 is quantity of cassava tubers (kg) are independent variables. Also, β_0 and μ are constant and random error terms, respectively.

RESULTS AND DISCUSSION

Descriptive statistics of the socio-economic characteristics of the respondents (garri processors): Table 1 contains the result of descriptive statistics for the socio-economic variables. It was found that 86.75% of the processors were female and 13.25% were only men/male among them, meaning that the firm is women women-dominated venture due to its feminine nature. Also, Unaeze *et al.*[9] found that a greater percentage of garri producers were females with an average age of 47 years. The age bracket of 41-50 years comprised the majority (53.61%) of the garri processors with an average age of 47.69 years which conforms with the finding of Henry *et al.*[9], while 31.33% of them fell within 51-60 years, 12.04% of them were between 31-40 years and the rest (3.61%) were 60 years and more. This finding is in agreement with Bitunde *et al.*[10], who reported that the processing of cassava involves much energy and requires agile, middle-aged individuals who have more energy to carry out cassava processing activities.

Table 1: Socio-economic characteristics of the respondents (garri processors n = 83)

Socio-economic characteristics	Frequency	Percentage	Mean
Sex			
Female	72	86.75	
Male	11	13.25	
Total	83	100	
Age grouping			
31-40	10	12.04	
41-50	44	53.01	
51-60	26	31.33	
Above 60	3	3.61	
Total	83	100	47.69 years
Marital status			
Single	2	2.41	
Married	53	63.86	
Widow	9	10.84	
Divorced	19	22.89	
Total	83	100	
Household size			
<5	66	79.52	
6-10	17	20.48	
Total	83	100	5 persons
Years of education			
0-12	71	85.54	
Above 12	12	14.46	
Total	83	100	12.62 years
Experience years			
<5	9	10.84	
6-10	28	33.73	
11-15	27	32.53	
15-20	8	9.64	
<20	11	13.25	
Total	83	100	12.83 years
Full-time processor			
No	9	10.84	
Yes	74	89.16	
Total	83	100	

Source: Data analysis, 2023

About 64% of them were married, 22.89% were divorced, 10.84% were widowed and 2.41% were single. This finding indicated that most of the respondents have family members to consider because household consumption carries the lion's share of income earnings. The distribution of household size reveals that 79.52% of respondents had 5 people or fewer and 20.48% had household size between 6-10 people with a mean household size of about 5 persons[8]. The processors were also distributed according to year of education, it was observed that 85.54% of them attended school within 1-12 years, while the rest of them (14.46%) had 12 years and more of education with a mean value of 12.63 years. It is indicated that most of the respondents attended primary and secondary schools and their educational background is expected to positively complement the processing activities involved in cassava products like garri. In addition, the year of experience in the business were discussed to show their accumulated years of working experience and specifically, 33.73% of them have accumulated experience of about 6-10 years in the work, 32.53% have work experience between 11-15 years, 13.25% have the highest (20 years and above) of experience, 10.84% of them have (15-20) years of experience in the work and about 9.64% of them have 5 years of experience or less with mean of 12.83 years. The finding was in line with the result of Adeniyi *et al.*[11], who reiterated that more years of experience make processors better at cassava processing activities. Concerning the occupation of the processors, the majority (89.16%) of them were involved in the cassava

Table 2: Statistics of resources/inputs and garri output per season

Resources used	Observation	Mean	Standard deviation	Min and max
Equipment owners	83	0.7951807	0.4060228	0-1 dummy
Labour wage	83	10819.28	4384.409	0-15000 N
Cooperative credit	83	0.9759036	0.1542807	0-1 dummy
Source of cassava tubers	83	1.86747	0.3411274	1-2 count
Fuel energy	83	1993.976	54.88213	1500-2000 N
Water resource	83	147.5181	82.06413	50-400 L
Quantity of cassava	83	3975.904	1387.891	0-8000 kg
Garri output	83	1171.687	461.4527	200-2000 kg

Source: Data analysis, 2023

processing activity as full-time processors, this is in concordance with the expectation since the study was directed to processors. Only 10.84% diversified into other livelihood activities to cope with the current harsh economic situation in this country. Meanwhile, Okpeke and Onyeagocha[12] revealed that the majority (66%) of the processors were into cassava processing on a part-time basis which contradicted the finding of this study.

Summary statistics of the identified resources/inputs used in garri processing: The major resources needed for processing garri are identified and discussed with the summary statistics revealed in Table 2. Given this resource reservoir, the number of observations is 83 respondents and constant for all. An equipment owner was estimated with a mean value of 0.7951807 and close to 1 (maximum), indicating the tendency of all processors to become the owners of garri processing stands and/or equipment in the study area. The average labor wage is N10819.28 per month and the highest wage received by permanent laborers in the study area is N15000. Cooperative credit access is more feasible for all garri processors as evidenced by the average value of cooperative credit source which is found to be 0.9759036 and close to 1 (maximum). This finding ascertains that the respondents have the opportunity to take loans from cooperative societies in the study area. Whereas fewer respondents accessed credit for their processing enterprise according to Vihi *et al*.[13]. This therefore disagreed with the presence finding.

Additionally, the cassava tubers were identified to be either sourced directly from the farm or the market, wherein the farm source response is encoded 1 and the response for the market source is encoded 2. The mean value of sources of cassava tubers is 1.86747 and the value is skewed to 2 indicating that most cassava processors continue to rely on market sources for cassava tubers. Clean energy use for roasting cassava granules is of paramount importance for processing garri to maintain the quality taste and odor/aroma. Its supply consumes huge sum of money from business, this study showed that fuel energy on average is N1993.973 per month and the highest amount of N2000 is expended by the processors. The water resource is not replaceable with anything and it is purposively meant to wash away the stored dirty from peeled cassava tubers, the quantity utilized is estimated to be 147.5181 liters on average while the least and maximum water used is between 50 to 400 L per month. Furthermore, garri output produced every month is also reported to be 1171.687 kg on average with the least and highest quantities of 200 to 2000 kg. The quantity of cassava tubers used for garri processing is 3975.904 kg on average. It is the major determinant of garri output among other resources.

Result of multiple regression analysis for garri processing activity: The regression result revealed that the adjusted R^2 of 0.7523 means that 75.23% of the variations in the dependent variable were explained by its relations with the independent variables. According to this finding, the set of variables affecting the output of garri includes processing experience, processing equipment owner, labor wage, fuel energy, water resource and quantity of cassava tubers *Cetera paribus*. The coefficients of processing experience, processing equipment owner, labor wage, fuel energy and cassava tubers are positive and were statistically significant at 10, 5 and 1%, respectively except water resource which is negative and significant at 1% level. This result is relatively comparable to the finding conducted by Okpeke and Onyeagocha[12],

Table 3: Multiple regression model estimated for garri processors

Explanatory variables	Estimated coefficients	Standard errors	t-values	P>|t|
Constant	4.713702	0.304569	15.48	0.000
Processing experience	0.0106886	0.0057031	1.87*	0.061
Ownership of equipment	0.5744046	0.1168514	4.92***	0.000
Labour wage	0.0594652	0.0230475	2.58**	0.012
Source of cassava	0.1323994	0.1070298	1.24	0.220
Fuel energy	0.0000247	0.0000103	2.41**	0.044
Water resource	-0.002267	0.0004749	-4.77***	0.000
Transportation cost	9.96e-06	8.41e-06	1.18	0.240
Quantity of cassava	0.0721866	0.0265955	2.71***	0.008

Data analysis, 2023, Number of obs: 83, F (8, 74): 32.14, Prob>F: 0.0000, R-squared: 0.7765, Adj R-squared: 0.7523, *1% level of significant, **5% level of significant and ***10% level of significant

where the processing labor cost, the number of cassava tubers and others showed a significant positive influence on income realized from garri processing. This result implies that the more experienced a processor is, the better the efficiency and the output of the product and that an additional increase in minimum wage earned by the laborers leads to an increase in output of cassava flake (garri) or vice versa. This result is in tandem with Vihi *et al.*[13] wherein the year of processing experience indicated a positive implication on the adoption of improved garri processing technologies. Similarly, Esheya[14] proved that access to labor, years of processing experience, household size, income and access to credit had positive and significant influence on the economic returns on garri processing.

Likewise, the ownership of the processing stand/equipment can improve the convenience of processing activities better, so the result suggests that the state of being owners of the processing stand/equipment gives more opportunity to raise garri output all things being equal. The use of clean and suitable fuel energy also enhances the quality of garri (in terms of taste/appearance) and was statistically significant at 5%. This implies that the more the fuel energy, the more the quality and quantity of garri flakes. Also, the quantity of cassava tubers processed has a positive relationship with the output of garri and is significant at 1% level, this signifies that an increase in the cassava tubers will lead to an increase in garri processed. It is agreed with the research expectation. However, water resource has a negative coefficient and is statistically significant at 1% level, this implies that the output of garri is indirectly hinged on the excessive water utilization by the processors in the study area (Table 3).

This study is essential to encourage garri processors on better performance of this business and enlighten them about efficient use of limited resources encountered in all stages of processing. In addition, the outcome of this research has significant contributions to the local economic activity and agricultural food system if well circulated among the stakeholders.

CONCLUSION

This study examined the key resources affecting cassava flake (garri) processing in Ogbomoso ADP Zone, Oyo State, Nigeria, highlighting the role of socio-economic factors in processing activities. The majority of respondents were educated, married women, which enhanced their adoption of new technology. Key inputs identified include business experience, ownership of processing stands, labor wages, fuel, water and cassava tubers, with an adjusted R^2 of 75.23%. The study recommends encouraging youth and experienced participants in processing, providing clean water, supporting farmers to grow more cassava and offering equipment, fuel and labor assistance to improve productivity and food security.

SIGNIFICANCE STATEMENT

Cassava cultivation plays a crucial role in smallholder farming systems, particularly in developing countries like Nigeria, due to its weather tolerance, high productivity and ability to combat hunger. Cassava flakes, derived from processed cassava tubers, serve as a vital income source for rural households. This study highlights the key resources influencing cassava flake production, including processing experience, equipment ownership, labor wages and material inputs, which collectively affect processors' returns.

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