Analysis of food security status among garri processors in Oyo State, Nigeria

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Food insecurity is a worldwide issue that affects many countries but has a disproportionate impact on Africa. Numerous studies have been done to know the level of food security in agricultural families. None of these studies, however, has addressed food security concerns among garri processors. Thus, this research quantified food security status, analysed the variables affecting food security, and highlighted survival strategies used by garri processors to mitigate the effects of food insecurity in Oyo state, Nigeria. Multiple sampling techniques were used to generate a sample size of 120 garri processors. The study objectives were accomplished via the use of descriptive statistics, the USDA's technique for quantifying food insecurity, and multinomial regression analysis. The research found that none of the households were food secure, whereas 39.2% were food insecure without hunger (FIWH), 22.5% were food insecure with moderate hunger (FIWHM), and 38.3% were food insecure with severe hunger (FIWHS). It was also found that age, the number of years of experience of garri processors, the size of the family, and garri processing technology are all important predictors of food insecurity. The effective coping methods employed in the research region to combat food insecurity are access to remittances to purchase food, intake of grains only and engaging in off-farm jobs to supplement family income, access to remittance to purchase food and borrowing money to purchase food items. Consequently, we suggest the need for intervention to subsidise modern technologies in garri processing technology since the traditional processing methods are labour intensive and yield little return on investment.

Keywords: Food insecurity, garri processors, strategies, USDA approach

Food is regarded as the fundamental source of sustenance, and a balanced diet, both in number and standard, is necessary for a viable and effective life (FAO 2005). Food is the most basic requirement in the hierarchy of needs. Thus, achieving food security is critical for every government. Food security refers to the constant availability, accessibility and appropriate usage of food for human consumption as well as the capacity to ensure food consumption in the future. According to FAO et al. 2018, for a nation to achieve sustained food security, food resources must keep pace with population growth. This is because urban agriculture, like many non-agricultural land uses in cities, reacts to competition for land (Haddabi et al. 2019).

The global population is now suffering from the repercussions of the COVID-19 outbreak, which has added to the existing issue of food security experienced by nations worldwide. As a consequence of the pandemic, achieving the United Nations' objective of zero hunger in less than a decade (2030) seems infeasible, as the proportion of food insecure countries has lately increased. Africa, with a large population living below the poverty line, is the area worst hit by the epidemic. According to the FAO, between 2014 and 2020, Africa will be the second area in the world with the greatest prevalence of food insecurity, at both moderate and worrying levels (after Asia). Western Africa, in particular, remained the most impacted area in the region, seeing an extraordinary rise, while North Africa had the lowest level of food insecurity when compared to other sub-regions (FAO et al. 2021). Nigeria's dreadful food insecurity situation has deteriorated to the point that it has been classified as one of 42 low-income food deficit nations (World Bank 2003; Ayantoye et al. 2011).

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Nigeria is the world's largest producer of cassava, producing over 34 million tonnes of tuberous roots annually, with over 70% of this commodity eaten domestically (Phillips et al. 2004). Cassava offers a plethora of potential inherent in its production and processing, all of which may be reaped by cassava farmers and the country at large. According to Adebayo et al. (2009), cassava's strong resilience and adaptation to a broad variety of ecological circumstances have ensured its production in sub-Saharan Africa for several generations since it was introduced into this region in 16th century. It is used in a variety of traditional recipes. Garri, fufu, starch, cassava flour, tapioca, animal feed and industrial starch are some of the most common traditional processed cassava products.

Garri, a processed cassava, is a staple food in the diets of many West Africans, especially urban inhabitants. Its simplicity of preparation for domestic use has contributed to its enormous popularity among urban dwellers (Oyewole and Philip 2006). It is one of those foods that transcends socioeconomic level, religious affiliation, and ethnic origin (Nweke and Enete 1999). To make garri, cassava tubers are peeled, grated, fermented and cleared of cyanide and organic acids before being roasted over an open fire in a pan. Garri processing is mostly done by women and is labour intensive when it is done using old-fashioned manual methods (Oyewole and Philip 2006).

The significant incentives for garri processing are the value-added and marketing margins shared by processors. The rapid population growth and urbanisation in Nigeria have resulted in a surge in demand for garri. This increased interest in industrial garri production is a consequence of the federal government's restriction on the importation of certain basic foods such as rice and maize (Idowu 1990). In South-Western Nigeria, the bulk of garri production and processing takes place in Oyo state, where the food item is the primary source of income for the majority of the population. It is unlikely that an ordinary family in the state, and particularly in Ilora, would go a single day without consuming garri. Despite this, their food security is deemed inadequate. Numerous studies (Babatunde et al. 2007; Omonoma and Agoi 2007; Amaza et al. 2008; Salau et al. 2018) have been undertaken on the determinants of food security status for various target groups, including rural farming families and urban households. None of these studies, however, has examined food security among garri processors. Thus, this research quantified food security status, analysed the variables affecting food security and highlighted survival strategies used by garri processors to mitigate the effects of food insecurity in Oyo state, Nigeria. This research was done to provide answers to the following research questions:

1. What are the socioeconomic circumstances of garri processors in the study area?
2. What is the food security status of the respondents?
3. What are the factors determining food security status among garri processors?
4. What are the coping strategies adopted by the garri processors?

Objectives of the study

The specific objectives were to:

1. Identify the socioeconomic features of the respondents in the study area.
2. Measure the food security status of the respondents.
3. Determine the factors influencing food security status among garri processors.
4. Identify coping strategies against food insecurity in the study area.

Methodology

Study area

This study area is Oyo state, located in the South-West geopolitical zone of Nigeria. The State covers a total of 28,454 km^2 of land mass and it is bounded in the south by Ogun State, in the north by Kwara State, in the west it is partly bounded by Ogun State and partly by the Republic of Benin, while in the East it is bounded by Osun State. It had a population of 132,184 people (NPC 2009).The State is well drained with rivers flowing from the upland in the north-south direction. Oyo State has an equatorial climate with dry and wet seasons and relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25 °C (77 °F) and 35 °C (95 °F), almost throughout the year. The vegetation pattern of Oyo State is that of rain forest in the south and guinea savannah in the north. Thick forest in the south gives way to grassland interspersed with trees in the north. The climate favours the cultivation of crops like Maize, Yam, Cassava, Millet, Rice, Plantain, Cocoa tree, Palm tree and Cashew.

Oyo State consists of 33 Local Governments and 29 Local Council Development Areas. The Local Government Areas are: Afijio, Akinyele, Atiba, Atisbo, Egbeda, Ibadan North, Ibadan North-East, Ibadan North-West, Ibadan South-East, Ibadan South West, Ibarapa Central, Ibarapa East, Ibarapa North, Ido, Irepo, Iseyin, Itesiwaju, Iwajowa, Kajola, Lagelu, Ogbomoso North, Ogbomoso South, Ogo-Oluwa, Olorunsogo, Oluyole, Ona-Ara, Oorelope, Oriire, Oyo East, Oyo West, Saki East, Saki West and Surulere. The Local Council Development Areas (LCDAs) are Aare Latosa, Afijio West, Ajorosun, Akinyele East, Akinyele South, Akinyele West, Akorede, Araromi, Atisbo South, Ibadan East, Ibadan South East, Ibadan West, Ibarapa North-East, Ibarapa North-West, Ifeloju, Iganna, Inukan, Irepodun, Iseyin South, Iwa, Lagelu North, Ogbomoso Central, Ogbomoso South-West, Ogo-oluwa West, Oke'badan, Omi Apata, Surulere North, Surulere South and Wewe.

Sampling procedure and data collection

The research targeted garri processors in Oyo State's Afijio LGA. Respondents were selected using a multistage sampling approach. The first stage involved the deliberate selection of Afijio LGA as it is renowned for cassava farming and garri processing. In the second stage, three major villages in the LGA; Awe, Ilora, and Fiditi were randomly selected. The third stage was the choice of two wards at random from each of the three villages. Awe I and II were chosen in Awe, Ilora I and II were chosen in Ilora and Fiditi I and Fiditi II were chosen in Fiditi ward. The fourth stage involved randomly selecting 20 garri processors from each of the designated wards, for a total of 120 respondents. The research obtained primary data using a well-structured questionnaire in combination with an interview schedule. The questionnaire was divided into three sections: Section A dealt with the socioeconomic characteristics of the respondents; Section B described the food security status of the respondents while Section C identified the adopted coping strategies against food insecurity in the area.

Food security status of the respondents

The rural families' food security status was determined using the core module of the United States Department of Agriculture's food security questionnaire (Bickel et al. 2000). The USDA categorises families using a developed food security scale that ranges from 0 to 10 for households without children (over the age of 17) and 0 to 18 for households with children (up to 17 years old). Households were classified into food security status categories

based on the number of food-insecure responses to the questions consistent with statistical evidence that this number reflects the level of food hardship experienced by the family (Table 1). The four categories of household food security are:

- ***High food secure (HFS):*** if a family (with or without children) reported less than three instances of food-insecure responses.
- ***Food insecure without hunger (FIWH):*** if a household with children reported more than two but less than eight food insecure responses, and if a household without children reported more than two but fewer than six food insecure responses.
- ***Food insecure with hunger, moderate (FIWHM):*** if a household with children reported more than seven but less than 13 food-insecure replies, and if a household without children reported more than five but fewer than nine food-insecure responses.
- ***Food insecure with hunger, severe (FIWHS):*** if a household with children reported more than 12 food insecurity responses, and if a household without children reported more than eight food insecurity responses.

Each household's answer to each question was initially categorised as affirmative or negative; each question had three response categories: never true, sometimes true and often true. "Sometimes true" and "often true" were deemed affirmative responses since they indicated that the condition happened within the research period. The scale, however, did not differentiate between the two affirmative responses.

Table 1: USDA food security classification

Number of affirmative responses		**Food security status level**	
Households with children (out of 18) responses	**Households without children (out of 10) responses**	**Code**	**Category**
0 – 2	0 – 2	0	Food secure
3 – 7	3 – 5	1	Food insecure without hunger
8 - 12	6 – 8	2	Food insecure with hunger, moderate
13 - 18	9 – 10	3	Food insecure with hunger, severe

Source: USDA, 2006.

Determinants of food security among garri processors

The factors of food security among garri processors were analysed using multinomial logistic regression. This was used to model processes with a single outcome among numerous ranking alternatives, however food security is represented as an ordered set of statuses ranging from "Food secure" to "Food insecure with hunger, severe." A less restrictive multinomial logit model was considered more appropriate than using an ordered logit or ordered probit model. This is because ordered logit or probit models involve estimating specific cut points, whereas the determinants of food security in the model were expected to affect food security categories in different ways.

The multinomial logit model determines the probability that a household *i* experiences one of *j* outcomes: food secure, food insecure without hunger, food insecure with hunger, moderate, and food insecure with hunger, severe (Y_{ij}). The probability is given by:

$$Y_0 = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 \quad (1)$$

$$Y_1 = \alpha_0 + \alpha X_1 + \alpha_2X_2 + \alpha_3X_3 + \alpha_4X_4 + \alpha_5X_5 + \alpha_6X_6 \quad (2)$$

$$Y_2 = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 \quad (3)$$

$$Y_3 = \gamma_0 + \gamma_1X_1 + \gamma_2X_2 + \gamma_3X_3 + \gamma_4X_4 + \gamma_5X_5 + \gamma_6X_6 \quad (4)$$

Where:

Y_0 = high food secured ***(HFS)***
Y_1 = food insecure without hunger ***(FIWH)***
Y_2 = food insecure with hunger, moderate ***(FIWHM)***
Y_3 = food insecure with hunger, severe ***(FIWHS)***
X_1 = age (years)
X_2 = education level (years of schooling)
X_3 = household size (in number)
X_4 = garri processing experience (years)
X5 = gender (dummy: 1 if male and 0 if otherwise)
X_6 = type of processing technology used (dummy:1 if modern technology is employed and 0 if otherwise)
$b_0 - b_6, \alpha_0 - \alpha_6, \beta_0 - \beta_6$ *and* $\gamma_0 - \gamma_6$ are the coefficients to be estimated.

However, in order to estimate the model, one of the outcome variables had to be omitted and defined as the base category. In this study, very low food security was chosen as the benchmark to which other food security levels were compared.

Coping strategies against food insecurity in the study area

A total of eight statements were made to capture the coping strategies adopted by processors against food insecurity. These statements were ability to reduce quantity of food consumed, borrow money from friends and relatives, eating foods that are less preferred, sending of children to relatives, consuming grains only, engaging in off-farm jobs to increase household incomes, borrowing from banks to buy foods and accessing remittances to purchase food items. A three-point Likert rating scale as 1 (less effective), 2 (effective), 3 (most effective) was used to rank these coping strategies based on the level of agreement or disagreement to those statements.

Results and discussion

Socioeconomic features of garri processors

The characteristics of garri processors in the research area are summarised in Table 2. These socioeconomic characteristics were chosen based on prior research. Most of the respondents 88.3% were females, while 11.7% were males. This indicates that garri processing in the research area is dominated by females. This result is consistent with that of Adesope et al. (2020) in Oyo state's Ibrapa LGA; according to their findings, the garri processing sector is dominated by women, accounting for 70% of the survey population. Additionally, 73.3% of household heads were between the ages of 31 and 60. With an average age of 42 years, it is clear that garri processors are economically engaged and have a significant impact on their productivity and food security; this outcome is consistent with Adeola et al. (2017). In terms of educational attainment, 46.7% of respondents had completed secondary school and 13.3% had tertiary education. The respondents' educational level is important since it influences many of their choices about garri processing techniques, whether traditional or mechanised, which might affect their degree of food security. The marital status of the head of the family has a direct correlation with the size of the household. Given that the majority (72.5%) of respondents were married, married households are more likely to have a greater household size than other households. This might pose a threat to food accessibility, which

tends to affect the food security in the study area. Amao and Ayantoye (2017) concurred, stating that the majority of household heads were married in their research on food insecurity status among agricultural families in North Central Nigeria.

Half (50%) of the respondents had a household size of between four and six persons. This result shows that the majority of households are large in numbers. This may affect the ability of such households to be food secure because a larger household requires large quantities of food to be secured. This conclusion is consistent with Babatunde et al. (2007) findings in research on the socio-economic characteristics and food security status of farming in Kwara State, Nigeria. Additionally, 75% of respondents reported having access to credit. Credit availability has a significant impact on the sort of food consumed and the household's consumption expenditure. Finally, the mean of around 21 years of experience in garri processing demonstrates the respondents' high rate of years of experience.

Table 2: Socioeconomic features of garri processors

Characteristics	Frequency	Percentage
Age (years)		
30 and under	32	26.7
31 - 60	88	73.3
Education level		
No schooling	13	10.8
Primary school certificate	35	29.2
Secondary school certificate	56	46.7
Tertiary institutions	16	13.3
Household size		
1 - 3	23	19.2
4 – 6	60	50
7 – 9	34	28.3
>9	3	2.5
Garri processing experience (years)		
Below 10	21	17.5
11 – 20	50	41.7
Above 20	49	40.8
Gender		
Male	14	11.7
Female	106	88.3
Type of Technology used		
Modern	24	20.0
Traditional	96	80.0
Marital status		
Single	16	13.3
Married	87	72.5
Widowed	14	11.7
Divorced	3	2.5
Access to credit		
Yes	90	75.0
No	30	25.0

Food Security Status of the Garri Processors

Table 3 summarises the respondents' food security level as determined by the USDA food security questionnaire core module. None of the families were food secure; 39.2% were food insecure without hunger; 22.5% were food insecure with moderate hunger, and 38.3% were food insecure with severe hunger. This indicates that a significant number of garri processors in the research area experienced food insecurity at both the FIWH and FIWHS levels. While rural regions provide the majority of food consumed, rural Nigerian families face severe food insecurity, which is a very worrying conclusion. Omotayo et al. (2022) also documented increased food insecurity in Nigeria's rural families as a consequence of the pandemic's disruptions to food prices, availability, and supply chains.

Table 3: Distribution of respondents according to food security category

Food security category	Frequency	Percentage
Food secure	0	0
Food insecure without hunger (FIWH)	47	39.2
Food insecure with hunger, moderate (FIWHM)	27	22.5
Food insecure with hunger, severe (FIWHS)	46	38.3
Total	120	100

Determinants of food insecurity status among garri processors

Table 4 shows the determinants of food insecurity in the study area. The result shows that age ($P \leq 0.01$), years of experience in garri processing ($P \leq 0.05$), type of technology adopted ($P \leq 0.01$) significantly and positively determine the likelihood of household falling into food insecurity with hunger (FIWH) rather than food insecurity with hunger severe (FIWHS). This implies that as age increases, garri processing experience and adoption of modern technology significantly enhance the likelihood of falling into FIWH instead of FIWHS.

On the other hand, household size and years of experience in garri processing significantly and positively determine the likelihood of households falling into food insecurity with hunger moderate (FIWHM) rather than food insecurity with hunger severe (FIWHS). This means that as household size and years of garri processing increases, the likelihood of a household being food insecure with hunger moderate increases. Years of experience are more likely to have an effect because as years of experience accumulate, the processor's age increases, which is detrimental to productivity and efficiency. However, adopting the modern method of garri processing will mitigate the influence of these variables. Other research, such as Otekunrin et al. (2021) and Amao and Ayantoye (2017), validated these results by identifying comparable characteristics as being associated with rural families' insecurity status.

Table 4: Determinants of food insecurity among garri processors

Food Insecurity status	Variables	Coefficients	Std. error	Sig.	Odds ratio
FIWH(Y_1)	Age	1.626	1.311	.000***	1.028
	Education level	-.015	.056	.781	1.016
	Household size	-.066	.095	.485	.936
	Processing exp.	.650	.296	.028**	1.915
	Gender	.589	.701	.400	1.803
	Technology type	.0370	1.269	.000***	34.181
FIWHM (Y_2)	Age	-.106	.186	.570	.900
	Education level	.018	.066	.785	1.018
	Household size	1.004	.517	.052*	1.115
	Processing exp	19.335	.795	.000***	1.034
	Gender	-.290	.913	.751	.748
	Technology type	-.385	1.625	.812	.680

***, **, * = significant at 1%, 5% and 10% respectively

FIWH: food insecure without hunger; FIWHM: food insecure with hunger, moderate; FIWHS: food insecure with hunger, severe

The reference category is FIWHS

Coping strategies adopted by the garri processors

Table 5 shows the coping strategies employed by processors to mitigate the effects of food insecurity. Access to remittance to purchase food items has a mean score (MS) of 2.12, consumption of grains only (MS = 1.93) and engaging in off farm jobs to increase processors income (MS = 1.89) are the most effective coping strategies adopted in the area and are ranked first, second and third respectively.

Table 5: Coping strategies adopted by the garri processors

	Variables	Less effective	Effective	Most effective	Mean	Ranking
1	Access to remittance to buy foods	27 (22.5%)	52 (43.3%	41 (34.2%)	2.12	1st
			55 (45.8%)	13 (10.8%)	1.93	2nd
2	Consume grains off-farm jobs	51 (42.5%)	53 (44.2%)	27 (22.5%)	1.89	3rd
3	Engaging in off-farm jobs	40 (33.3%)	59 (49.2%)	16 (13.3%)	1.76	4th
4	Borrowing from banks to buy foods	45 (37.5%)				
5	Reduction in the quantity of food consumed	56 (46.7%)	52 (43.3%)	12 (10.0%)	1.63	5th
6	Eating foods that are less preferred	58 (48.3%)	48 (40.0%)	14 (11.7)	1.63	5th
7	Sending of children to relatives	69 (57.5%)	38 (31.7%)	13 (10.8%)	1.53	6th
8	Borrowing food from friends and relatives	69 (57.5%)	43 (35.8%)	8 (6.7%)	1.49	7th

Source: Field Survey, 2021

Conclusion and recommendations

Based on the empirical information gathered throughout this study, it was determined that none of the garri processors are food secure. The study indicated that age, household size, years of experience in garri processing, and type of technology employed are major determinants of food security in the study area. Lastly, in the respondents' opinion, consumption of grains only, reduction in the quantity of food consumed, access to remittance to purchase food items, sending of children to relatives, borrowing food from friends and relatives, eating food that is less preferred, borrowing money to buy food, engaging in off-farm jobs to increase garri processors to increase household income and eating of foods that are less preferred are the most effective coping strategies for mitigating food insecurity's impact.

Therefore, it can be concluded that food-insecure households constitute the majority among garri processors in Oyo state. This study emphasised the need for intervention to subsidise modern technologies in garri processing because the local method of processing is characterised by low efficiency. Therefore, transitioning into the use of modern technologies will improve processor productivity and return on investment, hence, raising the standard of living and also reduce food insecurity.

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