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Influence of Value Addition on Food Insecurity among Cassava-based Farm Households in Kogi State, Nigeria

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Abstract
The study investigated the influence of value addition on food insecurity among cassava-based farm households in Kogi State, Nigeria. A total of 246 respondents were selected via a three-stage sampling procedure. The data were analyzed using descriptive statistics, the Household Food Insecurity Access Scale (HFIAS), and Ordered Logit Regression at ($p \leq 0.05$). Results revealed that cassava cultivation was male-dominated (72%). Only about 60% of the cassava tubers harvested were processed. Extension contact was low (13.6%). All the respondents still used traditional processing methods. Participation in cassava value-addition activities was low, with only about 56% of respondents processing raw cassava tubers into other forms. Most respondents (61.4%) were mildly food-insecure, while only 4% were acutely food-insecure. Further, participation in value addition (-0.217), education (-0.020), other income sources (-0.201), and farm experience (-0.006) reduced respondents' food insecurity. The government, through extension agents, should raise awareness of the benefits and potential of value addition. The government should urgently provide modern processing equipment for farmers at a subsidized rate.
Keywords: Value Addition, Cassava-Based Farm Households, Food Insecurity, Nigeria

Introduction

Food insecurity remains a major global development challenge, affecting individuals' well-being, productivity, and survival. About 3.1 billion people worldwide still experience food insecurity, while many others suffer from "hidden hunger" due to deficiencies in essential nutrients or proteins [1]. More than 800 million people have insufficient food to meet their daily energy requirements [2]. The regions with the highest levels of food insecurity and hunger are Asia (418 million out of 4.6 billion people) and Africa (282 million out of 1.3 billion people) as of 2020 [3]. Currently, approximately one-fifth of Africa's population about 278 million people out of 1.4 billion suffers from undernourishment, and 55 million children under the age of five are stunted due to severe malnutrition [1]. In Nigeria, an estimated 25 million people faced food insecurity as of August 2023, representing about 1 in 9 people [4]. Globally, about 14% of food is lost before reaching the market, amounting to an estimated economic loss of US$400 billion [5]. Reducing postharvest losses is therefore critical to addressing the global food challenge [6].

Value addition is regarded as a powerful strategy for improving food security. Through value addition, farmers can process, package, and store agricultural products more effectively, thereby extending shelf life and increasing market opportunities. When farmers do not add value to their produce, they forgo opportunities to improve income and household food security, contributing to persistent poverty. Despite government efforts to address food insecurity through policy formulation and implementation, additional measures are still required [7].

Cassava has several advantages, including low production costs for food energy, year-round availability, and resilience to harsh environmental conditions, making it a key crop for combating food shortages in Africa [8]. Owing to its low failure rate, cassava is often described as a "famine security crop." In Nigeria, cassava is cultivated in 24 of the 36 states, mainly by smallholder farmers, with an average yield of 10.6 tons per hectare [9]. To this end, there is a growing focus on adding value to the agricultural sector, particularly through activities such as cassava processing. This started as a way to make the roots less bulky, given their high-water content of 60-70% and eliminate the toxic cyanogenic glycosides that render the roots perishable. These value-added processes improve

cassava's shelf life, enhance its digestibility, and make it more appealing to consumers. They also enable cassava products to be stored for longer periods, extending their availability across regions and seasons, helping stabilize food availability and improve food security at both national and household levels (FAO, 2020). Consequently, this study examines the influence of value addition on household food insecurity among cassava-based farmers in rural areas of Kogi State, Nigeria.

Materials and Methods

The study was conducted in Kogi State, Nigeria. This study used primary data gathered through well-structured English-language questionnaires administered via Kobo Collect. Kobo Collect is a free, open-source Android application designed for primary data collection in challenging field environments, such as humanitarian emergencies. It allows users to collect data on smartphones or tablets, both online and offline, and then sync the gathered information with Kobo Toolbox. The respondents were chosen using a three-stage sampling process. Descriptive statistics, such as averages and proportions, were used to summarize the socioeconomic characteristics of the respondents and the various products that cassava tubers were processed into. The Household Food Insecurity Access Scale (HFIAS) was used to measure food insecurity status, while an ordered logit regression model was utilized to analyze the influence of value-adding activities on respondents' food insecurity status. The model is specified as follows:

$$F_j^* = G_j^I \beta_j + U_j^I \qquad (1)$$

where F = HFIAS ordered as follows:

F1 = 1 (Food secure families: 0 − 1), F2 = 2 (Mildly food insecure families: 2 − 8), F3 = 3 (Moderately food insecure families: 9 − 16), F4 = 4 (Severely food insecure families: 17 − 27), F∗ = Family's food security status, β = Vector of parameters to be estimated, Ulj = Disturbance term, Glj = Explanatory variables, which are; G1 = Access to extension services (1= yes, 0, otherwise), G2 = Value addition (1= yes, 0 otherwise), G3 = Years of schooling, G4 = Household size (number of people), G5 = Farm size (ha), G6 = Farm experience (Years), G7 = Other income sources (1= yes, 0 otherwise), G8 = Gender (1 = female, 0 otherwise), G9 = Marital status (1 = married, 0 otherwise).

Results and Discussion

Socioeconomic characteristics of cassava-based farm households

Table 1 shows that 72% of the family heads were men. The mean age stood at 40 years. This suggests that respondents were within their economically active age range. About 54% of the respondents were married. The literacy level among respondents is very high. The average household size was 6. The mean years of cassava experience was 18 years. Respondents cultivate an average land size of 1.8 hectares. While only 28.5% of respondents were members of a cooperative society, just about 8% had access to agricultural extension services during the planting season under study. All the respondents were still using the traditional method of processing cassava. Furthermore, only about 56% of respondents processed cassava tubers from their farms into other products.

Table 1: Socioeconomic characteristics of respondents

Variable	Percentage (n = 246)	Mean	Std. dev.
Age (years)	-	40	10.68
Sex (Male)	72	-	-
Marital status (Yes)	54.5	-	-
Education (years)	-	12.9	4.62
Household Size	-	6	2.87
Farming experience (years)	-	18	10.58
Farm Size (hectare)	-	1.86	1.95
Other income source (yes)	85	-	-
Member of Coop. Society(yes)	28.5	-	-
Access to Extension services (yes)	8.0	-	-
Traditional Processing Method (Yes)	100.0	-	-
Value Addition Activities (Yes)	55.69	-	-

Source: Data analysis, 2024

Products created from cassava tubers

Table 2 presents the products obtained from processing cassava tubers. As shown in the table, nearly 60% of the harvested cassava was transformed into various processed products, including cassava flakes, flour, paste, and starch. This finding is consistent with the submission

[10]. Approximately 53% of the processed cassava was converted into cassava flakes, followed by cassava flour at 37%. Only about 0.3% of the processed quantity was converted into starch. This indicates that most value addition activities focused on consumer goods intended for local consumption, with minimal processing directed toward industrial use. Similar results have been reported in earlier studies [10, 11].

Table 2: Distribution of products created from cassava tubers

Descriptive Statistics	Qt harvested (tons)	Qt processed (tons)	Quantity processed to (tons): flakes	flour	pastes	starch	others
Mean	21.3402	12.71429	6.7310	4.7043	0.9000	0.3769	0.4308
Std. dev.	17.6908	14.08308	6.002	5.6232	0.6700	0.1825	0.1800
Maximum	115	111	42	42	6	8	13
Minimum	3.6	2	1	1	0	0	0

Source: Data analysis, 2024

Distribution of the respondents based on their food security status

Figure 1 shows that only 5.3% of the respondents were classified as food secure, while 4.0% were severely food insecure. The majority of the respondents were mildly food insecure (61.4%) and moderately food insecure (29.3%). This implies that about 96% of the farmers do not experience acute hunger associated with severe food insecurity. The mean Household Food Insecurity Access Scale (HFIAS) score was 7.8, indicating that respondents were, on average, mildly food insecure.

This outcome may be attributed to several factors, including engagement in supplementary income-generating activities and respondents' relatively high literacy levels. In addition, the predominance of younger farmers suggests greater physical strength and productivity. Furthermore, the fact that most respondents are experienced in cassava farming is likely to enhance their food security, as farming experience reduces production costs and lowers on-farm and post-harvest food losses. These findings are consistent with [12] but contradict [13].

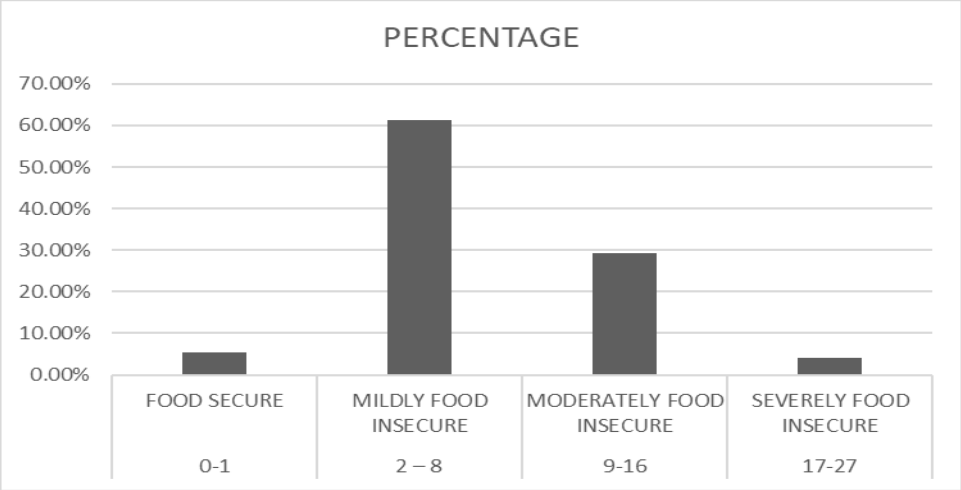

Figure 1: Chart showing categories of Food insecurity among respondents

Effects of participation in value addition on food insecurity

Table 3 shows that the overall model is statistically significant (p-value = 0.000), indicating that the included predictors jointly explain variation in household food insecurity status. The pseudo-R-squared of 0.52 indicates that approximately 52% of the variation in the dependent variable is explained by the independent variables, with the remaining variation attributable to the error term. The cut-off points reported in the lower part of the output define the thresholds at which the latent variable representing the propensity for food security is categorized into observed outcomes: food insecure, moderately food insecure, mildly food secure, and food secure. These thresholds clarify how the continuous latent variable is translated into discrete food security categories. The results further indicate a significant and positive association between value addition and food security. Cassava farmers engaged in value addition activities were 22.0% less likely to be categorized as

moderately food insecure, implying that involvement in value addition shifts households toward more food-secure categories. The positive effect of value addition on household food security can be attributed to increased income, income diversification, reduced post-harvest losses, improved cassava utilization, and employment opportunities generated through value-adding activities. These findings are consistent with earlier studies [14].

Household size was positive and statistically significant at the 1% level, indicating that households with more members were 21% less likely to be moderately food insecure. This outcome is plausible, particularly when household members are of working age, as they can provide family labour, reduce production costs, and increase household income available for food consumption. This result aligns with previous findings reported by [13].

The education variable also showed a significant, positive effect, suggesting that respondents with higher levels of education were 19% less likely to be moderately food insecure. This may be due to better access to information, improved decision-making, and greater participation in value-addition opportunities among educated farmers. These findings corroborate earlier studies emphasizing the importance of education in household food security [15–18], although contrary evidence has also been reported [19].

Farming experience was found to have a significant, positive coefficient, indicating that greater experience increases the likelihood of achieving food security. This suggests that experienced farmers are less likely to be moderately food insecure, possibly due to improved farming practices, better resource management, and the accumulation of assets and financial capital over time. This finding is consistent with previous studies [13, 20], although some researchers have reported opposing results [19, 21].

The coefficient for multiple income sources was also positive and statistically significant, implying that households with additional income streams were more likely to achieve food security. Specifically, having supplementary income reduced the probability of being moderately food insecure by about 20%. Income diversification enhances purchasing power, improves access to food, and reduces vulnerability to food insecurity [17, 19, 22]. However, contrasting evidence suggests that non-farm income may reduce food security under certain conditions [23].

Table 3: Effects of participation in value addition on food insecurity

Variable	Marginal effect			
	FI	**MoFI**	**MFI**	**FS**
Access to Extension Agent	-0.103 (0.00)	-0.178 (0.04)	0.107 (0.04)	0.304 (0.04)
Value addition	-0.209 (0.01)	-0.217*** (0.03)	-0.217*** (0.03)	0.03 (0.01)
Education	-0.301 (0.00)	-0.020*** (0.00)	-0.019*** (0.00)	-0.401 (0.00)
Household size	-0.201 (0.00)	-0.021*** (0.01)	0.021*** (0.01)	0.101 (0.00)
Farm size	-0.400 (0.00)	-0.106 (0.02)	0.306 (0.02)	0.400 (0.00)
Farm experience	-0.203 (0.00)	-0.006** (0.00)	-0.300 (0.00)	-0.200 (0.00)
Other income	-0.309 (0.01)	-0.201***(0.04)	-0.200*** (0.04)	-0.100 (0.00)
Gender	-0.203 (0.00)	-0.160(0.04)	0.265 (0.04)	0.503 (0.00)
Marital status	0.306 (0.01)	-0.134** (0.06)	-0.134** (0.06)	-0.406 (0.01)
Cut-off:				
μ1	1.4811			
μ2	6.4361			
μ3	15.4363			
Model diagnostics:				
Log-likelihood	-81.8975			
Pseudo R2	0.5147			
Chi-square	173.74			
Prob > chi2	0.0000			

Note: ***, ** sig @ 1%, and 5% respectively; Food Insecure (FI), Moderately Food Insecure (MoFI), Mildly Food Insecure (MFI), Food Secure (FS). Source: Data analysis, 2024

Conclusion

Findings from this study showed that value addition, education, farm size, and other income sources significantly lower food insecurity among the respondents in the study area. Hence, the government, through extension agents, should raise awareness among respondents about the benefits and potential of value addition. They should also provide modern cassava processing equipment and techniques to farmers at a subsidized rate to encourage them in value-adding activities. Farmers should be encouraged to join associations like the Farmers' Cooperative Society to promote respondents' awareness of the importance of value addition.

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