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Capacity-Building Needs of Homemakers in Processing and Utilization of Plantain Products for Food Security in Delta State, Nigeria

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Abstract
Food insecurity remains a persistent challenge in many developing regions, including Nigeria, where inadequate processing skills and limited value addition often reduce the nutritional and economic benefits of agricultural produce such as plantain. In Delta State, homemakers play a key role in food processing and household nutrition, yet many lack the necessary capacity to effectively process and utilize plantain products for improved food security. This study therefore assessed the capacity-building needs of homemakers in processing and utilization of plantain products in Delta State, Nigeria. A descriptive survey design was adopted, with a population of about 1,236,315 homemakers across 25 Local Government Areas. A sample of 384 respondents was selected using multistage sampling from five LGAs and ten markets, ensuring urban and rural representation. Data were collected using a validated questionnaire on plantain products such as flour, chips, puree, and biscuits. Analysis involved SPSS, using mean, standard deviation, and t-test at 0.05 significance level. A total of 309 valid responses were analyzed, giving an 84.5% return rate.The results showed that among 309 homemakers in Delta State, most were married (71.5%), with a majority having household sizes of 5–7 persons (47.9%). A large proportion (83.2%) had at least secondary education, while income levels were fairly distributed across categories. Findings on capacity-building needs revealed that all 17 items scored below the 2.50 benchmark, indicating that homemakers generally lacked adequate skills in processing and utilizing plantain products such as flour, chips, biscuit, and puree, and therefore require training in these areas. A significant difference was also found between young and old homemakers, with young respondents showing greater training needs.Further results showed that homemakers faced several challenges in plantain processing, including communication gaps, inadequate funding, poor government policies, lack of storage facilities, and limited technical know-how, with a high grand mean of 3.50 confirming agreement. However, no significant difference was found between rural and urban homemakers regarding these challenges.The study concluded that homemakers in Delta State lack essential skills for effective plantain processing and utilization, which limits their contribution to household food security and value addition.

Keywords: Capacity-building, homemakers, plantain products, food security, Delta State

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Introduction

Homemaker requirements in terms of capacity-building to process and use plantain products are crucial to improving household food security, especially in sub-Saharan Africa where plantain is one of the staples. Plantain is a source of high amounts of calories, work, and income, but the full potential of this crop is underestimated because of poor competencies, insufficient knowledge of processing, and the lack of access to the right technologies (Udomkun et al., 2021; Adi, 2024) . Thus, households with homemakers, who are predominant in food preparation, food preservation and household nutrition, should be empowered to enhance food availability, access and utilization. Technical knowledge and skills on processing techniques of plantains is one of the key capacity building requirements. Plantain is a highly perishable crop, and the loss of plantains after harvest is estimated to be up to 40 percent in West Africa because of the poor handling and absence of processing opportunities (Adi, 2024) . Homemakers need to be trained about modern and traditional

methods of processing like drying, frying, fermentation and flour manufacturing. As an example, plantain can be made into flour, chips, and beverages, as well as prolong shelf life and diversify diets (Mundéné-Timothée et al., 2024). Most local processing methods are however not standardized resulting in low quality and low market value. The capacity-building programmes must thus concentrate on the standardized procedures and hygiene practices and value addition techniques to enhance product quality and safety.

Availability of proper processing technologies and equipments is another critical need. Most housewives use crude tools which restrict efficiency and productivity. Research indicates that better processing technologies, which include integrated machines to dry and mill plantain are not accessible and affordable in Nigeria (Oyejide et al., 2018) . Capacity building must also involve training on how to use small scale and cheap technologies that can be used in the rural households. This would lower the intensity of labour and enhance output and promote commercialization of plantain products. Another potential area of capacity development is entrepreneurial and marketing skills. Although the processing of plantains can be a source of income, most homemakers do not know the market trends, prices, packaging and distribution. The quality attributes of plantain products like taste, texture, and presentation have different consumer preference based on their quality (Udomkun et al., 2021) . Homemakers can be trained on business management, product branding, and value chain involvement to convert subsistence processing to profitable business to increase household income and food security.

Also, there is a need of nutrition education and knowledge in product utilization. Plantain is also a good source of carbohydrates, dietary fibre, vitamins and minerals and plays an important role in food security to millions of people in Africa (Agidi et al., 2025) . Nevertheless, it is mostly used in a small number of typical dishes. The capacity-building programs must also inform homemakers on nutritional value of plantain and new methods of using it in a variety of dishes, such as weaning foods and composite flours. This would enhance dietary variety and help in solving malnutrition particularly in children and the vulnerable groups. Also, there is need to have post-harvest skills in handling and storage to minimize losses and have year-round supply of plantain products. High moisture levels, poor storage facilities and poor transportation are also responsible of the rapid spoilage (Ejobee et al, 2026) . Proper harvesting, handling, preservation and storage methods including drying and better packaging can greatly decrease the waste and increase food security. Localized practices such as post-harvest that are specific to the local environment have been suggested as effective measures of reducing losses among farmers and traders (Morris et al., 2019) .

The other important capacity requirement is an access to extension services and lifelong training. Numerous homemakers work in the informal environment with the minimal exposure to the agricultural innovations and best practices. Training, demonstrations and advisory services can be offered by extension services on better processes and technologies to be used. There is an indication that plantain agricultural practices can be effectively countered by creating awareness and adoption of better farming technologies (Olojede and Odoemelam, 2018) to alleviate food insecurity among plantain producing households. Enhancing extension systems and getting them to women and homemakers is thus crucial. Capacity building is about financial literacy and access to credit. The value-added processing of plantain involves the use of equipment, packaging and raw materials, which require initial investment. A good number of homemakers have no access to financial resources or credit facilities knowledge. Financial management, savings, and cooperative formation training can boost their skills in investing small scale processing enterprises.

This study is needed because there is always gaps in knowledge, skills and technology among the homemakers in plantain processing despite its significance in food security in Nigeria. Plantain is very perishable, where more than half of postharvest losses are as a result of poor processing and storage methods (Ogbonyomi et al., 2023; Agidi et al., 2026) . The existing literature has paid much attention to production and consumer preferences, whereas the needs of capacity-building in women processors at home level were given less attention (Udomkun et al., 2021; Anaekwe et al, 2025)). There are also knowledge gaps in the market, exploiting diversity, and proper small-scale

technologies. Thus, this research is needed to fill these shortcomings and improve food security in Delta State.

Research Questions

1. What are the capacity-building needs of homemakers in processing and utilization of plantain products to achieve food security in Delta state?
2. What are the challenges encountered by homemakers in Delta State in processing and utilization of plantain products for food security?

Hypotheses

1. There is no significant difference between the responses of older homemakers and younger homemakers on the capacity-building needs of homemakers in processing and utilization of plantain products to achieve food security in Delta State.
2. There is no significant difference between the responses of urban homemakers and rural homemakers on the challenges encountered by homemakers in processing and utilization of plantain products for food security in Delta State.

Method

The research was carried out in Delta State in South-South geopolitical zone in Nigeria. The state was established on August 27, 1991, out of the old Bendel State in latitudes 5 00 -6 30 N and longitudes 5 00 -6 45 E spanning a land area of 16,842 square kilometers. It borders the Edo State to the north, Anambra and Rivers States to the east, Bayelsa State to the south and the Bight of Benin to the west. The state of Delta has 25 Local Government Areas, the capital of which is Asaba and the economic centre is Warri. The research targeted homemakers who participated in the processing and use of plantains in some of the local government of the region of interest, as the plantain trade was a leading business in the area. The research design adopted is descriptive survey research design since it enabled the researcher to obtain data about a large population and describe the current situations of homemakers capacity building requirements in the processing of plantains as food security. The households were an estimated 1,236,315 homemakers in the 25 Local Government Areas. Out of this population, a sample of 384 respondents was calculated based on 95 per cent confidence level. The sampling method used was multistage sampling which started by purposively selecting five Local Government Areas which included Isoko North, Ika South, Ughelli North, Ukwuani and Uvwie which were actively engaged in the trade of plantains. Two markets of each area were then randomly identified and 38 respondents were selected via stratified random sampling in each of them to ensure that there was a representation of both urban and rural areas.

The authors have targeted specific plantain products including plantain flour, chips, puree, and biscuits that are a common production and consumption in the state. A structured questionnaire that was used to collect the data was called Homemakers Capacity Building Needs in Processing and Utilization of Plantain Products Questionnaire (HCBNPUPPQ). The instrument consisted of two parts, including demographic data and questions assessing the requirements of capacity building and was designed on a four-point Likert scale. Experts in the related academic fields have validated the instrument to make it clear and relevant, whereas reliability was determined using test-retest method and gave a coefficient of 0.80, which implies high consistency. To collect data, the researcher and with the aid of three research assistants, he administered the questionnaire directly to the respondents in the areas of choice. A total of 384 copies were given out and 309 were effectively recalled, with a response rate of 84.5. Statistical package of social sciences (SPSS) Version 23.0 was used to analyze the data. Research questions were answered by the use of mean and standard deviation and hypotheses were tested using t-test at a level of significance of 0.05. The average score of 2.50 was used as the reference point when making decisions where a higher score would mean agree and the reverse is also true.

Results

Research Question 1: What are the capacity-building needs of homemakers in processing and utilization of plantain products to achieve food security in Delta State?

Table 1: Mean ($\bar{x}$) and Standard Deviation Scores on the Capacity-Building Needs of Homemakers in Processing and Utilization of Plantain Products (n = 309)

S/N	Items	Mean ($\bar{x}$)	SD	Remark
	Plantain Flour			
1.	I am able to package the flour in dampness proof packaging material	2.48	1.04	Disagreed
2.	Ability to know that unripe plantain floor is used to lowers cholesterol, triglycerides in the blood	2.44	1.11	Disagreed
3.	Ability to understand that it is used to combat a range of symptoms associated with erectile dysfunction	2.39	1.23	Disagreed
4.	Ability to understand that unripe plantain contains antioxidant compounds that help to generates a slow release of glucose, prevent colon cancer, constipation	2.44	1.12	Disagreed
	Plantain Chips			
5.	I am able to dry/process plantain cuts/chips in a sledge process	2.48	1.09	Disagreed
6.	With the guide of a mechanical slicer, I am able to cut the mash	2.37	1.08	Disagreed
7.	I am able to package the chips in dampness proof packaging material	2.46	1.01	Disagreed
8.	I understand that plantain chips serves as energy booster, a source of vitamins like A, B3, and D	2.38	1.16	Disagreed
	Biscuit			
9.	I am able to identify different sizes of baking pans used	2.44	1.10	Disagreed
10.	I know the time required for cooling the products is 45 minutes for 310g sample	2.40	1.12	Disagreed
11.	I know that cooling time depends on the size of the biscuit	2.49	1.31	Disagreed
12.	I understand that reconciliation of sales expenditure determines profits or loss of the enterprise	2.44	1.23	Disagreed
13.	I know it helps the body to absorb iron	2.31	1.21	Disagreed
14.	I know plantain biscuits are rich in vitamin K which helps in blood clots	2.16	1.20	Disagreed
	Plantain Puree			
15.	I am able to use blender to make the puree	2.43	1.21	Disagreed
16.	I know the fiber/complex carbohydrate content gives a feeling of satisfaction when consumed	2.47	1.12	Disagreed
17.	I understand that plantain has both antioxidant/anti-inflammatory properties that protects little ones from diseases	2.26	1.22	Disagreed

Table 1 shows the mean ($\bar{x}$) and standard deviation scores of capacity-building needs of homemakers in processing and utilization of plantain products to achieve food security in Delta State. The results showed that all the 17 items (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17) had mean ($\bar{x}$) scores less than the acceptable cut-off mean score of 2.50, showing that homemakers disagreed to the possession of the skills involved in processing and utilization of plantain products.

This indicated that they require capacity building in understanding how plantain flour can be used to combat a range of symptoms associated with erectile dysfunction (2.39), ability to cut mash to make plantain chips with the guide of a mechanical slicer (2.37), ability to know that plantain biscuit helps the body to absorb iron (2.31), and ability to understand that plantain has both antioxidant/anti-inflammatory properties that protects little ones from diseases (2.26).

Hypothesis 1: There is no significant difference between the mean ($\bar{x}$) responses of young and old homemakers on their capacity-building needs in processing and utilization of plantain products.

Table 2: Summary of t-test Analysis on the Mean ($\bar{x}$) Responses of Young and Old Homemakers on their Capacity-Building Needs in Processing and Utilization of Plantain Products (n=309)

Homemakers	N	$\bar{x}$	SD	Df	t-value	p-value	Decision
Young Homemakers	164	2.31	1.06	307	-2.17	0.03	Reject Ho
Old Homemakers	144	2.58	1.16				

$p<0.05$

Table 2 presents the summary of t-test analysis on the mean ($\bar{x}$) responses of young and old homemakers on their capacity-building needs in processing and utilization of plantain products. The result shows that the t-value is -2.17, and the p-value is 0.03 at 0.05 alpha value. The hypothesis was therefore rejected since the p-value is less than the alpha value. This implies that there was a significant difference between the mean ($\bar{x}$) responses of young and old homemakers on their capacity-building needs in processing and utilization of plantain products. The lower mean score for young homemakers indicates that they have less possession of the skills in processing and utilizing of plantain products; thus they require more capacity-building than the old homemakers.

Research Question 2: What are the challenges encountered by homemakers in processing and utilization of plantain products for food security in Delta State?

Table 3: Mean ($\bar{x}$) and Standard Deviation Scores on the Challenges Encountered by Homemakers in Processing and Utilization of Plantain Products (n = 309)

S/N	Items	Mean ($\bar{x}$)	SD	Remark
18.	Low level of awareness of the areas of scarcity for effective marketing	2.95	0.79	Agreed
19.	Low technical know-how of the personnel involved	3.52	0.50	Agreed
20.	Communication gaps between the processors, marketers, and consumers	3.67	0.47	Agreed
21.	Unfavorable market climate for sustainable value addition to plantain industry	3.50	0.50	Agreed
22.	Inadequate funding of agriculture by the government and stakeholders	3.66	0.47	Agreed
23.	Competition for relative prices of other food crops and products	3.49	0.50	Agreed
24.	Irregular/poor government policies on agriculture policies	3.63	0.48	Agreed
25.	Gender disparity in plantain value addition enterprise	3.45	0.50	Agreed
26.	High cost of labour for the activities in plantain value addition	3.50	0.50	Agreed
27.	Inadequate storage facilities for plantain value added products	3.61	0.49	Agreed
	Grand Mean ($\bar{x}$)	**3.50**	**0.52**	**Agreed**

Table 3 shows that the grand mean ($\bar{x}$) of item 18 – 27 is 3.50, greater than the acceptable cut-off mean ($\bar{x}$) score of 2.50, and a standard deviation of 0.52. Furthermore, the mean ($\bar{x}$) scores for each item were more than the acceptable cut-off mean of 2.50, which implies that all items are challenges encountered by homemakers in processing and utilization of plantain products for food security in Delta State. The four items with the highest mean ($\bar{x}$) scores were item 20 (Communication gaps between the processors, marketers, and consumers, 3.67), item 22 (Inadequate funding of agriculture by the government and stakeholders, 3.66), item 24 (Irregular/poor government policies on Agriculture policies, 3.63), and item 27 (Inadequate storage facilities for plantain value added products, 3.61).

Hypothesis 2: There is no significant difference between the mean ($\bar{x}$) responses of rural and urban homemakers on their challenges in processing and utilization of plantain products for food security in Delta State.

Table 4: Summary of t-test Analysis on the Mean ($\bar{x}$) Responses of Rural and Urban Homemakers on their Challenges in Processing and Utilization of Plantain Products

Location	N	$\bar{x}$	SD	Df	t-value	p-value	Decision
Rural	113	3.72	0.45	307	-1.60	0.11	Accept Ho
Urban	196	3.63	0.49				

p>0.05

Table 4 revealed a t-value of -1.60, and a p-value is 0.11, which is greater that the alpha value of 0.05. The hypothesis was therefore accepted, showing that there was no significant difference between the mean ($\bar{x}$) responses of rural and urban homemakers on their challenges in processing and utilization of plantain products for food security in Delta State.

Discussion of findings

Finding from the result showed seventeen (17) skills required by homemakers for capacity-building in processing and utilization of plantain products, which are ability to understand how plantain flour can be used to combat a range of symptoms associated with erectile dysfunction, cut mash to make plantain chips with the guide of a mechanical slicer, know that plantain biscuit helps the body to absorb iron, understand that plantain has both antioxidant/anti-inflammatory properties that protects little ones from diseases, among others. This shows that homemakers in Delta State do not possess skills in understanding the health benefits of plantain products. Bello-Perez, et al. (2011) reported that plantain products are fermented in the large intestine, producing shot-chain fatty acids that are associated with the prevention of colon cancer and cardiovascular diseases; Krishnan and Prabhasankar (2010) opined that plantain contains high amounts of essential minerals such as potassium, phosphorus, chlorine, and vitamins. There is need for capacity-building programmes where homemakers can gain relevant skills in understanding some of these health benefits and how to process and utilize plantain products for food security in Delta State. The null hypothesis was rejected, showing that there was a significant difference between the mean ($\bar{x}$) responses of young and old homemakers on their capacity-building needs in processing and utilization of plantain products. The lower mean ($\bar{x}$) score for young homemakers indicates that they have less possession of the skills in processing and utilizing of plantain products; thus they require more capacity-building than the old homemakers.

Finding further showed ten (10) challenges encountered by homemakers in processing and utilization of plantain products for food security in Delta State were found to include communication gaps between the processors, marketers, and consumers, inadequate funding of Agriculture by the government and stakeholders, irregular/poor government policies on Agriculture policies, inadequate storage facilities for plantain value added products, inadequate storage facilities, and so on. The challenges identified by respondents are in agreement with those outlined by Eno (2018), Ekunwe and Ajayi (2010) which include high post-harvest losses due to lack of storage facilities, poor

government policies, diseases, poor pricing, unstable government policies, financial challenges, among others. The findings are also in agreement with Udosen (2016) who revealed that the challenges faced in processing and utilization of plantain include deterioration in quality/spoilage due to lack of storage facilities, seasonal price fluctuations, lack of funds, high cost of transportation, among others. Furthermore, the null hypothesis shows that there was no significant difference between the mean ($\overline{X}$) responses of rural and urban homemakers on their challenges in processing and utilization of plantain products for food security in Delta State. This implies that homemakers in rural and urban areas encounters the same challenges in processing and utilization of plantain products in Delta State.

Conclusion

The study concluded that homemakers in Delta State have significant capacity-building needs in the processing and utilization of plantain products for food security. The result showed that majority of the homemakers are poorly skilled and lack knowledge in the main production of plantain flours, processing of chips, preparation of biscuits and use of puree. This shows that there is a discrepancy between current practice and competencies needed to achieve effective value addition and food security improvement. The paper also determined that young homemakers need more training than their older counterparts and lack of sufficient funding, technical know-how, effective communication channels and sufficient storage facilities are some of the obstacles to effective plantain processing. There was however no significant difference between rural and urban homemakers with respect to the challenges encountered. The research finds that capacity-building programmes, offering technical assistance, and empowering agricultural policies are critical towards promoting the productivity of the homemakers and ensuring sustainable food security by adding value to plantain in Delta State.

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