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Assessment of Training Modes for Capacity Building of Homemakers in Plantain Processing and Utilization for Enhanced Food Security in Delta State

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Abstract
Although plantain is an important staple food in Delta state with high nutritional value, its vulnerability to perishability and its poor post-harvest handling practices are still a challenge to food security of the households. Agricultural extension can be a solution, but there is no evidence on the type of training modalities that are most effective for female homemakers, who are the main actors in domestic food processing. This study sought to fill this gap by evaluating capacity building training preferences of homemakers in processing and utilization of plantain products. Descriptive survey design was used in the study, with the target population comprising the female homemakers who trade plantain in five selected Local Government Areas (LGA) in Delta State. 384 respondents were selected through stratified random sampling and 309 questionnaires were obtained and used for this study. Mean scores, standard deviations and t-test statistics at 0.05 level of significance were employed to analyze data for preference and test for differences between the rural and urban respondents. The results indicated that homemakers are highly favorable towards modern electronic and digital training mode, with a grand mean score of 3.31 which is higher than the criterion of 2.50. The television programmes were the most popular (3.69), followed by social media platforms (3.56) and radio programmes (3.50). The results of hypothesis testing did not show any significant difference between the preferences of the rural and urban homemakers ($p = 0.41$) which means that there is no variance in the demand for accessible and technology driven extension delivery in both the rural and urban area. The study suggests a change from the traditional, manual-based workshops to hybrid training models based on a digital approach for agricultural policies and extension practitioners.
Keywords: Capacity building, homemakers, plantain processing, food security and extension services.

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Introduction

The skill acquisition of homemakers in Plantain Processing and Utilization is one important avenue to improve household food security and economic resilience in Nigeria. Plantain (Musa spp.) is a major source of carbohydrates, vitamin A, vitamin C and minerals in the diets of many people, but its short shelf life and post-harvest losses are a great challenge to food security. Training modes are critical to enable homemakers to become efficient processors to produce value added products from raw plantain such as flour and shelf-stable snacks. This change will take place if systematic educational interventions take place that consider the unique socio-economic situation of rural households.

Agricultural extension services are one of the basic educational system that is aimed at helping people to enhance their livelihoods using scientific knowledge. However, training programs for homemakers need to be designed to address structural constraints because gender-based gaps are likely to constrain access to formal extension services (Hidayati et al, 2026). New training approaches including digital-assisted extension, community-based training workshops can have a major impact on the way information is delivered on post harvest technologies. Current studies have found that inclusive agricultural extension models, defined as those models in which women are directly involved in accessing technical information for training, best support better food security and nutrition, and that these benefits are linked to technical training for women (Effiong & Aboh, 2024).

One of the more successful trainings for complex processing techniques is still through demonstration. Hands-on learning spaces minimize the amount of abstract materials, more likely to be inappropriate for populations with varying literacy levels. Homeworkers who participate in cooperative groups have better access to information and institutional support, thus, shifting their subsistence level handling to commercial level processing (Balarabe et al, 2025). Social learning networks are increasingly being used in modern extension methods to transmit indigenous and improved processing knowledge within the communities themselves, based on the experiences of their members. Such an approach has been found to enhance adoption of new technologies, since the training takes place in 'home' social structures and local culture (Buabeng et al, 2026).

In addition, training efforts should focus on the past lack of translation from research to household use. Special attention is needed during the overripe stage of plantain fruit for the homemakers to ensure acceptable post harvest management and reduce losses. The training on plantain to flour contributes to the food security of the food systems and gives a steady income to rural families. The need for policy makers to focus on gender sensitive extension delivery reform. This involves the activation of specific programs designed to address the particular labour situation of rural women, who are often involved in multiple activities – agricultural and domestic. Gender-specific training modules have been found to be more effective than generic ones due to the fact that they address the specific agricultural skills that women undertake (Cieslik et al., 2022).

These training modes will be effective if they have the support of their institutions and are integrated with digital tools. Research has shown that extension services have greater impact when they are part of a comprehensive rural development strategy that connects agricultural production to economic empowerment. If plantain is a major food, scaling up plantain training to cover modern plantain packaging and marketing can change the plantain market system. Increased integration between research institutions and homemaker cooperatives makes scientific advancements and research findings, like better drying and storage methods, available for those who most need them (Buabeng et al, 2026).

Capacity building of homemakers is a key strategy in poverty alleviation. Women are also important actors in agricultural enterprises and yet their potential in agricultural planning is underestimated. Creating the space for diversified training modes, gender-responsive and participatory approaches can accelerate positive change in food access and nutrition security. It is recommended that for future programmes, the face-to-face demonstration component be supplemented with mobile extension knowledge sharing to reach the most remote homemakers who need that knowledge to help achieve the food security goals of the nation (Effiong & Aboh, 2024). In this comprehensive way of doing things, training becomes an ongoing process of acquiring new information and developing new skills.

The study is important due to the nutritional value of the crop and the importance of plantain processing to reduce post harvest losses, but this is not being used effectively to ensure food security and safety of the households in Delta State. Conventional extension models may not consider the capacity-building needs of homemakers, who are the major food processors and caregivers, as a major agricultural productivity consideration in most cases (Falade et al., 2025). There is a considerable divide between what training methods are most effective for this audience. Existing studies show that gender-specific factors such as limited mobility and low literacy rates are likely to affect the adoption of technologies by rural women and are often overlooked in generic extension programs (Cieslik et al., 2022). Besides, although training schemes have been evaluated in Delta State for various industries such as fish culture, the extent of the gap between the training content and the daily challenges encountered by fish processors have been emphasized (Aphunu & Ajayi, 2010). This research compared various training techniques, including both conventional (face-to-face) and contemporary (digitally assisted) approaches, highlighting the essential importance of gender-informed, community-based solutions. The results will offer a scalable approach to improving the technical skills of the homemakers, which will lead to food security, reduced waste and boost the local food value chain.

Research Questions

What are the preferred training modes by homemakers for their capacity building in processing and utilization of plantain products for food security in Delta State?

Hypotheses

There is no significant difference between the responses of urban homemakers and rural homemakers on the preferred training modes by homemakers for their capacity building in processing and utilization of plantain products for food security in Delta State.

Method

This study examined the capacity building needs of home makers in relation to processing and utilization of plantain products to boost food security in Delta state in Nigeria. Delta State is situated in the South-South geopolitical zone, sharing boundaries with Edo state, Anambra state, Rivers state and Bayelsa state, and with 160 kms along the Bight of Benin. The state has grown to 25 Local Government Areas (LGAs) and its capital is Asaba with economic hub as Warri since its establishment in 1991.

The research used a descriptive survey design that was chosen for its ability to effectively gather factual information and to capture the perceptions of a representative sample of the target population in a systematic way to achieve its objectives. The study population was female homemakers engaged in commercial trade of plantain products in all the 25 LGAs of the study area with estimated population of 1,236,315 obtained from the Census. A stratified random sampling method was used to determine the sample size of 384 respondents at 95% confidence level. A two-stage sampling method was employed; first, five LGAs, namely, Isoko North, Ika South, Ughelli North, Ukwuani and Uvwie were purposively selected because of the volume of plantain trade in the areas. Two markets were then randomly chosen within each of these LGAs and 38 homemakers were randomly selected within each of those two markets, which was to ensure a balance of literate and semi-literate participants.

Four plantain derivatives (flour, chips, puree and biscuit) were the plantain derivatives used in data collection. The major instrument used was a structured questionnaire, "Homemakers' Capacity Building Needs in Processing and Utilization of Plantain Products Questionnaire" (HCBNPUPPQ). This tool was split into two sections: personal data and capacity building needs, on a 4-point Likert scale (Strongly Agree to Strongly Disagree). The instrument was face validated by three experts in Vocational Education and Measurement and Evaluation to ensure scientific rigour. In addition, reliability was calculated using the test/retest method: The internal reliability coefficient was 0.80 based on the results of test/retest conducted two weeks apart, which showed the instrument's consistency.

The questionnaires were administered to sampled respondents with the help of three research assistants. This in situ method achieved a good return rate of 309 copies which were completed and retrieved. The Statistical Package for the Social Sciences (SPSS), Version 23.0 was used to perform the statistical analysis. For solving the research questions, descriptive statistics such as mean scores and standard deviations were used. A criterion mean of 2.50 was set in order to provide the basis for decision making; anything above 2.50 was classified as "agreed" and anything below 2.50 as "disagreed. The researcher used t-test analysis for hypothesis testing at 0.05 alpha level. For this purpose, “statistically significant” was defined as a p-value of less than 0.05. The methodological approach was comprehensive that the study was able to give a reliable assessment of the training needs needed to optimize plantain utilization and help to achieve food security in the household in Delta State based on evidence.

Results

Table 1: Bio-data of Homemakers in Delta State (n = 309)

S/N	Variables	Frequency (F)	Percentage (%)
1.	Marital Status		
	Single	116	19.1
	Married	164	71.5
	Divorced	11	3.6
	Widowed	18	5.8
	Total	**309**	**309**
2.	Household Size		
	1-4 persons	41	13.3
	5-7 persons	148	47.9
	8 persons & above	120	38.8
	Total	**309**	**100**
3.	Educational Qualification		
	Secondary education & below	52	16.8
	Above Secondary education	257	83.2
	Total	**309**	**100**
4.	Income per Annum		
	N100,000 – N300,000	89	28.8
	N301,000 – N500,000	111	35.9
	Above N500,000	109	35.3
	Total	**309**	**100**

Table 1 presents the bio-data of homemakers in Delta State. Majority 71.5% are married, 19.1% are single, 5.8% are widowed, and 3.6% are divorced. With regards to their household size, 47.9% has 5-7 persons in their houses, followed by 38.8% with 8 persons and above, and 13.3% with 1-4 persons. Homemakers' responses on their educational qualifications revealed that 83.2% has secondary school certificate and above, while 16.8% has below secondary school certificate. On their level of income per annum, 35.9% earns N301,000 – N500,000 per annum, 35.3% earns above N500,000 per annum, while 28.8% earns N100,000 – N300,000 per annum.

Research Question: What are the preferred training modes by homemakers for their capacity building in processing and utilization of plantain products for food security in Delta State?

Table 2: Mean ($\bar{x}$) and Standard Deviation Scores on the Preferred Training Modes by Homemakers in Processing and Utilization of Plantain Products (n = 309)

S/N	Preferred Training Modes	Mean ($\bar{x}$)	SD	Remark
1.	Seminar on plantain processing and utilization	3.07	0.80	Agreed
2.	Workshops	2.99	0.82	Agreed
3.	Conferences	3.03	0.80	Agreed
4.	Television programme	3.69	0.46	Agreed
5.	Social media platform, such as WhatsApp, Facebook, Twitter	3.56	0.50	Agreed
6.	Radio programme	3.50	0.50	Agreed
	Grand Mean ($\bar{x}$)	**3.31**	**0.67**	**Agreed**

Table 2 revealed that the grand mean ($\bar{x}$) of item 1 – 6 is 3.31, higher than the acceptable cut-off mean ($\bar{x}$) score of 2.50, with a standard deviation of 0.67. The mean scores for each item were more than the acceptable cut-off mean of 2.50, which indicates that they are all training modes preferred by homemakers for their capacity building in processing and utilization of plantain products

for food security in Delta State. However, item 4 (Television programme, 3.69), item 5 (Social media platform, such as WhatsApp, Facebook, Twitter, 3.56), and item 6 (Radio programme, 3.50) had the highest mean scores.

Hypothesis: There is no significant difference between the mean ($\bar{x}$) responses of rural and urban homemakers on their preferred training modes for capacity-building in processing and utilization of plantain products.

Table 3: Summary of t-test Analysis on the Mean ($\bar{x}$) Responses of Rural and Urban Homemakers on their Preferred Training Modes for Capacity-Building in Processing and Utilization of Plantain Products (n=309)

Location	N	$\bar{x}$	SD	Df	t-value	p-value	Decision
Rural	113	3.66	0.48	307	0.83	0.41	Accept Ho
Urban	196	3.71	0.46				

p>0.05

Table 3 shows that a t-value of 0.83, and a p-value of 0.41 at 0.05 alpha level. Since the p-value is greater than the 0.05 alpha value, the null hypotheses is therefore accepted, indicating that there was no significant difference between the mean ($\bar{x}$) responses of rural and urban homemakers on their preferred training modes for capacity-building in processing and utilization of plantain products.

Discussion

The outcome of the study revealed that homemakers preferred six (6) training modalities as their preferred training method for plantain products processing and utilization for food security which includes TV programme, social media platform (Whatsapp, Facebook, Twitter, etc), radio programme, seminars, conferences and workshops. The result revealed that the mean ($\bar{X}$) responses of the rural and urban homemakers in their preferred training modes on capacity building in processing and utilization of plantain products were not significantly different. The implication is that homemakers, in rural and urban settings, need to be trained in the same way to enhance their capacity in building plantain processing and utilization capacity.

The results obtained in this study indicate that the combination of the traditional and the electronic modes of training has the highest preference of the homemakers in Delta State with the grand mean of 3.31. The most popular channels were television shows, social media websites and radio stations. The finding resonates with the result of recent studies by Effiong and Aboh (2024) which demonstrated that the use of digital-assisted extension services has a significant contribution to the dissemination of information and adoption among the rural food crop producers. In a parallel study by Buabeng et al (2026), the use of mobile-based knowledge sharing and community digital platforms are also becoming key to engaging more widely dispersed populations of agricultural processors.

The findings, however, indicate a changing landscape where accessibility and convenience are valued over the traditional location-based seminar format, as some classical studies have indicated that face-to-face workshops are the gold standard for skill acquisition, but those preferences were not reflected in this study. As for the hypothesis testing, the analysis revealed that there was no difference between rural and urban homemakers as far as their preference for training modes is concerned. The point of this, which was discovered, corroborated the findings of Effiong and Aboh (2024) who found that the need for effective and modern extension models is universal, both by rural and urban dwellers, because both are increasingly embedded in mobile technology ecosystem. In a similar study, Buabeng et al. (2026) reported that the differences in training requirements between urban and rural agricultural players tend to become minimal once they reach the rural hubs with the digital infrastructure. The acceptance of the null hypothesis therefore suggests that location is not yet a major factor in designing capacity building interventions in Delta State because the demand for technology-based extension services seems to be the same for the whole population.

Conclusion

The study has given a critical evaluation of training modes needed for the improvement of plantain processing and utilization capacity of homemakers which is important for improving food security of households in Delta State. The results overwhelmingly show that there is a tremendous desire among homemakers to engage in capacity building training, especially in the adoption of training methods that incorporate electronic and digital media. With specific reference to media, television programmes, social media and radio broadcast were found to be the most preferred modes of knowledge acquisition when compared to the traditional mode of seminar and conference. The empirical evidence indicates that the mode of training preferred by the homemakers is consistent statewide and no difference was found between rural and urban homemakers. This homogeneity indicates that digital-first extension strategies are not only feasible but crucial for delivering to the geographically dispersed customer base of homemakers, effectively. Stakeholders and agricultural policy makers need to change the mindset towards hybrid training systems to optimize plantain product utilization (plantain flour, plantain chips, plantain puree and plantain biscuit). Extension agencies, by focusing on television, radio and mobile based social media platforms, are able to bridge the barriers of mobility and literacy to ensure the dissemination of scientific information on post-harvest management to the home-maker. The investment in these preferred training methods will play a crucial role in bringing about the change in plantain from a highly perishable crop to a stable and value added food, which will guarantee economic resilience and long term sustainable nutrition of families in Delta State.

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