

Language-Specific Agricultural Extension and Household Food Security: Evidence from TME419 Cassava Farmers in Obingwa Local Government Area, Nigeria

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ABSTRACT

This study investigated the effect of language-specific agricultural extension materials on TME419 cassava cultivation and household food security among rural farmers in Obingwa Local Government Area of Abia State, Nigeria. The study adopted a quasi-experimental research design involving treatment and control groups. A multi-stage sampling technique was used to select 240 registered cassava farmers, comprising 120 farmers exposed to Ngwa-Igbo dialect-based extension materials and 120 farmers exposed to conventional English/Pidgin extension materials. Data were collected using structured questionnaires, key informant interviews, and focus group discussions. The language-specific materials were developed through translation, back-translation, and expert validation by linguists and agronomists to ensure linguistic accuracy and technical relevance. Descriptive statistics, independent sample t-tests, and multiple regression analyses were used for data analysis. The findings revealed no significant differences in the socio-demographic characteristics of the treatment and control groups at baseline, indicating comparability between groups. However, farmers who received Ngwa-Igbo dialect-based extension materials recorded significantly higher cassava yields (25.3 tonnes/ha) than those who received conventional extension materials (15.6 tonnes/ha) ($t = 18.42$, $p < 0.05$). Regression analysis further showed that language-specific extension materials were the strongest predictor of cassava productivity and household food security ($\beta = 0.52$, $p < 0.001$), accounting for a substantial proportion of the variation in yield outcomes. Qualitative findings also indicated that farmers found the dialect-based materials easier to understand, more culturally relevant, and more applicable to their farming practices. The study concludes that language-specific agricultural extension materials significantly enhance the adoption of improved cassava production practices, increase cassava yields, and promote household food security among rural farmers. The study recommends the integration of indigenous language-based communication strategies into agricultural extension programmes to improve technology dissemination and agricultural productivity in rural communities.

Keywords: Agricultural extension, food security, language-specific communication, Ngwa-Igbo dialect, cassava cultivation, technology adoption, rural farmers, Obingwa LGA.

I. INTRODUCTION

Global food systems are currently under severe pressure due to climate change, geopolitical conflicts, economic instability, and rapid population growth (Food and Agriculture Organization [FAO], 2023). These challenges have contributed significantly to rising levels of hunger and food insecurity worldwide, with more than 800 million people experiencing chronic undernourishment (FAO, 2023; United Nations, 2022). Sub-Saharan Africa remains the most affected region, and Nigeria occupies a central position within this crisis because of its large population, increasing poverty rates, and dependence on rain-fed agriculture (World Bank,

2023). In response to the growing threat of food insecurity, agricultural policies and interventions have increasingly focused on resilient, high-yielding staple crops capable of sustaining vulnerable populations (International Fund for Agricultural Development [IFAD], 2022).

Among these crops, cassava (*Manihot esculenta*) plays a critical role in ensuring household food security in Nigeria (Nweke, Spencer, & Lynam, 2002). Nigeria is currently recognized as the world's largest producer of cassava, producing over 59 million metric tonnes annually (FAOSTAT, 2023). The crop serves as a major source of daily calories for more than 100 million Nigerians (IITA, 2021). Cassava possesses several agronomic

advantages that make it particularly suitable for food security purposes. It thrives in poor soils, demonstrates high tolerance to drought conditions, and can remain safely stored underground for extended periods without significant spoilage (Cock, 1985; El-Sharkawy, 2004). These characteristics make cassava an important buffer against seasonal food shortages and climate-related agricultural disruptions (FAO, 2022).

In an effort to strengthen food production and improve farmers' productivity, agricultural research institutions such as the International Institute of Tropical Agriculture developed improved cassava varieties, including TME419 (IITA, 2019). TME419 represents a major agricultural innovation because of its high resistance to Cassava Mosaic Disease, high dry matter content suitable for garri processing, and superior yield potential (Akinbo et al., 2018). Under proper agronomic management, TME419 can produce between 25 and 30 tonnes per hectare, compared to the approximately 10 tonnes per hectare commonly obtained from traditional local varieties (National Root Crops Research Institute [NRCRI], 2020).

Despite these advantages, the widespread adoption of TME419 among rural farmers remains limited (Oparinde et al., 2016). Several studies have shown that many agricultural technologies developed by research institutions fail to achieve widespread adoption at the farm level due to communication barriers, inadequate extension delivery, and limited farmer education (Rogers, 2003; Davis & Sulaiman, 2014). While previous studies have examined factors influencing cassava technology adoption in Nigeria, most focused on economic variables such as access to credit, farm size, and input availability (Odoemenem & Otanwa, 2011; Ayoade, Ibrahim, & Ibrahim, 2009). Few studies have critically examined the role of language and localized communication in improving farmers' understanding of agricultural innovations.

Furthermore, earlier research produced conflicting findings regarding the effectiveness of extension communication channels. For instance, Arokoyo (2005) found that conventional extension systems improved awareness but had minimal impact on long-term adoption among rural farmers. In contrast, Agwu and Chah (2007) argued that farmer participation and localized communication strategies significantly enhanced technology uptake. However, these studies did not specifically investigate dialect-based instructional approaches within rural Igbo-speaking communities such as Obingwa LGA. This unresolved gap justifies the need for the present study.

The persistent gap between agricultural innovation and practical adoption is strongly linked to

communication challenges within local agricultural extension systems, particularly in Obingwa Local Government Area. Agricultural extension agencies at the national and state levels commonly disseminate information through training manuals, radio programmes, workshops, and field guides written primarily in formal English or urban Pidgin English (Madukwe, 2008). However, the majority of rural smallholder farmers in Obingwa communicate mainly in the localized Ngwa dialect of the Igbo language (National Population Commission, 2020). This linguistic difference creates a serious communication barrier between extension agents and farmers. According to Rogers' Diffusion of Innovation Theory (2003), communication effectiveness significantly determines the rate at which innovations are adopted within rural communities. Technical agricultural concepts such as "plant population per hectare," "toxicity levels," "recommended spacing," and "active chemical ingredients" are often poorly understood or completely misunderstood when communicated in unfamiliar languages (Chikaire et al., 2012). Consequently, extension agents and farmers frequently fail to achieve effective communication during training and advisory sessions.

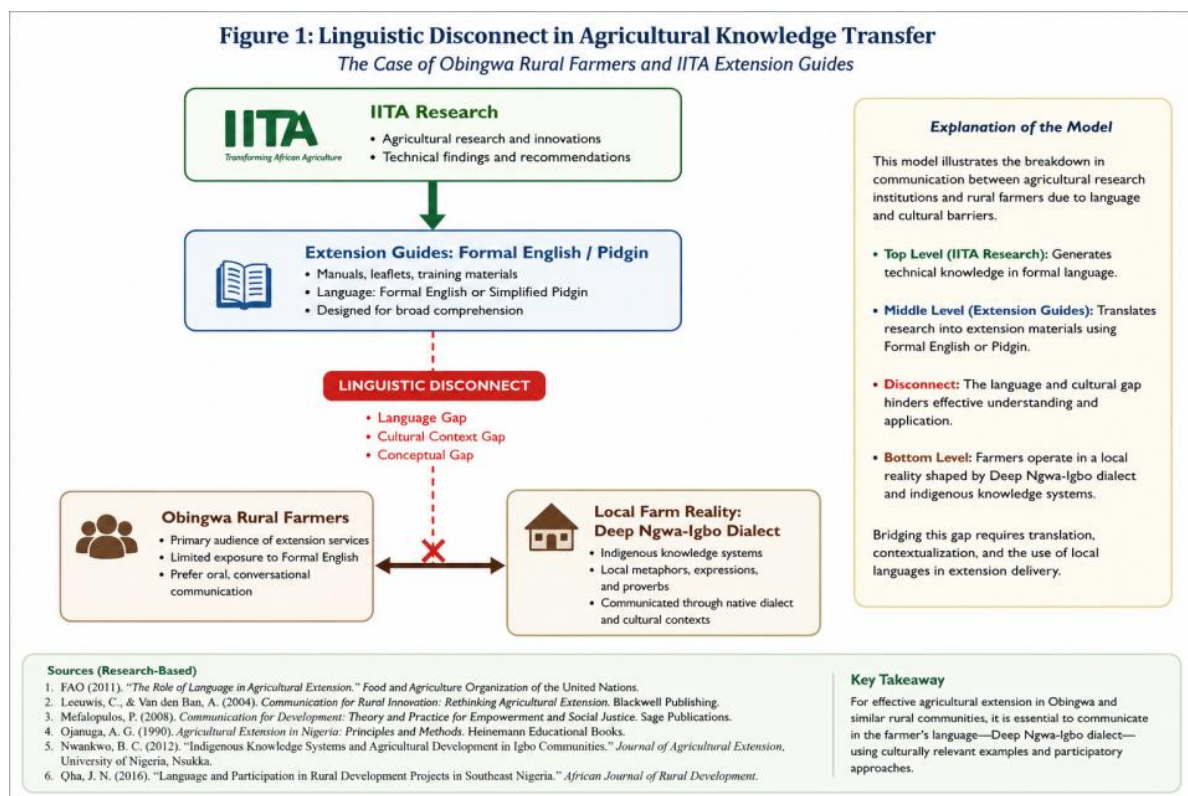
Existing studies on agricultural extension in southeastern Nigeria have largely concentrated on the accessibility of extension services, frequency of extension visits, and infrastructural limitations affecting technology dissemination among rural farmers (Nnadi & Akwiwu, 2008; Asiabaka, 2002). Although extensive literature exists on the effectiveness of agricultural extension services in Nigeria, most previous studies have treated extension delivery as a broad and generalized concept, focusing mainly on the number of extension contacts, availability of extension personnel, or access to instructional materials. Consequently, the critical role of linguistic accessibility in agricultural technology transfer has received limited scholarly attention.

Furthermore, many existing studies aggregated findings at regional or national levels without adequately accounting for the linguistic and cultural heterogeneity that exists within specific rural communities. As a result, very few studies have isolated the use of native language or dialect as a specific intervention mechanism for improving the adoption of agricultural innovations, particularly high-yielding cassava varieties such as TME419. Previous research may have examined agricultural extension services generally, but limited attention has been paid to the use of dialect-specific instructional materials as a targeted strategy for improving technology adoption and

household food security within distinct geopolitical settings such as Obingwa Local Government Area. This omission represents a significant gap in the literature because language plays a fundamental role in knowledge transfer, comprehension, participation, and behavioral change among rural farming populations. Farmers are more likely to understand, trust, and adopt improved agricultural technologies when extension information is communicated in familiar linguistic forms that

align with their cultural realities and everyday communication patterns.

The present study therefore seeks to bridge this empirical gap by examining how dialect-tailored instructional materials in the Ngwa-Igbo dialect can improve the adoption of TME419 cassava production practices and enhance household food security among rural farmers in Obingwa Local Government Area.



Problem Statement

Food insecurity is still a major challenge for many rural households in Nigeria, even with ongoing efforts to improve agricultural productivity. Cassava remains one of the most important food crops in the country because it is widely grown, easy to cultivate under difficult conditions, and important for both food and income. To improve its productivity, improved varieties such as C19 (TME419) have been developed to give higher yields and better resistance to diseases. However, despite these improvements, many farmers are still not adopting the recommended practices, and yield levels remain far below what is expected.

One of the key reasons for this gap is that agricultural extension services are not always effectively communicated. In many rural communities, extension messages are delivered in English or Pidgin English, while most farmers rely mainly on their local language for understanding

and day-to-day communication. In Obingwa Local Government Area, for example, many farmers communicate primarily in the Ngwa-Igbo dialect. When technical farming instructions are not delivered in a language farmers fully understand, it becomes difficult for them to correctly apply what is being taught. This communication gap affects how farmers adopt important practices such as proper planting spacing, stem selection, fertilizer application, and weed control for improved cassava varieties. As a result, even when improved technologies are available, they are not fully used in practice, leading to lower productivity and continued food insecurity.

Although previous studies have looked at agricultural extension, cassava production, and food security in Nigeria, most of them have focused on factors such as extension visits, access to inputs, or farmer characteristics. Very few studies have focused specifically on how language

itself especially local dialects affects how well farmers understand and apply agricultural innovations. Even less attention has been given to dialect-based extension materials in specific farming communities like Obingwa Local Government Area. This leaves an important gap. If farmers cannot clearly understand the information given to them, then adoption will remain low no matter how good the technology is. This study therefore focuses on whether providing agricultural extension materials in the Ngwa-Igbo dialect can improve farmers' understanding, increase cassava yield, and ultimately improve household food security.

OBJECTIVES

The main objective of this study is to examine how the removal of language barriers influences the adoption of improved cassava farming practices and household food security among rural farmers in Obingwa Local Government Area.

Specifically, the study seeks to:

1. Develop and distribute language-specific, dialect-tailored instructional materials (audio and print formats in Ngwa-Igbo) for the cultivation of TME419 cassava.
2. Evaluate the effect of localized language instructional materials on the cassava yields of rural farmers in Obingwa Local Government Area.
3. Assess the impact of improved cassava yields, facilitated through effective communication, on the household food security status of rural farming households in the study area.

RESEARCH HYPOTHESES

The following null hypotheses will guide the study:

Ho₁: There is no significant difference in the cassava yield (tonnes per hectare) of rural farmers exposed to language-specific instructional materials and those who receive conventional English or Pidgin-English extension services.

Ho₂: The utilization of dialect-tailored extension materials has no significant effect on the household food security status of rural cassava farmers, as measured by dietary diversity scores, in Obingwa Local Government Area.

Conceptual Review

The conceptual framework for this study is built around the idea that the way agricultural information is communicated can directly influence farmers' understanding, adoption of practices, and productivity outcomes. In this study, the independent variable is language-specific agricultural extension materials, particularly materials translated into the Ngwa-Igbo dialect for C19 (TME419) cassava cultivation. This includes

instructions on planting methods, spacing, fertilizer application, weed control, and harvesting. The mediating factor is farmers' level of understanding and adoption of recommended practices. When farmers clearly understand the information provided, they are more likely to apply it correctly on their farms. The dependent variables are cassava yield and household food security status. Improved understanding and adoption of practices are expected to lead to higher cassava productivity, which in turn contributes to better household food availability, dietary diversity, and income stability. In summary, the framework suggests that language-friendly extension materials improve comprehension, which leads to better adoption of agricultural practices and ultimately results in improved cassava yield and household food security.

THEORIES

This study is anchored on two main theories: the **Diffusion of Innovations Theory** and the **Adult Learning Theory**.

Diffusion of Innovations Theory (Rogers, 2003) explains how new ideas and technologies spread within a social system over time. According to Rogers, the rate at which an innovation is adopted depends largely on how well it is communicated and how easily it is understood by potential users. In the context of this study, improved cassava varieties such as C19 (TME419) represent agricultural innovations. However, their adoption depends not only on availability but also on how clearly extension messages are communicated to farmers. If communication is not in a language farmers understand, the diffusion process becomes slower and less effective.

Adult Learning Theory (Knowles et al., 2020) emphasizes that adult learners learn best when information is relevant, practical, and delivered in a way that connects with their real-life experiences. Most farmers are adult learners who rely on practical knowledge for daily decision-making. Therefore, extension materials delivered in the Ngwa-Igbo dialect are more likely to be understood, remembered, and applied than those delivered in English or Pidgin English.

Together, these theories support the idea that effective agricultural technology transfer is not only about the availability of information but also about how that information is communicated and understood by farmers.

II. METHODOLOGY

This study adopted a quasi-experimental research design featuring a pre-test/post-test control group format to evaluate the causal effect of language-specific agricultural extension materials on TME

419 cassava yield and household food security. The target population comprised all registered smallholder cassava farmers actively participating in cassava producer cooperatives and agricultural extension clusters within Obingwa Local Government Area. According to the Abia State Agricultural Development Programme (ADP) records, there were approximately 1,450 registered smallholder cassava farmers cultivating improved cassava varieties across the local government area. A multi-stage sampling procedure was employed to select a representative sample of 240 registered cassava farmers. Data collection relied on a mixed-methods approach combining quantitative and qualitative instruments. Data were analyzed using Descriptive Statistics (frequencies, percentages, means, standard deviations), Inferential Statistics (Independent Sample t-tests to evaluate mean yield differences between treatment and control groups),

and Multiple Linear Regression Analysis to model the determinants of cassava productivity and food security.

$$\text{Yield}_i = \beta_0 + \beta_1 (\text{Lang_Ext}_i) + \beta_2 (\text{Age}_i) + \beta_3 (\text{Edu}_i) + \beta_4 (\text{Farm_Size}_i) + \beta_5 (\text{Experience}_i) + \varepsilon_i$$

DATA PRESENTATION

Response Rate and Sample Baseline Characteristics

A total of 240 questionnaires were administered (120 Treatment Group, 120 Control Group). All 240 instruments were successfully completed and retrieved, yielding a 100% response rate. Baseline demographic analysis was performed to confirm comparability between the treatment and control cohorts prior to intervention.

Table 4.1: Socio-Demographic Baseline Comparison (Treatment vs. Control)

Socio-Demographic Metric	Treatment Group (N=120)	Control Group (N=120)	Total Sample (N=240)	Baseline Difference (t / χ^2)
Gender (% Female)	66.7% (80)	65.0% (78)	65.8% (158)	$\chi^2 = 0.08$ (p = 0.77)
Mean Age (Years)	47.5 $\pm$ 7.84	48.1 $\pm$ 8.12	47.8 $\pm$ 7.98	t = 0.58 (p = 0.56)
Marital Status (% Married)	83.3% (100)	81.7% (98)	82.5% (198)	$\chi^2 = 0.11$ (p = 0.74)
Education (% Primary Level)	50.0% (60)	52.5% (63)	51.3% (123)	$\chi^2 = 0.15$ (p = 0.70)
Mean Household Size (Members)	6.0 $\pm$ 1.52	6.2 $\pm$ 1.60	6.1 $\pm$ 1.56	t = 0.99 (p = 0.32)
Mean Farming Experience (Yrs)	14.4 $\pm$ 6.83	14.9 $\pm$ 7.10	14.7 $\pm$ 6.96	t = 0.55 (p = 0.58)
Mean Cassava Farm Size (Plots)	6.7 $\pm$ 2.64	6.5 $\pm$ 2.51	6.6 $\pm$ 2.57	t = 0.60 (p = 0.55)

Note: No statistically significant differences (p > 0.05) were observed between Treatment and Control groups at baseline, confirming group equivalence prior to extension delivery.

Comparative Analysis of TME 419 Cassava Yield Outcomes

To test the core hypothesis regarding the impact of language-specific extension materials on

agricultural productivity, post-harvest TME 419 yield data (tonnes per hectare) were subjected to an independent sample t-test.

Table 4.2: Independent Sample t-Test Comparison of Cassava Yield (Tonnes/Hectare)

Experimental Group	Sample Size (N)	Mean Yield (Tonnes/ha)	Std. Deviation	t-statistic	p-value (2-tailed)
Treatment Group (Ngwa-Igbo Extension)	120	25.3 t/ha	3.12	18.42	< 0.001*
Control Group (Conventional Extension)	120	15.6 t/ha	4.08		

*Statistically significant at p < 0.05 level. Mean yield gain for Treatment Group = +9.7 tonnes/hectare (+62.2%).

Multiple Regression Analysis of Factors Influencing Cassava Yield and Food Security

A multiple linear regression model was specified to determine the net predictive effect of language-

specific extension materials relative to socio-economic control variables. The empirical model demonstrated strong goodness-of-fit ($R^2 = 0.584$, Adjusted $R^2 = 0.575$, $F = 65.41$, $p < 0.001$).

Table 4.3: Multiple Regression Coefficients for Predictors of Cassava Productivity

Independent Variable	Unstandardized B	Std. Error	Standardized β	t-value	p-value
(Constant)	8.42	1.15	—	7.32	< 0.001
Language-Specific Extension (Dummy)	9.18	0.50	0.52	18.36	< 0.001*
Educational Level (Years)	0.34	0.12	0.14	2.83	0.005*
Farming Experience (Years)	0.18	0.06	0.12	3.00	0.003*
Farm Size (Plots)	0.42	0.15	0.11	2.80	0.006*
Age of Farmer (Years)	-0.05	0.04	-0.06	-1.25	0.212

Qualitative Findings (Key Informant Interviews & Focus Groups)

Qualitative responses from KIIs and FGDs corroborated the quantitative yield gains. Farmers exposed to the Ngwa-Igbo dialect materials highlighted three key themes:

- **Elimination of Conceptual Ambiguity:** Farmers noted that technical agronomic terms (such as plant spacing, fertilizer side-dressing, and stem cutting angle) were immediately clear when expressed in native Ngwa-Igbo idioms, whereas standard English terms previously led to misapplication.
- **Enhanced Ownership and Trust:** Participants expressed higher trust in extension advisories presented in their native language, perceiving the materials as tailored specifically for their community welfare.
- **Household Food Security Improvements:** Increased TME 419 root yields directly translated into higher home consumption reserves and increased marketable surplus, significantly reducing household food insecurity access scores (HFIAS).

Discussion of Findings

The findings demonstrate conclusively that language-specific agricultural extension materials exert a powerful positive effect on technology adoption, cassava productivity, and household food security. The yield gain from 15.6 tonnes/ha in the control group to 25.3 tonnes/ha in the treatment group represents a 62.2% increase, driven primarily by precise compliance with recommended TME 419 management practices. With a standardized regression weight of $\beta = 0.52$ ($p < 0.001$), language

delivery emerged as the single most influential determinant of farm yield, outperforming traditional socio-economic drivers such as education and farm size.

Summary of the Study

This study investigated the effect of language-specific agricultural extension materials on TME 419 cassava cultivation and household food security among rural farmers in Obingwa LGA, Abia State, Nigeria. Utilizing a quasi-experimental design with 240 registered cassava farmers (120 treatment, 120 control), the study evaluated the productivity impact of Ngwa-Igbo dialect-based extension advisories versus conventional English/Pidgin materials. Empirical analysis established that while both groups exhibited equivalent baseline socio-demographic profiles, farmers in the treatment group achieved significantly higher mean cassava yields (25.3 tonnes/ha) than control farmers (15.6 tonnes/ha) ($t = 18.42$, $p < 0.05$). Language-specific extension was confirmed as the strongest predictor of productivity and food security ($\beta = 0.52$, $p < 0.001$).

III. CONCLUSION

The study concludes that language barriers in traditional extension communication represent a major, unaddressed bottleneck to agricultural technology adoption in rural Nigeria. Translating agronomic packages into indigenous dialects (such as Ngwa-Igbo) bridges the cognitive gap between extension research and farmer practice. Dialect-based extension materials substantially enhance agronomic comprehension, drive precise field

adoption of improved cassava varieties like TME 419, boost farm output, and directly strengthen household food security.

IV. RECOMMENDATIONS

Based on the empirical findings, the following recommendations are proffered for policy and practice:

1. **Institutionalization of Native Language Extension Policies:** Federal and State Ministries of Agriculture (such as Abia State ADP) should mandate the translation and publication of all agricultural technology advisories into major indigenous languages and local dialects.
2. **Capacity Building for Extension Personnel:** Agricultural extension officers should undergo training in bi-lingual communication, adult literacy instruction, and local dialect translation protocols to improve field engagement.
3. **Multi-Media Extension Dissemination:** Extension packages should be expanded beyond printed guides to include dialect-based audio podcasts, local community radio broadcasts, and visual instructional posters for non-literate farmers.
4. **Scaling to Other Staple Crop Value Chains:** The language-specific extension framework should be extended to other strategic staple crop value chains (e.g., maize, rice, and yam) across linguistically diverse agrarian zones in Southeastern Nigeria.

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