

Article

Predictive Role of Extension Education in Achieving Sustainable Food Security in Enugu State, Nigeria

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Abstract

This study explored the predictive role of extension education in achieving sustainable food security in Enugu State, Nigeria. Employing a descriptive research design, the study was guided by two objectives and two research questions. The population comprised 2,452 individuals, including farmers and extension agents drawn from locally registered Community-Based Associations in Enugu State. Using a random sampling technique, 765 respondents were selected, consisting of 709 farmers and 56 extension agents. Data were collected using a researcher-developed questionnaire titled Predictive Role of Extension Education in Achieving Sustainable Food Security Questionnaire (PREEASFSQ), which was validated by three experts. The instrument's reliability was confirmed with a Cronbach's alpha coefficient of 0.79. Data analysis was conducted using mean and standard deviation. Findings revealed that extension education significantly contributes to achieving sustainable food security by equipping farmers with the necessary knowledge and skills for improved food production, processing, and packaging. Based on the findings, the study recommended that the government should support extension education agents in utilizing digital technologies for disseminating information to farmers, facilitating regular and efficient communication between farmers and extension agents.

Keywords: Extension education, sustainable food security, Enugu State, agricultural productivity, farmers and extension agents, knowledge transfer

Introduction

Food is widely considered a basic human necessity since it is of high importance for human well-being and economic productivity. However, the situation in Nigeria is that food demand has generally grown faster than total supply, contributing to food insecurity which is the lack of access to enough food and nutrition for an active and healthy life (Lutomia, Obare, Ariuki, & Muricho, 2019). The report also has it that Nigeria has extremely high food insecurity levels and approximately 15% undernourished population, that is, 29.4 million undernourished people despite being one of the largest economies in Africa (Ike, Jacobs & Kelly, 2017). More so, according to the 2019 National Bureau of Statistics (NBS) report, Enugu State has a high prevalence of food insecurity, with 34.6% of households experiencing food insecurity (Ezeocha & Nwosu, 2020). This food insecurity situation has even become worse over time due to the wide gap between the national supply and demand for food in Enugu state and other parts of Nigeria.

Based on the reported high rate of food insecurity in Enugu State, it becomes imperative to study steps for achieving sustainable food security in the state. Food security refers to a condition that allows members of society to always enjoy access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Peng & Berry, 2019). Peng and Berry (2019) further stated that the four dimensions of food security include the

availability, accessibility, utilization, and stability of foodstuffs. Agada and Igbokwe, (2016) also added that food security is not merely having enough and a sufficient quantity of our various staple foodstuffs, but it also involves access to these food items at affordable prices. Hence, for this study, food security is a multifaceted concept that involves not only the availability of food but also its accessibility, utilization, nutritional adequacy, cultural acceptability, sustainability, and stability. It requires a comprehensive approach that addresses the social, economic, environmental, and cultural dimensions of food systems.

On the other hand, sustainability is the ability to be maintained at a certain level or rate over some time, without depleting natural resources or causing harm to the environment. It is often used to describe the ability of an economy or a community to meet the needs of its current and future generations without compromising the ability of future generations to meet their own needs (Fritchie, 2020). Based on this, World Food Security (WFS) defines sustainable food security as the situation ensuring that all people have access to sufficient, safe, and nutritious food, without compromising the ability of future generations to meet their own needs (WFS, 2017). This definition presents sustainable food security as food security that is maintained through the availability of sufficient quantities of food at all times to meet the dietary needs of all members of the population, with an adequate supply of clean water, necessary nutrients, and stable access to resources needed for productive employment or meaningful participation in society. Therefore, sustainable food security exists when all generations of people in society can conveniently have access to adequate and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Sustainable food security is a fundamental human right, essential for the well-being of individuals and communities in Enugu state and general society. Agada and Igbokwe (2016) stated that sustainable food security is the foundation upon which many aspects of development are built, and its absence can have far-reaching consequences for human health, economic growth, and social stability. This is more so because, sustainable food security equips members of the society with adequate energy and nourishment to engage in productive activities, learn, and grow, which is essential for personal development and economic growth. Conversely, malnutrition can have devastating consequences, including stunted physical and cognitive development, weakened immune systems, and increased vulnerability to disease (Ani, Uvere & Ene-Obong, 2014). More so, beyond individual health outcomes, sustainable food security also plays a vital role in economic development. On this note, Onunka, Ihemezie, and Olumba (2018) stated that a reliable food supply chain can provide jobs and income opportunities for numerous categories of people ranging from farmers to processors to distributors in Enugu state. In turn, these economic benefits can help to reduce poverty and inequality, creating a more stable and prosperous society.

Furthermore, sustainable food security is closely linked to environmental sustainability since the way members of society produce, process, and consume food has a significant impact on the environment. While unsustainable agriculture practices can lead to deforestation, soil degradation, water pollution, and loss of biodiversity, adopting sustainable agriculture practices such as organic farming, agroforestry, and regenerative agriculture can promote ecosystem resilience and

environmental sustainability (Kassy, Ndu, Okeke, & Aniwada, 2021). Hence, it is safe to say that sustainable food security is a critical component of overall sustainable development since it is essential for ensuring that individuals have access to nutritious food, promoting economic growth and development, supporting environmental sustainability, and reducing social tensions.

However, sustainable food security is challenged by factors such as insufficient food production and low technology for food processing and storage. According to Matemilola and Elegbede (2017), both crop and livestock production remains below potential in many parts of Nigeria including Enugu state which has led to high dependence on the importation of livestock and staple crops such as rice and beans. Ezeocha and Nwosu (2020) also stated that the production of food in Enugu state is affected adversely by the fact that the majority of the farmland in the state is rain-fed, thereby limiting the rate of production. More so, the inherent characteristics of climate that manifest themselves as changes of climate over a period of time affect food production significantly in unpredictable ways as a result of their detrimental effect on pests, crop diseases, crop production, and animal husbandry in Enugu State (Chiemela, Chiemela, Apeh & Ilek, 2020). These changing climatic conditions affect both the physical and the economic availability of certain preferred food items. The impact of climate change on income-earning opportunities can also affect the ability to buy food, the availability of certain food products, and price.

The achievement of sustainable food security is a significant issue in Enugu State, Nigeria, with many residents struggling to access sufficient and nutritious food. A report from the National Bureau of Statistics (NBS) report, states that Enugu State ranks 14th among the 36 states in Nigeria in terms of food insecurity (Ezeocha & Nwosu, 2020). Kassy, Anne, Okeke, and Aniwada, (2021) stated that the rising rate of food insecurity in Enugu State could be a result of the fact that the state's agricultural production is characterized by low yields, poor soil quality, and inadequate irrigation systems, leading to insufficient food supply. Insufficient storage and food processing facilities for agricultural produce also lead to post-harvest losses and reduce the availability of food and adequate nutrition in Enugu State. Enugu State Government has implemented several initiatives to reduce food insecurity in the state.

Enugu State Agricultural Development Program (ENADEP) was established to plan and implement new agricultural projects aimed at increasing agricultural production and raising the standard of living of rural farmers through the application of modern-proven technologies and innovations. Enugu state government also partnered with Manamuz Electric Ltd to establish a Refrigerated Aggregation Center (RAC) in Ezeagu, Enugu state to minimize post-harvest waste in the area. However, despite initiatives put in place to improve food security in Enugu State, the observed high level of food insecurity in Enugu State as a result of insufficient food production and low technology for food processing and storage poses a significant threat to sustainable food security in the state. Many households in Enugu State struggle to access nutritious and sufficient food, with over 30% of children under five years suffering from stunting due to malnutrition. More so, smallholder farmers in Enugu State face numerous challenges, including a lack of modern farming techniques, inadequate irrigation systems, and limited access to

quality seeds and fertilizers, resulting in low crop yields and reduced food availability. Furthermore, there is a need to provide more empirical evidence on the extent to which extension education could improve food security in Enugu State through improved food production, processing, and storage. It is against this backdrop that the study seeks to assess the predictive role of extension education in achieving sustainable food security in Enugu state, Nigeria.

Purpose of the Study

The general purpose of this study is to assess the predictive role of extension education in achieving sustainable food security in Enugu state, Nigeria. Specifically, the study sought to:

1. Determine the extent to which extension education can improve food production in Enugu State towards achieving sustainable food security.
2. Determine the extent to which extension education can improve food processing and packaging in Enugu State towards achieving sustainable food security.

Research Questions

The following questions were designed to guide the study:

1. To what extent can extension education improve food production in Enugu State towards achieving sustainable food security?
2. To what extent can extension education improve food processing and packaging in Enugu State toward achieving sustainable food security?

Methodology

This study adopted a descriptive survey research design. A descriptive survey study describes a given state of affairs that exists at a particular time by critically observing events, objects, subjects, and ideas without any attempt to influence the condition of such phenomena. This involves direct contact with individuals whose characteristics, behaviours, and attitudes are relevant to the investigation (Jongbo, 2014). Hence, descriptive survey research design suits this study as it aimed to collect data from the respondents and systematically describe these data to assess the predictive role of extension education in achieving sustainable food security in Enugu state, Nigeria.

This study was carried out in Enugu State, Nigeria. Enugu State is one of the states in South-East Nigeria. Enugu State bounds with Abia State and Imo State to the South, Ebonyi State to the East, Benue State to the Northwest, and Anambra State to the West. The people are predominantly Igbo with a strong attachment to business and agriculture as a key source of income. The state has various market spots such as Ogbete main market, Ogige Market, Gariki Market, and Abakpa Market among other notable market areas where foodstuffs could be accessed. The state also boasts notable farmland areas in communities such as Adani, Ehamufu, and Iwollo among other communities.

The population of the study is 2,452, comprised of farmers and extension agents taken from locally registered farmers of Community-based Associations in Enugu State. A random sampling technique was used to select 765 respondents for the study, made up of 709 farmers and 56 extension agents. The researchers structured a questionnaire titled “Predictive Role of Extension Education in Achieving Sustainable Food Security Questionnaire (PREEASFSQ)” which was face-validated by three experts and used for data collection. Cronbach alpha technique was used to determine the internal consistency of the questionnaire items and a reliability coefficient of 0.79 was obtained. 765 copies of the questionnaire were distributed and collected by the researchers. However, from the 765 questionnaires administered, 751 were rightly completed accounting for a 98.2 % return rate, and were therefore used for data analysis. Mean and standard deviation were used to answer the research questions. The criterion mean of the scale of the items is 2.50. Any item with a weighted mean value of 2.50 and above was considered accepted while any weighted mean of less than 2.50 was considered not accepted.

Results

Research Question One: To what extent can extension education improve food production in Enugu State towards achieving sustainable food security?

Table 1: Mean and standard deviation of the ratings of respondents on the extent to which extension education can improve food production in Enugu State towards achieving sustainable food security.

S/N	Item Statement	Mean	STD. Deviation	Decision
1	Extension education can sensitize farmers on how to access grants and loans, to increase their productivity.	2.71	.64	HE
2	Extension education can improve productivity by educating farmers on crop enhancers such as fertilizers.	2.65	.71	HE
3	Through extension education, farmers can acquire some skills in utilizing basic mechanized tools for farming.	2.63	.54	HE
4	Extension education can facilitate the adoption of new technologies and innovations in agriculture, such as precision farming, biotechnology, and vertical farming.	2.79	.66	HE
5	Extension education can bring together farmers, researchers, policymakers, and other stakeholders to share knowledge, resources, and best practices.	2.54	.72	HE
6	Extension education can help farmers develop resilience to climate-related shocks and stressors by promoting climate-smart agriculture practices.	2.82	.76	HE
7	Extension education can help farmers develop better crop management practices, such as soil conservation, irrigation management, and pest and disease management, which can improve crop yields and reduce waste	2.70	.60	HE
	Cluster Mean	2.69	.66	HE

Table 1 shows the mean rating of respondents on the extent to which extension education can improve food production in Enugu State towards achieving sustainable food security. The table revealed that the mean rating of respondents on items 1 to 7 is between 2.54 to 2.82 with a cluster mean of 2.70. This implies that to a high extent, extension education can improve food production in Enugu State towards achieving sustainable food security. This explains why Owolabi, Kolawole, Ajala, Akangbe, Obaniji, Adebimpe, and Adeniyi (2019) stated that extension education providers are major agents that should relate with all other disciplines as they are the link between the farmers and other organizations that may want to deploy new technologies or new ways of doing things. Extension personnel can promote mechanized farming at the grassroots level in a way that will ensure continuous and optimum utilization.

Research Question Two: To what extent can extension education improve food processing and packaging in Enugu State towards achieving sustainable food security?

Table 2: Mean and standard deviation of the ratings of respondents on the extent to which extension education can improve food processing and packaging in Enugu State towards achieving sustainable food security.

S/N	Item Statement	Mean	STD. Deviation	Decision
1	Extension education can provide training for farmers on food safety and quality control while processing food.	3.24	.53	VHE
2	Extension education can provide training for farmers on the operation of food processing equipment.	2.61	.81	HE
3	Extension education can advise farmers on the selection of appropriate packaging materials that are durable, resistant to moisture and light, and suitable for specific products.	3.12	.65	VHE
4	Extension agents can educate farmers on proper labeling and branding practices, ensuring that consumers have access to accurate information about the product's contents, origin, and nutritional value.	2.65	.59	HE
5	Extension education can provide training on proper packaging techniques to farmers and food processors, ensuring that food products are packaged in a way that preserves their quality and extends their shelf life.	2.87	.62	HE
Cluster Mean		2.89	.65	HE

Table 2 shows the mean rating of respondents on the extent to which extension education can improve food processing and packaging in Enugu State towards achieving sustainable food security. The table revealed that the mean rating of respondents on items 1 to 5 is between 2.61 to 3.24. The implication of this is that to a high extent, extension education can improve food processing and packaging in Enugu State towards achieving sustainable food security. Extension education can play a significant role in improving food packaging by providing farmers, food processors, and consumers with knowledge and skills to enhance the quality and

safety of food products (Chiemela *et al.*, 2020). Through strategies such as on-farm demonstrations; workshops and training sessions; one-on-one consultations; collaborations with industry partners; research projects; policy briefs and advocacy, extension education can play a vital role in improving food packaging practices, ultimately enhancing the safety, quality, and sustainability of the food system.

Conclusion

Extension education has a profound predictive role in achieving sustainable food security in Enugu State, Nigeria. By empowering farmers with knowledge and skills, facilitating access to resources, and promoting environmentally sustainable practices, it can drive significant progress in food production, availability, and stability. To unlock its full potential, there is a need for strategic investment in extension services, policy support, and effective program implementation.

Sustainable food security is achieved when all generations in a society have consistent access to sufficient, nutritious food that satisfies their dietary requirements and preferences, enabling them to lead active and healthy lives. Extension education has the potential to significantly enhance food production in Enugu State by promoting the adoption of modern agricultural technologies and innovations, such as precision farming, biotechnology, and vertical farming. Additionally, extension education can play a critical role in improving food processing and packaging by guiding farmers in selecting appropriate packaging materials that are durable, moisture- and light-resistant, and suitable for preserving specific products.

Sustainable food security is a multi-dimensional concept, encompassing not only the availability of adequate food but also access, utilization, and stability. Extension education serves as a vital tool for addressing these dimensions, particularly in regions like Enugu State, Nigeria, where agriculture is predominantly practiced by smallholder farmers who often face challenges such as limited resources, lack of technical knowledge, and insufficient access to markets.

One of the greatest barriers to improving food security in Enugu State is the reliance on traditional farming methods, which limit productivity. Extension education bridges the knowledge gap by training farmers on the use of innovations like precision farming, which allows efficient resource utilization; and introducing biotechnology, including improved crop varieties that are pest-resistant, drought-tolerant, and more nutritious; promoting vertical farming and hydroponics, which are especially useful for land-constrained urban farmers.

By empowering farmers to adopt these innovations, extension education ensures higher yields, efficient use of resources, and reduced environmental impact, directly contributing to sustainable food security. Post-harvest losses remain a major threat to food security, particularly in rural areas like Enugu State. These losses occur due to poor handling, inadequate storage, and lack of proper processing techniques. Extension education helps mitigate this by training farmers and agribusinesses in food preservation techniques, such as canning, drying, and freezing, to prolong the shelf life of produce; and advising on appropriate packaging materials, which maintain the quality and safety of food products while meeting market standards. For instance, moisture- and light-resistant packaging prevents spoilage in

perishable goods. Extension education also helps in encouraging value addition, where farmers transform raw products into market-ready items. This not only reduces waste but also enhances farmers' income, ensuring economic sustainability, which is a crucial aspect of food security.

Enugu State, like many regions in Nigeria, is vulnerable to the effects of climate change, including unpredictable rainfall, increased temperatures, and extreme weather events. Extension education helps farmers build resilience by teaching climate-smart agricultural practices, such as agroforestry, conservation tillage, and integrated pest management. Water management techniques like rainwater harvesting and efficient irrigation methods are employed to combat water shortages.

Extension education does not function in isolation—it requires support from institutional and governmental infrastructure. In Enugu State, a robust extension education framework ensures regular training of extension agents, equipping them with up-to-date knowledge to support farmers effectively. Partnerships between government agencies, NGOs, and research centres deliver extension services and introduce innovative programmes. Policies supporting subsidized farm inputs, credit access, and digital tools like smartphones aid efficient dissemination of agricultural knowledge. A comprehensive institutional framework ensures that the efforts of extension education are sustained and scaled across the state.

Recommendation

Based on the findings of the study, the following recommendations were made:

- The Ministry of Agriculture should partner with relevant Non-Governmental organizations to conduct training programmes for farmers on best practices in crop production, including soil conservation, irrigation management, and pest and disease management.
- The government should establish demonstration centers where farmers, processors, and entrepreneurs can learn hands-on about various packaging technologies and techniques.

The government should support extension education agents to utilize digital means of information dissemination to farmers as this will support a more regular interaction between the farmers and the agents.

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