# Application of Agricultural Extension Principles to Sustainable Agricultural Practices in Rural Communities of Enugu State, Nigeria

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KEYWORDS

*Agricultual practices,*
*Enugu State,*
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ABSTRACT

*This paper explored agricultural extension principles that can be applied to sustainable agricultural practices in rural communities of Enugu State, Nigeria. The paper was based on a desk review of available relevant literature. Information was accessed through a web search, Google scholar, open-accessed journals, magazines, periodicals, newspapers, books, and reports. The paper identified sustainable agricultural practices such as ridging/mound making, planting of trees/grasses, terracing, and local water harvesting and examined agricultural extension principles that can be applied to them namely: the principle of starting at the level of farmers, the principle of education of farmers, the principle of cooperative work and principle of constant evaluation. Also, the following challenges were described: inadequate number of extension personnel, poor farmer-extension-research interaction, and low level of education between extension agents and farmers. The paper concluded that agricultural extension principles can be applied to sustainable agricultural practices and recommended recruitment of more educated extension personnel to close the huge gap between extension farmer ratio in the state and constant training of extension workers.*

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## INTRODUCTION

Humans and the environment are interconnected as man exploits the environment to meet man's need for food, clothing, and shelter. Agriculture is an age-long activity undertaken by the early man who went about scavenging for wild crops and animals with little or no threat to the natural ecosystem (Maude, 2020). Today, agriculture has grown in all ramifications through innovative research and other developmental efforts by relevant stakeholders to meet the food needs of the growing population. The world's population has been increasing from 32 million people in 1950 to about 600m people today and is expected to grow to about 8.5 billion by 2030 (The Guardian, 2022). Efforts are geared towards producing enough food on the same mass of land for the teeming population using diverse scientific methods and agricultural technologies such as pesticides, inorganic fertilizer application, and herbicides which pose a threat to the environment and natural ecosystem and hence, the need for sustainable practices to ensure that the needs of today's generation are met without compromising the ability of future generations to meet their own needs (Anani *et al.*,2020; Feenstra *et al*., 2021).

Sustainable practices can facilitate the protection of the natural ecosystem, increase yield, improve food security, and reduce rural poverty. Nigeria is far from reaching its Sustainable Development Goals (SDGs) come 2030, but sustainable agricultural practices can contribute to achieving goals of no poverty, zero hunger, responsible consumption and production, climate action, and sustainable cities and communities (Tajudeen and Taiwo, 2018; Otekunrin *et al.*,2019). Sustainable agricultural practices are those practices that allow for more efficient use of natural resources, mitigate the impacts of unsustainable agriculture practices on the natural ecosystem, and strengthen capacity for adaptation to climate change and variability in Enugu State, Nigeria (Pineiro *et al*., 2020). The people of Enugu State are predominantly farmers. The state is divided into three agricultural zones: Enugu North, West, and East. The major crops grown in the state include cassava, maize, plantain, cocoyam, rice, yam, groundnut, and vegetables like fluted pumpkin, Amaranthus, garden eggs, and okra. Enugu State has had its hit of climate change as increasing temperatures, rising temperatures, and

changes in rainfall patterns. This climate change has affected smallholder farmers' productivity since they depend on agriculture for their income, food, and livelihood and are the producers and suppliers of food consumed in urban areas and other neighboring states (Obetta *et al.*, 2020). According to the findings of Ozor (2010), who investigated the difficulties in adaptation to climate change by farmers in Enugu state, he posited that the most difficult challenge faced by farmers in adaptation to climate change impacts in the state is unsustainable agricultural practices. Also, a recent study carried out by Nwobodo *et al*. (2022), who investigated determinants of ruminant farmers' use of sustainable production practices for climate change adaptation and mitigation in Enugu State, revealed that there is a significant positive correlation between the knowledge level of farmers and their use of sustainable practices. This implies that an improved knowledge level of sustainable agricultural practices through extension education can enhance their resilience to the increasing impacts of climate change.

Therefore, the role of extension agents in raising farmers' awareness and knowledge level towards sustainable agricultural practices cannot be over-emphasized. Since the extension is the vehicle through which agricultural technologies are disseminated to rural farmers, it, therefore, becomes pertinent that the extension agents are thoroughly furnished with adequate knowledge and possess skills needed to carry out extension work and to achieve this goal, the extension agents have to understand the principles of extension work and its application in other to successfully help farmers change their skill, attitude, and knowledge as regards to sustainable agricultural practices (Olorunfemi *et al*., 2020). Over the years, agricultural extension as an academic discipline has developed a set of principles for carrying out its operations. These principles are the bedrock of success in agricultural extension work, but there is still a gap in its application in sustainable agricultural practices in Nigeria. Probably, this may be a result of poorly-trained extension personnel. Therefore, the paper examined the application of agriculture extension principles to sustainable agriculture in rural communities of Enugu State, Nigeria. Specifically, the paper sought to: examine sustainable agricultural practices in rural communities; identify the agricultural extension principles that can be applied to sustainable agriculture practices and challenges in the application of agriculture extension principles to sustainable agriculture practices in Enugu State.

## METHODOLOGY

The paper was based on a desk review of available relevant literature. Data were mainly through a web search, google scholar, open-accessed journals, magazines, periodicals, newspapers, books.

## RESULTS AND DISCUSSION

### Sustainable agricultural practices in rural communities

According to David (2017), through decades of science and practice, the following farming practices have proven effective in achieving sustainability when used in combination: crop rotation, mixed cropping, planting cover crops and perennials, reducing or eliminating tillage, applying integrated pest management (IPM), integrating livestock and crops, adopting sustainable agroforestry practices and managing whole systems and landscapes**.** These practices focus on the soil by keeping farm soils protected and teeming with living organisms can solve many of the problems associated with industrial agriculture. Healthy, living soil promotes healthy crops, holds water like a sponge, prevents pollution, and helps ensure that farmers and their communities can thrive. Furthermore, in the traditional setting, some of the sustainable agricultural practices in rural communities of Enugu State include:

i. **Ridging/mound making:** ridges and mounds are made across the flow of runoff water removing sand/nutrients from the soil.
ii. **Planting trees/grasses**: trees and grasses are planted annually on erosion-prone soil to reduce the impact of rainfall on the soil. Certain trees and grasses are required for this operation
iii. **Local water harvesting**: the building of modern houses with long roofing sheets has exacerbated the deterioration of agricultural land for farming. Harvesting rainwater using pots, jerry cans, and tanks of various shapes and sizes has contributed a lot to conserving water for agricultural purposes. In some instances, a water reservoir is constructed of concrete cement to collect rainwater.
iv. **Community water reservoir**: in some farming communities, large pits are dung at strategic locations to collect runoff water from different parts of the community. The water collected may be purified and used for various operations during water scarcity.
v. **Terracing**: this is the practice of cutting part of the hills or mountains and planting crops/flowers to control erosion. It does the dual purpose of beautifying the environment and producing food and fiber for the sustenance of livelihood and industry.

**Social capital**: this is the use of traditional rules and regulations to control crop and animal production. This includes levies /fines imposed on harvesting certain crops on unauthorized periods, roaming domestic animals and setting fire to bushes/forests, and seizure of straying animals.

**Agricultural extension principles that can be applied to sustainable agriculture practices**

Recently, global environmental issues have received attention due to the increase in global problems relating to climate change due to human and agricultural activities. The effects of these human activities due to high urbanization and population explosion have led to an increase in greenhouse gases such as carbon dioxide, nitrous oxide, and methane resulting in rising sea levels, high temperatures, and increasing rainfall. The need to produce food, clothing, and shelter to cater to the needs of the increasing human population characterized by the exploitation of natural resources has led to severe environmental degradation (Adu *et al.,* 2020). The IPCCS (2019) report indicates that 70% of the world's landscape has been affected by human activities and agricultural intensification, and these activities caused land degradation. Data from World Bank indicates crop production increased by 240% between 1961 and 2017. Agricultural forestry, and other related land use activities together emit about 13% carbon dioxide, 44% of methane, and 82% of nitrous oxide during the 2002-2016 period representing a total of 23% of all greenhouse emissions caused by anthropogenic factors (Shukla *et al.*, 2019),

To cub the negative impacts of climate change which threatens our environment there is a need for climate action through land use related adaptation and mitigation options by farmers. This implies that there is a need for extension to educate farmers on agricultural sustainability practices to reduce or eliminate farming activities that increase the concentration of carbon dioxide and methane in our environment by creating awareness using agricultural extension systems (Adu *et al.,* 2022). Hence, it becomes very expedient for extension personnel to understand the underlining principles of extension work to effectively disseminate agricultural sustainability technology to farmers. Agricultural extension principles are guidelines for the conduct of extension work, and these principles are the bedrock upon which extension service rests. These principles may not be suitable for all communities because of differences in culture, nature, and other socio-economic variables. The implication is that extension principles should be applied based on prior knowledge of farmers' socio-cultural and environmental conditions. One way to ensure the application of agricultural extension principles to sustainable agriculture practices is to involve the agricultural extension agencies. Agricultural extension as a discipline has all it takes to mainstream rural farmers into sustainable agriculture practices. Understanding these principles by extension personnel is germane and effective in convincing farmers to use sustainable agricultural practices (RUFORUM, 2023). The following agricultural extension principles can be applied to sustainable practices.

Extension workers base their program of sustainable agriculture practices on the present level of farmers and their environment. They consider the level of knowledge, interest, and degree of readiness by trying to understand the social structure, habits, traditional attitude, and economic status of the people and society to put into practical use to convince farmers to embark on sustainable agricultural practices with the aim of achieving a desired change. Also, extension workers ensure the application of sustainable agricultural practices by developing the interest of farmers and their need to use sustainable agriculture practices to protect the environment and our future generations. The extension agent raises sustainable practices awareness through planning, educating and training of farmers on such practices through sustainable education programmes. Therefore, farmers' interests and needs are easily directed to the use of sustainable agricultural practices in producing food and preserving the environment (Anthony *et al*., 2019).

Through educational means, extension workers assist farmers to take the right decisions in the use of sustainable agricultural practices. According to Enwelu *et al.* (2016), extension workers are well-qualified to educate farmers on sustainable agricultural practices. They possess the expertise and are viewed as a credible information source by farmers. As educators, they possess good communication and teaching skills which enables them to excel in their work.

One way extension workers can convince farmers to apply sustainable agricultural practices is by engaging them in cooperative work. Both extension workers, farmers and their families, and other major stakeholders must be involved in the planning of sustainable agricultural programmes. Furthermore, when they are involved in all stages of the project, they personalize the project leading to sustainable outcomes. Similarly, when a sustainable agricultural project is undertaken as a cooperative venture, farmers and their family members are likely to apply sustainable agricultural practices in their daily farming operations (Chromal, 2016).

Application of agricultural extension principles to sustainable agricultural practices can be enhanced by constant periodic evaluation of sustainable ongoing and implemented programmes. When extension workers evaluate sustainable agricultural practices constantly in light of existing and changing environmental conditions, farmers can easily appreciate whether the objectives of the agricultural project are being achieved or not. Also, as an intermediary between researchers and farmers, the facts extension workers acquire from researchers are exchanged with farmers while farmers' challenges are conveyed to researchers by extension workers. Therefore, extension workers convey facts about sustainable agricultural practices to farmers thereby improving their application of sustainable agricultural practices (Okoedo-Okojie and Edeoghon, 2017).

**Challenges in the application of agricultural extension principles to sustainable agricultural practices in Enugu State**

Agricultural extension over the years has proven to be inevitable in the delivery of adequate scientific research information to farmers and feeding researchers with challenges undermining farmers' quest for an improved standard of living. Agricultural extension as a discipline performs multitasks in any area of development. According to Ijeoma and Adesope (2015), the roles of extension today go beyond technology transfer and training of farmers but include assisting farmers to form groups, addressing public interest issues in

rural areas such as resource conservation, agricultural production, food safety, nutrition, youth development, and partnering with a broad range of service providers and other agencies. In the process of carrying out these enormous responsibilities, the following challenges are hampering agricultural extension service delivery in Nigeria.

**Inadequate number of extension personnel**

The number of extension workers is not enough to perform their front-line activities in the agricultural sector in Nigeria. Apantaku, *et al*. (2016), reported that inadequate extension personnel negatively affect effective agricultural extension service delivery. If the number of extension workers is not enough to carry out its traditional roles, it becomes an uphill task to engage in a sustainable agricultural project.

**Poor farmer-extension-research interaction**

The level of interaction of extension workers with researchers determines the quality of innovative products available to farmers. The interaction of researchers with extension workers enables them to have a good understanding of the sustainable agricultural practices to be passed to farmers. The World Bank era with Agricultural Development Programme (ADP) ensures regular technical fortnightly training meetings of researchers with extension workers to update them with the latest agricultural technologies for onward transfer to farmers. Presently, such interactions no longer exist or are performed on a skeletal basis. This is in line with the findings of Aderinto *et al*. (2017), who found out that irregular extension visits is the most severe constraints to extension service delivery.

**Low level of education between extension agents and farmers**

The low level of education of farmers and extension agents hampers the dissemination and assimilation of extension principles. Until now, few extension agents in rural communities have gotten degree certificates in agricultural extension while most farmers are still grappling with low educational challenges. This scenario can delay the application of sustainable agricultural practices by extension workers and farmers in the sense that extension workers may not be fully grounded in the principles they are passing on to farmers (Ajani and Onwubuya, 2013).

**CONCLUSION AND RECOMMENDATIONS**

Sustainable agricultural practices identified in rural communities of Enugu State were: ridging/mound making, planting of trees/grasses, terracing, and local water harvesting. Agricultural extension principles that can be applied to sustainable agricultural practices include the principle of starting at the level of farmers, the principle of cooperative work, and others. However, the major challenges affecting the application of agricultural principles to sustainable agricultural practices were the inadequate number of extension personnel, among others. The paper concluded that agricultural extension principles can be applied to sustainable agricultural practices and recommended the following: inclusion of sustainable agricultural practices in agricultural extension mandate, periodic evaluation of sustainable agricultural programmes and constant training of extension workers.

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