
**COMMUNICATION IN AGRICULTURAL EDUCATION RESEARCH AND
INNOVATION PROCESS A PARANCEA FOR SUSTAINABLE VEGETABLE CROPS
PRODUCTION AMONG RURAL WOMEN IN RIVERS STATE.**

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Abstract

The study investigated the role of communication in agricultural education and the innovation process as a catalyst for sustainable vegetable crop production among rural women in Rivers state, the purpose was to evaluate the extent of rural women's access to utilization of agricultural information and determine the influence of communication plat forms on the adoption of sustainable vegetable farming techniques. Three research questions and three hypotheses guided the study. The study adopted a descriptive survey design, the population of the study was 160 (120 women 40 men) the target population comprises of 150 respectively, the sample size of 150 was used to select the participants. Instrument used to gather data was a self- structured questionnaire designed titled Communication and Agricultural Innovation Questionnaire (CAIQ) in a 4-point rating scale of low extent (1) high extent (4) face and content validity, three experts from Agricultural Education, Measurement and digital evaluators review the instrument. The instruments reliability was established through a test-retest method, yielding a co-efficient of 0.82 Data were analyzed using mean standard deviation and z-test at 0.05 significance level. Findings revealed that while communication strategies such as radio programs, group training and extension services are considered effective, mobile phone use remain as limited. Rural women showed high levels of access and application of agricultural information, though challenges such as literacy and follow-up by extension agents persist, the study concludes that effective, inclusive and locally adopted communication is critically for enhancing sustainable vegetable crop

production. Based on the findings, the study recommends digital access, gender responsive outreach improve rural communication networks and evaluation mechanism.

Keywords: Communication, Agricultural Education, Innovation, Vegetable Crop Production, Sustainable.

Introduction

Effective communication is the cornerstone of agricultural transformation, especially in Regions where rural women dominate subsistence farming and vegetable crop production. In the context of sustainable agriculture, the role of communication in bridging the gap between agricultural research, education and rural women farmers cannot be overstated. In Rivers state many women are actively involved in vegetable farming, yet they face constraints in accessing relevant agricultural information due to weak communication linkages. Recent studies emphasize that the dissemination of agricultural innovations must be contextual, participatory and gender-sensitive to be effective (Okon and Akpan, 2021). Communication in agricultural education involves more than information sharing. It includes feedback problem – solving and empowering the end-users with skills and understanding to make informed decisions (Irohbe & Agwu, 2020). Furthermore, the food and Agricultural Organization (FAO, 2021) highlights the importance of inclusive communication strategies in achieving sustainable development goals especially as they relate to gender equality and food security, the lack of such strategies in rural farming communities contributes to low adoption of improved practices in vegetable production. Therefore, communicate in agricultural education research and innovation is a critical panacea for ensuring the sustainability of vegetable farming among rural women in Rivers State. Agricultural communication serves as a vital tool for enhancing innovation, knowledge dissemination and skill acquisition, especially among rural farmers. In the context of vegetable crop production, effective communication within agricultural education and research systems plays a crucial role in driving sustainable practices, rural women, who form the back bone of subsistence and small-scale agriculture in Nigeria, are often excluded from timely access to agricultural innovations due to gendered communication gaps (Agwu, Anyanwu and Okwoche, 2008).

According to Van den Ban and Hawkins (1996), communication in agricultural extension is not merely about passing information, it involves an interactive process of sharing knowledge, improving understanding and influencing behavior. The lack of effective communication channels, especially in rural areas, undermines the adoption of improved vegetable production techniques that could address food in security and malnutrition (Mbono and Edet, 2011). Agricultural education provides the structured platform through which rural women can access relevant information on innovation such as pest control, organic fertilizer use, irrigation practices and post-harvest storage, integrating research findings into communication tools such as radiograms, women-focused extension training and group based demonstrations enhances. The uptake of

sustainable vegetable crop production techniques (Arokoyo, 2012, FAO, 2020). The Role of communication in Agricultural innovation, communication is a strategic element in the promotion of agricultural research to puts as Rogers (2003) noted in his diffusion of innovation theory, innovation adoption is highly influenced by the manner in which information is shared among stake holders, for rural women, informal network local dialects and culturally appropriate methods improve receptivity and retention (Obi, 2017) Gender and Agricultural Extension Communication, several studies have emphasized the gender disparity in access to agricultural extension services, Rural Women are often marginalized due to cultural norms, illiteracy and male dominated extension services (Odurukwe, Matthews, Njoku and Ejiogu-Okereke, 2006). Yet women contribute significantly to vegetable crop production Enefiene and Nwachukwu (2015) recommended gender-sensitive communication approaches such as the use of female extension agents, local story telling and participatory learning models. Vegetable crop, production and sustainable Agriculture. Vegetable production plays a key role in house hold nutrition and income generation. Sustainable practices. Such as organic manure. Use, integrated pest management (Ipm) and rain water harvesting-require knowledge and regular training (Ibeawuchi 2010). Research based innovations need to be simplified and communicated through practical demonstration, visual aids, and local community groups (Nnadi and Akwiwu, 2005). Agricultural education as a communication platform, agricultural education, particularly through adult education models and on-farm trails, provides rural women with an opportunity to engage with new ideas and technologies. According to Ekong (2003) when education is delivered using a participatory and gender inclusive framework, it boosts self-efficacy and adoption of Dew practices. Communication is central to this process, acting as the bridge between knowledge, creation and knowledge utilization, Communication as tool for innovation transfer. According to Okeke and Eze (2022) communication serves as the conduct through which research outcomes reach end-users, especially in agriculture. They assert that the success of innovation transfer depends on how well messages are tailored to the socio-cultural context of the target audience. In the case of rural women, communication strategies should be simplified and delivered through appropriate channels such as local radio, group meetings and community demonstration plots. General responsive Agricultural Extension Communication, Contemporary research underscores the persistent gender gaps in agricultural extension delivery in their study, Olawuyi and Hassan (2021) emphasized that rural women are often excluded from innovation uptake due to limited access to extension agents and information networks. The authors advocate for the deployment female extension officers and the integration of indigenous knowledge systems to enhance communication effectiveness among women farmer's Agricultural education plays a vital role in interpreting and communicating research findings to farmers. Njoku and Ugochukwu (2020) argued that educational interventions aimed at rural farmers must be participatory and hands-on-they recommend experiential learning models and farmer field schools as platforms for embedding communication into education processes ensuring better understanding and application of improved ventetable production techniques, sustainable vegetable farming requires continuous

learning and access to updated information on climate smart agriculture, soil fertility organic farming and market access Eneji and Nwafor (2021) stress the need for inclusive knowledge systems that bridge research policy and local practices through effective communication. Recent technological advancements offer new channels for reaching rural women farmers with agricultural information. Mobile phones community radio, smashers and social media plat forms have been identified as effective communication tools. Adewale and Nwachukwu (2023) found that ICTs can bridge gaps in extension services especially in hard-to-reach communities, if properly aligned with the communication needs of women. However, access to these tools is still a challenge. Most rural women in Rivers State, Lack access to mart phones, stable electricity, or internet connectivity. Thus, while ICTs hold promise, the communication strategies must blend traditional and digital media to ensure. Inclusivity, communication in agricultural education and research is pivotal to sustainable vegetable crop production. Yet a gap exists in how these communication systems are structure and executed, particularly in gender sensitivity and community engagement, the works collectively stress the need for Participatory communication methods, Gender sensitive messaging and delivery, Simplified and localized content, Blended use of traditional (eg community groups, radio) and modern ICT tools. Integration of agricultural research findings into education and extension models despite the central role played by rural women in vegetable crop production in Rivers State, they remain largely under served by current agricultural communication and education frame works. Thee communication of research findings and innovations to this group is often top-down, sporadic and lacking in gender sensitivity, consequently, rural women continue to rely on traditional and less productive methods which compromises both yield and sustainability, Recent studies (Adewale and Nwachukwu, 2023, FAO, 2021) point to a mismatch between agricultural research, outcomes and their practical application at the farm level due to communication breakdowns. The exclusion of women from agricultural training sessions, limited access to digital communication plat form and language barriers all contribute to the low adoption of improved vegetable production practices. This communication gap highlight could this be the urgent need to strengthen the agricultural education research. Innovation nexus by promoting effective, inclusive and context-relevant communication strategies without this the goal of achieving sustainable vegetable production and food security in Rivers State will remain elusive thus, this paper explores how effective communication within the agricultural education research and innovation system can serve as a panacea for sustainable vegetable crop production among rural women in Rivers State.

The purpose of the study is to investigate the role and effectiveness of communication in agricultural education and the innovation process as a strategy for promoting sustainable vegetable crop production among rural women in Rivers State. Specifically, the study seeks to achieve the following:

1. Determine the effectiveness of communication strategies used in agricultural education for disseminating research innovations on vegetable crop production among rural women in Rivers State.
2. Determine the extent to which rural women in Rivers State access and utilize agricultural information related to sustainable vegetable farming practices in Rivers State.
3. Determine the extent to which the role of gender responsive communication in enhancing rural women's participation in agricultural education and innovation programs in Rivers State.

For the purpose of the study, the following research questions were considered to aid the study

1. What is the effect of communication strategies used in agricultural education for disseminating research innovations on vegetable crop production among rural women in Rivers State?
2. To what extent do rural women access and utilize agricultural information related to sustainable vegetable farming practices in Rivers State?
3. what is the role of gender responsive communication in enhancing rural women's participation in agricultural education and innovation programs in Rivers State?

The following null hypothesis was postulated and tested at 0.05 level of significance to guide the study.

1. There is no significant effect on communication strategies used in disseminating research innovations on vegetable crops production among rural women in Rivers State.
2. There is no significant access and utilize agricultural information related to sustainable vegetable farming practice among rural women in Rivers State.
3. There is no significant role in gender responsive communication in enhancing rural women's participation in agricultural education and innovation programs in Rivers State?

The study focuses on communication in agricultural education research and innovation processes as a means of promoting sustainable vegetable crop production among rural women in Rivers state, Geographically the study is limited to rural areas of rivers state while conceptually it is confined to agricultural education communication, research utilization, innovation, diffusion and sustainability outcomes in vegetable production.

Significance of the study, the findings of the study are expected to be beneficial to agricultural educators, rural women, farmers, policy makers, extension agencies and research institutions by

highlighting how effective communication bridges the gap between research innovations and practical farm application.

Policy significance, the study will provide empirical evidence to guide agricultural and gender responsive policies in rivers state, it will assist policy makers in designing policies that strengthen extension communication systems.

Socio-economic significance: by improving access to agricultural information and innovations, the study will enhance vegetable productivity, income generation and livelihood security among rural women, institutional significance, the study will be valuable to agricultural education institutions, research centers and extension services by emphasizing the importance of effective communication in technology transfer.

Methodology

The study was carried out in Rivers State Nigeria, a region located in the south-south geopolitical zone. Rivers State is known for its rich agricultural potential and home to numerous rural communities engaged in small-scale farming, the most agrarian region uses for stratification include: Khana, Gokana, Tai, Eleme and Oyigbo. These areas were selected due to their high concentration of women involved in farming activities and their exposure to agricultural extension programs. The study was a descriptive survey research design. The population comprised 160, (120 rural women and 40 men) involved in vegetable crop production across selected rural communities in Rivers State, the target population consists of 150 respectively. a total sample of 150 was used to select the participants, the instrument used to gather Data was a self- structured questionnaire titled Communication and Agricultural Innovation Questionnaire (CAIQ) designed in a 4 – point rating scale of (1) low extent (4) high extent which elicited information on each research question, face and content validity, three experts from Agricultural Education, Measurement and digital evaluators review the instrument for clarity, coverage and relevance, the reliability of the instrument was tested using the test-retest method to determine the reliability coefficient R achieved was 0.82 indicating high level of consistency, Data collected was analyzed using descriptive statistics, mean and standard Deviation with a criterion mean value of 2.50 and above while a z-test was used to test the three null hypotheses at 0.05 level of significance.

Results

Research Question 1: what is the effect of communication strategies used in agricultural education for disseminating research innovations on vegetable crop-production among rural women in Rivers State?

Table 1: Mean Score of Respondents on Effectiveness of Communication Strategies

S/N	Statements	Female (120)	Male (30)	Total (150)	Mean	SD	Decision
1	Extension visits improve vegetable production	120	30	150	3.10	0.82	
	High Extent						
2	Radio agricultural programs enhance adoption of innovations	120	30	150	2.85	0.76	High Extent
3	Demonstration farms increase practical knowledge	120	30	150	3.25	0.69	High Extent
4	Mobile phone messages support farming decisions	120	30	150	2.40	0.88	Low Extent
5	Farmers' group meetings improve information sharing	120	30	150	3.05	0.73	High Extent

Grand Mean = 2.93 | SD = 0.78 | Decision:

Source: field work 2025

High Extent The grand mean of 2.93, which is above the criterion mean of 2.50, indicates that communication strategies used in agricultural education influence vegetable crop production to a high extent. The relatively low standard deviation shows that respondents' opinions were closely related, suggesting consistency in responses. Effective dissemination of agricultural research findings through appropriate communication channels significantly enhances rural women's productivity and sustainability in vegetable farming.

Research Question 2

To what extent do rural women in Rivers State access and utilize agricultural information related to sustainable vegetable farming practices?

Table 2: Mean and Standard Deviation on Access and Utilization

S/N	Statements	Female (120)	Male (30)	Total (150)	Mean	SD	Decision
1	Access to improved vegetable seeds information	120	30	150	2.60	0.91	High Extent

2	Use of information on pest control methods	120	30	150	2.75	0.84	High Extent
3	Access to fertilizer application guidelines	120	30	150	2.45	0.80	Low Extent
4	Use of irrigation management information	120	30	150	2.30	0.87	Low Extent
5	Participation in agricultural training programmes	120	30	150	2.95	0.72	High Extent

Grand Mean = 2.61 | SD = 0.83 | Decision: High Extent

Source: field work 2025

Research Question 3

To what extent the role of gender responsive communication in enhancing rural women's participation in agricultural education and innovation programs in rural women in Rivers State?

Table 3: Mean and Standard Deviation on Gender-Responsive Communication

S/N	Statements	Female (120)	Male (30)	Total (150)	Mean	SD	Decision
1	Use of local language improves women participation	120	30	150	3.20		
	0.66 High Extent						
2	Training schedules consider women's household roles	120	30	150	3.05		
	0.74 High Extent						
3	Women-friendly extension agents encourage participation	120	30	150	3.30		
	0.61 High Extent						
4	Equal opportunities in innovation programs	120	30	150	2.55	0.83	High Extent
5.	Inclusive decision-making improves productivity	120	30	150	3.15	0.70	High Extent
	Grand Mean = 3.05 SD = 0.71 Decision						

Source: fieldwork 2025

High Extent The grand mean of 3.05, which is well above the criterion mean, indicates that gender-responsive communication enhances participation to a high extent. This means that when

communication strategies are tailored to consider women's needs—such as using local language, flexible training schedules, and inclusive approaches—participation in agricultural education and innovation programs improves significantly. Gender-sensitive communication plays a crucial role in increasing rural women's involvement, confidence, and effectiveness in vegetable crop production.

Hypothesis 1: There is no significant difference in the mean responses of male and female respondents on the effectiveness of communication strategies used in disseminating research innovations for sustainable vegetable crop production.

Category		
Sample size (n)	150	
Mean ($\bar{X}$)	2.93	
Standard Deviation (SD)	0.78	
Standard Error (SE)	0.20	
Z-calculated	6.72	
z-critical ($\alpha=0.05$)	± 1.96	Reject Null
Decision	Since z_{cal}	

There is a significant effect of communication strategy effectiveness on vegetable crops production

Hypothesis 2: There is no significant difference in the mean responses of rural women on their access to and utilization of agricultural information.

Table 5: z-test analysis on mean response of rural women on their access to and utilization of agricultural information

Category		
Sample size (n)	150	
Mean ($\bar{X}$)	2.61	
Standard Deviation (SD)	0.83	
Standard Error (SE)	0.21	
Z-calculated	1.62	
z-critical (a-0.05)	±1.96	Fail to Reject
Decision	Since xx	z-cal

There is no significant extent of access and utilization of agricultural information.

Hypothesis 3

There is no significant difference in the mean response of the role of gender responsive communication in enhancing rural women's participation in agricultural education and innovation programs in Rivers State.

Table 6: z-test analysis on mean response of the role of gender responsive communication.

Category		
Sample size (n)	150	
Mean ($\bar{X}$)	3.05	
Standard Deviation (SD)	0.71	
Standard Error (SE)	0.18	
Z-calculated	1.62	
z-critical (a-0.05)	±1.96	
		z-cal Reject Null
Degree of freedom (df)	149	

The mean of 3.05, which is well above the criterion mean, indicates that gender responsive communication enhances participation to a high extent. The significant Z-test result confirms its strong influence.

Discussion of Findings

The findings revealed a grand mean of 3.05 which is above the criterion mean of 2.50, indicating a high extent which further showed that communication strategies have a significant effect on vegetable crop production. This implies that communication channels such as extension visits, demonstration farms, radio programs, and farmers' group meetings positively influence rural women's knowledge, adoption of improved practices, and overall productivity. The high mean scores on demonstration methods and group meetings suggest that participatory and practical approaches are more impactful than passive communication methods. This finding aligns with Okeke and Eze (2022) who emphasized that communication must be simplified, localized and consistent to be effective in rural agricultural settings. The minor gender differences in perception may reflect differences in engagement levels or direct experiences with rural women farmers. The z-test analysis showed no significant difference in the mean response of male and female respondents, confirming that both groups held similar views on the communication strategies used. The finding supports the idea that effective agricultural communication enhances innovation diffusion, improves decision-making, and increases farm yield. It also suggests that when agricultural education research outputs are properly disseminated, rural women are more likely to adopt sustainable vegetable production practices. Findings from research question2, showed a grand mean of 2.61, slightly above the criterion mean of 2.50, indicating a moderate to high extent of access and utilization. However, the Z-test result ($Z = 1.62$) showed that this extent was not statistically significant. This suggests that although rural women report some level of access to agricultural information—particularly in areas such as improved seeds and pest control—the access may not be strong, consistent, or sufficient enough to produce significant measurable impact. The lower mean values recorded in irrigation management and fertilizer guidelines indicate possible barriers such as limited infrastructure, poor dissemination systems, financial constraints, or limited digital literacy. This finding implies that while communication strategies exist, there may still be structural and systemic limitations affecting the depth and sustainability of information utilization among rural women in vegetable production. these findings support Olawuyi and Hassan (2021) who stressed that gender-sensitive agricultural communication improves access and use of information by women. The data suggest that agricultural education is gradually becoming more inclusive and accessible, although more structured and consistent engagement may be needed, z-test results revealed no significant difference between educated and non-educated women, meaning that both groups similarly perceived their access to and use of agricultural information-possibly due to non-formal training like cooperative meetings community gatherings or radio broadcasts.

Findings from research question3 indicated a grand mean of 3.05, which is well above the benchmark of 2.50, showing a high extent. The Z-test result ($Z = 9.48$) confirmed that gender-responsive communication plays a significant role in enhancing participation. High ratings were recorded for use of local language, women-friendly extension services, flexible training schedules,

and inclusive decision-making. This suggests that when communication strategies consider women's socio-cultural realities, household responsibilities, and educational background, participation improves significantly. The finding highlights that gender-sensitive approaches are critical in agricultural education and innovation processes. It confirms that communication that respects cultural norms, promotes inclusiveness, and reduces structural gender barriers enhances women's confidence, engagement, and productivity in vegetable farming. The research question received the highest agreement across all variables, both male and female respondents confirmed that the role of gender responsive communication in enhancing rural women's participation in agricultural education and innovation programs, are actively accessing and utilizing agricultural information through both formal and informal channels, applying this knowledge to enhance their farming practice. This finding aligns with Adeqale and Nwachukwu (2023) who observed that while digital platforms hold promise, traditional media remain more effective in rural Nigeria. The study demonstrates that communication is a powerful tool in agricultural education and innovation. While general communication strategies significantly improve vegetable crop production, access to information still needs strengthening. Most importantly, gender-responsive communication emerges as a critical factor for sustainable participation and productivity among rural women in Rivers State.

Conclusion

From the results of the research the study therefore investigated the effectiveness of communication in agricultural education and the innovation process as a panacea for sustainable vegetable crop production among rural women in Rivers State. The findings revealed that while communication strategies such as radio broadcasts, extension visits and group trainings are widely used and generally effective, there remain gaps in follow-up services and digital engagement. Rural women are actively accessing and utilizing agricultural information through both formal and informal channels, applying this knowledge to enhance their farming practices. However, issues such as limited literacy, inconsistent training schedules and minimal use of mobile technologies continue to hinder the full impact of communication efforts.

Recommendations

From the conclusion, the study recommends that

1. Strengthen Agricultural Communication Networks and enhance follow-up and demonstration services.
2. Promote Gender, inclusive communication approaches and invest in Rural Digital literacy and infrastructure.

3. Engage local women's cooperatives as communication Hubs also monitor and evaluate communication out come. A frame work should be developed for regularly assessing the impact of agricultural communication on knowledge gain, technology adoption and productivity among rural women.

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