

Adult Literacy and Farmers' Adoption of Agricultural Innovation in South-East, Nigeria

Vincent Chidindu Asogwa

Department of Agricultural Education and Extension, University of Eswatini
asovinchidi@yahoo.com
<https://orcid.org/0000-0002-8743-0139>

Edward Chukwuka Isiwu

Department of Agricultural and Vocational Education, Michael Okpara University of Agriculture, Umudike, Abia State,
edwardisiwu@gmail.com

Chris Olusola Omoregie

Department of Adult Education, University of Ibadan, Nigeria
comoregie@gmail.com

Article History

Received: 22nd October 2025
Accepted: 18th December 2025
Published: 30th March 2026

Keywords

adult literacy, agricultural innovation, farmers, farmers' adoption South-East Nigeria

*Corresponding Author:

edwardisiwu@gmail.com

Abstract

Adult literacy aims to equip farmers with essential skills in reading, writing, and numeracy, enabling them to better understand and embrace innovations, including those related to agricultural practices. Despite its importance, there has been limited empirical evidence linking adult literacy to farmers' adoption of agricultural innovations in South-East Nigeria. This study therefore investigated the relationship between adult literacy and farmers' adoption of agricultural innovation in the region. A quantitative approach using a correlational survey design was employed, involving 379 respondents selected through multistage sampling procedures. Data were collected using a 44-item structured instrument titled Adult Literacy and Agricultural Innovation Farmers' Adoption Questionnaire (ALAIFAQ). The questionnaire was content validated by three experts, and its reliability was confirmed using the Cronbach Alpha method, yielding a coefficient of 0.76. Data analysis was conducted using the Pearson Product Moment Correlation to address the research questions and test the null hypotheses at the 0.05 significance level. Findings revealed that adult literacy has a significant positive high correlation with farmers' awareness and a significant positive moderate correlation with farmers' interest in agricultural innovations. The study also showed a non-significant positive low correlation between adult literacy and farmers' evaluation of innovations. However, adult literacy demonstrated a significant positive high correlation with farmers' trial of innovations and their eventual adoption for sustainable agricultural development in South-East Nigeria. The study concludes that adult literacy is a critical factor influencing farmers' engagement with agricultural innovations. Strengthening adult literacy programmes is therefore recommended to enhance farmers' awareness, interest, trial participation, and adoption of new technologies.

Introduction

Agriculture is an essential sector in Nigeria, and it contributes significantly to the country's Gross Domestic Product (GDP). According to the National Bureau of Statistics (2021),



agriculture contributed 21.97% of Nigeria's GDP in the fourth quarter of 2020. To further increase this contribution in Southeastern Nigeria, there is a need for farmers to adopt agricultural innovations, which requires advancing their literacy levels. In the submission of Faure (2019), agricultural innovation is a product of social negotiation, as an intrinsic characteristic of farmers is that they innovate to sustain and improve their production systems. Asogwa (2024) described agricultural innovation as the process of creating and putting into use combinations of agricultural knowledge, principles, and practices (KPP) from many different sources, like researchers, farmers, and consumers. The knowledge, principles, or practices may not be brand new but are usually a combination of existing ones. Glover et al. (2019) noted that agricultural innovation has to be novel to the farmer, group of farmers, or place of adoption during diffusion but may not be necessarily new globally. The adoption of agricultural innovations is essential for increasing productivity among farmers and the sustainable development of the sector (Carmela Annosi et al., 2020; Pandey et al., 2025).

Adoption, in the submission of Rogers (1983), is the use or nonuse of a new technology by a farmer over a given period of time. It could be individual (farm-level) or aggregate adoption. In distinguishing them, Feder et al. (1985) defined individual (farm level) adoption as the degree of use of a new technology (innovation) in a long-run equilibrium when the farmer has full information about the new technology and its potential, while aggregate adoption (diffusion) was the process of spreading a technology within a region. Kikuchi (2025) and Thirtle and Ruttan (1987) defined aggregate adoption as the spread of a new technique within a population. The implication is that aggregate adoption is measured by the aggregate level of use of a given technology within a given geographical area. Hassan (1996) clarified that the adoption decision process includes the simultaneous choice of whether to adopt a technology or not and the intensity of its use. Mpinda et al. (2025) emphasised that before adoption choices are made, a farmer makes a set of several interdependent decisions.

Furthermore, Rogers (1983) identified five stages in the adoption of agricultural innovation among farmers, irrespective of whether they were individual farmers, farmers' groups, or whole communities. The stages are: (1) *Awareness*: This is a stage where a farmer learns of the existence of the idea but knows little about it. (2) *Interest*: Here, the farmer develops a feeling of curiosity or concern about the idea and seeks more information about it from either a friend or the extension agent. (3) *Evaluation*: This is the stage at which the farmer judges if the new idea will be of benefit or disadvantage to his farming operations and how difficult it might be to put into practise. The farmer may seek further information or go to a demonstration or meeting and then decide whether or not to try out the new idea. (4) *Trial*: At this stage, the farmer decides to try the idea on a small scale. For example, they may decide to put manure or fertiliser on a small part of one field and compare the result with the rest of the field. To do this, they seek advice on how and when to apply fertiliser or manure. (5) *Adoption*: If the farmer is convinced by the trial, he or she accepts the idea fully for adoption, and it becomes part of his or her customary farming practices.

However, the capacity of farmers to adopt agricultural innovations is significantly influenced by several factors such as their level of literacy (Llewellyn & Brown, (2020). Nmadu (2015) and Onyeneke (2017) found that the rate of adoption of agricultural innovations among individual or group farmers is impacted by several factors, such as level of education, attitude of farmers, financial status of the farmer, farm size, presence of extension agents, and results of demonstration plots. Asogwa et al. (2014) and Yoon et al. (2020) revealed that farmers' level of education is one of the most important factors affecting their rate of adoption of agricultural innovations. Similarly, Odoemenem and Obinne (2010) and Duru et al. (2018) reported that the

present level of education among farmers in South-East Nigeria is low, with only 23.6% having completed secondary school. According to Duru et al. (2018), and Eludire et al. (2025) the majority of farmers in Nigeria's southeast region have only primary education, 14.3% have a secondary education, and 1.9% have a higher degree. This shows that to enhance farmers' accessibility to knowledge and adoption rates of agricultural innovations in South-East Nigeria, there is a need to improve adult literacy in South-East Nigeria.

Adult literacy is the practice of teaching reading, writing, and numeracy knowledge, skills, or values to adults who lack these abilities (Gal et al., 2020). As an aspect of adult education, it is classified into four areas: functional literacy, written literacy, mathematical literacy, English as a Second or Other Language (ESOL), and cultural literacy (Cun, 2022). The National Centre for Education Statistics (NCES) explained that adult literacy programmes aim to improve individuals', like farmers, employment opportunities, community involvement, health outcomes, and overall quality of life (Kutner et al., 2007; Omoregie & Oyelami, 2021). Prajapati et al. (2025) and Zossou et al. (2020) buttressed that adult literacy in agriculture extension is designed to help farmers understand and communicate their challenges effectively and also access and adopt agricultural innovations from research institutes.

In South-East Nigeria, farmers' adoption of agricultural innovation is low, and this affects their productivity, whereas adult literacy plays an important role in their adoption of agricultural innovation. For farmers to use new technologies and practice them effectively, they must have the ability to read and comprehend information. This is especially true in the face of rapid technological advancement, as new methods and tools are constantly being introduced into the agricultural sector. Farmers can keep up with the most recent technologies and use them to improve their yields and livelihoods with more access to educational resources, such as adult literacy programmes. Despite the endorsement of a policy on adult education by the Central Board of Education in 1951 (Nnazor, 2005), a focused group interaction by the researchers with nine extension officers, three from each state in south-eastern Nigeria, confirmed that farmers' rate of adoption of agricultural innovation is still very slow compared to neighbouring states. The agents noted that their major challenges are farmers' low educational levels and limited financial resources. According to Aker (2011) and Effiong et al. (2025), low literacy levels and affordability of mobile devices still pose challenges to widespread adoption of agricultural innovation among rural farmers in Calabar South Local Government Area, Cross River State, Nigeria. Consequently, further research was needed to determine whether adult literacy correlates with farmers' adoption of agricultural innovation and, if so, the extent of this correlation in South-East Nigeria, given that other factors may also influence farmers' adoption of such innovations. Consequently, this study aims to investigate the relationship between adult literacy and farmers' adoption of agricultural innovation in the South-East of Nigeria. The findings can be used to develop strategies for increasing farmer adoption rates and, as a result, agricultural productivity in the region. It could also provide valuable insights for policymakers and development practitioners working to improve agricultural productivity in the region.

Purpose of the Study

The purpose of the study was to investigate the extent to which adult literacy facilitated and farmers' adoption of agricultural innovation in South-East Nigeria. Specifically, the study determined the extent to which adult literacy correlates with:

1. farmers' awareness of agricultural innovation in South-East Nigeria;
2. farmers' interest in agricultural innovation in South-East Nigeria;

3. farmers' evaluation of agricultural innovation in South-East Nigeria;
4. farmers' trial of agricultural innovation in South-East Nigeria; and
5. farmers' adoption of agricultural innovation in South-East Nigeria

Research questions

1. To what extent does adult literacy correlate with farmers' awareness of agricultural innovation in the South-East of Nigeria?
2. What is the extent to which adult literacy correlates with farmers' interest in agricultural innovation in the South-East of Nigeria?
3. To what extent does adult literacy correlate with farmers' evaluations of agricultural innovation in the South-East of Nigeria?
4. What is the extent to which adult literacy correlates with farmers' trials of agricultural innovation in the South-East of Nigeria?
5. To what extent does adult literacy correlate with farmers' adoption of agricultural innovation in the South-East of Nigeria?

Hypotheses

1. Adult literacy significantly correlates with farmers' awareness of agricultural innovation in the South-East of Nigeria.
2. Adult literacy does not significantly correlate with farmers' interest in agricultural innovation in the South-East of Nigeria.
3. Adult literacy significantly correlates with farmers' evaluations of agricultural innovation in the South-East of Nigeria.
4. Adult literacy does not significantly correlate with farmers' trials of agricultural innovation in the South-East of Nigeria.
5. Adult literacy significantly correlates with farmers' adoption of agricultural innovation in the South-East of Nigeria.

Theoretical Framework

The theory underpinning this correlation study is diffusion theory, which believes that adult literacy improves farmers' ability to learn and apply new agricultural practices, resulting in increased productivity and sustainable development. Everett Rogers (1987) proposed diffusion theory, which is particularly relevant to this study since it describes how new ideas and inventions spread throughout society, including in the setting of agriculture. This theory aided in identifying the characteristics that influence farmers' adoption of sustainable agricultural practices in South-East Nigeria, such as relative advantage, compatibility, complexity, trialability, and observability. Understanding these factors allows policymakers, extension agents, and adult educators to create literacy interventions that promote the adoption of sustainable farming practices in the region.

Methodology

This study adopted a quantitative method with a correlational survey research design. Quantitative research is the act of collecting and analysing numerical data in order to create predictions, evaluate causal linkages, and generalise results to larger populations (Bhandari, 2022). This design is suitable because the study established a relationship between two variables: independent, which is "adult literacy" and dependent, which is "farmers' adoption of

agricultural innovation". Secondly, a group of people were studied by collecting information from a representative of a population using a structured questionnaire, and the findings were generalised to the entire population. The study was carried out in South-East Nigeria, which is made up of five states: Abia, Anambra, Ebonyi, Enugu, and Imo, as shown in Figure 1.

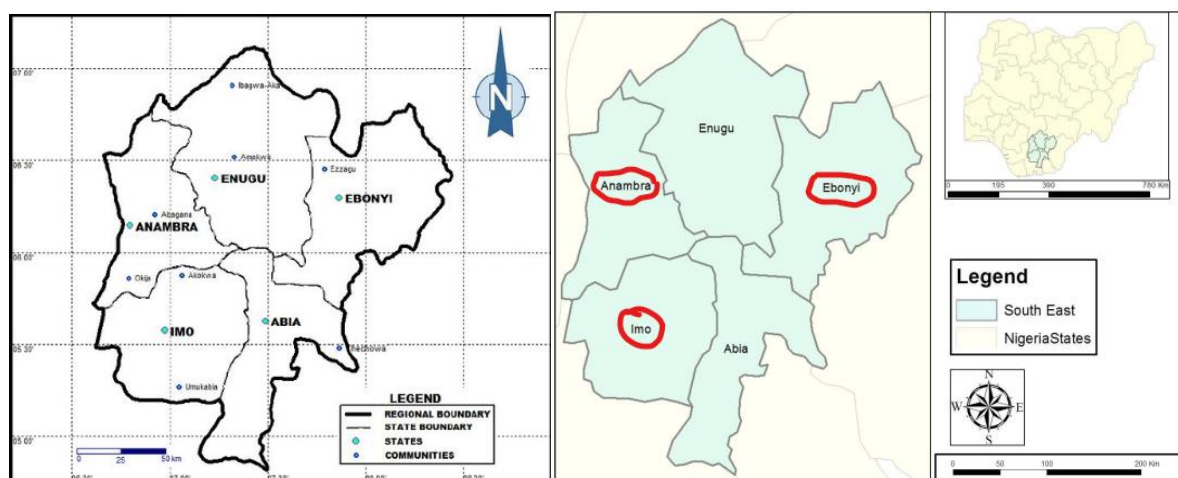


Figure 1: Map of South-East Nigeria (Anejionu et al., 2013).

Using the Roasoft calculator (2024), a sample size of 385 was estimated at 5% marginal error, 95% confidence level, 50% population proportion, and unlimited population size. The application of Roasoft to estimate a specified value helped to maximise the sampling error and statistically represent the entire population so that generalisations of the findings can be reliably made for a wider context.

Firstly, a stratified proportionate simple random sampling technique was used to select three from the five states, which resulted in Anambra, Ebonyi, and Imo being chosen. This technique was employed to give each state equal chances of being selected. Secondly, a simple random sampling technique was also used to sample one agriculture zone from each of the three states selected, summing up to three zones. Thirdly, the stratified proportionate sampling (SPS) technique was used to establish the number of respondents from the selected agriculture zone in each of the three states, thus: 164 from the Awka zone in Anambra, 56 from Ebonyi South in Ebonyi, and 108 from Okigwe in Imo State. The SPS technique gave sampled states and zones relative chances of selection according to their populations. Fourthly, a simple random sampling technique was used to pick each individual farmer who responded to the questionnaire.

However, due to the difficulty of data collection in developing countries and the usability of the returned questionnaires, a reserve of 33% was added. Therefore, 600 questionnaires were first distributed (300 in each state and/or 30 in each community). Although 290 questionnaires from Ebonyi and 190 from Anambra states were returned, complete information necessary for this study was available in only 259 and 141 questionnaires from Ebonyi and Anambra states, respectively. Therefore, the final sample size used in the study was 400 farm households. The field survey was very intensive and was carried out during the months of October and November 2011. The questionnaire was pre-tested and modified as required prior to final administration.

The instrument used for data collection was a 37-item structured questionnaire developed by the researchers from a literature review and titled the Adult Literacy and Agricultural Innovation Farmers' Adoption Questionnaire (ALAIFAQ). The instrument was divided into three parts. Part A was on demographic variables of the respondent; Part B focused on the participation of farmers in literacy programmes; and Part C was on farmers' adoption of agricultural innovation. This last part was further subdivided into farmers' awareness, farmers' interest, farmers' evaluation, farmers' trials, and farmers' adoption of agricultural innovation for sustainable development in South-East Nigeria to cover the 5 research objectives.

The items on Parts B and C were structured on a four-point scale of strongly agree, agree, disagree, and strongly disagree, with corresponding values of 4, 3, 2, and 1, respectively. The instrument was content validated by three experts: one from the Department of Adult Education, one from the Department of Agricultural Education, and the other from the Department of Agricultural Extension at the Michael Okpara University of Agriculture, Umudike. Their corrections and suggestions were used to improve the initial copy for the production of the final copies of the questionnaire. There was item mobility from 52 items on the initial draft to 44 on the final version of the questionnaire. An overall scale Content Validity Index (S-CVI) of 0.90 was obtained indicating high content validity of the questionnaire (Wang & Sahid, 2024). Thirty-five copies of the ALAIFAQ were administered to 35 farmers in Benue State who were not part of the study but have similar characteristics by virtue of their farming operations. The Cronbach's alpha reliability method was used to estimate the internal consistency of the questionnaire items. A reliability coefficient of .76 was obtained, which implied that the questionnaire items were reliable for the study. Five research assistants who were familiar with the area of study and fluent in the language were hired and given orientation on how to administer and retrieve the questionnaire from respondents. Four hundred copies of the questionnaire were administered, but 379 copies were retrieved, giving a retrieval rate of 94.75%.

The data collected for the study was analysed using Pearson Product Moment Correlation to answer research questions and test the null hypotheses at the 0.05 level of significance since the study was designed to establish a relationship and the strength of the relationship between variables: adult literacy and farmers' adoption of agricultural innovation. The extent or strength of the relationship between the variables was interpreted using Creswell's (2008) correlation coefficient scale, which says that .70–1.00 = strong or high, .30–.69 = moderate or medium, and .00–.29 = none (.00) to weak or low. Creswell asserted that correlation coefficients can range from -1.00 to +1.00, with positive numbers being used to identify a positive relationship and negative numbers being used to identify a negative relationship, while no linear association is indicated with a correlation coefficient of 0.00. Asterisks are often used to indicate correlations that are statistically significant in Pearson Product Moment Correlation Analysis (Briggs, 2019; Slavin, 2007). Statistical significance for correlational research indicates that the probability of any obtained correlation coefficient between two variables is due to chance less than .05 or .01 (depending on which cutoff a researcher has selected). Therefore, the hypothesis of no significant difference was rejected where the p-value was less than the alpha-value of .05 but not rejected where the p-value was greater than or equal to the alpha-value of .05. All statistical analyses were performed with the Statistical Package for Social Sciences (SPSS) software version 20.0.

Ethical Consideration

The Ministry of Agriculture in Umuahia, Abia State, was approached for ethical approval. The cover page of the instruments was a consent letter to present the study and ask approval from the respondents prior to participation because it was optional. The goal of the study and the method of data collection were explained to participants. The materials used to acquire the data were solely available to the research team. The respondents were permanently protected because no portion of the instrument contained information that might be used to track down a specific individual after data collection. The respondents' identities were kept anonymous, and only their gender was recorded for data analysis. Respondents were informed that they might opt out of the study at any moment. All of the materials recovered were kept in a locked cabinet, and the computer data was password protected. The acquired data was treated confidentially, thoroughly evaluated, and discussed for this academic objective. This article has been verified for plagiarism and has remarkable uniqueness.

Findings

The findings of the data analysis for answering research questions and testing hypotheses are presented in Tables 1 to 5.

Table 1: Correlation Matrix of Adult Literacy and Farmers’ Awareness of Agricultural Innovation

		Adult literacy	Farmers’ awareness
Adult literacy	Pearson Correlation	1	.755*
	Sig. (2-tailed)		.008
	N	379	379
Farmers’ awareness	Pearson Correlation	.755*	1
	Sig. (2-tailed)	.008	
	N	379	379

*. Correlation is significant at the 0.05 level (2-tailed).

Table 1 indicates a correlation coefficient of .76, which is positive and within the range of .70 to 1.00. This indicates that adult literacy, to a high positive extent, correlates with farmers’ awareness of agricultural innovation. The table also shows a p-value of .008, which is less than the alpha value of .05. This means that adult literacy significantly correlates with farmers’ awareness of agricultural innovation in South-East Nigeria. Therefore, the hypothesis that adult literacy significantly correlates with farmers’ awareness of agricultural innovation in South-East Nigeria was upheld.

Table 2: Correlation Matrix of Adult literacy and farmers’ interest in agricultural innovation

		Adult literacy	Farmers’ interest
Adult literacy	Pearson Correlation	1	.617*
	Sig. (2-tailed)		.036
	N	379	379
Farmers’ interest	Pearson Correlation	.617*	1
	Sig. (2-tailed)	.036	
	N	379	379

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2 indicates a correlation index of .62, which is positive and within the range of .30 to .69. This shows that adult literacy, to a moderate positive extent, correlates with farmers’ interest in agricultural innovation. The table also shows a p-value of .04, which is less than the alpha value of .05. This indicates that adult literacy significantly correlates with farmers’ interest in

agricultural innovation in South-East Nigeria. Therefore, the hypothesis that adult literacy does not significantly correlate with farmers’ interest in agricultural innovation in South-East Nigeria was rejected.

Table 3: Correlation Matrix of Adult literacy and farmers’ evaluation of agricultural innovation

		Adult literacy	Farmers’ evaluation
Adult literacy	Pearson Correlation	1	.230
	Sig. (2-tailed)		.201
	N	379	379
Farmers’ evaluation	Pearson Correlation	.230	1
	Sig. (2-tailed)	.201	
	N	379	379

*. Correlation is significant at the 0.05 level (2-tailed).

Table 3 reveals a correlation coefficient of .23, which is positive and within the range of .00 to .29. This indicates that adult literacy, to a low positive extent, correlates with farmers’ evaluations of agricultural innovation. The table also shows a p-value of .20, which is greater than the alpha value of .05. This means that adult literacy does not significantly correlate with farmers’ evaluations of agricultural innovation in South-East Nigeria. Therefore, the hypothesis that adult literacy significantly correlates with farmers’ evaluations of agricultural innovation in South-East Nigeria was not upheld.

Table 4: Correlation Matrix of Adult literacy and farmers’ trial of agricultural innovation

		Adult literacy	Farmers’ trial
Adult literacy	Pearson Correlation	1	.703
	Sig. (2-tailed)		.001
	N	379	379
Farmers’ trial	Pearson Correlation	.703	1
	Sig. (2-tailed)	.001	
	N	379	379

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4 indicates a correlation index of .70, which is positive and within the range of the correlation coefficient of .70 to 1.00. This shows that adult literacy, to a highly positive extent, correlates with farmers’ trials of agricultural innovation. The table also shows a p-value of .00, which is less than the alpha value of .05. This indicates that adult literacy significantly correlates with farmers’ trials of agricultural innovation in South-East Nigeria. Therefore, the hypothesis that adult literacy does not significantly correlate with farmers’ trials of agricultural innovation in southeast Nigeria was rejected.

Table 5: Correlation Matrix of Adult literacy and farmers’ adoption of agricultural innovation

		Adult literacy	Farmers’ adoption
Adult literacy	Pearson Correlation	1	.811
	Sig. (2-tailed)		.000
	N	379	379
Farmers’ adoption	Pearson Correlation	.811	1
	Sig. (2-tailed)	.000	
	N	379	379

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5 shows a correlation coefficient of .81, which is positive and within the range of .70 to 1.00. This indicates that adult literacy, to a high positive extent, correlates with farmers’ adoption of agricultural innovation. The table also reveals a p-value of .00, which is less than

the alpha value of .05. This means that adult literacy significantly correlates with farmers' adoption of agricultural innovation in southeast Nigeria. Therefore, the hypothesis that adult literacy significantly correlates with farmers' adoption of agricultural innovation in southeast Nigeria was upheld.

Discussion of Results

The findings of the study in Table 1 indicate that adult literacy correlates to a significant, high-positive extent with farmers' awareness of agricultural innovation. This implies that as farmers' literacy increases, their awareness of agricultural innovation also increases. Amusan et al. (2021) affirmed that boosting adult literacy in South-East Nigeria could lead to improved awareness of agricultural innovation among farmers, which could contribute to the region's long-term growth. As a result, investing in adult literacy programmes could be a major strategy for encouraging economic growth and reducing poverty in the area. In the same vein, the World Bank reported that Nigerian farmers find it difficult to adopt modern agricultural technologies and practices because of their poor literacy and education levels, which ultimately limits their country's potential for economic growth and poverty eradication (Maddison, 2007; Vasavi, et al., 2025). Agba et al. (2014) noted that the growth of the South-East Nigerian region's economy may be significantly impacted by adult literacy programmes and financial literacy initiatives. Also, farmers' knowledge of crop diversity management in cropping systems was positively correlated with involvement in crop-tree-livestock systems but negatively correlated with the adoption of agroforestry systems, although these correlations were weak (Segnon et al., 2015).

Table 2 indicates that adult literacy significantly moderately positively correlates with farmers' interest in agricultural innovation in the South-East of Nigeria. The implication is that as farmers advance in literacy, their interest in agricultural innovation also increases. This shows that raising literacy among farmers could be a viable technique for increasing their interest in adopting sustainable agricultural practices, such as agroforestry systems, which can benefit both the environment and their livelihoods (Mbow et al., 2014). This finding is in line with the results of Fiore et al. (2024), and Segnon et al. (2015), who found that farmers' intention to adopt agroforestry systems was significantly affected by the ecological region where farmers operated, sociolinguistic membership, and land tenure. Besides, Seyoum and Amdemeske (2016) found that the relationship between overall adult learning achievement and assessment of learning was positive and significant. The authors also found that the methods used by facilitators correlated positively and significantly.

Table 3 reveals that adult literacy, to a non-significantly low positive extent, correlates with farmers' evaluations of agricultural innovation in South-East Nigeria. This means that an increase in farmers' literacy to a lesser degree results in their evaluation of agricultural innovation in South-East Nigeria. According to the findings, while adult literacy is vital for farmers to evaluate agricultural innovation, other factors may also play a key role in their decision-making process. This result is in conformity with the result of Ongachi and Belinder (2025) and Sadati et al. (2010), which showed that there was a positive correlation between literacy, participation in extension courses, off-farm income, farmer's knowledge about sustainable agriculture, level of use of sustainable agriculture methods, extension contacts, and job satisfaction, and a negative correlation between age, experience in agricultural activities, family size, and agrarian land with attitude towards sustainable agriculture. In addition, Zheng and Lin (2018) found that there is a strong positive correlation between agricultural economic growth and the degree of agricultural industrial agglomeration in China. As the agricultural economy grows, the degree of agricultural industrial agglomeration gets better, and the

improvement in the degree of agricultural industrial agglomeration promotes agricultural product specialisation, thus imposing a reaction on the agricultural economy itself. Mustapha et al. (2022) found that education and income correlated highly positively with the knowledge, attitude, and practice level of the farmers and extension workers.

Table 4 indicates that adult literacy correlates to a significantly high positive extent with farmers' trials of agricultural innovation in South-East Nigeria. This indicates that farmers' literacy is remarkably directly proportional to farmers' trials of agricultural innovation in the South-East of Nigeria. As a result, it is critical to engage in adult literacy programmes for farmers and extension workers in order to promote sustainable agricultural practices and boost their capacity to adopt novel techniques. Furthermore, these programmes can increase contact between farmers and extension workers, resulting in a more efficient transmission of information on sustainable agriculture. Kebede and Zizzo (2015) found that experimentally measured money burning on the village level is negatively correlated to real-life agricultural innovations. Fiore et al. (2024) and Segnon et al. (2015) found that farmers' knowledge was positively influenced by the ecological contexts in which they were living, sociolinguistic membership, and socio-demographic factors such as education.

Table 5 shows that adult literacy significantly high positively correlates with farmers' adoption of agricultural innovation in South-East Nigeria. The result displays that any effort made by the government towards enhancing farmers' literacy results equally in farmers' adoption of agricultural innovation in South-East Nigeria. According to the study, increasing adult literacy rates in South-East Nigeria could lead to increased adoption of sustainable agriculture practices. This could have a good impact on the environment and the livelihoods of farmers in the region. Similarly, Segnon et al. (2015) found that adoption of agroforestry systems was significantly affected by ecological region, sociolinguistic membership, and land tenure but did not vary significantly with their age. Adesope et al. (2012) posited that increasing farmer education levels in Nigeria may result in the adoption of new agricultural practices, which will ultimately be advantageous to the agricultural economy as a whole. Leitgeb et al. (2011) and Khan et al. (2025) asserted that promoting environmental consciousness while offering farmers educational opportunities may result in more agricultural inventions and knowledge.

Conclusion

This study concludes that adult literacy plays a critical and multifaceted role in farmers' engagement with agricultural innovation in South-East Nigeria. The findings demonstrate that literacy strongly enhances farmers' awareness, interest, trials, and adoption of agricultural innovations, while its influence on evaluation, though positive, is moderated by other socio-economic and institutional factors. These results confirm that literacy empowers farmers to access information, build confidence, and make informed decisions about sustainable agricultural practices. However, literacy alone is insufficient without complementary support such as extension services, income opportunities, and enabling policy environments. Therefore, sustained investment in adult literacy programmes, integrated with agricultural extension, financial education, and community-based training, remains essential for accelerating innovation adoption, improving livelihoods, and fostering long-term agricultural and economic development in South-East Nigeria.

Recommendations

Based on the findings of the study and conclusion, it was recommended that:

1. farmers should advance their literacy to increase their rate of adoption of agricultural innovations;
2. adult literacy facilitators and agricultural extension agents should organise literacy programmes, seminars, and workshops for farmers to educate them and help them learn how to read and write to be able to adopt new agricultural practices and technologies;
3. adult literacy facilitators should work together with agricultural extension agents to increase the relationship between farmers' literacy and their adoption of agricultural innovations;
4. extension workers should create and administer literacy programmes for farmers in order to increase their uptake of agricultural innovation, and policymakers should prioritise the supply of functional adult literacy education in rural areas;
5. adult literacy programmes should be prioritised by the government and other stakeholders as a means of increasing farmers' adoption of agricultural innovation, and their curriculum should be adapted to the specific requirements and challenges experienced by farmers in the study region;
6. the Ministry of Education should add more adult literacy programmes to their annual budget to increase farmers' literacy and adoption of agricultural innovations; and
7. adult educators and agricultural researchers could conduct additional research to look into other factors that might affect farmers' adoption of agricultural practices.

Funding

Researchers contribute to the study's funding.

Interests

In this work, the researchers have no conflict of interest.

Acknowledgments

The researchers admit that all of the authors contributed equally to the design, conduct, and reporting of this investigation. Although the study's concepts and conclusions are original and reliable, all writers whose works were consulted but not referenced are hereby recognised.

ORCID: <https://orcid.org/0000-0002-8743-0139>

Authors' Contributions

VCA: Conception/design, development of data collection instrument, analysis, interpretation of data, revised manuscript (55%)

ECI: Conception/design, development of data collection instrument, interpretation of data, revised manuscript (20%)

COO: Data collection, analysis and interpretation of data and first draft (25%)

References

Adegbite, O. O., & Machethe, C. L. (2020). Bridging the financial inclusion gender gap in smallholder agriculture in Nigeria: An untapped potential for sustainable development. *World Development*, 127, 104755.

- Adesope, O. M., Matthews-Njoku, E. C., Oguzor, N. S., & Ugwuja, V. C. (2012). *Effect of socio-economic characteristics of farmers on their adoption of organic farming practices, Crop Production Technologies, Dr. Peeyush Sharma (Ed.), ISBN: 978-953-307-787-1, InTech.*
- Agba, A. M., Akpanudoedehe, J. J., & Ocheni, S. (2014). Financing poverty reduction programmes in rural areas of Nigeria: The role of non-governmental organisations (NGOs). *International Journal of Democratic and Development Studies (IJDDS)*, 2(1), 1-16.
- Aker, J. C. (2011). Dial 'A' for agriculture: A review of information and communication technologies for agricultural extension in developing countries. *Agricultural Economics*, 42(6), 631-647.
- Anejionu, O. C.D., Nwilo, P. C.& Ebinne, E. S. (2013). *Long Term Assessment and Mapping of Erosion Hotspots in Southeast Nigeria.* In FIG Working Week (pp. 1-19). Environment for Sustainability, Abuja, Nigeria.
- Asogwa, V. C. (2024). Hybridizing global best practices in agricultural education for sustainable national development and economic competitiveness. *International Journal of Agricultural Education & Research*, 2 (2) 147, 173(2).
- Asogwa, V. C., Nongugwa D. T. & Ugwuoke C. U. (2014) Water source management approaches adopted by farmers for sustainable irrigation for enhancing crop production in Benue State. *Pacesetter Journal of Agricultural Science Research*. 2(7).79-83, <http://www.pacesetteronlinepublishers.org/pjar>.
- Bhandari, P. (2022). What Is Quantitative Research? Definition, Uses & Methods <https://www.scribbr.com/methodology/quantitative-research/>
- Briggs, B. (2019). Teaching methods as correlate of student performance in business studies in selected public secondary schools in Port Harcourt. *International Journal of Innovative Social and Science Education Research*, 7(2), 1-12.
- Carmela Annosi, M., Brunetta, F., Capo, F., & Heideveld, L. (2020). Digitalization in the agri-food industry: the relationship between technology and sustainable development. *Management Decision*, 58(8), 1737-1757.
- Cun, A. (2024). Learning about the literacy practices of mothers with refugee backgrounds. *Urban Education*, 59(8), 2395-2426..
- Duru, C. B., Nnebue, C. C., Iwu, A. C., Oluoha, R. U., Ndukwu, E. U., & Nwaigbo, E. (2018). Utilization of family planning services among women of reproductive age in urban and rural communities of Imo State, Nigeria: A comparative study. *Afrimedical Journal*, 6(1), 11-26.
- Effiong, J.B., Azu, S.B., Ekpenyong, U.C., & Etim, O.U. (2025). Socioeconomic factors and challenges affecting adoption of extension strategies among rural farmers in Calabar South Local Government Area, Cross River State, Nigeria. *FNAS Journal of Scientific Innovations*, 6(2), 44-50.
- Eludire, O. O., Faloye, O. T., Alatise, M., Ajayi, A. E., Oguntunde, P., Badmus, T., ... & Ogunrinde, A. T. (2025). Evaluation of Evapotranspiration Prediction for Cassava Crop Using Artificial Neural Network Models and Empirical Models over Cross River Basin in Nigeria. *Water*, 17(1), 87.

- Faure, G., Knierim, A., Koutsouris, A., Ndah, H. T., Audouin, S., Zarokosta, E., ... & Heanue, K. (2019). How to strengthen innovation support services in agriculture with regard to multi-stakeholder approaches. *Journal of Innovation Economics & Management*, 28(1), 145-169.
- Feder, G., Just, R. E., & Zilberman, D. (1985). Adoption of agricultural innovations in developing countries: A survey. *Economic development and cultural change*, 33(2), 255-298.
- Fiore, V., Borrello, M., Carlucci, D., Giannoccaro, G., Russo, S., Stempfle, S., & Roselli, L. (2024). The socio-economic issues of agroecology: a scoping review. *Agricultural and Food Economics*, 12(1), 16.
- Gal, I., Grotlüschen, A., Tout, D., & Kaiser, G. (2020). Numeracy, adult education, and vulnerable adults: a critical view of a neglected field. *Zdm*, 52, 377-394.
- Glover, D., Sumberg, J., Ton, G., Andersson, J., & Badstue, L. (2019). Rethinking technological change in smallholder agriculture. *Outlook on Agriculture*, 48(3), 169-180.
- Hassan, R. M. (1996). Planting strategies of maize farmers in Kenya: a simultaneous equations analysis in the presence of discrete dependent variables. *Agricultural Economics*, 15(2), 137-149.
- Kebede, B., & Zizzo, D. J. (2015). Social preferences and agricultural innovation: an experimental case study from Ethiopia. *World Development*, 67, 267-280.
- Khan, F., Abbass, K., Qun, W., & Grebinevych, O. (2025). Moderating role of digital media on environmental awareness and environmental beliefs to shape farmers' behavioral intentions towards sustainable agricultural land conservation practices. *Journal of Environmental Management*, 373, 123745.
- Kikuchi, T. (2025). Dual-Channel Technology Diffusion: Spatial Decay and Network Contagion in Supply Chain Networks. arXiv preprint arXiv:2510.24781.
- Kikuchi, T. (2025). Dual-Channel Technology Diffusion: Spatial Decay and Network Contagion in Supply Chain Networks. *Sarhad Journal of Agriculture*, 38(1).
- Kutner, M., Greenberg, E., Jin, Y., Boyle, B., Hsu, Y. C., & Dunleavy, E. (2007). Literacy in Everyday Life: Results from the 2003 National Assessment of Adult Literacy. NCES 2007-490. *National Center for Education Statistics*.
- Leitgeb, F., Funes-Monzote, F. R., Kummer, S., & Vogl, C. R. (2011). Contribution of farmers' experiments and innovations to Cuba's agricultural innovation system. *Renewable Agriculture and Food Systems*, 26(4), 354-367.
- Llewellyn, R. S., & Brown, B. (2020). Predicting adoption of innovations by farmers: What is different in smallholder agriculture? *Applied Economic Perspectives and Policy*, 42(1), 100-112.
- Maddison, D. (2007). The perception of and adaptation to climate change in Africa (Vol. 4308). World Bank Publications.
- Mbow, C., Smith, P., Skole, D., Duguma, L., & Bustamante, M. (2014). Achieving mitigation and adaptation to climate change through sustainable agroforestry practices in Africa. *Current Opinion in Environmental Sustainability*, 6, 8-14.

- Mpinda, M. O., Bett, H. K., & Muluvi, A. S. (2025). Determinants of adoption of climate-smart agricultural practices among smallholder maize farmers in North East District, Botswana. *Discover Agriculture*, 3(1), 114.
- National Bureau of Statistics (2021), Nigerian Gross Domestic Product Report. (Q4 & Full Year 2020). <https://www.statista.com>
- Nmadu, J. N., Sallawu, H., & Omojoso, B. V. (2015). Socio-economic factors affecting Adoption of Innovations by Cocoa Farmers in Ondo State, Nigeria.
- Nnazor, R. (2005). Adult education in Nigeria: The consequence of neglect and agenda for action. *International Education Journal*, 6(4), 530-536. <http://iej.cjb.net>
- Nwachukwu, L. N., Agwu, N. M., Ezech C. I. & Mbanasor, J. A. (1993). *Evaluation of FADAMA Development Project in Nigeria*. Onitsha: New Nigeria publishers.
- Odoemenem, I. U., & Obinne, C. P. O. (2010). Assessing the factors influencing the utilization of improved cereal crop production technologies by small-scale farmers in Nigeria. *Indian Journal of Science and technology*, 3(1), 180-183.
- Okorie O.J. (2012). Level of Adoption of Improved Cassava Varieties and the Profitability of Cassava Production in Enugu State, Nigeria. Masters' Thesis, Department of Agricultural Economics, Faculty of Agriculture, University of Nigeria, Nsukka.
- Omorie, C.O. & Akara, G.I. (2021). Ensuring Improved Service Delivery to Adult Learners Through Training Programmes For Facilitators in Abia State, Nigeria. *National Council for Adult Education Journal*. 26(1), 133-141.
- Ongachi, W., & Belinder, I. (2025). Agricultural extension as a pathway to livelihood diversification and sustainable development in rural communities: a systematic review. *BMC Agriculture*, 1(1), 6.
- Onyeneke, R. U. (2017). Determinants of adoption of improved technologies in rice production in Imo State, Nigeria. *African Journal of Agricultural Research*, 12(11), 888-896.
- Pandey, S. C., Modi, P., Pereira, V., & Fosso Wamba, S. (2025). Empowering small farmers for sustainable agriculture: a human resource approach to SDG-driven training and innovation. *International Journal of Manpower*, 46(4), 652-675.
- Prajapati, C. S., Priya, N. K., Bishnoi, S., Vishwakarma, S. K., Buvanewari, K., Shastri, S., ... & Jadhav, A. (2025). The role of participatory approaches in modern agricultural extension: bridging knowledge gaps for sustainable farming practices. *Journal of Experimental Agriculture International*, 47(2), 204-222.
- Roasoft calculator (2024), *Sample size calculator*. <http://www.roasoft.com/samplesize.html>
- Rogers, E. (1983). *Diffusion of innovations*. The Free Press, New York.
- Rogers, E. M. (1987). Diffusion of innovations: An overview. Use and impact of computers in clinical medicine, 113-131
- Sadati, S. A., Shaabanali Fami, H., Asadi, A., & Sadati, S. A. (2010). Farmer's attitude on sustainable agriculture and its determinants: A case study in Behbahan County of Iran. *Research Journal of Applied Sciences, Engineering and Technology*, 2(5), 422-427.
- Segnon, A. C., Achigan-Dako, E. G., Gaoue, O. G., & Ahanchédé, A. (2015). Farmer's knowledge and perception of diversified farming systems in sub-humid and semi-arid areas in Benin. *Sustainability*, 7(6), 6573-6592.

- Slavin, R. (2007). *Educational research in an age of accountability*. Boston, MA: Pearson Education.
- Thirtle, C. G., & Ruttan, V. W. (1987). *The role of demand and supply in the generation and diffusion of technical change* (Vol. 21). Taylor & Francis.
- Vasavi, S., Anandaraja, N., Murugan, P. P., Latha, M. R., & Selvi, R. P. (2025). Challenges and strategies of resource poor farmers in adoption of innovative farming technologies: A comprehensive review. *Agricultural Systems*, 227, 104355.
- Wang, F., & Sahid, S. (2024). Content validation and content validity index calculation for entrepreneurial behavior instruments among vocational college students in China. *Multidisciplinary Reviews*, 7(9), 2024187-2024187.
- Yoon, C., Lim, D., & Park, C. (2020). Factors affecting adoption of smart farms: The case of Korea. *Computers in Human Behavior*, 108, 106309.
- Zheng, Q., & Lin, B. (2018). Impact of industrial agglomeration on energy efficiency in China's paper industry. *Journal of cleaner production*, 184, 1072-1080.
- Zossou, E., Arouna, A., Diagne, A., & Agboh-Noameshie, R. A. (2020). Learning agriculture in rural areas: the drivers of knowledge acquisition and farming practices by rice farmers in West Africa. *The Journal of Agricultural Education and Extension*, 26(3), 291-306.