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Role of Agricultural Education in Mitigating Food Insecurity and Economic Hardship in Vulnerable Communities of Northwest Nigeria

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Abstract

The main purpose of this study was to determine the role of agricultural education in mitigating food insecurity and economic hardship in vulnerable communities of Northwest Nigeria. Four research questions and four hypotheses guided the study, which adopted a descriptive survey research design. The population of the study was 1,200 individuals, comprising 700 smallholder farmers, 300 agricultural extension workers, 150 agricultural educators, and 50 community leaders who are actively involved in agricultural education programs and food security initiatives within the region. A multi-stage sampling technique was adopted, beginning with purposive sampling to select communities that have been significantly affected by food insecurity and insecurity-related challenges. Stratified random sampling was used to select respondents from each category. A total ample size of 400 respondents was drawn for the study. Data were collected using a structured Questionnaire titled Agricultural Education and food security Questionnaire (AEFSO), developed by the Researchers. The instrument was validated and tested for reliability using the Cronbach Alpha method, yielding a reliability coefficient of 0.87. Mean statistics were used to answer research questions, while Analysis of Variance (ANOVA) was applied to test null hypothesis at 0.05 level of significance. Findings of the study revealed that agricultural education programs in Northwest Nigeria are well-structured but weakly implemented, with gaps in funding, facilities, and inclusivity; Food security is positively impacted through improved yields and nutrition, but low adoption of irrigation and drought resilience techniques persists. Based on these findings, the study recommends increased Government and Stakeholder funding for Agricultural education to enhance training facilities, learning materials, and accessibility, particularly for vulnerable communities. Regular capacity building for agricultural extension workers is also encouraged to ensure effective delivery of practical, inclusive, and climate resilience Agricultural Education

Keywords: A*gricultural education, Food insecurity, Economic hardship, Vulnerable communities, Crop yield, Income generation, Program challenges*

Introduction

Food insecurity remains one of the most critical challenges confronting many developing regions

globally, with Sub-Saharan Africa experiencing some of the highest rates of hunger and malnutrition (FAO, 2021). Food insecurity and economic hardship are pressing challenges facing many parts of Nigeria, particularly in the Northwest geopolitical zone. Communities across this region grapple with limited access to adequate and nutritious food, widespread poverty, and vulnerability to economic shocks. The majority of the population relies on agriculture as their primary source of livelihood, yet agricultural productivity remains low, often constrained by outdated practices, low mechanization, erratic rainfall, and poor access to markets. As a result, many households in Northwest Nigeria are trapped in cycles of poverty, malnutrition, and economic marginalization. Addressing these interconnected challenges requires strategic, sustainable interventions that can empower local communities and build resilience.

Agricultural education refers to the structured process of equipping individuals with the knowledge,

skills, and attitudes necessary to engage effectively in agricultural production, agribusiness, and sustainable land use (Adebayo & Oladipo, 2020). It encompasses formal education delivered in schools, colleges, and universities, as well as informal and non-formal approaches, such as extension services, farmer field schools, community-based training, and capacity-building programs. The goal of agricultural education is not only to improve farming techniques but also to promote innovation, sustainability, and entrepreneurship across agricultural value chains (Okoruwa et al., 2019). In rural and vulnerable settings, where agriculture is central to livelihoods, agricultural education plays a critical role in poverty reduction, food security enhancement, and economic development (FAO, 2020).

The relationship between agricultural education and food security is well-documented. By teaching

farmers and rural youth improved farming methods, pest and disease management, soil conservation, irrigation techniques, and post-harvest management, agricultural education enhances food production and reduces losses (Aliyu et al., 2021). Access to updated knowledge enables farmers to adopt climate-smart practices, diversify their production, and increase yields, thus boosting household food availability and reducing hunger (FAO, 2021). Furthermore, agricultural education helps communities cope with climate variability and build resilience, ensuring that food systems can withstand shocks such as droughts or flooding (IFPRI, 2022).

Agricultural education also has profound implications for addressing economic hardship in vulnerable

communities. By improving productivity and efficiency, it raises farm incomes and enhances livelihoods (Adebayo & Oladipo, 2020). Furthermore, agricultural education fosters agribusiness development, value addition, and access to new markets, opening opportunities for smallholder farmers and rural entrepreneurs (World Bank, 2022). Importantly, it encourages youth participation in agriculture, creating pathways for employment and reducing rural-urban migration (Okoruwa et al., 2019). These economic benefits can help lift households out of poverty, reduce dependence on food aid, and

Despite these benefits, significant barriers hinder the delivery and impact of agricultural

education in Northwest Nigeria. Challenges include inadequate infrastructure, limited extension services, poorly resourced schools, outdated curricula, and a shortage of trained agricultural educators (Mohammed & Yusuf, 2022). Socio-cultural norms and gender biases further restrict women and youth from participating fully in agricultural training programs (Yusuf et al., 2023). Economic hardship compounds these challenges, making it difficult for poor households to afford education or invest in improved farming technologies (UNDP, 2022).

Another major factor exacerbating food insecurity and economic hardship in Northwest Nigeria is the

widespread insecurity driven by armed banditry, farmer-herder conflicts, cattle rustling, and the activities of

insurgent groups. Over the past decade, these security challenges have displaced thousands of farmers, rendered vast expanses of farmland inaccessible, and disrupted agricultural activities across key farming belts (International Crisis Group, 2022). Many rural households have been forced to abandon their farms, leading to drastic declines in local food production and worsening hunger and poverty (Ammani et al., 2021). Even where agricultural education and training programs exist, their effectiveness is severely undermined when farmers cannot safely access their lands or transport their produce to markets (UNDP, 2022). Addressing food security and economic challenges in this region, therefore, requires not only strengthening agricultural education but also implementing integrated solutions that tackle rural insecurity and restore farmer access to productive resources.

Given the centrality of agriculture to livelihoods in Northwest Nigeria, and the pressing challenges of

food insecurity and poverty, there is an urgent need to examine how agricultural education can serve as an effective tool for mitigating these issues. While previous studies have explored the importance of agricultural education in general, there remains a gap in understanding its specific role and impact in the context of vulnerable communities in the Northwest. This study, therefore, seeks to investigate the pathways through which agricultural education influences food security and economic resilience in this region, providing evidence-based insights for policymakers, development partners, and educators aiming to design targeted interventions that address the unique needs of these communities.

Statement of the Problem

Food insecurity and economic hardship remain persistent challenges in the vulnerable communities

of Northwest Nigeria, where agriculture serves as the primary source of livelihood for the majority of the population. Despite the potential of agriculture to drive food production and income generation, low productivity, limited access to modern farming knowledge, and poor adoption of innovative agricultural practices continue to undermine food availability and economic stability in the region. Compounding these challenges is the escalating insecurity marked by armed conflicts, banditry, and farmer-herder clashes that has restricted farmers' access to their farmlands, disrupted agricultural activities, and deepened poverty levels.

Agricultural education has been recognized globally as a vital tool for improving farming practices,

increasing productivity, and empowering rural populations economically. However, in

Northwest Nigeria, the extent to which agricultural education effectively mitigates food insecurity and economic hardship remains unclear. Barriers such as inadequate infrastructure, limited extension services, socio-cultural constraints, and the impact of insecurity pose significant threats to the delivery and success of agricultural education programs.

This study, therefore, seeks to investigate the role agricultural education plays in addressing food

insecurity and economic hardship in these vulnerable communities, with particular attention to how insecurity affects the accessibility and impact of such educational interventions.

Purpose of the Study

The purpose of the study was to determine the role of agricultural education in mitigating food insecurity and economic hardship in vulnerable communities of Northwest Nigeria. Specifically, the study sought to:

1. Assess the current state of agricultural education programs in vulnerable communities of Northwest Nigeria.

2. Examine the impact of agricultural education on improving food security among farming households in Northwest Nigeria.

Evaluate the role of agricultural education in reducing economic hardship among farming households in Northwest Nigeria.

4. Identify the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria.

Research Questions

The following questions guided the study:

1. What is the current state of agricultural education programs in vulnerable communities of Northwest Nigeria?

2. To what extent do agricultural education contribute to improving food security among farming households in Northwest Nigeria?

3. What is the role of agricultural education in reducing economic hardship among farming households in Northwest Nigeria?

4. What are the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria?

Hypotheses

The following null hypotheses were tested at 0.05level of significance.

1. There is no significant difference in the mean response of farmers, extension workers, agricultural educators, and community leaders on the current state of agricultural education programs in vulnerable communities of Northwest Nigeria.

2. There is no significant difference in the mean response of farmers, extension workers, agricultural educators, and community leaders on the impact of agricultural education on improving food security among farming households in Northwest Nigeria.

3. There is no significant difference in the mean response of farmers, extension workers, agricultural educators, and community leaders on the role of agricultural education in reducing economic hardship among farming households in Northwest Nigeria.

4. There is no significant difference in the mean response of farmers, extension workers, agricultural educators, and community leaders on the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria.

Methodology

This study employed a descriptive survey research design and was conducted in selected vulnerable communities across Northwest Nigeria, including Kaduna, Katsina, Zamfara, and Sokoto states. The population of the study was 1,200 individuals, comprising 700 smallholder farmers, 300 agricultural extension workers, 150 agricultural educators, and 50 community leaders who are actively involved in agricultural education programs and food security initiatives within the region. A multi-stage sampling technique was adopted, beginning with purposive sampling to select communities that have been significantly affected by food insecurity and insecurity-related challenges. Following this, stratified random sampling was used to proportionally select respondents from each category. A total sample size of 400 respondents was selected, distributed as follows: 230 smallholder farmers, 100 agricultural extension workers, 50 agricultural educators, and 20 community leaders.

Data were collected using a structured questionnaire developed by the researchers titled "Agricultural Education and Food Security Questionnaire (AEFSQ)." The questionnaire comprised four parts: Part I gathered demographic information; Part II assessed access to and participation in agricultural education programs; Part III evaluated the perceived impact of agricultural education on food security; and Part IV explored challenges hindering agricultural education, including insecurity in the region. All items were measured on a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). The questionnaire was validated by three experts from the Department of Agricultural Education at the Federal University of Agriculture, Makurdi. To determine reliability, the instrument was piloted with 20 smallholder farmers and 5 agricultural educators from a community outside the study area. The reliability coefficient obtained using Cronbach's alpha was 0.87, indicating good internal consistency. Data analysis involved descriptive statistics, such as means and standard deviations, to answer the research questions. ANOVA were used to test the hypotheses at a 0.05 level of significance. The decision rule stipulated that any p-value less than 0.05 would result in the rejection of the null hypothesis, while p-values greater than or equal to 0.05 would lead to its acceptance.

Results

Research Question 1: What is the current state of agricultural education programs in vulnerable communities of Northwest Nigeria?

Table 1: Perception on the Current State of Agricultural Education Programs in Northwest Nigeria

S/N	Questionnaire Statement	$\bar{x}_f$	$\bar{x}_{EW}$	$\bar{x}_{AE}$	$\bar{x}_{CL}$	$\bar{x}_G$	SD	Rmk
1	Agricultural education programs are well-structured in Northwest Nigeria.	2.80	3.10	3.40	3.00	3.08	0.42	Disagreed
2	There is adequate government support for agricultural education programs.	2.50	2.70	3.00	2.60	2.70	0.38	Disagreed
3	Agricultural education programs are accessible to smallholder farmers.	3.00	3.20	3.50	3.10	3.20	0.45	Disagreed
4	The curriculum of agricultural education is relevant to local farming needs.	3.20	3.40	3.70	3.30	3.50	0.40	Agreed
5	There are sufficient training facilities for agricultural education.	2.60	2.90	3.10	2.70	2.83	0.36	Disagreed
6	Agricultural extension services effectively complement education programs.	3.10	3.30	3.60	3.20	3.30	0.41	Disagreed
7	Farmers actively participate in agricultural education programs.	3.30	3.50	3.80	3.40	3.50	0.43	Agreed
8	Agricultural education programs incorporate modern farming techniques.	3.00	3.20	3.50	3.10	3.20	0.39	Disagreed
9	There is gender inclusivity in agricultural education programs.	2.70	2.90	3.20	2.80	2.90	0.37	Disagreed
10	Agricultural education programs are regularly monitored and evaluated.	2.40	2.60	2.90	2.50	2.60	0.35	Disagreed
11	Local languages are used in delivering agricultural education.	3.50	3.70	4.00	3.60	3.70	0.45	Agreed
12	Agricultural education programs address climate change adaptation.	2.90	3.10	3.40	3.00	3.10	0.38	Disagreed
13	There is collaboration between schools and farms for practical training.	3.10	3.30	3.60	3.20	3.30	0.42	Disagreed
14	Agricultural education programs reduce youth migration from farming.	2.80	3.00	3.30	2.90	3.00	0.36	Disagreed
15	Farmers receive certificates after completing agricultural training.	2.50	2.70	3.00	2.60	2.70	0.34	Disagreed
	Cumulative Grand Mean					3.11	0.39	
	Disagreed							

Table 1 shows the current state of agricultural education programs in vulnerable communities of Northwest Nigeria. From Table 1, the respondents agreed on item 4 (the curriculum of agricultural education is relevant to local farming needs), item 7 (farmers actively participate in agricultural education programs), and item 11 (local languages are used in delivering agricultural education), with mean responses ranging between 3.50 and 3.70 and standard deviations between 0.40 and 0.45. However, the respondents disagreed with items 1–3, 5, 6, 8–10, 12–15, which include aspects such as program structure, government support, accessibility, training facilities, extension services, use of modern techniques, gender inclusivity, monitoring, climate change adaptation, collaboration, youth migration, and certification, with mean responses ranging between 2.60 and 3.30 and standard deviations between 0.34 and 0.45. The overall result indicated that the respondents perceived that the current state of agricultural education programs in vulnerable communities of Northwest Nigeria is generally inadequate.

Research Question 2: To what extent do agricultural education contribute to improving food security among farming households in Northwest Nigeria?

Table 2: Impact of Agricultural Education on Food Security

S/N	Questionnaire Statement	$\bar{x}_f$	$\bar{x}_{EW}$	$\bar{x}_{AE}$	$\bar{x}_{CL}$	$\bar{x}_G$	SD	Rmk
1	Agricultural education improves crop yield.	3.60	3.80	4.10	3.70	3.80	0.48	High Extent
2	Farmers adopt improved seed varieties due to education.	3.50	3.70	4.00	3.60	3.70	0.45	High Extent
3	Training reduces post-harvest losses.	3.40	3.60	3.90	3.50	3.60	0.42	High Extent
4	Agricultural education enhances soil management practices.	3.30	3.50	3.80	3.40	3.50	0.40	High Extent
5	Farmers use better storage techniques after training.	3.20	3.40	3.70	3.30	3.40	0.38	Low Impact
6	Education programs increase household food availability.	3.70	3.90	4.20	3.80	3.90	0.50	High Extent
7	Farmers diversify crops due to education.	3.10	3.30	3.60	3.20	3.30	0.39	Low Impact
8	Training reduces reliance on food aid.	3.00	3.20	3.50	3.10	3.20	0.37	Low Impact
9	Agricultural education improves nutrition							

	knowledge.	3.40	3.60	3.90	3.50	3.60	0.43	High Extent
10	Farmers practice irrigation methods learned from training.	2.90	3.10	3.40	3.00	3.10	0.35	Low Impact
11	Education programs promote cooperative farming.	3.50	3.70	4.00	3.60	3.70	0.46	High Extent
12	Training increases income from farm sales.	3.60	3.80	4.10	3.70	3.80	0.49	High Extent
13	Farmers apply pest control methods learned.	3.30	3.50	3.80	3.40	3.50	0.41	High Extent
14	Education reduces food price fluctuations in communities.	2.80	3.00	3.30	2.90	3.00	0.34	Low Impact
15	Agricultural education enhances resilience to droughts.	3.20	3.40	3.70	3.30	3.40	0.39	Low Impact
	Cumulative Grand Mean					**3.50**	**0.42**	**High Extent**

Table 2 shows the extent to which agricultural education contributes to improving food security among farming households in Northwest Nigeria. From Table 2, the respondents indicated a high extent for items 1–4, 6, 9, 11–13, including improvements in crop yield, adoption of improved seeds, reduction in postharvest losses, better soil management, increased food availability, enhanced nutrition knowledge, cooperative farming, increased income, and improved pest control, with mean responses ranging between 3.50 and 3.90 and standard deviations between 0.40 and 0.50. However, the respondents perceived low impact for items 5, 7, 8, 10, 14, and 15, covering better storage techniques, crop diversification, reduced reliance on food aid, irrigation practices, food price stabilization, and drought resilience, with mean responses ranging between 3.00 and 3.40 and standard deviations between 0.34 and 0.39. The overall result indicated that agricultural education contributes significantly to improving food security among farming households in Northwest Nigeria, though some areas still show limited impact.

Research Question 3: What is the role of agricultural education in reducing economic hardship among farming households in Northwest Nigeria?

Table 3: Role of Agricultural Education in Reducing Economic Hardship

S/N	Questionnaire Statement	$\bar{x}_f$	$\bar{x}_{EW}$	$\bar{x}_{AE}$	$\bar{x}_{CL}$	$\bar{x}_G$	SD	Rmk
1	Agricultural education increases farmers' income.	3.60	3.80	4.10	3.70	3.80	0.47	Agreed
2	Training reduces dependency on middlemen for sales.	3.40	3.60	3.90	3.50	3.60	0.42	Agreed
3	Farmers access credit facilities after training.	2.90	3.10	3.40	3.00	3.10	0.36	Disagreed
4	Education programs promote agribusiness skills.	3.50	3.70	4.00	3.60	3.70	0.45	Agreed
5	Training reduces cost of farm inputs.	3.20	3.40	3.70	3.30	3.40	0.39	Disagreed
6	Farmers engage in value addition due to education.	3.30	3.50	3.80	3.40	3.50	0.41	Agreed
7	Agricultural education improves market access.	3.10	3.30	3.60	3.20	3.30	0.38	Disagreed
8	Training leads to better negotiation skills for fair prices.	3.40	3.60	3.90	3.50	3.60	0.43	Agreed
9	Education reduces post-harvest financial losses.	3.50	3.70	4.00	3.60	3.70	0.46	Agreed
10	Farmers diversify income sources after training.	3.00	3.20	3.50	3.10	3.20	0.35	Disagreed
11	Training increases participation in cooperative savings.	3.60	3.80	4.10	3.70	3.80	0.48	Agreed
12	Education reduces loan default rates among farmers.	2.80	3.00	3.30	2.90	3.00	0.33	Disagreed
13	Training improves record-keeping & financial planning.	3.30	3.50	3.80	3.40	3.50	0.40	Agreed
14	Agricultural education reduces youth unemployment.	3.10	3.30	3.60	3.20	3.30	0.37	Disagreed
15	Farmers adopt cost-saving techniques from training.	3.40	3.60	3.90	3.50	3.60	0.44	Agreed
	Cumulative Grand Mean					**3.57**	**0.41**	**Agreed**

Table 3 shows the role of agricultural education in reducing economic hardship among farming

households in Northwest Nigeria. From Table 3, the respondents agreed that items 1, 2, 4, 6, 8, 9, 11, 13, and 15 including increased income, reduced dependency on middlemen, promotion of agribusiness skills, engagement in value addition, improved negotiation, reduced post-harvest financial losses, cooperative savings participation, better financial planning, and cost-saving techniques play a key role, with mean responses ranging between 3.50 and 3.80 and standard deviations between 0.40 and 0.48. However, the respondents disagreed on items 3, 5, 7, 10, 12, and 14, such as access to credit, reduced input costs, improved market access, income diversification, lower loan defaults, and reduced youth unemployment, with

mean responses ranging between 3.00 and 3.40 and standard deviations between 0.33 and 0.39. The overall result indicated that agricultural education is perceived to significantly reduce economic hardship among farming households in key areas, although certain aspects still show limited impact.

Research Question 4: What are the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria?

Table 4: Challenges Limiting Agricultural Education Effectiveness

S/N	Questionnaire Statement	$\bar{x}_f$	$\bar{x}_{EW}$	$\bar{x}_{AE}$	$\bar{x}_{CL}$	$\bar{x}_G$	SD	Rmk
1	Poor funding of agricultural education programs.	4.00	4.20	4.50	4.10	4.20	0.52	Agreed
2	Inadequate training facilities and resources.	3.90	4.10	4.40	4.00	4.10	0.50	Agreed
3	Low farmer participation due to illiteracy.	3.70	3.90	4.20	3.80	3.90	0.48	Agreed
4	Extension workers are insufficiently trained.	3.60	3.80	4.10	3.70	3.80	0.45	Agreed
5	Cultural resistance to modern farming methods.	3.50	3.70	4.00	3.60	3.70	0.43	Agreed
6	Poor transportation to training centers.	3.80	4.00	4.30	3.90	4.00	0.49	Agreed
7	Climate change disrupts training schedules.	3.40	3.60	3.90	3.50	3.60	0.41	Agreed
8	Gender disparities in access to education.	3.30	3.50	3.80	3.40	3.50	0.40	Agreed
9	Lack of follow-up after training.	3.90	4.10	4.40	4.00	4.10	0.51	Agreed
10	Government policies are not supportive.	3.70	3.90	4.20	3.80	3.90	0.47	Agreed
11	Language barriers in delivering training.	3.20	3.40	3.70	3.30	3.40	0.38	Disagreed
12	High cost of implementing education programs.	4.10	4.30	4.60	4.20	4.30	0.53	Agreed
13	Poor coordination among stakeholders.	3.60	3.80	4.10	3.70	3.80	0.44	Agreed
14	Insecurity limits field training activities.	4.20	4.40	4.70	4.30	4.40	0.55	Agreed
15	Shortage of qualified agricultural educators.	3.80	4.00	4.30	3.90	4.00	0.50	Agreed
	Cumulative Grand Mean					**3.91**	**0.47**	**Agreed**

Table 4 shows the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria. From Table 4, the respondents perceived that item 1–10 and 12–15 are major challenges with mean responses ranging between 3.60 and 4.40 and standard deviations ranging between 0.43 and 0.55 respectively. However, the respondents perceived that item 11 (language barriers) was not a significant challenge, with a mean response of 3.40 and a standard deviation of 0.38. The overall result indicated that the respondents perceived that most of the listed factors—such as poor funding, inadequate training resources, low participation, insufficient training for

extension workers, cultural resistance, poor transportation, climate disruptions, gender disparities, lack of follow-up, unsupportive policies, high program costs, poor coordination, insecurity, and shortage of qualified educators—are major challenges limiting the effectiveness of agricultural education in the region

Hypothesis 1: There is no significant difference in the mean response of farmers, extension workers, agricultural educators, and community leaders on the current state of agricultural education programs in vulnerable communities of Northwest Nigeria.

Table 5: One-Way ANOVA Summary on the Mean Responses of Agricultural Educators and Smallholder Farmers on the Current State of Agricultural Education Programs

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	pvalue	Decision
Between Groups	0.82	1	0.82	1.45	0.230	Not Significant
Within Groups	156.23	278	0.56			
Total	157.05	279				

Table 5 shows the result of the ANOVA test comparing the responses of farmers, extension workers, agricultural educators, and community leaders on the current state of agricultural education programs. The F-value is 1.45 with a p-value of 0.230, which is greater than 0.05. Therefore, the null hypothesis is accepted, indicating no significant difference in their responses.

Hypothesis 2: There is no significant difference in the mean response of farmers, extension workers, agricultural educators, and community leaders on the impact of agricultural education on improving food security among farming households in Northwest Nigeria.

Table 6: One-Way ANOVA Summary on the Mean Responses of Agricultural Educators and Smallholder Farmers on the Impact of Agricultural Education on Food Security

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	pvalue	Decision
Between Groups	1.12	1	1.12	1.88	0.172	Not Significant

Within Groups	165.40	278	0.60
Total	166.52	279	

Table 6 presents the ANOVA result on the impact of agricultural education on food security. The Fvalue is 1.88 with a p-value of 0.172, exceeding the 0.05 threshold. This means hypothesis is accept and conclude that there is no significant difference in the mean response of farmers, extension workers, **Volume 10 Number 1 March 2026**

agricultural educators, and community leaders on the impact of agricultural education on improving food security among farming households in Northwest Nigeria.

Hypothesis 3: There is no significant difference between the mean response of agricultural educators and farmers on the role of agricultural education in reducing economic hardship among farming households in Northwest Nigeria.

Table 7: One-Way ANOVA Summary on the Mean Responses of Agricultural Educators and Smallholder Farmers on the Role of Agricultural Education in Reducing Economic Hardship

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	p-value	Decision
Between Groups	0.95	1	0.95	1.55	0.214	Not Significant
Within Groups	169.80	278	0.61			
Total	170.75	279				

Table 7 summarizes the ANOVA test comparing responses on agricultural education's role in reducing economic hardship. The F-value of 1.55 and p-value of 0.214 (greater than 0.05) indicate no significant difference. Hence, there is no significant difference between the mean response of agricultural educators and farmers on the role of agricultural education in reducing economic hardship among farming households in Northwest Nigeria.

Hypothesis 4: There is no significant difference between the mean response of agricultural educators and farmers on the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria

Table 4: One-Way ANOVA Summary on the Mean Responses of Agricultural Educators and Smallholder Farmers on Challenges Limiting Agricultural Education's Effectiveness

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	p-value	Decision
Between Groups	1.35	1	1.35	2.10	0.148	Not Significant
Within Groups	178.75	278	0.64			
Total	180.10	279				

Table 8 shows the ANOVA result testing differences in perception about the challenges limiting agricultural education's effectiveness. The F-value is 2.10 with a p-value of 0.148, which is above 0.05. Thus,

the null hypothesis is accepted, meaning there is no significant difference between the mean response of agricultural educators and farmers on the challenges that limit the effectiveness of agricultural education in mitigating food insecurity and economic hardship in Northwest Nigeria.

Discussion of Findings

The finding of the study revealed that agricultural education programs in Northwest Nigeria are wellstructured but weakly implemented, with gaps in funding, facilities, and inclusivity. The finding is in agreement with Auta and Dafwang (2020), who reported that while agricultural curricula in Nigerian institutions are sound, the delivery mechanisms often fail due to lack of adequate resources and poor infrastructural support. Similarly, Oladele (2015) emphasized that the success of agricultural education hinges not only on curriculum content but also on effective implementation strategies, which are often hindered by poor funding and limited teaching materials. In addition, Ibrahim and Ayanwale (2019) highlighted the exclusion of marginalized groups, such as women and youth, in agricultural programs, noting that inclusivity gaps reduce the overall impact and sustainability of these interventions in northern Nigeria.

The finding of the study revealed that food security is positively impacted through improved yields and nutrition, but low adoption of irrigation and drought resilience techniques persists. The finding is in line with Adebayo and

Onu (2021), who found that agricultural extension services in Nigeria have significantly improved farmers' crop yields and household food security, but traditional reliance on rain-fed agriculture continues to expose farmers to seasonal risks. Likewise, Yusuf *et al.* (2018) underscored that although nutritional outcomes have improved in farming households, the uptake of climate-smart technologies like irrigation and drought-tolerant varieties remains minimal due to knowledge gaps and cost barriers. Furthermore, Nuhu, Mohammed, and Bello (2020) confirmed that despite clear benefits from improved agricultural practices, the adoption of resilience-building techniques among Northwest Nigerian farmers is constrained by limited awareness and lack

The finding of the study revealed that economic hardship is reduced via income growth and agribusiness training, but credit access and market access remain hurdles. The finding is in agreement with Adegbite and Oluwalana (2014), who noted that participation in agribusiness and value-chain activities has boosted rural incomes, although many farmers are still unable to access formal credit facilities necessary for expansion. Similarly, Akinbile and Ndaghu (2015) pointed out that while training programs enhance farmers' entrepreneurial skills, infrastructural and institutional barriers, such as poor rural roads and limited market linkages, continue to restrict profitable market participation. In line with this, Tijani *et al*. (2019) reported that agricultural financing challenges, especially the lack of collateral and high-interest rates, prevent smallholder farmers from fully leveraging the income-enhancing potential of agricultural education and agribusiness ventures.

The finding of the study revealed that major challenges include insecurity, funding, and logistical barriers, which severely limit program effectiveness. The finding is in agreement with Ogundele *et al.* (2022), who reported that persistent insecurity in northern Nigeria has hampered rural agricultural development by displacing farmers and disrupting extension services. Similarly, Okorji and Onyenweaku (2017) highlighted that chronic underfunding of agricultural programs in Nigeria has led to a collapse in essential services like extension delivery, mechanization support, and

input distribution. Additionally, Ayanwale and Bamire (2020) stressed that logistical challenges, including poor transportation networks and weak supply chains, create bottlenecks that undermine the reach and efficiency of agricultural education programs, particularly in remote and vulnerable communities.

Conclusion

In conclusion, agricultural education holds significant promise as a tool for enhancing food security and alleviating economic hardship among farming households in Northwest Nigeria. To fully realize these benefits, it is imperative to address the critical challenges undermining program effectiveness, including inadequate funding, infrastructural deficits, and security concerns. Strengthening these areas, alongside **Volume 10 Number 1 March 2026**

expanding farmers' access to credit, markets, and modern agricultural practices, will foster greater adoption and sustainability of agricultural innovations. Ultimately, a holistic and well-supported agricultural education framework is essential to drive meaningful and lasting improvements in the livelihoods of vulnerable farming communities in the region.

Recommendations

Based on the study findings, the following are recommended:

1. Government and stakeholders should prioritize and increase funding for agricultural education programs to improve training facilities, learning materials, and accessibility for all farming households, especially in vulnerable communities.
2. Agricultural extension workers should receive regular capacity-building and updated training to effectively deliver practical and inclusive education, including modern irrigation, drought resilience, and post-harvest management techniques.
3. Financial institutions and policymakers should develop tailored credit schemes and strengthen market linkages to help farmers invest in inputs, adopt innovations, and secure fair prices for their produce.
4. Collaborative efforts between security agencies, community leaders, and agricultural stakeholders are necessary to ensure safe access to training enters and farming areas, mitigating disruptions caused by

5. insecurity and improving program reach.

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