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Impact of Insecurity on Crop Productivity of Rural Women in Northeastern Nigeria

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Abstract

The study analysed the impact of insecurity on crop productivity of rural women in Northeastern Nigeria *Purposive, multistage and random sampling methods were employed for the selection of 403 respondents in the study area. Data were collected from cross-sectional survey with the aid of well-structured questionnaires along with interviews. The data were analysed using descriptive statistics and the Structural Equation Model (SEM). The results revealed that a larger proportion (48.39%) of the women fell between 31 and 40 years, married (54.09%) with household size of 1-10 persons (45.16%). Also, 31.51% of respondents had an annual income of 110,000-200,000 naira. 52.00% had attained school ranging from primary to university level, 36.48% had the farming experience of 6-10. Further, the SEM showed that 1% increase in an attack by kidnapping, farmer-harder conflict and Boko haram led to a decrease in productivity by 89.00% 76.00% and 64.00%, respectively. Conclusively, the findings revealed that the productivity of rural women was significantly affected by insecurity in the study area. This study therefore, recommends that the government should provide up-to-date surveillance equipment, and appropriate training to ensure that security personnel are well-equipped to safeguard women farmers in the study area. This will require concerted efforts from government, Non-Governmental Organisations (NGOs), community leaders, and other stakeholders to create conducive environment for sustainable agricultural productivity*

Keywords: Insecurity, Productivity, Structural Equation Model Rural Women.

INTRODUCTION

The contribution of women in agricultural development cannot be over emphasised. According to the United Nations (2020), female farmers make up between 80%, 60% and 40% of the agricultural labour force in Asia, Africa, and Latin America, respectively. Most of the food that households consume in African continent comes from the efforts of female farmers (United Nations, 2020). Women are heavily involved in essential parts of food production, including planting, harvesting, food processing, marketing activities, and small animal husbandry (Ugwu, 2019). In the agricultural sector, women have been recognised for their achievements on a global basis as the world's leading producers of food crops, where they have produced 50% of the world's food supply (Akokuwebe *et al.*, 2021). The projected population of Nigeria reported by NBS, (2021) in 2021 was 218,541,212 at 2.41 percent growth

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rate as of 2006 (NPC, 2006). Women make up roughly 50% of the population and they play a crucial role in all farm-related activities from land preparation to final consumption (Wanjiru, 2021). Hence, rural women are enormously prolific in agricultural production.

The globe has experienced violent conflicts, most notably in the Middle East, Afghanistan, Iraq, Syria, and parts of Africa, as well as the proliferation of civil wars within countries, leading to disharmony among several communities (Pettersson *et al.,* 2021). This scenario ultimately disrupts the labour force input contribution by women thereby lowering productivity and by extension the total farm output (Amodoi and Di-Maio, 2018). These incessant conflicts have had devastating effects on inputs access and utilisation among farming communities (Le *et al*., 2022). Further to this affirmation, FAO (2020) therefore, noted that 70.80 million people were forcefully displaced globally, with 26.40 million from Africa. Of this total population, women accounted for more than half of all displaced persons. However, 2.6 million Persons in North East Nigeria were internally displaced in 2021 (UNICEF, 2023). For instance, in Borno State alone, 4.5 million metric tonnes of wheat were recorded as a decreased from the country's annual consumption. Consequently, 258.30 billion pounds were spent on importing wheat in first quarter of the year 2020 (AFDB, 2021). In the same vein, Elebeke (2022) pointed out those foreign investments in Nigeria had declined by 81.46 percent as a result of conflicts. In this regard, conflict had a negative influence on women's participation in agricultural production.

Global Agricultural Productivity (GAP) (2022) reported that, agricultural productivity growth is the major source of global agricultural output. As Total Factor Product (TFP) grows, land expansion may be regulated, and fewer inputs are required per acre for optimal agricultural production. Further to this, the report documented that, productivity in smallholder farming systems, has been steadily declining over the last decade as a result of catastrophic weather occurrences and insecurity. However, USDA (2022) observed that, there was a remarkable increase in agricultural productivity at an average of 1.12 percent annually from 2011- 2020. This gave a considerable reduction from the average rate of 1.99 percent from 2000-2010. In view of the above analysis, there was a decline in agricultural productivity globally.

Therefore, insecurity is one of the most devastating issue that upset the peaceful cohabitation of populations in Sub-Saharan Africa, and it has been associated with instability and severe economic setback (Fang *et al.,* 2020). Women are excessively affected by these forms of insecurity challenges, African norms where hereditary and cultural practices accord male undue advantages of rights to land pose another barrier. This similar trend was also reported by Ojo *et al.* (2018) in the northern eastern part of Nigeria where studies in Borno and Gombe State were carried out, apparently indicating that insurgency had a negative effects on crop production.

Similarly several research works were conducted by Ja'afar-Furo *et al.* (2018) who reported that, violent conflicts in Nigeria have also resulted in economic setback, loss of life, destruction of crops and animals, and societal instability. Violence has both physical and physiological effects on human abilities (Biliyaminu, 2019). The menace of insecurity had a negative influence on agricultural efficiency and the full participation of crop producers. There is therefore the need to explore the impact of impact of insecurity on the productivity of rural women in crop production in Northeast Nigeria. The study also attempts to proffer a solution to the immediate problem of decline in agricultural output.

Hypotheses of the Study

The following hypotheses were tested in the study:

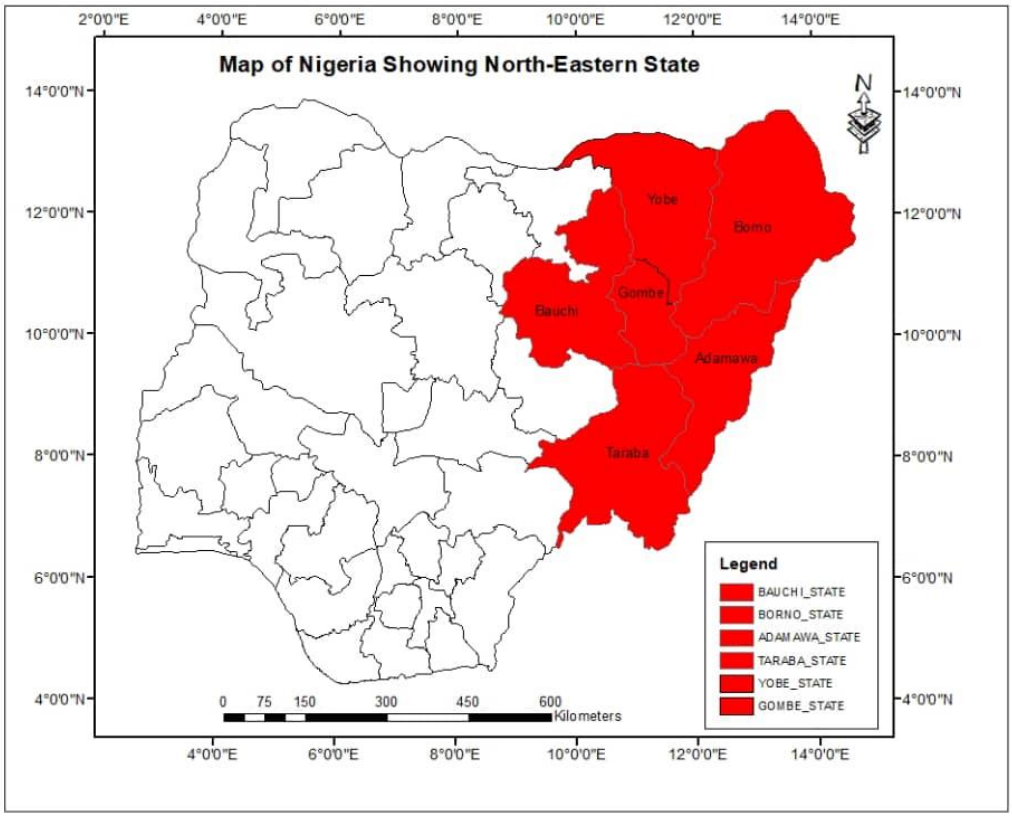
H_0: Insecurity does not significantly influenced crop productivity of rural women in Northeastern

H_1: Insecurity significantly influenced crop productivity of rural women in Northeastern

METHODOLOGY

The Study Area

This study was conducted in Northeastern Nigeria; the North-East geopolitical zone has about six States that is Borno, Adamawa, Yobe, Taraba, Gombe and Bauchi state. This zone lies between the vast and expense of the Sahara and dense tropical rain forest alone the Guinea cost with latitude of 28^0, 6^0N, 1^0 44^0 3^0N, and latitude 44^0 8^0, E 38^0, and 14E. Delimiting the area is Cameroon on the east, Niger and Chad republics on the north, North-Central Nigeria on the west, and South- Eastern Nigeria on the south. The geographical area constitutes Borno, Adamawa, Yobe, Taraba, Gombe and Bauchi State. Since the State creation in 1996 the most distinctive characteristics features of this zone are geographical diversity, it contains high mountains and dissected plains and the climate is essentially continental in nature; its vegetation varies from dense guinea savannah with thorny acacias and low annual grasses. The soil varied in nature, others are well suited for irrigation, cultivation of crops and rearing animals. However, it has high number of illiteracies with about 7.23% literacy among the populace the lowest in Nigeria (Amaza, 2017). 2.6 million Persons in North East Nigeria were internally displaced in 2021 (UNICEF, 2023).



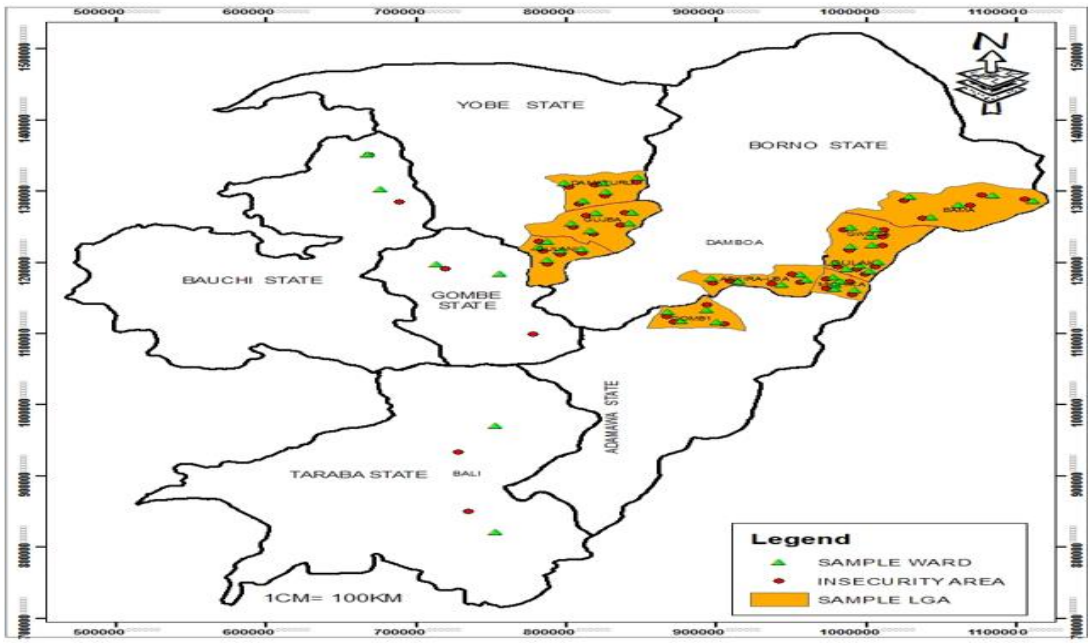


Fig. 1: Map of Northern Nigeria showing the Study area

Sources and sample size

Primary data were collected from cross-sectional survey with the aid of well-structured questionnaires along with interviews. The questionnaire was designed for information on inputs and output as well as the socioeconomic characteristics of the respondents via Kobo Collect installed on mobile phone. The questionnaire was administered personally to guarantee that it was thoroughly optimised and that the sample framework was not tampered with. Therefore, the sample size was determined to be 403

Sampling Procedure and data collection

This study employed purposive, multistage and random sampling methods was employed for the selection of 403 respondents in the study area, and firstly, purposive selection of three States where insecurity was more pronounce specifically Adamawa, Borno and Yobe States. Secondly involved purposive selection of four (4) Local Government Areas from each state based on agricultural zones within the States, this is to have complete coverage where the productivity of rural women was highly affected by insecurity. The thirdly involved the purposive selection of three (3) wards from each Local Government Areas making a total of thirty-six (36) wards considering devastating effects of insecurity. Finally, random sampling and the snowball method were employed for the selection of respondents proportionately from each ward making the total of 403 respondents who actively engaged in crop production.

Data Analysis of the data

The data for the study were analysed using two analytical methods: Descriptive statistics and the Structural Equation Model (SEM).

Descriptive statistics

Descriptive statistics were adopted to determine the socioeconomic characteristics of the rural women who were involved in crop production in the study areas. The demographic qualities considered were age, marital status, level of education and experience using frequency distribution, percentages, mean, standard deviation, types of crops grown and farm size.

The Structural Equation Model (SEM)

The Structural Equation Model (SEM) is a multivariate statistical technique adopted to analyse the magnitude of the structural relationship or scientific investigations to test and evaluate multivariate causal relationships. SEM constitute of two components; confirmatory factor analysis; this is to evaluate the latent psychological traits, like attitude and satisfaction (Galton 1888; Pearson and Lee 1903; Spearman 1904). While Path analysis evaluates biometrics which aims to discover the causal relationship among multiple variables using the Adanco or Amos diagram (Wright, 1921), SEM was adopted by Biliyaminu (2019) to analysed impact of Boko Haram insurgence on students' performance in Adamawa State, Nigeria. In this regard, this study therefore adopted the Structural Equation Model (SEM) to handle the impact of insecurity on the productivity of rural women in crop production.

$Y^* = X_1\beta_1 + \varepsilon^*$ ……...…… (1)

The Structural Equation Model (SEM) can therefore be expressed further as:

$Y = X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + X_5\beta_5 + X_6\beta_6 + \varepsilon.$ ..... ε^* (2)

Where:

Y^* = output (Endogenous/dependent variables Y)

X^* = Insecurity (i.e. inputs: Exogenous/independent variables Xs)

$\beta^* = \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$, (parameter estimates)

ε^* =Error Terms

Dependent variables

PRD = Productivity

Explanatory variables

X_1 =Boko haram

X_2= Banditry

X_3=Kidnapping

X_4=farmer-harder conflict

RESULTS AND DISCUSSION

The analysis of the socioeconomic characteristics of women engaged in crop production in the Northeast region of Nigeria, as derived from a field survey conducted in 2023, reveals a nuanced demographic composition. Among the respondents, the age distribution indicates a multifaceted involvement of women across different life stages. Subsequently, the study progresses to delineate the spectrum of crops cultivated by these women.

Table 1: **Distribution of respondent Based on Marital Status, Age, and Family Size.**

	Frequency	Percentage	Mean
Marital Status			
Single	34	8.44	
Married	218	54.09	
Widow	96	23.82	
Divorce	37	9.18	
Separated	18	4.47	
Age of respondents			
< 20	7	1.74	
21-30	90	22.33	
31- 40	195	48.39	36.362
41-50	104	25.81	
Family Size			
0-5	128	31.76	
6-10	182	45.16	8.000
11- 15	86	21.34	
16- 20	6	1.49	
Total	**403**	**100.00**	

Source: Field survey, 2023

The analysis of the marital status of women engaged in crop production in the Northeast region of Nigeria, based on the field survey conducted in 2023, illuminates the diverse relational landscapes within this demographic group. A notable 8.44% of the women identified as single, signifying a proportion of the agricultural workforce that is not currently in a marital union. The largest contingent, constituting 54.09%, is classified as married, indicating that the majority of women actively involved in crop production are within the bounds of matrimonial partnerships. This finding is in consonant with Umar *et al.* (2023) who reported that the majority of women involved in farming are married. Hence, married women are highly committed to domestic and other responsibilities; married individuals tend to be more serious and focused on agricultural activities than unmarried.

Widowhood is a significant factor, with 23.82% of respondents falling into this category, underscoring the prevalence of women who may be managing agricultural responsibilities independently due to the loss of a spouse. This finding is in agreement with Batha (2022) who stated that war and other factors contributed to a sharp rise in widowhood, an uncountable number of the widow were deprived of free access to social amenities and assets, including land and property that they jointly possessed with her late spouse. This implies that widows have had psychiatric illnesses and poor mental health due to isolation and depravity. This may likely affect their performance and participation in farming activities. Moreover, the relatively high percentage of widows emphasises the vulnerability of this demographic group and the need for targeted support mechanisms to enhance their resilience and livelihood opportunities. In addition to that, 9.18% of the women reported being divorced, while 4.47% stated that they were separated. The results of this study is consistent with the findings of Fadipe *et al.* (2022), who noted that these figures emphasised the complex nature of marital relationships in the context of a woman working for her daily needs, implying the existence of specific problems and support requirements connected with different marital situations. This highlights the importance of considering marital status changes as factors influencing women's access to resources, land tenure, and decision-making power within agricultural households. Policies aimed at empowering rural women should account for the diversity of marital statuses and their implications for the economic empowerment of women, social inclusion, and overall well-being. Recognition of these differences is crucial for the formulation of targeted interventions and policies that address the specific circumstances of single, married, widowed, divorced and separated women engaged in crop production. Policy maker and development programs aimed at empowering rural women should account for the diversity of marital statuses and their implications for economic empowerment of women, social inclusion, and overall well-being and productivity of women in the agricultural sector.

Age Distribution of the Rural Women Crop Farmers

A relatively modest 2.02% of respondents fall within the >20 age group, indicating a lower representation of younger women in active crop production. In contrast, 22.33%, fall within the 21-30 age range, suggesting a substantial presence of younger women entering the agricultural sector. Notably, the 31-40 age brackets comprises the largest proportion, accounting for 48.39% of respondents, indicating a core group of experienced practitioners actively contributing to crop production. This finding is in harmony with Tunde and Tilakasiri (2020) who stated that the active and productive individuals in agricultural practices are between the ages of 15 and 46. The results further revealed that the Mean age group of rural women engaged in crop production was 36.36 years. In contrast to the findings of Nwaiwu *et al.* (2013) were of the opinion that the mean aged group of rural women involved in the cultivation of vegetables was 44 years. This is because crop production requires physically fit workers for farming, which increases output production for the family and can have an impact on decisions that improve crop production.

The demographic landscape continues with 25.81% in the 41-50 age groups, reflecting sustained engagement into middle age. While only 1.74% is above 50, implying a lower representation of older women in active agricultural pursuits. This implies that age is one of the most important variables that may deter agricultural households from achieving their goals. These findings are in line with research results conducted by Dlova *et al*. (2004) revealed that age also has a favorable impact on long-term family food supply since younger individuals are better at implementing new farming techniques than older people. The older farmer may have the experience but the physical strength may not be adequately enough to achieved their goal, hence productivity of farms declines with ageing farmers. This distribution highlights the diverse age structure within the surveyed population, indicating the need for tailored approaches to address the varying life stages and potential roles of rural women in agriculture. The predominance of respondents in the 31-40 age group suggests that women in this group are particularly active in crop production activities, potentially representing a crucial demographic for agricultural development interventions. Understanding the specific needs, challenges, and aspirations of women within different age brackets is essential for designing effective policies and programs aimed at enhancing their participation, productivity, and well-being in the agricultural sector. The presence of respondents across a wide age spectrum highlights the intergenerational dynamics at play within rural farming communities. Younger women (<30 years old) may bring fresh perspectives and innovative ideas to agricultural practices, while older women (>50 years old) may possess valuable traditional knowledge and experiences. Integrating intergenerational approaches into agricultural development initiatives can foster knowledge exchange, skills transfer, and mentorship opportunities, thereby strengthening the resilience and sustainability of rural livelihoods.

Family Size of the Rural Women Crop Farmers

The examination of the family size among women engaged in crop production in the Northeast region of Nigeria, as gleaned from a broad field survey conducted in 2023, sheds light on the household structures within this demographic. The data reveals a diverse range of family sizes, providing valuable insights for understanding the social and economic contexts in which these women operate. A significant proportion, comprising 31.76% of respondents, falls within the range of 0-5 family size, indicating number of women managing relatively small household. This indicate that rural women maximises their output with the available labour force. Understanding the implications of family size on resource allocation, labour distribution, and decision-making processes is essential for designing targeted interventions that support the well-being and resilience of rural women and their families. The higher the family size the lesser will be spent on workmanship. A study conducted by Umar *et al.* (2023) and Fadipe *et al.* (2022) reported that family labour is critical, in comprehending to nature and strength of the farm size-productivity connection. When family labour is measured in terms of market wage rate rather than marginal output, the relationship between farm size and yield and Total Factor Productivity will be maximised. The category of 6-10 family size is the most prevalent, accounting for 45.16% of respondents, representing a significant number of active women responsible for medium-sized families. As a result, large family sizes can successfully establish household labour, implying that labour costs would be substantially decreased. On the other hand, Dery and Dongzagla (2020) pointed out that female farmers rely on hired labour, and a large amount of money will be spent on manpower. Additionally, 21.34% of respondents report family sizes within the 11-15 range, reflecting a sizable portion of women managing larger households. The 16-20 and above 20 categories represent smaller percentages 1.49% and 0.25% respectively, indicating that a minority of women are responsible for relatively larger families. These findings underscore the importance of recognising the diverse family structures and sizes within the female

agricultural workforce. Policymakers and development programs should consider the varying needs and challenges associated with different family sizes when designing interventions and support mechanisms. Modifying initiatives to address the specific circumstances of women managing small, medium, and large families is crucial for promoting the well-being and productivity of women engaged in crop production in the Northeast region. Understanding the implications of family size on resource allocation, labour distribution, and decision-making processes is essential for designing targeted interventions that support the well-being and resilience of rural women and their families.

The presence of respondents across different family size categories stresses the need for personalised approaches to address the specific challenges and opportunities associated with varying household sizes. Larger families may face greater pressure on resources such as food, water, and land, necessitating strategies to enhance household food security, income diversification, and access to social services. Moreover, smaller families may require support to overcome economic vulnerabilities and strengthen social networks within their communities. Recognising the diverse family size profiles revealed by this data, policymakers and development practitioners can devise general strategies to promote the holistic development and resilience of rural households. This may involve investments in livelihood diversification programs, social protection schemes, and family planning initiatives tailored to the specific needs and circumstances of rural women and their families. Additionally, initiatives aimed at strengthening community cohesion and social capital can enhance collective resilience and foster mutual support networks within rural communities.

Table 2: **Distribution of Respondents According to Income, Education Level, Farming Experience and Farm Size in the Study Area.**

	Frequency	Percentage	Mean
Annual income(NGN)			
10,000-100,000	45	11.17	
110,000-200,000	127	31.51	
210,000 -300,000	123	30.52	
210,000 -300,001	2	0.50	229,553.35
310,000-400000	85	21.09	
>410,000	21	5.21	
Level of Education			
Primary (6 years)	65	16.13	
Secondary (12 years)	87	21.59	6
NCE/Diploma (15 years)	44	10.92	
University (16 years)	12	2.98	
Illiterate (0 years)	195	48.39	
Years of Experience			
<1	6	1.49	
1-5	125	31.02	
6-10	147	36.48	8.199
11-15	102	25.31	
16 – 20	22	5.46	
Farm size			
<1	49	12.16	
1-2	128	31.76	2.766
3-4	185	45.91	
5-6	37	9.18	
7-8	1	0.25	
>8	3	0.74	

Source: Field survey, 2023

Annual income of the Rural Women Crop Farmers

The distribution of respondents by total annual income provides an important understanding

of the economic status and livelihoods of rural women engaged in crop production in Northeast Nigeria. Table 2 illustrates the frequency and percentage of respondents across different income brackets. For instance, 11.17% of respondents reported total annual incomes ranging from 10,000 to 100,000 Naira (₦), This suggests that rural women engaged in crop production operate with lesser income, resulting in low output production, which tends to rise with time, The results also suggest that high disparities in income have prevented equal distribution of aggregate income growth among people without work, which is consistent with the findings of Jiriko, (2015) who also revealed that most women are trapped in a vicious cycle of low income and low productivity despite long hours of toil. 31.51% falls within the range of 110,000 to 200,000 NGN. Additionally, 30.52% of respondents indicated incomes between 210,000 and 300,000 NGN, while with smaller percentages for higher income ranges have access to credit facilities to purchase farm inputs. This results were validated by Mukhtar *et al.* (2018) who demonstrates how access to revenue enhances the availability of agricultural resources for crop production. As a result, it aids in providing the cash required for input acquisition in situations when adequate credit is unavailable. Unrestricted relationship between farms, markets and consumers can be an essential source of income generation and job creation to rural women in the areas. This distribution highlights the diverse economic circumstances within the surveyed population, emphasizing the range of income levels and livelihood strategies employed by rural women in crop production activities.

The prevalence of respondents across various income brackets highlights the need for tailored approaches to address the challenges and opportunities associated with income generation and poverty alleviation in rural communities. The mean total annual income of approximately 229,553.35 NGN provides a central measure indicating the average income level among the surveyed rural women. This average represents the population's general economic condition and serves as a baseline for evaluating income distribution and inequalities in the agriculture sector. Recognising the various income profiles shown by this data, policymakers and development practitioners may build policies to promote economic empowerment and livelihood diversification among rural women in Northeast Nigeria. This might include investments in income-generating activities, access to financial services, value chain development, and market connections that are targeted to rural women's individual needs and goals.

Educational Level of the Rural Women Crop Farmers

The educational level of women engaged in crop production in the Northeast region of Nigeria, reveals that, diverse educational landscape, reflecting varying degrees of formal education among the respondents. The majority 51.61%, went to school while 48.39% identified as illiterate, indicating a significant proportion of women engaged in crop production who may not have received formal schooling. This research is in agreement with the findings by Ijatuyi *et al.* (2022); Ugwu, (2019) who stated that, the majority of the female famers are learned. This means that looking at their educational level rural women adopt innovations as output production increases. Further to this, lack of formal education leads to low productivity, joblessness, and low earning capacity, finally it will result in poverty and undernourishment. Among those with formal education, 16.13% have completed primary education, representing a notable but relatively smaller percentage. The secondary education level accounts for 21.59% of respondents, suggesting a significant number of women who have pursued education beyond the primary level. Moreover, 10.92% have attained NCE/Diploma qualifications, reflecting a noteworthy portion of women with higher educational achievements beyond secondary school. The smallest percentage, at about 2.98%, represents women with a university education, indicating a limited but present group of

highly educated individuals in the sample. These findings emphasise the importance of acknowledging in diverse educational backgrounds of women engaged in crop production." Addressing illiteracy through literacy programs and adult education initiatives is crucial for unlocking rural women's potential and promoting inclusive development in the agricultural sector. This results is in consonant with the research by Fadipe *et al*. (2022) revealed that most women had basic education and therefore were able to read, write and comprehend basic instructions. In addition to that, the Mean of educational level provided in the Table above is an indication of the average level of school attainment of the rural women who engaged in crop production. This may involve investments in educational infrastructure, teacher training, curriculum development, and adult literacy programs tailored to the specific needs and contexts of rural communities. Ultimately, improving educational outcomes among rural women can contribute to enhancing their agency, productivity, and well-being, driving sustainable agricultural development in the study area.

Years of Experience of the Rural Women Crop Farmers

The analysis of the years of farming experience among rural women engaged in crop production in the Northeast region of Nigeria, The data reveals a spectrum of experience levels, showcasing the diverse backgrounds of women contributing to agricultural activities. A small percentage, constituting 1.49% of respondents, reports having less than one year of farming experience, indicating a limited but present group of newcomers to the agricultural sector, the majority fells within the 1-10 years' experience range, 1-5 years with 31.02%, of range and 36.48% reporting 6-10 years of farming experience. This suggests a significant proportion of women who have acquired foundational and intermediate levels of expertise in crop production. Additionally, 25.31% report 11-15 years of farming experience, signifying a substantial group of women with a more extended history of engagement in agriculture. The 16-20 years' experience category accounts for 5.46% of respondents, representing those with a more seasoned background in farming which showed that they had extensive knowledge of their output production. This study is in harmony with research conducted by Tshaka, *et al.* (2023). The smallest percentage, at 0.25%, reports above 20 years of farming experience, rural women engaged in crop production with high years of experience attain optimum output production. This implies that crop yield was mainly influenced by the farmer's experience, The Mean farming experience of approximately 8.199 years provides a central measure indicating the average duration of farming expertise among the surveyed rural women. This mean reflects a significant level of accumulated knowledge and hands-on experience within the agricultural sector, Farmers' experience, had strong and positively related to output. This finding therefore, Highlighted the importance of leveraging the expertise enhance agricultural productivity, sustainability, and resilience among women in rural communities, This result further indicate that the respondents have enough experience in crop production hence; they can admit and embrace innovations this is in line with Jamilu *et al.* (2020). The prevalence of respondents with 1-10 years of farming experience suggests that many are relatively early in their agricultural careers, potentially indicating a group of emerging farmers in the region.

Farm Size of the Rural Women Crop Farmers

Table 2 displays the frequency and percentages of respondents across various categories of farm size and offers a snapshot of landholding distribution among rural women engaged in crop production in Northeast Nigeria. It illustrates the diversity in farm sizes within the surveyed population, with 12.16% reporting less than 1 hectare of land, and 31.76% falling within the range of 1-2 hectares. The mean farm size was 2.766 hectares. This indicates that substantial number of rural women involved in crops production were small-scale farmers with restricted access to farmland due to the land tenure system, cultural inclination, and insecurity issues. Further to this, small farm size maximises output than the larger farms when

managed well. This finding is in conformity with study by Helfand and Taylor (2020) who reported that, small farms have a greater production than big farms when family labour is estimated. The results further revealed that farm size has a significant influence on gross income and productivity, even when controlled labour input. This research concord with Mishra *et al.* (2023), subsequently, rural women in agriculture encountered significant barriers to obtaining productive resources such as land and capital. Rural women have less decision-making power over household income and have time constraints due to their triple weight of productive, domestic and communal duties. The data highlights the importance of understanding the degree of farm size distribution to tailor interventions effectively. Notably, the large number of respondents, constituting approximately 45.91%, possesses farms ranging from 1- 4 hectares in size. This indicates that small to medium-sized farms are prevalent among rural women in the study area. While >8 with 0.74% were limited in number, this is as result of the opportunity to purchased and inherited land. This distribution provides a valuable understandings of the agricultural landscape and land tenure patterns, hinting at a focus on subsistence or small-scale farming activities rather than large-scale commercial agriculture. Such understanding is essential for policymakers and stakeholders in formulating targeted policies and interventions aimed at enhancing agricultural productivity, livelihoods, and gender equity among rural women in Northeast Nigeria.

Impact of Insecurity on the Productivity of Rural Women in Crop Production

Figure 1 shows that Boko Haram attacks, Banditry attacks, Kidnapping, and Farmer-Harder Conflict have significant and negative impact. Furthermore, Figure 4.1 also confirms the reliability of the latent variables for each of the latent construct as indicated by the significance probabilities of all the latent variables.

Table 3: Impact of Insecurity on the Crop Productivity of Rural Women

S/N	Parameters Estimate	Coefficient	Attacks	Decrease in Productivity
1	Boko Haram	-0.64	1%	64%.
2	Banditry	-0.78,	1%	78%
3	Kidnapping	-0.89	1%	89%.
4	Farmer-Harder	-0.76.	1%	76%

Source: Field Survey, 2023

Table 3: Present the value of the parameters estimate of Boko Haram attacks on female famers have the coefficient of (-0.64). This implies that an increase in the Boko haram attacks decreases productivity by 64%. The parameter estimate for Banditry has the coefficient of (-0.78), which indicate that productivity decreases by 78% due to a 1% increase in banditry attack. On the other hand, the parameter estimate for Kidnapping has a coefficient of (-0.89). This means that as kidnapping increase by 1% productivity decreases by 89%. Finally, the parameter estimates for the Farmer-Harder conflict was (-0.76). This shows that productivity reduces by 76% as a result of 1% increase in farmer-harder conflict. This is in agreement with Biliyaminu (2019) this therefore, implies that insecurity which is being proxied by Boko Haram attacks, Banditry attack, Kidnapping, and Farmer Harder Conflict, is significantly contribute to the reduction of Productivity.

Table 4: Correlations between Independent Variables:

	Independent Variables			Estimate
1	Farmers Harder Conflict	⟷	Boko Haram	-0..078
2	Boko Haram	⟷	Kidnapping	0.691
3	Boko Haram	⟷	Banditry	-0.752
4	Farmers Harder Conflict	⟷	Banditry	0.253
5	Farmers Harder Conflict	⟷	Kidnapping	0.314
6	Banditry	⟷	Kidnapping	-0.699

Source: Generated by the author using Amos, version 22

Correlation analysis from path diagram

The correlation is analysed in Table 4. Which was originated from the path diagram using Amos software, indicating how each of the variable correlate with one another in the model. The correlation that exists between Farmers Harder Conflict and Boko Haram was -0.078, Boko Haram and Kidnapping was 0.691, Boko Haram and Banditry was -0.752, Farmers Harder Conflict and Banditry was 0.253, Farmers Harder Conflict and Kidnapping was 0.314 and finally, Banditry and Kidnapping was -0.699. This implies that, as the issues of Boko Haram increase farmers harder conflict reduces, but such reduction is insignificant (8%). In the case of the correlation between Boko Haram and Kidnapping it has been observed to be positive and highly significant (69%). This means that high level of Boko Haram attack is accompanied by the high rate of Kidnapping. On the other hand, the level of correlation between Boko Haram and Banditry is significantly negative (-0.752). That is, high level of Boko Haram attack results to in low level of Banditry. Furthermore, in the case of famers harder conflict, Banditry, and Kidnapping correlation, it has been studied to be insignificantly positive (25%) and (31%). However, the Banditry and Kidnapping correlation happen to be significantly negative (70% approximately)

Measurement Model

The BKH (Boko Haram), BDR (Banditry), KDP (Kidnapping), and FHC (Farmers Harder Conflict), are used as an independent variable, whereas, PRD (Productivity) as the dependent variables. As such, four (4) relevant questions were theoretically raised for each variable to stands for a latent construct of the Boko Haram, Banditry, Kidnapping, Farmers Harder Conflict, and Productivity. However, the latent constructs satisfied the series of pre-estimation test of model fitness, reliability and validity as shown in figure 1 and Table 5. The entire factor loadings are significantly higher than 0.6. This shows that all the factor loadings are within the acceptable range based on the decision rule.

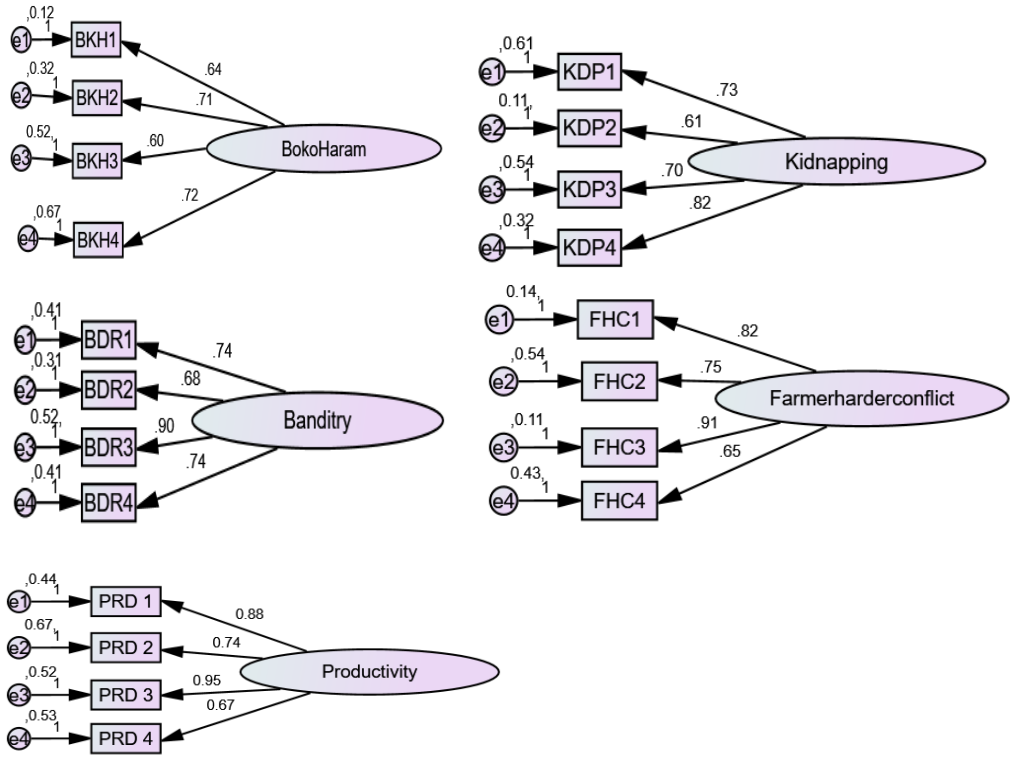


Figure 1: Structural Equation Model

Source: Generated by the Author using Amos, version 22. Figure 1: measurement model

Individual Confirmatory Factor Analysis CFA (Model Fit) and Reliability Test

Table 5: Individual Confirmatory Factor Analysis CFA (Model Fit) and Reliability Test

Variables	RMSEA	GFI	AGFI	CFI	TLI	NFI	CHISQ/ DF	PV	Cronbach α
Boko Haram	0.084	0.991	0.942	0.966	0.968	0.999	3.352	0.002	0.728
Banditry	0.046	0.921	0.917	0.932	0.937	0.913	1.656	0.047	0.791
Kidnapping	0.047	0.999	0.907	0.902	0.994	0.989	4.601	0.065	0.701
Farmer Harder Conflict	0.061	0.987	0.905	0.911	0.948	0.919	2.569	0.036	0.773
Productivity	0.092	0.911	0.911	0.956	0.941	0.919	2.422	0.004	0.712

Source: Generated by the author using Amos, version 22

Table 5: Presented the results which were obtained through Confirmatory Factor Analysis (CFA) to provide support for the issue of unidirectional, validity and internal reliability. The result for the CFA shows relatively a reasonable fit of the five factors model on the basis of a number of fit statistics. The table shows that the models are of good fit: the ratio of Chi-square to degree of freedom (CHISQ/DF), Root Mean square Error Approximation (RMSEA), Goodness of the Fit Index (GFI), Adjusted Goodness of the Fit Index (AGFI), Comparative Fit Index (CFI), Tucker Lewis Index (TLI) and Normed Fit Index (NFI) are all within the acceptance range.

The factor loading for all latent constructs was all above 0.6 as shown in Table 5.
The Cronbach Alpha for BKH, BDR, KDP, FHC, and PRD were 0.728, 0.791, 0.701, 0.773, and 0.712. All the Cronbach Alpha exceeds the minimum value of > 0.7. Model fitness results were also clearly indicated in Table 5. Shows RMSEA=0.084 for BKH, 0.046 for BDR, 0.047 for KDP, 0.061 for FHC, 0.092 for PRD. GFI**=** 0.991, 0.921, 0.999, 0.987, and 0.911 for BKH, BDR, KDP, FHC, and PRD respectively. While the AGFI=0.942, 0.917, 0.907, 0.905, and 0.9 11 for all the variables. The CFI for the variables are 0.966, 0.932, 0.902, 0.911, and 0.956. The TLI for the all variables were 0.968, 0.937, 0.994, 0.948, and 0.941. The NFI and the (CHISQ/DF) for all variables were also satisfy the requirement of acceptance level as indicated in Table 5.

Structural Model on **the Impact of Insecurity on Crop Productivity of Rural Women**
The structural models in regard to this study are first of all subjected to the stated hypotheses. Four (4) hypotheses are formulated with respect to
[Impact of insecurity on productivity of rural women in crop production in the northeast], thus:
H_0. Boko Haram attack has no significant impact on productivity
H_0: Banditry attack does not significantly impact on productivity
H_0: There is no significant relationship between Kidnapping and productivity
H_0: Farmer Harder Conflict does not have significant impact on productivity

Base on the objectives of the study which were subjected to the stated hypothesis above, Structural Equation Model (SEM) was introduced in order to determine whether the null hypothesis statement would be accepted or not.

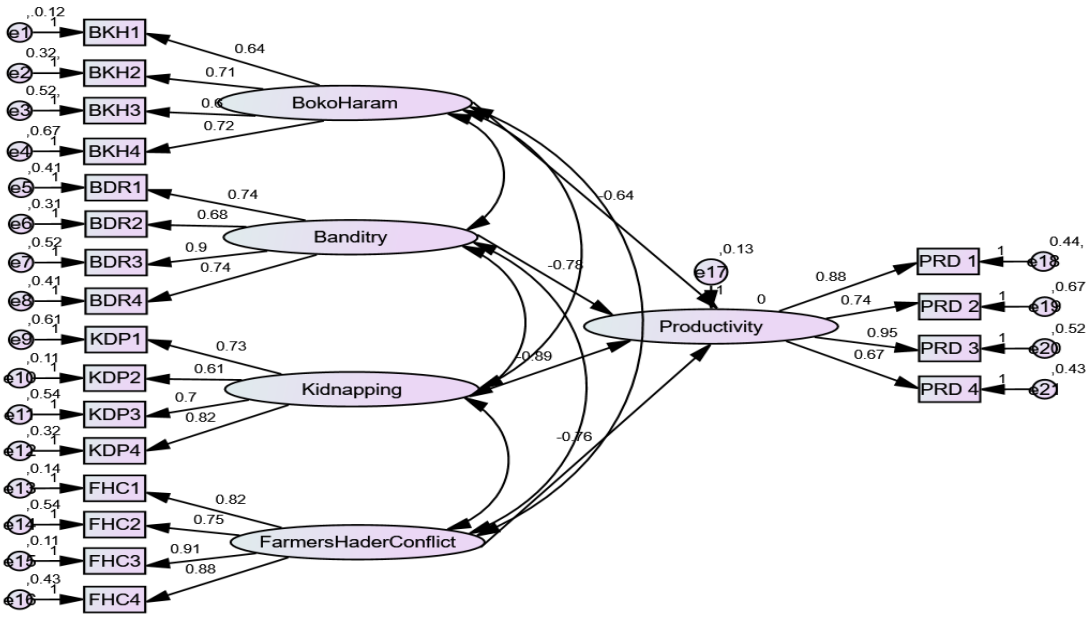


Figure 2: Impact of Insecurity on the Productivity of Rural Women
Source: Generated by the author from Appendix III using Amos, version 22

Consequences of insecurity on the productivity of rural women

Table 6: Unstandardised Regression Weights of Impact of Attacks on Women Farmers.

Criterion		Parameters	Estimate	S.E.	C.R.	P
Productivity	<---	Boko Haram	-0.235	0.180	-1.304	***
Productivity	<---	Farmers Harder Conflict	-0.467	0.134	3.486	***
Productivity	<---	Kidnapping	-0.313	0.141	-2.221	***
Productivity	<---	Banditry	-0.287	0.161	-1.781	***
BKH1	<---	Boko Haram	1.000			***
BKH4	<---	Boko Haram	1.031	0.049	21.130	***
BKH3	<---	Boko Haram	0.041	0.044	0.945	.345
BKH2	<---	Boko Haram	0.200	0.060	3.344	***
BDR1	<---	Banditry	1.000			
BDR4	<---	Banditry	1.000	0.000	555.640	***
BDR3	<---	Banditry	0.214	0.061	3.516	***
BDR2	<---	Banditry	-0.312	0.048	-6.542	***
KDP1	<---	Kidnapping	1.000			
KDP4	<---	Kidnapping	1.088	0.024	45.737	***
KDP3	<---	Kidnapping	-0.069	0.057	-1.212	.225
KDP2	<---	Kidnapping	-0.271	0.052	-5.207	***
FHC1	<---	Farmers Herder Conflict	1.000			
FHC4	<---	Farmers Herder Conflict	0.918	0.077	11.918	***
FHC3	<---	Farmers Herder Conflict	-0.204	0.077	-2.667	.008
FHC2	<---	Farmers Herder Conflict	0.548	0.073	7.484	***
PRDI4	<---	Productivity	-0.224	0.048	-4.673	***
PRDI1	<---	Productivity	1.000			
PRDI3	<---	Productivity	-0.294	0.062	-4.742	***
PRDI2	<---	Productivity	0.183	0.052	3.527	***

Source: Generated using Amos version 22, *** (p <0.01)

Figure 2 and Table 5 depict the consequences of insecurity on the productivity of rural women. The impacts are considerable, as evidenced by the probability and CR values in Table 6. Furthermore, Figure 2 and Table 5 confirm the reliability of the latent variables for each latent construct, as evidenced by the significant probabilities of all latent variables. Furthermore, the observed factors (Boko Haram, Farmers Harder Conflict, Kidnapping, and Banditry) have strong predictive power for the incidence of insecurity, as evidenced by their probabilities. The estimations in Table 6 cannot be provided because they are unstandardized. However, the estimates in Table 7 can be published since they are standardised.

Standardised Regression Weights:

Table 7: Standardised Regression Weights **of Impacts of Attacks on Women Farmers**

Criterion		Parameters	Estimate
Productivity	<---	Boko Haram	-0.636
Productivity	<---	Farmers Harder Conflict	-0.763
Productivity	<---	Kidnapping	-0.886
Productivity	<---	Banditry	-0.781
BKH1	<---	Boko Haram	0.637
BKH4	<---	Boko Haram	0.715
BKH3	<---	Boko Haram	0.617
BKH2	<---	Boko Haram	0.711
BDR1	<---	Banditry	0.743
BDR4	<---	Banditry	0.735
BDR3	<---	Banditry	0.887
BDR2	<---	Banditry	0.677
KDP1	<---	Kidnapping	0.766
KDP4	<---	Kidnapping	0.816
KDP3	<---	Kidnapping	0.701
KDP2	<---	Kidnapping	0.606
FHC1	<---	Farmers Herder Conflict	0.819
FHC4	<---	Farmers Harder Conflict	0.876
FHC3	<---	Farmers Harder Conflict	0.905
FHC2	<---	Farmers Harder Conflict	0.745
PRD I4	<---	Productivity	0.667
PRD I1	<---	Productivity	0.875
PRD I3	<---	Productivity	0.946
PRD I2	<---	Productivity	0.740

Source: Generated using Amos version 22

Factor loading of all the latent constructs for BKH1-- 0.637, BKH2 --0.715, BKH3-- 0.617, BKH4-- 0.711, BDR1--0.743, BDR2--0.677, BDR3--0.887 and BDR4--0.735; KDP1--0.766, KDP2--0.606, KDP3--0.701, KDP4--0.816; FHC1--0.819, FHC2--0.745, FHC3--0.905 and FHC4--0.876; PRD I1--0.875, PRD I2--0.740, PRD I3--0.946 and PRD I4--0.667, all the values obtained are above the decision rule (≥0.6). This confirmed the significant impact of insecurity on the productivity of rural women in Northeastern Nigeria. From these findings productivity of rural women in Northeastern Nigeria was significantly affected by insecurity. As such, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted (i.e: insecurity significantly influenced crop productivity of rural women).

CONCLUSION

The exploration of insecurity's impact and the examination of the socioeconomic characteristics of rural women engaged in crop production in Northeast Nigeria yields significant insights into their demographic and experiential profiles. A predominant cohort of women (49.10%) falls within the 31-40 age bracket, underlining the crucial role played by this age group in agricultural activities. Marital status reveals a majority (53.81%) of married women, and a noteworthy proportion (44.17%) tends to households with larger family sizes ranging from 6 to 10 members. However, Structural Equation Model (SEM) determine the impact on the productivity of rural women in crop production. All the independent variables serve as latent variables representing insecurity. The findings unequivocally establish a negative correlation, highlighting the detrimental effect of insecurity on the productivity of women in this region. The determinants of rural women's participation in crop production were meticulously dissected using robust logistic regression. The study identifies insecurity attacks as a substantial deterrent, revealing the complex interplay of factors shaping women's engagement in crop production. The Pseudo R-Square of 0.221 attests to the model's robust explanatory power, explaining 22.1% of the variations in women's participation by explanatory variables.

In light of the study's findings, the following policy recommendations have been proposed. These recommendations are rooted in the empirical evidence derived from the investigation and are designed to offer practical and effective solutions to address the identified challenges. First of all, in response to the pronounced impact of insecurity on the productivity of rural women in crop production, it is imperative to prioritise and enhance security measures in the studied regions. Collaborative efforts involving local authorities, law enforcement agencies, and community leaders should be undertaken to mitigate the impact of farmer-herder conflicts, Boko Haram insurgency, banditry, and kidnapping. A secure environment is fundamental to fostering a conducive atmosphere for sustained agricultural activities and women's active participation in crop production.

Policy makers, Government, Non-Governmental Organisation and development programs should aimed at empowering rural women account for the diversity of marital statuses and their implications for economic empowerment of women, social inclusion, and overall well-being and productivity of women in the agricultural sector

Policymakers and stakeholders should formulate targeted policies and interventions should aimed at enhancing agricultural productivity considering agricultural landscape and land tenure patterns, focus on subsistence or small-scale farming activities rather than large-scale commercial agriculture livelihoods and gender equity among rural women in Northeast Nigeria.

Policymakers and financial institutions should design and implement targeted financial support programs for rural women in crop production. Accessible credit facilities, grants, or low-interest loans can alleviate financial barriers, empowering women to invest in their agricultural endeavours and enhance productivity.

The issue of land ownership poses a significant challenge for rural women. To address this, policies should be reinforced to facilitate equitable land ownership and access. Legal frameworks ensuring secure land tenure rights for women will empower them to make long-term investments in their farming activities without fear of dispossession, thereby fostering sustained agricultural productivity. Furthermore, promoting gender equality in agriculture is a fundamental recommendation stemming from the study's findings. Initiatives to break

down societal barriers, challenge stereotypes, and create an environment where women have equal opportunities and recognition in agricultural activities are essential. Gender-sensitive policies and awareness campaigns should be implemented to create a more inclusive and equitable agricultural landscape.

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