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Effect of Rural Banditry on Agricultural Productivity and Food Security in Southern Taraba, Nigeria

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Abstract

This study examined the effect of rural banditry on agricultural productivity and food security among farming households in Southern Taraba, Nigeria. A multistage sampling procedure was used to select 120 respondents, and data were collected using structured questionnaires. Descriptive statistics, multiple regression, and chi-square analyses were used to analyse the data. The socioeconomic results indicated that respondents were predominantly male (65.0%) and married (75.8%), with a mean age of 45.80 years, mean household size of 8.37 persons, mean farming experience of 14.58 years, mean farm size of 2.67 ha, and mean annual farm income of ₦518,333.33. Farming was the major occupation of 68.3% of respondents, while maize was the most widely cultivated crop (26.7%). Furthermore, 57.5% belonged to farmers' associations, and 71.7% had access to extension services, whereas only 39.2% had access to agricultural credit. Regression analysis indicated that the linear functional form provided the best fit, with $R = 0.945$, $R^2 = 0.893$, adjusted $R^2 = 0.885$, and $F = 115.89$ ($p < 0.01$), explaining 89.3% of the variation in agricultural productivity. Rural banditry had a negative and statistically significant effect on agricultural productivity ($B = -7,278.78$; $p < 0.05$). Regarding food security, 25.8% of households were food secure, 27.5% mildly food insecure, 27.5% moderately food insecure, and 19.2% severely food insecure. Food security declined with increasing exposure to banditry: food-secure households decreased from 45.0% among those with low exposure to 10.0% among those with high exposure, while severe food insecurity increased from 7.5% to 35.0%. The relationship between banditry exposure and household food-security status was statistically significant ($\chi^2 = 18.64$, $df = 6$, $p = 0.005$), with a moderate association (Cramer's $V = 0.279$). The study concludes that rural banditry constitutes a significant constraint to agricultural productivity and household food security in Southern Taraba. It recommends strengthened rural security, improved access to agricultural credit and inputs, enhanced extension services, and targeted food security and livelihood interventions for highly exposed households.

Keywords: Rural banditry, agricultural productivity, food security, farming households, Southern Taraba, Nigeria.

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INTRODUCTION

Agriculture is a pivotal sector in Nigeria, contributing to employment, GDP, and food security (Akinwale, 2020). Taraba State, predominantly agrarian, relies heavily on farming and livestock rearing for sustenance and economic stability (Muhammad *et al*., 2019). However, the rise of rural banditry has posed significant threats to these agricultural activities. Bandit groups engage in cattle rustling, theft of farm produce, and destruction of farmlands, leading to reduced agricultural output and heightened food insecurity (Abubakar & Musa, 2021). The pervasive insecurity has displaced farmers, disrupted supply chains, and deterred investment in the agricultural sector (Ibrahim *et al*., 2022). Addressing the impact of rural banditry is essential for restoring agricultural productivity and ensuring sustainable food security in Taraba State.

Rural banditry, encompassing armed raids, cattle rustling, herder-farmer clashes, and organised criminal violence, is increasingly recognised as a critical challenge to agricultural productivity and food security in Nigeria's

rural areas. Scant but troubling evidence indicates that in regions like Taraba State, such insecurity disrupts cropping cycles, impedes input use and outreach services, and forces livelihood shifts, yet the mechanisms and local impacts remain understudied. A harrowing incident in **May 2025** vividly illustrates this scale of violence: "Over 30 people were killed, and numerous houses and food stores were razed" when suspected herdsmen attacked parts of the state, leading to mass displacement and widespread loss of assets from daily trust reporting (*Daily Trust*, 2025). Just days later, another fresh wave of communal violence claimed sixteen lives in clashes between farming and herder communities across villages like Munga-dosso, Bandawa, and Wuro Guga (Zagazola Makama, *Zagazola*, 2025). And within the same period, Leadership Nigeria tallied killings, injuries, and displacement in herder-farmer confrontations in Bandawa (Leadership, 2025). These disturbing developments come amid reports that Taraba State serves as a major **dry-season rice farming hub**, annually attracting hundreds of farming households even as insecurity mounts. The harsh realities of rural violence in Taraba State contrast sharply with the region's potential for intense productivity. The harsh realities of rural violence in the state contrast sharply with its intense productivity potential (Daily Trust, 2025). The harsh realities of rural violence in Taraba State contrast sharply with the region's intense productivity potential (Daily Trust, 2025). The intense productivity potential highlights the harsh realities of rural violence in the state (Daily Trust, 2025). The intense productivity potential highlights the harsh realities of rural violence in the state (Daily Trust, 2025). In broader terms, Taraba State remains overwhelmingly agricultural: “Cash crops produced in the state include rice, along with staple grains like maize, sorghum, millet, cassava, and yam, highlighting the high stakes of disrupted crop systems." Conceptually, rural banditry affects agriculture through direct and indirect pathways. Direct impacts, e.g., killings, destruction of assets, and theft of inputs, diminish households’ productive capacity. Indirect effects, such as increased transport risks, reduced labour access, market disruptions, and risk-induced shifts in cropping practices (favouring lower-value or less input-intensive crops), can accumulate over time, depressing yields, incomes, and nutritional diversity (Zagazola Makama, 2025). Understanding which pathways predominate in Karim Lamido’s context is critical for designing responsive, resilient solutions. Despite the growing scholarship on farmer-herder conflicts, there remains a dearth of empirically grounded, localised studies linking incident-level insecurity to household agricultural and food-security outcomes. Many studies remain descriptive, lacking measurements of productivity changes, food-security indicators, or resilience behaviours. Taraba State, whose mix of **irrigated dry-season and rainfed cropping**, coupled with reported violent outbreaks, offers a uniquely suitable setting for such an investigation (Zagazola Makama, *Zagazola*, 2025).

Statement of the Problem

The escalating rural banditry in Taraba State has severely undermined agricultural productivity and compromised food security. Bandit activities destroy farmlands, steal livestock, and displace farmers, leading to decreased crop yields and loss of livelihoods. This insecurity has disrupted the agricultural supply chain, causing food shortages and inflated prices, thereby exacerbating food insecurity among the local population. There is an urgent need to comprehensively understand the extent of this impact to inform effective policy interventions. Agriculture is fundamental to the economy and food security of Taraba State. The disruption caused by rural banditry threatens not only the livelihoods of farmers but also the broader economic stability and food availability in the region. Understanding the specific impacts of banditry on agricultural productivity and food security is critical to creating targeted interventions. This study will provide empirical evidence to guide policymakers, security agencies, and agricultural stakeholders in mitigating the adverse effects of banditry and promoting sustainable agricultural practices.

Agricultural production in Nigeria’s rural communities faces growing threats from insecurity, particularly in the form of rural banditry. This phenomenon manifests as armed attacks, cattle rustling, farm destruction, and mass displacement. Researchers have increasingly documented this phenomenon in Taraba State, where it manifests as armed attacks, cattle rustling, farm destruction, and mass displacement increasingly documented in Taraba State. Notable incidents such as the May 2025 attacks on Munga Lelau, which left over thirty people dead and destroyed grain stores, and the violent clashes in Bandawa and Wuro Guga communities that displaced hundreds of households exemplify the severity of the challenge (Magaji Hunkuyi, 2025; Leadership Nigeria, 2025). These events have direct and indirect consequences for agricultural productivity. Farmers in affected areas often abandon farmlands, reduce cultivated acreage, and adopt low-risk, low-input cropping systems to minimise potential losses (Akinyemi & Olaniyan, 2023). Livestock theft, destruction of irrigation facilities, restricted mobility, and market disruptions further erode production capacity and income streams. Over time, these disruptions translate into declining yields, shrinking household food reserves, and heightened vulnerability to food insecurity (Audu *et al*., 2022). Despite the persistence of such threats, there is a lack of empirical, place-specific studies that quantify the agricultural and food security impacts of rural banditry in Karim Lamido. Existing literature on rural insecurity in Nigeria often focuses on broader state or regional trends,

relying on aggregated data or anecdotal evidence (Okoli & Ugwu, 2021). The absence of robust, disaggregated, and location-specific evidence limits the ability of policymakers to design targeted interventions that address both the security and agricultural dimensions of the crisis. Southern Taraba is among the major agricultural hubs in the Northeast, with both rain-fed and irrigated systems contributing significantly to the local and state food supply. The effects of rural banditry on its production systems have implications beyond the LGA. Understanding the magnitude and mechanisms of these effects is essential for informing security planning, agricultural recovery programmes, and food security interventions.

Objectives of the Study

The broad objective of this study was to examine the effect of rural banditry on agricultural productivity and food security in Southern Taraba, Nigeria. The specific objectives are:

1. Describe the socioeconomic characteristics of the respondents.
2. Assess the effect of rural banditry on the cultivated land area, crop yields, and livestock production among farming households in Taraba State.
3. Examine the relationship between exposure to rural banditry and household food security status using standardised food security indicators.

METHODOLOGY

Description of the Study Area

The study was conducted in Southern Taraba, Nigeria. Southern Taraba constitutes the southern senatorial zone of Taraba State in northeastern Nigeria and comprises five Local Government Areas (LGAs), namely Wukari, Takum, Donga, Ussa and Ibi. The zone is strategically important to agricultural production in the state because of its extensive arable land, favourable climatic conditions, river systems and large rural population whose livelihoods depend substantially on agriculture. The five LGAs also constitute an important food-producing belt of Taraba State, making the area suitable for examining the effect of rural banditry on agricultural productivity and food security.

Geographically, Southern Taraba lies approximately between latitude 6°30′56″N and 8°46′26″N and longitude 9°06′25″E and 10°45′39″E, covering an estimated land area of about 14,195.8 km². The individual administrative centres are located approximately at Wukari (7.963°N, 9.848°E), Donga (7.591°N, 10.213°E), Takum (7.412°N, 10.045°E) and Ussa (7.087°N, 10.038°E), while Ibi is situated farther north within the zone. The area shares boundaries with other parts of Taraba State and neighbouring states, including Benue, Plateau and Nasarawa, while the southeastern part of the zone is relatively close to the international boundary with the Republic of Cameroon. These geographical characteristics facilitate movement of agricultural commodities and interaction among communities across administrative boundaries.

Southern Taraba has a large population, most of which lives in rural areas. A population projection released by the National Population Commission in 2022 estimated the population of the five LGAs at approximately 1,071,500 people, comprising about 209,400 persons in Donga, 211,700 in Takum, 132,600 in Ibi, 143,000 in Ussa and 374,800 in Wukari. The relatively large population, combined with the predominantly agrarian nature of the communities, provides a substantial labour force for crop and livestock production. It also creates a large population that faces food insecurity. Insecurity restricts access to farmland, markets, labour, and other agricultural resources, which can affect the food security of the large population. Insecurity restricts access to farmland, markets, labour, and other agricultural resources, which affects the food security of the large population. Agriculture constitutes the major economic activity in Southern Taraba. Crop production, livestock production, fishing and agricultural trading provide livelihoods for a large proportion of the population. Major crops cultivated in the area include maize, rice, yam, cassava, sorghum, millet, groundnut, Bambara groundnut, soybean, sesame, melon and sugarcane, among others. Despite these agricultural and economic potentials, Southern Taraba has experienced considerable insecurity, including communal conflicts, kidnapping and rural banditry. Recent studies have identified the zone as one of the insecurity-prone areas of Taraba State. Rural insecurity is particularly important to agricultural households because farming activities require regular movement between residential communities and often geographically dispersed farm locations.

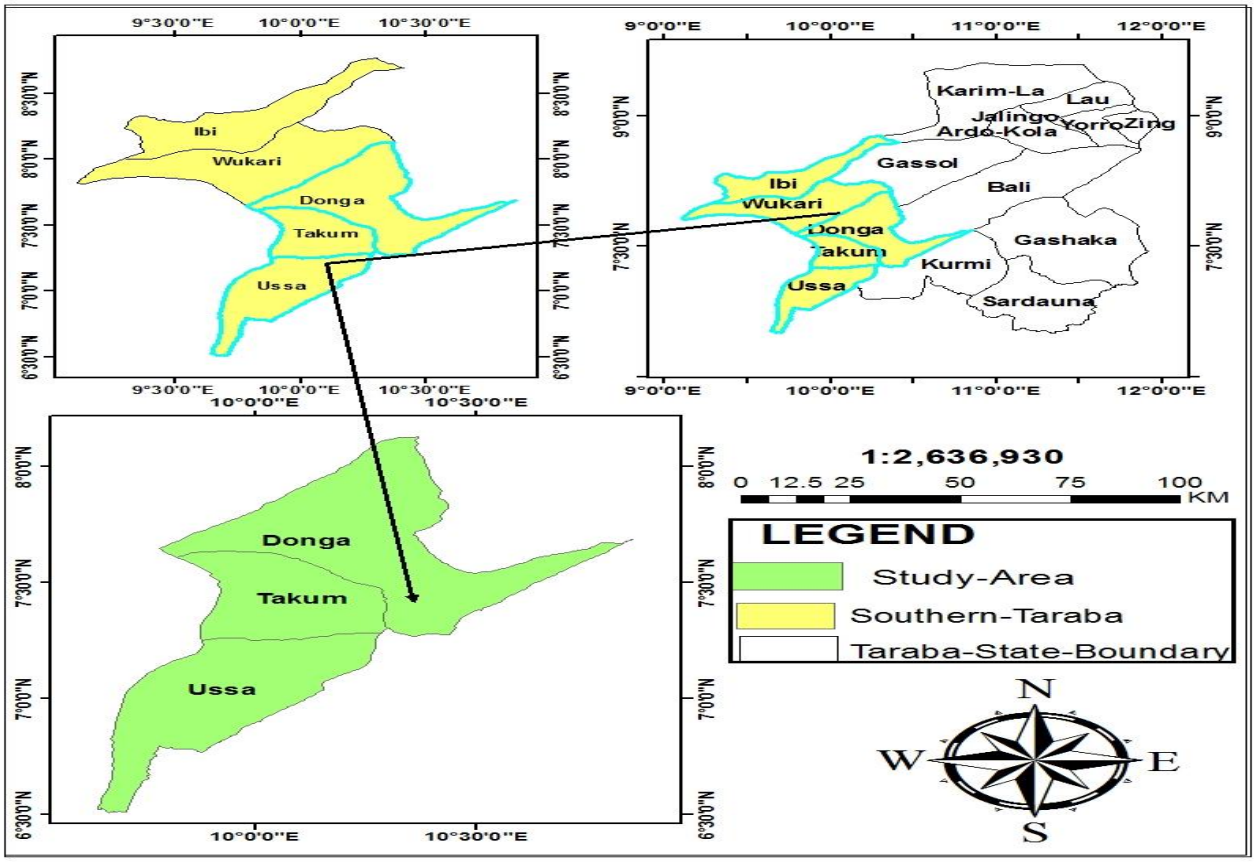

Fig 1: Map of the Study Area

Data Collection

Data were collected using a combination of primary and secondary sources: structured questionnaires were administered to the affected farmers and communities. Secondary data were sourced from government reports, security briefs, and agricultural production statistics.

Sampling Procedure and Sample Size

A multistage sampling technique was used to select respondents for the study. The study area was first stratified into selected LGAs and communities in Southern Taraba based on their level of exposure to rural banditry. Representative communities from each stratum were purposively selected, after which household lists were obtained to create sampling frames. Proportionate sampling was then used to determine the number of respondents selected from each community, while systematic random sampling was employed to select households. The household head or main farm decision-maker served as the respondent. The total sample size was 120 respondents, allocated proportionally across the selected LGAs and communities based on their respective sampling frames. Inclusion criteria required residency for at least one agricultural season and active engagement in farming, while informed consent was obtained from all participants.

The sample size was calculated using Yamane's (1967) formula:

$n = N / (1 + N \times e^2)$

Where:

n = Sample size

N = Population size

e = Level of precision (margin of error)

Given:

N = 13,500

e = 0.091

Calculation:

$n = 13,500 / (1 + 13,500 \times 0.091^2)$

$n = 13,500 / (1 + 13,500 \times 0.008281)$

$n = 13,500 / (1 + 111.79)$

$n = 13,500 / 112.79$

$n \approx 120$

Table 1: Sampled LGAs, Villages, Sampling Frame and Sample Size

Sampled LGAs	Sampled Villages	Sampling Frame (N_i)	Sample Size (n_i)
Donga	Asibiti	1,200	11
	Marraraba	1,050	9
	Akate	1,000	9
	Suntai	1,200	11
Subtotal		**4,450**	**40**
Takum	Sabon Gida Turuben	1,300	12
	Kahimbila	900	8
	Bete	1,150	10
	Dutse	950	8
Subtotal		**4,300**	**38**
Ussa	Bika	1,000	9
	Kpambo	1,050	9
	Kpambo Riri	1,200	11
	Fikyu	1,500	13
Subtotal		**4,750**	**42**
Total	**12 villages**	**13,500**	**120**

Source: Author Construct, 2026

Data Analysis

The collected data were analyzed using both descriptive and inferential statistics. Descriptive statistics were used to analyze objective 1. Multiple regression analysis was employed to achieve objective 2. Objective 3 was achieved using Pearson's Correlation Coefficient

Multiple Regression Model Specification

Multiple regression analysis was used to analyze objective 2. It was employed to analyze the effect of rural banditry on agricultural productivity in the study area. The four functional forms are linear function, exponential function, semi-log function, and double log function. The general form of the model is given as;

$Y = f(X_1, X_2, X_3 \text{---------} Xn, Ui)$ ……(1)

Four functional forms of the regression model were tried to select the one with the best fit (based on statistical, mathematical, econometric criteria, and a priori expectation).

The specification of the model functional forms is as follows;

i. Linear function: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \text{-------} + \beta_8 X_8 + U$

ii. Exponential function: $LnY = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \text{------} + \beta_8 X_8 + U$

iii. Semi-log function: $Y = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \text{------} + \beta_8 LnX_8 + U$

iv. Double-log function: $LnY = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \text{-------} + \beta_8 LnX_8 + U$

The model is specified as:

Where:

Y = Agricultural productivity (₦)

X_1 = Incidence of rural banditry (number of attacks)

X_2 = Cultivated land area (ha)

X_3 = Access to extension services (1 = Yes, 0 = No)

X_4 = Access to agricultural credit (1 = Yes, 0 = No)

X_5 = Distance to market (km)

X_6 = Household size (number)

X_7 = Farming experience (years)

X_8 = Livestock holdings (TLU)

β_0 = Constant

β_1–β_8 = Regression coefficients

U_i = Error term

Model Specification for Pearson's Correlation Coefficient

The Pearson's Correlation Coefficient (r) is expressed as:

$r = \Sigma [(Xi - \bar{X}) (Yi - \bar{Y})] / \sqrt{[\Sigma (Xi - \bar{X})^2 * \Sigma (Yi - \bar{Y})^2]}$…….. (2)

Where:

r = Pearson's correlation coefficient (measures the strength and direction of the linear relationship between two variables)

Xi = value of variable X for observation i

Yi = value of variable Y for observation i

$\bar{X}$ = mean of variable X

$\bar{Y}$ = mean of variable Y

Σ = summation over all observations

Decision rule:

r ranges from -1 to +1

r > 0 indicates a positive relationship

r < 0 indicates a negative relationship

r = 0 indicates no linear relationship

RESULTS AND DISCUSSION

The results in Table 1 show that 65.0% of the respondents were male, while 35.0% were female. This indicates that farming activities among the sampled households The data indicates that men predominantly undertook farming activities among the sampled households, although women also made up a significant portion of the farming population. by men, although women also constituted a substantial proportion of the farming population. The finding is consistent with Kehinde et al. (2026), who reported that 71.9% of smallholder farming households in their study were male-headed. The relatively higher participation of men in farming may be associated with their greater involvement in land preparation, cultivation and other farm activities requiring substantial labour. The age distribution shows that 31.7% of the respondents were between 41 and 50 years, followed by 23.3% who were 31–40 years and 22.5% who were 51–60 years. Thus, 77.5% of the respondents were between 31 and 60 years, indicating that the farming population was largely composed of economically active adults. Only 10.0% were below 30 years, while 12.5% were above 60 years. Kehinde et al. (2026) similarly reported a mean age of 49.39 years among smallholder farming households in Nigeria, indicating the predominance of middle-aged farmers. The relatively high representation of middle-aged farmers suggests that the respondents possessed both the physical capacity and farming experience required for agricultural production.

With respect to marital status, 75.8% of the respondents were married, while 11.7% were single, 5.0% divorced and 7.5% widowed. The dominance of married respondents suggests that agricultural production in the study area The prevalence of married respondents indicates that family-based households primarily conducted agricultural production in the study area. within family-based households. Marriage can provide access to family labour for various farm operations, particularly in smallholder farming systems where household members constitute an important source of labour. This finding agrees with Kehinde et al. (2026), who reported that 81.75% of heads of smallholder farming households in their study were married. The educational distribution indicates that 35.8% of respondents had secondary education, 25.8% had primary education, 15.8% had no formal education, 15.0% had tertiary education and 7.5% had adult education. Overall, 84.2% of the respondents had received some form of formal or adult education. This level of educational attainment could facilitate farmers' ability to understand extension messages, interpret agricultural information and make decisions concerning improved production technologies. Kehinde et al. (2026) emphasised the importance of education among smallholder farmers, reporting that educational attainment was associated with access to microcredit and other livelihood resources. Similarly, Kehinde et al. (2025) found that years of education significantly influenced access to livelihood capital among Nigerian smallholder farmers. The results regarding household size indicate that 53.3% of respondents had between 6 and 10 household members, whereas 21.7% had 1 to 5 members. A further 18.3% had 11–15 members, and 6.7% had more than 15 members. The predominance of relatively large households suggests that family labour may constitute an important resource for agricultural production in the study area. However, large households may also increase food and consumption requirements and consequently place additional pressure on farm income. Kehinde et al. (2026) reported an average household size of 6.89 persons among Nigerian smallholder farming households, which supports the observation that relatively large household structures are common among farming communities. Farming experience shows that 25.8% of the respondents had 11–15 years of farming experience, 23.3% had more than 20 years, 22.5% had 16–20 years and 20.0% had 6–10 years. Only 8.3% had less than five years of farming experience. The result therefore indicates that most respondents were experienced farmers. Extensive farming experience may enhance farmers' knowledge of local climatic conditions, production practices, crop management and strategies for dealing with agricultural risks. Kehinde et al. (2024) found that farming experience was among the significant factors influencing crop diversification among farming households in Nigeria, while Kehinde et al. (2025) identified it as an important component of farmers' human capital.

The distribution of farm size indicates that 40.8% of respondents cultivated between 1 and 2 hectares, while 33.3% cultivated 3–5 hectares. Only 10.8% cultivated more than 5 hectares, whereas 15.0% cultivated less than one hectare. The findings therefore suggest that most

respondents were operating relatively small- to medium-sized farms. Limited farm size can constrain agricultural output and income, particularly when farmers face difficulties accessing improved inputs, credit, mechanisation and extension services. Kehinde et al. (2024) similarly identified farm size as an important factor influencing crop diversification and food-security outcomes among Nigerian farming households. The annual farm-income distribution shows that 40.0% of respondents earned between ₦300,001 and ₦600,000, while 24.2% earned less than ₦300,000. Another 22.5% earned ₦600,001–₦900,000, whereas only 13.3% earned above ₦900,000. This indicates that a considerable proportion of the respondents operated at relatively low levels of annual farm income. Low farm income can reduce farmers' capacity to purchase improved inputs and invest in productivity-enhancing technologies. Kehinde et al. (2026) similarly reported relatively low-income levels among Nigerian smallholder farming households and emphasised the importance of financial access in improving household welfare and food-security outcomes.

The results further show that 57.5% of respondents belonged to farmers' associations, while 42.5% did not. Membership of farmers' associations can facilitate access to agricultural information, extension services, inputs, credit and collective marketing opportunities. Kehinde et al. (2024) found that cooperative membership was an important factor associated with the socioeconomic conditions of smallholder farming households. Similarly, Kehinde et al. (2025) reported that association membership significantly influenced farmers' access to livelihood capital in Nigeria.

Regarding extension services, 71.7% of respondents reported having access to agricultural extension services, while 28.3% did not. The relatively high level of extension access suggests that agricultural extension remains an important source of production information among farmers in Southern Taraba. This finding is particularly relevant because Williams, Sa'adu, and Egbeadumah (2025) examined access to extension services among small-scale farmers in Southern Taraba and highlighted the increasing role of alternative communication platforms, including social media, in providing agricultural information. Access to extension can enhance farmers' knowledge of improved production practices and strengthen their capacity to respond to agricultural challenges. Finally, the findings indicate that only 39.2% of respondents had access to agricultural credit, while 60.8% did not. This represents an important constraint because inadequate access to agricultural finance may limit farmers' ability to purchase improved seeds, fertilisers, agrochemicals, hire labour and adopt productivity-enhancing technologies. Kehinde et al. (2026) found that access to credit, farm size, education, cooperative membership and extension access were important factors associated with smallholder farmers' access to microcredit and food-security outcomes. Similarly, Kehinde et al. (2024) established that credit access significantly influenced crop diversification and household food security. The socioeconomic characteristics indicate that the respondents were predominantly male, middle-aged, married and experienced farmers operating relatively small- to medium-sized farms.

Table 1: Socioeconomic Characteristics of Respondents (n = 120)

S/N	Variable	Frequency	Percentage (%)	Mean
	Sex			—
	Male	78	65.0	
	Female	42	35.0	
	Age			45.80 years
	Less than 30	12	10.0	
	31–40	28	23.3	
	41–50	38	31.7	
	51–60	27	22.5	
	Above 60	15	12.5	
	Marital Status			—
	Single	14	11.7	
	Married	91	75.8	
	Divorced	6	5.0	
	Widowed	9	7.5	
	Educational Level			1.50

S/N Variable	Frequency	Percentage (%)	Mean
No Formal Education	19	15.8	
Primary Education	31	25.8	
Secondary Education	43	35.8	
Tertiary Education	18	15.0	
Adult Education	9	7.5	
Household Size			8.37 persons
1–5	26	21.7	
6–10	64	53.3	
11–15	22	18.3	
Above 15	8	6.7	
Farming Experience			14.58 years
Less than 5	10	8.3	
6–10	24	20.0	
11–15	31	25.8	
16–20	27	22.5	
Above 20	28	23.3	
Farm Size			2.67 ha
Less than 1 ha	18	15.0	
1–2 ha	49	40.8	
3–5 ha	40	33.3	
Above 5 ha	13	10.8	
Annual Farm Income			₦518,333.33
Less than ₦300,000	29	24.2	
₦300,001–₦600,000	48	40.0	
₦600,001–₦900,000	27	22.5	
Above ₦900,000	16	13.3	
Membership of Farmers' Association			—
Yes	69	57.5	
No	51	42.5	
Access to Extension Services			—
Yes	86	71.7	
No	34	28.3	
Access to Agricultural Credit			—
Yes	47	39.2	
No	73	60.8	

Source: Field Survey, 2026

The results presented in Table 2 show the estimates of four alternative functional forms – linear, semi-log, double-log and exponential – for examining the determinants of agricultural productivity among the 120 respondents. All four models were statistically significant, although their explanatory powers differed. The linear model recorded the highest goodness-of-fit, with an R-value of 0.945, an R^2 of 0.893 and an adjusted R^2 of 0.885. The F-value of 115.89 was significant at the 1% level, indicating that the explanatory variables jointly exerted a significant influence on agricultural productivity. The model therefore explained approximately 89.3% of the variation in agricultural productivity. This relatively high explanatory power is consistent with the broader

evidence that farm-level productivity is strongly influenced by a combination of land, market access, institutional services, productive assets and household characteristics (Alene et al., 2019; Fan & Zhang, 2019). The semi-log model also produced a strong fit, with R = 0.937, R^2 = 0.878 and adjusted R^2 = 0.869, while its F-value of 99.62 was significant at the 1% level. Similarly, the exponential model recorded R = 0.937, R^2 = 0.878 and adjusted R^2 = 0.869. The double-log model had the least explanatory power, with R = 0.913, R^2 = 0.834, and adjusted R^2 = 0.822. However, its F-value of 69.61 was still significant at the 1% level. The comparison suggests that the linear functional form provides the best statistical fit to the data, since it recorded the highest R^2 and adjusted R^2. The importance of selecting an appropriate functional form is particularly relevant in agricultural production analysis because the relationship between farm inputs and output may vary depending on whether variables enter the model in absolute or logarithmic form.

The incidence of rural banditry had a negative and statistically significant effect on agricultural productivity in the linear model (B = −7,278.78; $p < 0.05$). The same negative relationship was observed in the semi-log and exponential models (B = −0.0150; $p < 0.05$), although the coefficient in the double-log model was negative but not statistically significant (B = −0.0336). The consistent negative direction suggests that insecurity constitutes an important constraint to agricultural production. Rural insecurity can restrict farmers' movement to their farms, reduce the frequency with which farmers visit their fields, discourage investment and disrupt the timely execution of farming activities. In conflict-affected agricultural communities, insecurity can also disrupt input supply, labour availability and produce marketing. These mechanisms are consistent with the wider literature showing that insecurity and conflict can undermine agricultural production and rural livelihoods (FAO, 2021; World Bank, 2022). Thus, the negative coefficient for rural banditry suggests that improving security is an important prerequisite for restoring and sustaining agricultural productivity in affected communities.

Cultivated land area had a positive and highly significant effect on agricultural productivity across all four functional forms. The linear model recorded a coefficient of 58,803.43 ($p < 0.001$), while the semi-log and exponential models produced coefficients of 0.1205 ($p < 0.001$), and the double-log model recorded 0.3619 ($p < 0.001$). This indicates that farmers cultivating larger areas tended to achieve higher levels of agricultural productivity. Access to adequate productive land allows farmers to expand cultivation and allocate inputs across a larger production base. Land availability is consequently an important component of smallholder production systems, particularly where farming remains the principal livelihood activity (Hazell & Rahman, 2017; Alene et al., 2019). Access to extension services had a positive and statistically significant effect in all four models. The coefficient was 37,227.89 ($p < 0.001$) in the linear model and 0.0791 ($p < 0.001$) in the semi-log and exponential models. The double-log model produced a coefficient of 0.0900, significant at the 1% level. The result suggests that farmers with access to extension services tend to have higher agricultural productivity. Extension services facilitate farmers' access to improved production technologies, information on input application, pest and disease management, climate information and improved farm management practices. Agricultural extension is therefore an important mechanism through which innovations and improved technologies reach smallholder farmers. This finding agrees with the broader argument that institutional and knowledge-based services can contribute to improved smallholder productivity (Alene et al., 2019; FAO, 2021).

Access to agricultural credit also showed a positive and statistically significant relationship with agricultural productivity in all four functional forms. The linear coefficient was 38,851.06 ($p < 0.001$), while the semi-log and exponential models recorded 0.0844 ($p < 0.001$), and the double-log model produced 0.1087 ($p < 0.001$). The positive relationship indicates that access to credit may enhance farmers' ability to purchase improved seeds, fertiliser, agrochemicals, machinery and labour at the appropriate time. Financial constraints are particularly important for smallholder farmers because limited liquidity can prevent them from applying recommended inputs at optimal levels. Improved access to agricultural finance can therefore facilitate investment, commercialisation and productivity improvement (Hazell & Rahman, 2017; World Bank, 2022).

Distance to market had a negative and statistically significant effect across all four functional forms. The linear model yielded a coefficient of −6,368.35 ($p < 0.001$), while the semi-log and exponential models recorded −0.0136 ($p < 0.001$). The double-log model also produced a negative coefficient of −0.1080 ($p < 0.001$). This finding indicates that farmers located farther from markets tended to have lower agricultural productivity. Greater market distance increases transportation expenses, reduces access to agricultural inputs, and may discourage farmers from commercialising their output. Poor transportation infrastructure can also increase post-harvest losses and force farmers to sell their produce at unfavourable prices. Ibrahim and Yusuf (2022) similarly emphasised the role of transportation infrastructure in reducing post-harvest losses and improving market efficiency among rural farmers in Nigeria. More broadly, rural infrastructure has been identified as an important determinant of agricultural commercialisation and rural economic development (Olagunju et al., 2020; Fan & Zhang, 2019).

Household size was positive and statistically significant in all four models. Its coefficient in the linear model was 6,947.78 ($p < 0.001$), compared with 0.0134 ($p < 0.001$) in the semi-log and exponential models and 0.0989 ($p < 0.001$) in the double-log model. The positive

association may reflect the contribution of household labour to agricultural production. In smallholder farming systems, larger households can provide additional family labour for land preparation, planting, weeding, harvesting and post-harvest activities potentially reducing dependence on hired labour. However, the productivity effect of household size may depend on the proportion of household members who are economically active and available for farm work (Hazell & Rahman, 2017). Farming experience also had a positive and statistically significant effect across the four models. The linear coefficient was 2,999.59 ($p < 0.001$), while the semi-log and exponential forms recorded 0.0069 ($p < 0.001$), and the double-log model produced 0.0941 ($p < 0.001$). The finding implies that farmers with greater farming experience tended to achieve higher agricultural productivity. Farming experience can improve farmers' knowledge of local soil conditions, weather patterns, crop management, pest control and timing of farm operations. Experienced farmers may also be better positioned to respond to production risks and make decisions based on accumulated knowledge. This supports the broader view that farmers' human capital and accumulated production knowledge are important components of smallholder agricultural performance (Alene et al., 2019).

Livestock holdings, measured in Tropical Livestock Units (TLU), also had a positive and highly significant effect on agricultural productivity. The linear model recorded a coefficient of 15,714.87 ($p < 0.001$), while the semi-log and exponential models produced 0.0312 ($p < 0.001$), and the double-log model recorded 0.2101 ($p < 0.001$). The result suggests that farmers with greater livestock holdings tend to have stronger agricultural production systems. Livestock can complement crop production by providing income diversification, manure for soil fertility improvement and, in some farming systems, draft power. Diversification between crop and livestock enterprises can also strengthen household resilience by providing alternative sources of income and food when crop production is affected by shocks (Hazell & Rahman, 2017; FAO, 2021). The results demonstrate that rural banditry and distance to market constrain agricultural productivity, whereas cultivated land area, access to extension services, agricultural credit, household labour, farming experience and livestock holdings enhance productivity. Among the four functional forms, the linear model is the preferred specification, based on its comparatively superior goodness-of-fit statistics: R^2 of 0.893, adjusted R^2 of 0.885 and F-value of 115.89 ($p < 0.001$). The finding reinforces the importance of addressing both security and structural constraints affecting agricultural production. In particular, interventions aimed at reducing rural insecurity, improving rural roads and market access, expanding agricultural extension and credit services, and strengthening productive assets could contribute to improved agricultural productivity and rural livelihoods in Southern Taraba. This is consistent with the broader rural development literature, which identifies infrastructure, institutional support and productive resources as important foundations for agricultural transformation and inclusive rural development (IFAD, 2019; Fan & Zhang, 2019; World Bank, 2022).

Table 2: Estimates of Alternative Functional Forms of the Determinants of Agricultural Productivity (n = 120)

Variables	Linear	Semi-log	Double-log	Exponential
Constant	118,980.09***	12.3184***	12.0245***	12.3184***
Incidence of rural banditry	-7,278.78*	-0.0150*	-0.0336	-0.0150*
Cultivated land area	58,803.43***	0.1205***	0.3619***	0.1205***
Access to extension services	37,227.89***	0.0791***	0.0900**	0.0791***
Access to agricultural credit	38,851.06***	0.0844***	0.1087***	0.0844***
Distance to market	-6,368.35***	-0.0136***	-0.1080***	-0.0136***
Household size	6,947.78***	0.0134***	0.0989***	0.0134***
Farming experience	2,999.59***	0.0069***	0.0941***	0.0069***
Livestock holdings (TLU)	15,714.87***	0.0312***	0.2101***	0.0312***
R	0.945	0.937	0.913	0.937
R^2	0.893	0.878	0.834	0.878
Adjusted R^2	0.885	0.869	0.822	0.869
F-value	115.89*	99.62*	69.61*	99.62*
N	120	120	120	120

Source: Field Survey, 2026 *** Significant at 1%, ** Significant at 5%, * significant at 10%

The results in Table 3 show that the food security of households varied considerably according to the level of exposure to rural banditry. Among households with low exposure to rural banditry, 45.0% were food secure, while 30.0% were mildly food insecure, 17.5% were moderately food insecure and only 7.5% were severely food insecure. In contrast, only 10.0% of households with high exposure to banditry were food secure, while 20.0%, 35.0% and 35.0% were mildly, moderately and severely food insecure, respectively. The results therefore reveal a clear deterioration in food security as exposure to rural banditry increased. The proportion of food-secure households declined from 45.0% among those with low exposure to 22.5% among those with moderate exposure and further to 10.0% among those with high exposure. Conversely, severe food insecurity increased from 7.5% among households with low exposure to 15.0% among moderately exposed households and 35.0% among highly exposed households. This pattern suggests that prolonged or intense exposure to banditry may increase household vulnerability to food insecurity. The Pearson chi-square statistic of 18.64 with 6 degrees of freedom was statistically significant at the 1% level ($p = 0.005$). Therefore, the null hypothesis that there was no significant relationship between exposure to rural banditry and household food security status was rejected. This implies that exposure to rural banditry was significantly associated with food security among farming households in Southern Taraba. The Cramer's V value of 0.279 further indicates a moderate association between the two variables. The observed relationship can be explained by the effects of insecurity on agricultural production and household livelihoods. Rural banditry can prevent farmers from accessing their farms, particularly distant farmlands, resulting in a reduced cultivated area and lower agricultural output. Bandit attacks can also result in crop destruction, livestock theft, displacement and disruption of agricultural markets. These consequences can reduce both the physical availability of food and the income needed to purchase food. This finding agrees with Ijirshar et al. (2025), who found that insecurity negatively affected crop and livestock production among farming households. Reduced agricultural production can directly affect food security because smallholder farming households frequently depend on their farm output for household consumption and on agricultural income to purchase other food items. Similarly, Amare et al. (2025) reported that violent conflict in Nigeria disrupted farmers' use of productivity-enhancing inputs and negatively affected agricultural productivity. When insecurity prevents farmers from accessing farms, obtaining inputs or carrying out timely farming operations, reductions in farm output can subsequently translate into reduced household food availability and purchasing power.

The finding is also consistent with FAO, IFAD, UNICEF, WFP and WHO (2025), who identified conflict and insecurity as important drivers of food insecurity. Conflict can disrupt food production, livelihoods, markets and household purchasing power, making affected households more vulnerable to food insecurity. This mechanism is particularly relevant to Southern Taraba, where many rural households depend substantially on agriculture for both food and income. The findings consequently demonstrate that rural banditry constitutes not only a security threat but also an important livelihood and food-security challenge. The substantially higher proportion of severely food-insecure households among those highly exposed to banditry indicates that interventions addressing food insecurity in Southern Taraba should also address the underlying security and agricultural disruptions. Measures such as improved rural security, restoration of access to farmland, agricultural extension support, access to productive inputs, improved market connectivity and livelihood assistance could help strengthen household resilience. The findings indicate that higher exposure to rural banditry was associated with worse household food security. The statistically significant chi-square result ($\chi^2 = 18.64$; $df = 6$; $p = 0.005$) confirms that the relationship was unlikely to have occurred by chance, while the Cramer's V of 0.279 indicates a moderate association between banditry exposure and household food security.

Table 3: Relationship between Exposure to Rural Banditry and Household Food Security Status among Farming Households (n = 120)

Exposure to Rural Banditry	Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure	Total
Low exposure	18 (45.0)	12 (30.0)	7 (17.5)	3 (7.5)	40 (100.0)
Moderate exposure	9 (22.5)	13 (32.5)	12 (30.0)	6 (15.0)	40 (100.0)
High exposure	4 (10.0)	8 (20.0)	14 (35.0)	14 (35.0)	40 (100.0)
Total	**31 (25.8)**	**33 (27.5)**	**33 (27.5)**	**23 (19.2)**	**120 (100.0)**
Inferential statistics	**$\chi^2 = 18.64$**	**df = 6**	**p = 0.005**	**Cramer's V = 0.279**	**Significant**

Source: Field Survey, 2026. Note: Figures in parentheses are percentages. χ^2 = Pearson Chi-square. Significant at 1% level ($p < 0.01$).

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concludes that rural banditry significantly undermines agricultural productivity and household food security in Southern Taraba, Nigeria. Increased exposure to banditry was associated with reduced agricultural performance and a significant deterioration in household food security. Therefore, improving agricultural outcomes in the area requires strengthened rural security alongside better access to agricultural inputs, credit, extension services and livelihood support**.**

Recommendations

Based on the findings of the study, the following four recommendations are proposed:

1. Make rural areas safer: The government and security agencies should step up patrols and community-based security measures to ensure that people can safely get to their farms and that attacks on farming families are less likely to happen.

2. Improve access to agricultural inputs and credit: Government and financial institutions should provide affordable credit, improved seeds, fertilisers and other essential inputs to enable affected farmers to restore and sustain agricultural production.

3. Expand extension and livelihood support: Agricultural extension services should be strengthened in banditry-affected communities, alongside livelihood diversification programmes to improve household resilience and reduce dependence on vulnerable farming activities.

4. Target food-security interventions: Highly exposed and food-insecure households should be prioritised for targeted food assistance, agricultural recovery programmes and improved market access, given the significant association between banditry exposure and household food insecurity.

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