VOL. 09 NO. 1,
AUGUST, 2025
E-ISSN 3027-0995
P-ISSN 3026-8265

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of Biotechnology and Agricultural Research (JBAR)

Socio-Economic Effects of Pastoralist Activities on Arable Crop Farmers in Southwestern Nigeria

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DOI: https://doi.org/10.70382/ajbar.v9i1.003

Abstract

This study assesses the socio-economic effects of pastoralist activities on arable crop farmers in southwest Nigeria. Using a multistage sampling technique, data were collected from 160 crop farmers and 32 pastoralists through a structured and validated interview schedule and analyzed with descriptive statistics. Consistent with earlier studies on farmer-herder dynamics, respondents were predominantly male, married, and within the productive age range of 40–49 years and average farm and herd sizes typical of smallholder systems. The results reveal that key pastoralist activities such as open grazing, crop trampling, theft for cattle feed, and water contamination significantly disrupt crop production and increase farmers' operational costs. These disruptions translate into substantial income losses, reinforcing existing evidence that pastoralist incursions undermine rural livelihoods and food security in Nigeria. By providing farm-level economic estimates of revenue losses in maize and cassava production, the study extends current literature, which has largely been descriptive, and offers measurable insights aligned with resource competition and livelihood vulnerability theories. The study recommends stricter implementation of sustainable land management policies, rehabilitation of grazing reserves, and strengthened extension and conflict-mitigation programmes to support peaceful coexistence.

Keywords: Herders-farmers conflict, Pastoralist activities, arable crop farmers, socio-economic effects, productivity, income loss, Nigeria.

Introduction

Agriculture remains the backbone of many developing economies, providing employment, food security, rural livelihoods, and foreign exchange earnings. In Nigeria, the agricultural sector continues to play a pivotal role in national development, contributing significantly to GDP growth, poverty reduction, and livelihood sustainability (Central Bank of Nigeria, 2023; World Bank, 2022). The sector consists of four key subsectors: crop production, livestock, forestry, and fisheries. Among these, crop production is dominant, accounting for about 85% of agricultural GDP, followed by livestock production which is largely driven by pastoralism (National Bureau of Statistics [NBS], 2022).

Pastoralism, practiced predominantly by Fulani herders, is characterized by the seasonal movement of livestock in search of pasture and water. Mobility remains a central feature of Nigerian pastoralism, allowing herders to optimize resource availability across ecological zones (Akintunde, 2020). However, this mobility increasingly intersects with sedentary crop farming, leading to competition over land and water resources. As herders migrate across farmlands, their livestock often stray into cultivated fields, destroying crops, compacting soil, and increasing labour requirements for land preparation (Amadi & Aleru, 2021). Such disruptions reduce crop yield, threaten food security, and elevate production risks for farmers.

In recent years, climate change, rapid population growth, the expansion of farmlands, and the shrinking of traditional grazing reserves have intensified farmer-herder conflicts across Nigeria (Adejumo et al., 2023; Olaniyi & Adisa, 2022). Studies in the Middle Belt and Southwestern Nigeria report increasing cases of crop destruction, violent confrontations, displacement of farming households, and widespread income losses (Silas et al., 2023). Pastoralists argue that their traditional grazing routes, water points, and transhumance corridors have been obstructed by agricultural expansion, while farmers express concerns about rising insecurity and threats to their livelihoods (International Crisis Group, 2021).

These conflicts have substantial socio-economic implications. Empirical evidence shows that recurrent pastoralist invasions lead to reduced agricultural output, abandonment of farmlands, increased food prices, and heightened rural poverty (Yahaya et al., 2020; Obi-Egbedi et al., 2023). Recent field studies in Oyo and surrounding states further document measurable income losses, loss of investments, and reduced food availability among affected households (Olaiya et al., 2022; Akinbile et al., 2024).

Despite a growing literature on farmer-herder conflicts in Nigeria, significant gaps remain, especially regarding crop-specific, farm-level economic quantification of losses due to pastoralist invasions. Existing studies tend to focus on causes, perceptions, or regional conflict patterns (Aderanti et al., 2019; Olagbemiro, 2022). Few have conducted detailed comparisons of production costs, revenues, and net farm incomes before and after pastoralist invasions, particularly for staple crops such as maize and cassava in Southwestern Nigeria. Providing such empirical evidence is essential for designing targeted interventions such as grazing reserves, insurance products, compensation schemes, and sustainable land-use policy reforms.

This study therefore investigates the socio-economic effects of pastoralist activities on arable crop farmers in Ondo and Oyo States, Southwestern Nigeria. It aims to: describe the socio-economic characteristics of arable farmers and pastoralists; assess how pastoralist activities affect crop production processes; and quantify the effects of these activities on farmers' income by comparing production costs and returns before and after pastoralist invasions. By integrating farmer surveys, pastoralist interviews, and budgetary analysis across multiple LGAs, the study provides robust, policy-relevant insights for fostering peaceful and productive farmer-herder coexistence.

Objectives of the Study

The study examined the socioeconomic effects of pastoralist activities on arable crop farmers 'production in southwest Nigeria. Specifically, the study.

i. ascertain the socio-economic characteristics of the respondents in the study area;
ii. determine the effects of pastoralists activities on arable crop farmers' production and
iii. examine the effects of pastoralists activities on arable crop farmers' income.

METHODOLOGY

Study area and design

This study was conducted in selected Local Government Areas (LGAs) of Ondo and Oyo States, Southwestern Nigeria. A mixed methods approach was employed combining quantitative survey data (structured questionnaires) with qualitative interview schedules and focus group discussions to triangulate findings on the socio-economic effects of pastoralist activities on arable crop farmers.

Sampling procedure

A multi-stage sampling technique was used to select study locations and respondents: The first stage involves the purposive selection of Ondo and Oyo State from the South-West Nigeria due to the prevalent activities of the pastoralist and arable crop farming

in these areas. The second stage involves purposive selection of four Local Government Area (LGAs) where crop and livestock activities were prominent each from the two states. In Ondo State, Owo, Ondo East, Ifedore and Akure North was selected while Atisbo, Irepo, Iseyin and Itesiwaju was selected for Oyo state. In the third stage, two villages were purposively selected each from the four LGAs earlier selected making a total of eight villages each. The fourth stage involve random selection of ten arable crop farmers per village and two pastoralists, making a total of twenty arable crop farmers and four pastoralists per LGAs. In all 160 arable crop farmers and 32 Pastoralists were interviewed for the study.

Sample size justification

The sample size was based on the study's objectives to estimate population proportions and perform budgetary comparisons at farm level. A target of 10 farmers and two pastoralists per villages provided sufficient observations for descriptive statistics and farm-level budgetary analysis across sites. The purposive steps ensured coverage of high-conflict/agricultural areas; random selection at the household level reduced selection bias among respondents.

Validity of instrument for data collection

Content validity was carried out to ascertain that the instrument measure what it intends to measure: A drafted questionnaire was given to expert in the field of Agricultural Extension and animal science. The questionnaire was reviewed and an appropriate item was selected to represent the entire content of the study.

Reliability of instrument for data collection

Test and re-test methods were used to determine the consistency of the research instrument. This was done by administering the questionnaire two times at one week interval in two randomly selected communities (Akure South Local Government and Eseke community in Oyo town) which are close to the chosen communities in the two states of the study. The result of the test was compared with the re-test and the correlation coefficients were conputed: pastoralists activities that affects crop production showed correlation coefficient of 0.89. This is greater than 0.5, indicating good internal consistency.

Ethical considerations

The study adhered to ethical research standards. Ethical approval was obtained from the Department of Agricultural Extension and Communication Technology, Federal University of Technology, Akure. Informed consent was obtained from all participants

after explaining the objectives of the study, ensuring voluntary participation, and guaranteeing confidentiality through anonymized data reporting.

Data analysis

Data analysis comprised descriptive and budgetary analysis. Descriptive statistics such as requencies, percentages, means and standard deviations were computed to summarize socio-demographic and farm characteristics. Budgetary analysis: A partial budget approach was used to quantify the economic effects of pastoralist activities on maize and cassava production. For each crop, the following were computed:

Total variable cost (A)

Total fixed cost (B)

Total cost of production (C = A + B)

Revenue (D = quantity × price)

Gross margin (E = D − A)

Net farm income (F = E − B). Budgetary comparisons were made between years with and without pastoralist invasions to estimate changes in costs, revenues, gross margins and net incomes.

Limitations and measures to reduce bias

Key limitations include reliance on farmer recall for some input and output quantities and purposive selection of LGAs (which may limit generalizability beyond the selected study area). To mitigate recall bias, the questionnaire used anchoring questions (e.g., reference to memorable events/harvest dates), and corroborating information such as market price records where available. Random selection at the household level helped reduce selection bias.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Results in Table 1 show that the majority of arable farmers were male (66.3%), while all the pastoralists interviewed were male. The complete dominance of men in pastoralism aligns with Fulani cultural norms in which herding is considered a male responsibility due to its physical demands and long-distance mobility requirements. This finding supports Okunlola (2023), who also reported that pastoral activities in Nigeria are culturally and functionally male-dominated. In terms of religion, most farmers were Christians (75.6%), whereas all pastoralists were Muslims a reflection of the ethnic composition of Fulani herders, who are predominantly Muslim across West Africa. The religious differences highlight the cultural heterogeneity between both groups, a factor often cited in conflict literature as influencing misunderstandings and communication gaps (Turner, 2021).

Marital status data indicate that 90.6% of farmers and 96.9% of pastoralists were married. This is typical of rural agrarian and pastoral systems where marriage enhances household labour and social support networks. According to household production theory (Becker, 1981), larger married households supply essential labour, which reduces production costs and improves livelihood security. In rural Nigeria, married individuals typically engage family members including children in farm and herding activities. This supports findings by Akinpeloye et al. (2020), who noted that household labour is a critical component of both farming and pastoral production systems.

Household size further reinforces this pattern. Over half of farmers (56.3%) and pastoralists (59.4%) had households of 6–10 persons, with a mean household size of six for both groups. Larger households increase labour availability, which is especially important for labour-intensive activities such as land preparation, weeding and herding. Previous studies (e.g., (Aderanti et al., 2019; Olagbemiro, 2022) similarly observed that household size contributes significantly to livelihood resilience among rural farmers and pastoralists in Nigeria. Larger family units not only distribute labour but also provide social security, especially in conflict-prone environments where labour shortages can heighten vulnerability to attacks or crop damage.

Age distribution reveals that respondents were predominantly within the economically active age bracket of 40–49 years (42.5% of farmers and 40.6% of pastoralists), with mean ages of 47.5 and 44.8 years, respectively. The presence of relatively young and able-bodied individuals suggests strong physical capacity to engage in farming and herding. This corresponds with findings by Nwankwo et al. (2021), who reported that productive age adults dominate rural agricultural activities in Nigeria. Younger and middle-aged pastoralists also tend to be more mobile, which is linked to transhumance patterns.

Farm and herd sizes provide insight into livelihood structure. A significant proportion of farmers (83.1%) cultivated 0.1–5 hectares, with a mean farm size of 4.1 hectares. This is consistent with the national pattern of smallholder-dominated arable crop farming (Olagbemiro, 2022). Smallholder systems are often highly vulnerable to external shocks such as cattle incursions because even minor losses can significantly affect household food security. For pastoralists, 81.3% owned herds of 1–100 cattle, with a mean herd size of 96 cattle. This aligns with Sulaiman (2020), who reported that the optimal herd size for subsistence and semi-commercial pastoralism in Nigeria ranges between 80 and 120 cattle.

These demographic profiles have several implications. Both groups rely heavily on land (farmers) and grazing resources (pastoralists), increasing competition for space. An active labour force increases production potential but may also intensify encounters between mobile herders and stationary farmers, particularly during peak

growing seasons. Differences in cultural practices and social norms may heighten misunderstanding, especially in areas without strong conflict-resolution structures. Small farms are disproportionately affected by cattle encroachment, as even limited crop destruction translates into substantial income loss.

Table 1: Distribution of Respondents according to their Socio-Economic Characteristics

	Farmers			Pastoralists		
Variable	**Frequency**	**(%)**	**Mean**	**Frequency**	**(%)**	**Mean**
Sex						
Male	106		66.3	32		100
Female	54		33.8	0		0
Religion						
Christianity	121		75.6	0		0
Islam	36		22.5	32		100
Traditional	3		1.9	0		0
Marital status						
Single	4		2.5	0		0
Married	145		90.6	31		96.9
Widowed	11		6.9	1		3.1
Age						
20-29	7		4.4	1		3.1
30-39	36		22.5	12		37.5
40-49	68		42.5	47.5	13	40.6	44.8
50-59	31		19.4	6		18.8
60 and above	18		11.3	0		0
Household size						
1-5	67		41.9	12		37.5
6-10	90		56.3	6	19	59.4	6
>11	3		1.9	1		3.1
Farm/Herd size						
0.1-5Ha /1-100	133		83.1	24		81.3
Above 5Ha/100-150	27		16.9	4.1	8	18.8	96

Source: Field Survey, 2024

Effects of pastoralists' activities on soil and arable crop production in the study area

Results in Table 2 reveal substantial negative consequences of pastoralist activities on arable crop production in the study area. The most severe impact was the need for re-running planting operations ($\bar{x}$ = 3.99), followed by reduced harvests due to crop destruction and theft ($\bar{x}$ = 3.67), and increased production costs ($\bar{x}$ = 3.49). Farmers also reported significant reductions in time spent on farms ($\bar{x}$ = 3.05) and reductions in farm income ($\bar{x}$ = 3.48). Although less frequently mentioned, respondents also identified premature harvesting ($\bar{x}$ = 3.04), loss of agricultural labour ($\bar{x}$ = 2.87), and crop relocation ($\bar{x}$ = 2.55) as emerging concerns. The high mean score for re-planting

operations ($\bar{x}$ = 3.99) reflects the severe physical destruction caused by cattle trampling on ridges and feeding on immature crops. This aligns with findings by Amadi & Aleru (2021), who observed that unregulated grazing leads to the destruction of plants at early growth stages, forcing farmers to repeat planting cycles an outcome that significantly increases seed, labour, and land preparation costs.

Reduced harvests due to crop destruction and theft ($\bar{x}$ = 3.67) also ranked high among the effects. Farmers described instances where pastoralists intentionally harvested or cut crops to feed their animals an issue reported in earlier studies across Southwestern Nigeria (Ahmed, 2024). Reduced harvests translate directly into lower household incomes and diminished food supplies. The increase in production costs ($\bar{x}$ = 3.49) results from the need to hire additional labour, purchase extra inputs, reconstruct ridges, and extend growing periods. Okunlola (2022) similarly reported that pastoral incursions significantly elevate production costs due to replanting and repairs to damaged farmland. These added expenses reduce profit margins and undermine farmers' economic resilience, especially for smallholders already operating with limited capital. Respondents also reported a reduction in hours spent on farms ($\bar{x}$ = 3.05) and a loss of agricultural labour ($\bar{x}$ = 2.87).

Fear of violent clashes or retaliatory attacks discourages both farmers and hired labourers from staying long on the farms, particularly in isolated areas. This aligns with Ayantoye et al., (2024), who identified fear-induced labour displacement as a major consequence of farmer-herder conflicts. The Household Labour Allocation Theory suggests that households withdraw labour from high-risk activities to protect members' safety further explaining the reduced farm presence. Premature harvesting ($\bar{x}$ = 3.04) is another coping strategy adopted to prevent total loss of crops. Farmers indicated that they often harvest immature maize, cassava, and vegetables to avoid losing them to grazing cattle. This practice reduces crop quality and quantity, consistent with Ahmed (2024), who described early harvesting as a widespread defensive response among farmers in conflict-prone communities. The associated reduction in enthusiasm for farming ($\bar{x}$ = 2.89) signals a long-term threat to agricultural sustainability and food security. Respondents stated that the destructive nature of herding activities diminishes their enthusiasm for farming; often forcing them to harvest crops early to avoid further destruction. During focus group discussions with farmers in Ondo State, farmers expressed deep frustration over the significant reduction in farm output and income whenever pastoralists encroached on their farms. They reported that pastoralists often enter their farms and harvested crops to feed their cattle, which compels farmers to harvest prematurely. One farmer lamented, "We *are left with no choice but to harvest early, even when the crops are not fully mature, just to prevent herders from taking everything."* These findings align with Ahmed, (2024)

who identified open grazing of cattle as a serious threat to farming, exacerbating the conflict between herders and farmers.

Table 2: Effects of Pastoralists Activities on Arable Crop Production

Effects		Mean	SD	Rank
1.	Re-run of planting operations	3.99*	0.07	1
2.	Reduces harvest due to destruction and theft of crops	3.67*	0.57	2
3.	Reduces income	3.48*	0.55	3
4.	Increases cost of production	3.49*	0.54	4
5.	Reduction in hours spent in farm	3.05*	0.70	5
6.	Premature harvest	3.04*	0.70	6
7.	Shortage of food	2.38	0.68	7
8.	Loss of agricultural labour	2.87	0.83	8
9.	Competition for water	2.76	0.74	9
10.	Relocation of Farm	2.55	0.71	10
11.	Increases soil fertility	2.54	0.71	11
12.	Destruction of farm storage	2.28	0.69	12
13.	Facilitate seeds germination	2.00	1.69	13

Source: Field Survey, 2024.

Stage-Specific Effects on Crop Production

Figure 1 shows that most farmers (66%) experienced disruptions after planting, 29% during planting, and 5% during pre-planting. This pattern reveals that grazing cattle are more attracted to tender, young crops—posing serious threats during germination and early growth stages. Ahmed (2024) similarly found that early vegetative crops are highly vulnerable to cattle grazing due to their softness and high moisture content. The concentration of damage in the post-planting stage explains the high incidence of replanting, yield losses, and premature harvesting documented in this study.

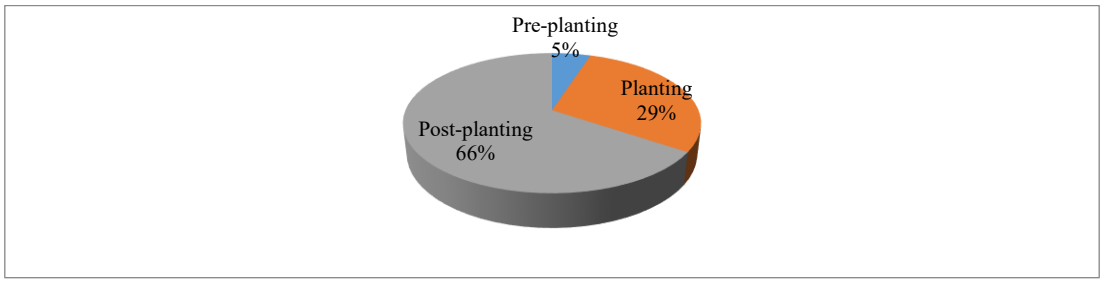


Figure 1: Crop production stages most affected most by pastoralists' activities
Source: Field Survey, 2024.

Effects of Pastoralists' Activities on Farm Income

The results of this study demonstrate that pastoralist activities exert a substantial negative influence on the profitability of arable crop farming in the study area. As shown in Tables 3 and 4, the total production costs for maize and cassava increased in years affected by pastoralist invasions, while corresponding revenues declined sharply. Specifically, net farm incomes shifted from positive values of ₦204,854 and ₦122,390 for maize and cassava, respectively, in invasion-free years, to negative values of ₦-161,148 and ₦-132,010 during years with invasions. This represents net losses of ₦416,502 for maize and ₦293,720 for cassava, with revenue reductions of 34.2% and 28.4%, respectively. These results corroborate the findings of Obi-Egbedi et al. (2023), who documented severe economic losses among farmers affected by pastoralist invasions in Oyo State. These findings underscore the magnitude of the economic disruption caused by herder-farmer conflicts, emphasizing that such conflicts threaten not only household income but also the overall sustainability of crop production in the affected regions.

The increase in production costs during invasion years from ₦829,066 and ₦567,140 to ₦874,248 and ₦653,700, represents an increase of ₦45,182 (5.5%) for maize and ₦86,560 (15.3%) for cassava. The increase in production could be attributed to several factors, including crop trampling, destruction, theft, and the additional labor and inputs required to mitigate these losses. For example, farmers often incur extra costs in replanting damaged crops, protecting their farms, and hiring additional labor to safeguard against further destruction. These findings align with prior studies which indicate that pastoralist incursions contribute to inefficiencies in the agricultural value chain, raising operational costs and reducing productivity (Olayemi & Nwachukwu, 2021; Obi-Egbedi et al., 2023; Akinbile et al., 2024).

Furthermore, the drastic decline in revenues reflects the direct loss of crop yields resulting from pastoralist activities. Maize and cassava, being staple crops in the study area, form a critical component of household food security and income generation. The observed reductions highlight that pastoralist invasions can significantly compromise both economic stability and food availability, potentially exacerbating rural poverty and vulnerability (Yahaya et al., 2020; Adelakun, 2025).

Economically, these findings demonstrate the urgent need for interventions aimed at reducing conflict between farmers and pastoralists. Policy measures such as the establishment and proper management of grazing reserves, strict enforcement of anti-grazing laws, and agricultural insurance schemes could mitigate financial losses and stabilize rural livelihoods. In addition, promoting alternative livestock management practices, such as ranching or rotational grazing, could reduce direct encroachment on farmland while maintaining pastoral productivity (Olaiya et al., 2022).

Table 3: Average Costs and Returns of Maize and Cassava Before and After Invasions

	Before		After	
Variable	Maize	Cassava	Maize	Cassava
Variable Costs				
Cost of labour	89,600	43,500	81,400	36,700
Cost of seed	35,750	-	30,500	-
Cassava Stem	-	19000	-	13,600
Cost of fertilizer	213,000	65,000	222,000	65,000
Cost of agrochemicals	22,000	19,400	24,000	24,500
Transportation	87,200	55,100	109,340	75,300
Processing (threshing)	75,600	86,000	79,100	94,900
Packaging	31,400	24,800	37,250	33,000
Cost of hiring tractor	70,000	50,000	80,000	60,000
Total (A) Total Variable Cost(₦)	624,550	362,800	663,590	403,000
Fixed cost				
Cost of Hiring land	17,500	20,000	17,500	20,500
Cost of hoes	9,000	9,000	11,000	10,000
Cost of cutlass	7,000	7,000	10,200	7,000
Wheel barrow	101,200	101,200	101,200	101,200
Cost of knapsack sprayer	59,800	59,800	59,800	59,800
Depreciation	10,016	7,340	10,958	8,050
(B) Total fixed cost (₦)	204,516	204,340	210,658	250,700
(C) Total cost of production(A+B)	829,066	567,140	874,248	653,700
Returns				
(D) Revenue (Output)(₦)	1,084,420	728,850	713,100	521,690
(E)Gross margin(₦) (D-A)	459,870	366,050	49,510	118,690
(F) Net Farm Income(₦) (E-B)	255,354	161,710	-161,148	-132,010

Figure 4 clearly illustrates that farmers suffer substantial revenue losses during periods of pastoralist invasions, with revenue from maize and cassava declining by 34.2% and 28.4%, respectively. This significant reduction in income highlights the severe economic impact of pastoralist incursions on agricultural livelihoods.

Table 4: Revenue Differences Before and After Invasions

Crops	Before	After	Revenue difference	% Loss
Maize	₦1,084,420	₦713,100	₦371,320	34.2%
Cassava	₦728,850	₦521,690	₦207,160	28.4%

CONCLUSIONS

The study showed that most arable crop farmers in the study are middle-aged men with long years of farming experience, and generally older than the pastoralists operating in the same area. Pastoralist activities especially open grazing, crop destruction, theft, and water contamination were found to significantly reduce crop yields, raise production costs, and cause serious income losses. Maize and cassava farmers, in particular, lost up to 34.2% and 28.4% of their revenue during years of pastoralist invasion, clearly demonstrating the economic severity of these conflicts. The findings highlight the urgent need for effective policies that can reduce clashes, protect farmlands, and promote peaceful co-existence between farmers and herders.

Recommendations

To address these challenges, the study recommends stronger enforcement of land management and anti-grazing laws, rehabilitation of grazing reserves, and the introduction of insurance schemes targeted at farmers affected by pastoralist incursions. It also emphasizes the importance of dialogue, sensitization campaigns, and improved extension services to promote understanding and reduce tensions.

Contributions to Knowledge

This study contributes to knowledge by providing quantitative evidence of the economic impact of pastoralist activities on arable crop production. By documenting actual cost and revenue changes before and after invasions, it offers data that can guide policymakers and development stakeholders in designing more targeted and sustainable solutions to farmer-herder conflicts.

Areas of Further Research

Although this study provides valuable insights into the socio-economic impacts of pastoralist activities on arable crop farmers in southwest Nigeria, several areas warrant deeper investigation. First, future research should explore longitudinal impacts of farmer-herder interactions to determine how recurring conflicts influence long-term agricultural productivity, household resilience, and livelihood transitions. Second, there is a need for comparative studies across multiple agro-ecological zones in Nigeria to examine regional variations in conflict intensity, coping strategies, and institutional responses.

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