Effect of agricultural crimes on cashew crop farmers in Ogbomoso Agricultural zone of Oyo State, Nigeria

Janet Temitope Ojediran[1], Olasumbo Kafilat Jubreel[1], Deborah Tosin Fajobi[2], Damilola Toluse Adeomi[2] & Rasheed Gbolagade Adeola[1]

[1] Department of Agricultural Extension and Rural Development, Ladoke Akintola University of Technology, Ogbomoso, 21021, Nigeria

[2] Department of Agricultural Economics, Ladoke Akintola University of Technology, Ogbomoso, 21021, Nigeria

Correspondence: Janet Temitope Ojediran, Department of Agricultural Extension and Rural Development, Ladoke Akintola University of Technology, Ogbomoso, 21021, Nigeria. E-mail: jtojediran@lautech.edu.ng

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Abstract

Agricultural crime stays mostly under-researched. This study examined the effects of agricultural crimes on cashew crop farmers in the Ogbomoso Agricultural Zone of Oyo State, Nigeria. A multi-stage sampling technique was employed, utilising a well-organised questionnaire administered via an interview schedule. The collected data were analyzed using descriptive statistics and multiple regression. Five per cent of 180 villages were purposefully selected due to their high concentration of cashew plantations. The second stage involves the random selection of cashew crop farmers in the study area. In the third stage, 10 cashew farmers from each selected village within the study area were randomly chosen. Consequently, 90 cashew farmers were selected randomly for the study. The results revealed that most cashew farmers are men (61.1%), with an average age of 50 and 23 years of growing experience. Most of the people who answered worked on small farms (an average of 7 hectares), and they used both family and hired workers. Among the most common crimes in agriculture were theft of cashew nuts (97.8%), theft of other goods (96.7%), damage to property (86.7%), and trespassing (73.3%). These crimes caused big problems, like fewer fruits being harvested (WMS 3.14) and less income (WMS 2.99). Farmers took steps to stop theft by firing dishonest workers, marking crops and tools, and using community-based surveillance like vigilante patrols. Statistical analysis showed a significant positive correlation between levels of education and the ability to manage the effects of these crimes ($r = 0.42$). Agricultural crimes are a major threat to cashew production and the way farmers in the area make a living. Therefore, we recommend strengthening community policing, educating farmers, and providing institutional support to enhance security and sustain cashew production.

Keywords: cashew, crime, agriculture, farmers.

Efeito dos crimes agrícolas sobre os produtores de caju na zona agrícola de Ogbomoso, Estado de Oyo, Nigéria

Resumo

Os crimes agrícolas permanecem em grande parte pouco pesquisados. Este estudo examinou os efeitos dos crimes agrícolas sobre os produtores de caju na Zona Agrícola de Ogbomoso, Estado de Oyo, Nigéria. Foi empregada uma técnica de amostragem em múltiplas etapas, utilizando um questionário bem estruturado aplicado por meio de entrevistas. Os dados coletados foram analisados por meio de estatísticas descritivas e análise de regressão múltipla. Cinco por cento das 180 vilas foram selecionadas intencionalmente devido à alta concentração de plantações de caju. A segunda etapa envolveu a seleção aleatória de produtores de cajú na área de estudo. Na terceira etapa, 10 produtores de caju de cada vila selecionada foram escolhidos aleatoriamente. Consequentemente, 90 produtores de cajú foram selecionados para o estudo. Os resultados revelaram que a maioria dos produtores de caju são homens (61,1%), com idade média de 50 anos e 23 anos de experiência no cultivo. A maioria dos respondentes trabalhava em pequenas propriedades (média de 7 hectares) e utilizava tanto mão de obra familiar quanto contratada. Entre os crimes agrícolas mais comuns estavam o furto de castanhas de

caju (97,8%), furto de outros bens (96,7%), danos à propriedade (86,7%) e invasão de terras (73,3%). Esses crimes causaram grandes impactos, como redução na colheita de frutos (WMS 3,14) e diminuição da renda (WMS 2,99). Os agricultores adotaram medidas para conter os furtos, como demitir trabalhadores desonestos, marcar plantações e ferramentas, e utilizar vigilância comunitária, incluindo patrulhas de vigilantes. A análise estatística mostrou correlação positiva significativa entre o nível de escolaridade e a capacidade de lidar com os efeitos desses crimes (r = 0,42). Os crimes agrícolas representam uma grande ameaça à produção de caju e ao sustento dos agricultores da região. Portanto, recomenda-se o fortalecimento do policiamento comunitário, a educação dos agricultores e o apoio institucional para aprimorar a segurança e manter a produção de caju.

Palavras-chave: caju, crime, agricultura, Produtores.

1. Introduction

Crime has morphed into a worldwide social monster, which harms every aspect of human survival and sustainability (Ige et al., 2016). As the backbone of the agricultural economy of the nation, farms are not spared, as animals are taken and thieves harvest crops before farmers have a chance. To sell animals and collect crops in their barns. Agricultural crime is therefore a cankerworm and one of the most obvious dangers to farming techniques and agricultural output. As Omisakin (1998) forcefully pointed out, "Crime is a social menace, an undeniable stigma to national image and a major source of threat to the people's safety and wellbeing."

According to Adejumobi et al. 2009, crime-related insecurity is widespread in Nigeria and emerging nations. By changing nature to fit economic, social, psychological, and physiological needs, man has constantly tried to improve the quality of life (Vansteenkiste et al., 2020). Natural endowments that provide these needs include mineral resources, forests, crude oil, and the agricultural activity-generated food supply (Ige et al., 2016). In many developing countries, agriculture is a major occupational sector and a foundation of Nigeria's economy, providing necessary food for its growing population (Muhammad et al., 2020).

Recently, many individuals have taken up various agricultural activities as their primary occupation to earn a living or generate income. By growing food and cash crops for export, agriculture helps improve national security, hence contributing to economic development (Achterbosch et al., 2014). Agricultural crime is a unique and complex problem. Like rural crime in general (Well; Weisheitm, 2004), agricultural crime stays mostly under-researched by criminologists and inadequately handled by legislators (Weisheit; Donnermeyer, 2000; Donnermeyer; Barclay, 2005).

Theft of agricultural products, supplies, or equipment, as well as activities influencing farm output, are crimes that affect consumers as well as farmers. Over the years, criminal justice studies have mostly ignored rural crime (Barclay, 2001; Barclay; Donnermeyer, 2022). Generally speaking, crime theories are created and studied inside metropolitan populations; rural areas receive little attention. With much of the outside funding, e.g., grants going to these approaches, policing tactics are designed to fit the needs of large departments (Hollis; Hankhouse, 2019). Ultimately, research results primarily from urban environments inform the creation of most national and state crime policies. Several elements contribute to this bias, including the comparatively tiny populations of rural areas and the assumption that policing methods should be consistently implemented across urban and rural areas (Weisheit; Donnermeyer, 2000).

The prevalent notion that rural locations possess an intrinsically low crime rate is also culpable (Carrington, 2014). Conversely, they are perceived as utopian communities devoid of issues substantial enough to warrant consideration. Agricultural crime is a comprehensive term that includes activities such as vandalism, arson, trespassing, illegal dumping, and theft. The targets of theft encompass a diverse range, including crops, pesticides, herbicides, big machinery, livestock, and specialized agricultural equipment (Barclay, 2001). Theft of livestock and crops ranks among the most expensive crimes, both individually and on a larger scale; yet, these offences are not the most commonly perpetrated agricultural crimes. Instead, farms are frequently exposed to milder types of victimization, including the theft of minor tools and equipment (Barclay, 2001). As a result, the repercussions of agricultural crime manifest for the public through increased commodity prices (Chalfin, 2007) and/or employment losses in food-related sectors.

Agriculture is a multibillion-dollar industry necessitating substantial input expenditures, including machinery, chemicals, and various supplies, as well as a significant investment of labour, either from family members or through the employment of non-family labourers. Agriculture is as commercially significant as any other sector of the economy, particularly in sophisticated capitalist economies. However, criminology and criminal justice researchers hardly focus on agricultural crimes. Many people believe that agriculture has no crime problems, and

this idea is still accepted by many in the criminology field, suggesting that rural areas are less affected by crime compared to cities (Donnermeyer, 2018).

The cashew crop (*Anacardium occidentale*) is an evergreen perennial species from the Anacardiaceae family, indigenous to tropical America and farmed in tropical regions for its nuts and cashew apple (Swamy 2023) It is a prominent cash crop that has garnered international recognition for various countries, including Brazil, India, Ivory Coast, Vietnam, Nigeria, Indonesia, the Philippines, Benin, Tanzania, Guyana, and Mali (FAO. 2021). It was brought to Nigeria many years ago by Portuguese explorers and has swiftly disseminated across all agroecologies of the country (Hammed et al., 2008). The crop has historically provided sustenance and serves as a significant source of income for farmers. It serves as a valuable source of foreign income and generates numerous employment possibilities, particularly for rural regions. While the impoverished view cashews as a crop, the affluent view it as a delicacy (Thirumarpan, 2014). Cashew agriculture thrives in arid regions due to favourable meteorological conditions and soil characteristics that promote high yields. Cashew agriculture thrives in arid regions due to favourable meteorological circumstances and soil characteristics that promote high yields (Thushyanthini; Sanotharan, 2018)

The trees are mainly grown for their nuts and apples. The nut consists of the shell and inner kernel. The shell liquid is used in automobile brake systems while the edible kernel is used for food and feed while the apple can be eaten or processed into juice (Ojediran et al., 2024). The nuts, when roasted, have a very pleasant taste (Kosoko, et al. 2014). The cashew crop is cultivated in 20 states in Nigeria, which include Kwara, Oyo, Ondo, Enugu, Anambra, Benue, Kogi, Cross River, Imo, Edo, Sokoto, Nassarawa, Ogun and Osun (Azeez; Olabanji, 2024). This study examines the effect of agricultural crimes on cashew crop farmers in the Ogbomoso Agricultural Zone of Oyo State.

2. Materials and Methods

2.1 Study area

The study area was located in Ogbomoso, Oyo State. Ogbomosho is one of the largest towns in Oyo State, with an urban population of about 861,300. Ogbomoso comprises five Local Government Areas (LGAs), namely: Ogbomoso North, Ogbomoso South, Ogo-oluwa, Oriire, and Surulere. The town lies between latitude $80^0$29' North of the equator and between $40^0$30' North of the Greenwich Meridian. Ogbomoso has an area landmass covering about 37,984 square kilometres and is located in the Northern part of Oyo State. Ogbomoso is located in the derived savannah vegetation (Ojediran et al., 2022), and it is a commercial centre situated in an agricultural region producing yams, cassava, corn, cotton, cashew, and tobacco (Ojediran, 2020).

2.2 Population of the Study

The population of this study comprises cashew crop farmers in the Ogbomoso agricultural zones of Oyo State.

2.3 Statistical analysis

A multi-stage sampling technique was employed using a well-organized questionnaire administered via an interview schedule. The collected data were analyzed using descriptive statistics and multiple regression. This study utilized a multistage sampling technique. In the initial step, nine villages were purposively selected from a total of 180 villages because of the concentration of cashew plantations. The villages are Iresa-apa, Adudu, Idi-ayin, Maami, Okin apa, Oko, Kueke, Pooro, and Osun. The second stage involves the random selection of cashew crop farmers in the study area. In the third stage, 10 cashew farmers are randomly selected from each of the study area's selected villages. Consequently, 90 cashew farmers were selected randomly for the study.

3. Results

3.1 Socio-economic characteristics of respondents

This section explains the socio-economic characteristics of the cashew crop farmers (Table 1).

3.1.1 Sex

The result indicates that 61.1% of the respondents were male, while 38.9% were female.

3.1.2 Marital Status

The marital status distribution of the respondents indicates that 71.1% were married, 12.2% were single, 4.4% were divorced, and 12.2% were widowed.

3.1.3 Age

Table 1 indicates that 24.4% of the respondents were aged between 60 and 69 years, while 22.3% fell within the 40 to 49 age bracket. Additionally, 21% of the respondents were aged 50 to 59 years, 13.3% were between 20 and 29 years, and 12.1% were aged 30 to 39 years. Those in the 70 to 79 age group comprised 5.5%, and only 1.1% of respondents were between 80 and 89 years. The average age of the respondents was calculated to be 50 years.

3.1.4 Household size

The household size indicated that 27.7% of the respondents had up to five members, 66.8% had between 6 and 10 members, and 5.5% had between 11 and 15 members in their household. On average, a family has seven members.

3.1.5 The level of education of the respondents

The respondents attained various forms of education. The result shows that 40% of the farmers had a tertiary education, 27.8% had a secondary school education, 21.1% had no formal education, and 11.1% had a primary school education. The findings implied that most of the respondents were educated.

3.1.6 Farming experience

The result reveals that 33.2% of the respondents had farming experience between 10 to 19 years, 29.9% had between 20 and 29years, 16.6% had between 30 and 39 years, 11.1% had between 40 and 49years, 7.7% had below 9 years, while 1.1% had experience above 50 years. The mean farming experience was observed to be twenty-three (23) years.

3.1.7 Source of labour

This result shows that 60% of the respondents were engaged in both family and hired labour, while 26.7% were engaged in hired labour and 15.6% were engaged in family labour.

3.1.8 Farm size

The result reveals that 81.1% of the respondents had farm sizes of 8 hectares and below, while 18.8% had 8 hectares and above. The mean farm size is 7 hectares per farmer.

3.1.9 Primary occupation

The primary occupation of the respondents shows that 44.4% were into trading, 37.8% were cashew crop farming, 16.7% were civil servants, and 1.1% were students.

3.1.10 Secondary occupation

The result shows that about 78.0% of the respondents were engaged in cashew crop farming, 20.0% were engaged in trading, and 2.2% were civil servants as a secondary occupation.

Table 1. Distribution of respondents according to socio-economic characteristics.

Socio-economic Characteristics	Frequency	Percentage	Mean

Age			
20 – 29	12	13.3	50
30 – 39	11	12.1	
40 – 49	20	22.3	
50 – 59	19	21	
60 – 69	22	24.4	
70 – 79	5	5.5	
80 – 89	1	1.1	
Sex			
Male	55	61.1	
Female	35	38.9	
Marital status			
Married	64	71.1	
Single	11	12.2	
Divorced	4	4.4	
Widow	11	12.2	
Household size			
0 ≤ 5	25	27.7	7.0
6 – 10	60	66.8	
11 – 15	5	5.5	
Educational level			
No formal education	18	20	
Primary school	10	11.1	
Secondary school	25	27.8	
Tertiary school	36	40	
Others (Student)	1	1.1	
Farming experience			
0 – 9	7	7.7	
10 – 19	30	33.2	
20 – 29	27	29.9	23.0
30 – 39	15	16.6	
40 – 49	10	11.1	
50 – 59	1	1.1	
Source of labour			
Family labour	14	15.6	
Hired labour	24	26.7	
Both	52	57.8	
Primary occupation			
Cashew crop farming	34	37.8	
Civil servant	15	16.7	
Trading	40	44.4	
Student	1	1.1	

Secondary occupation			
Cashew crop farming	70	77.8	
Civil servant	2	2.2	
Trading	18	20	
Farm size			
≤ 8	73	81.1	7.0
Above 8	17	18.8	
Total	90	100	

Source: Field survey 2022.

3.2 Criminal activities experienced in cashew production

The result in Table 2 shows the criminal activities experienced in cashew crop production. The result shows that 97.8% of the respondents experienced theft of cashew nut, 96.73% experienced pilfering of cashew crop, 86.7% experienced vandalization of cashew apples and their nut, arson and dumping of waste, 77.8% experienced theft of tools and equipment, 73.3% experienced trespassing, 56.7% of the respondent's experience theft of pesticides, 55.6% of the respondent experience theft of herbicides while 6.7% of the respondents experienced burglary.

Table 2. Criminal activities experienced in cashew production.

Criminal activities	Frequency	Percentage
Theft of tools and equipment	70	77.8
Theft of herbicides	50	55.6
Theft of pesticide	51	56.7
Theft of cashew Nuts	88	97.8
Vandalisation of cashew apple and its seeds	78	86.7
Arson	78	86.7
Trespassing	66	73.3
Pilfering	87	96.7
Dumping of waste	78	86.7
Burglary	6	6.7

Source: Field survey 2022.

3.3 Effect of criminal activities on cashew crop production

The result in Table 3 reveals the effect of criminal activities on cashew crop production. From the table, the respondents agreed that there is a reduction in cashew seeds gathered for sales which were ranked first with a Weighted Mean Score (WMS) of 3.14: there is low income due to the quantity of seeds gathered, ranked second (WMS 2.99), financial difficulties could lead to delay in payments to workers was ranked third (WMS 2.99), it could result to poverty and despair, ranked fourth with WMS of 2.80, criminal activities reduce the market value of cashews ranked fifth (WMS 1.74), and it could lead to an increase in cashew prices ranked sixth WMS 0.45).

Table 3. Effect of the criminal activities on cashew crop production.

Statement	Strongly agreed	Agreed	Disagreed	Strongly disagreed	WMS	Rank
There is a reduction in the cashew seeds gathered for sales	74(82.2)	16(17.8)	-	-	3.14	1st
There is low income due to the quantity of seeds gathered	62(68.9)	28(31.1)	-	-	2.99	2nd
Criminal activities reduce the market value of cashew	5(5.6)	59(65.6)	7(7.8)	19(21.1)	1.74	5th
This can lead to an Increase in cashew price	1(1.1)	11(12.2)	11(12.2)	67(74.4)	0.45	6th
This could result in Poverty and despair	61(67.8)	19(21.1)	6(6.7)	4(4.4)	2.80	4th
Financial difficulties could lead to a delay of payments to workers	70(77.8)	16(17.8)	-	4(4.4)	2.99	3rd

Note: Percentages are in parentheses. Source: Field survey 2022.

3.4 Measures taken by the farmers to reduce criminal activities

The result in Figure 4 shows the measures taken by the farmers to reduce criminal activities. The result showed that 100% of the respondents do fire employees who are involved in theft; 97.8% were engaged in marking of grain sacks, equipment and crop-marking, 95.6% embarked on locking of input, 94.4% engaged in the use of vigilance and monitoring of employees; 91.1% engaged housing machinery at night, 17.8% ensured proper fencing; while 16.7% employ guards.

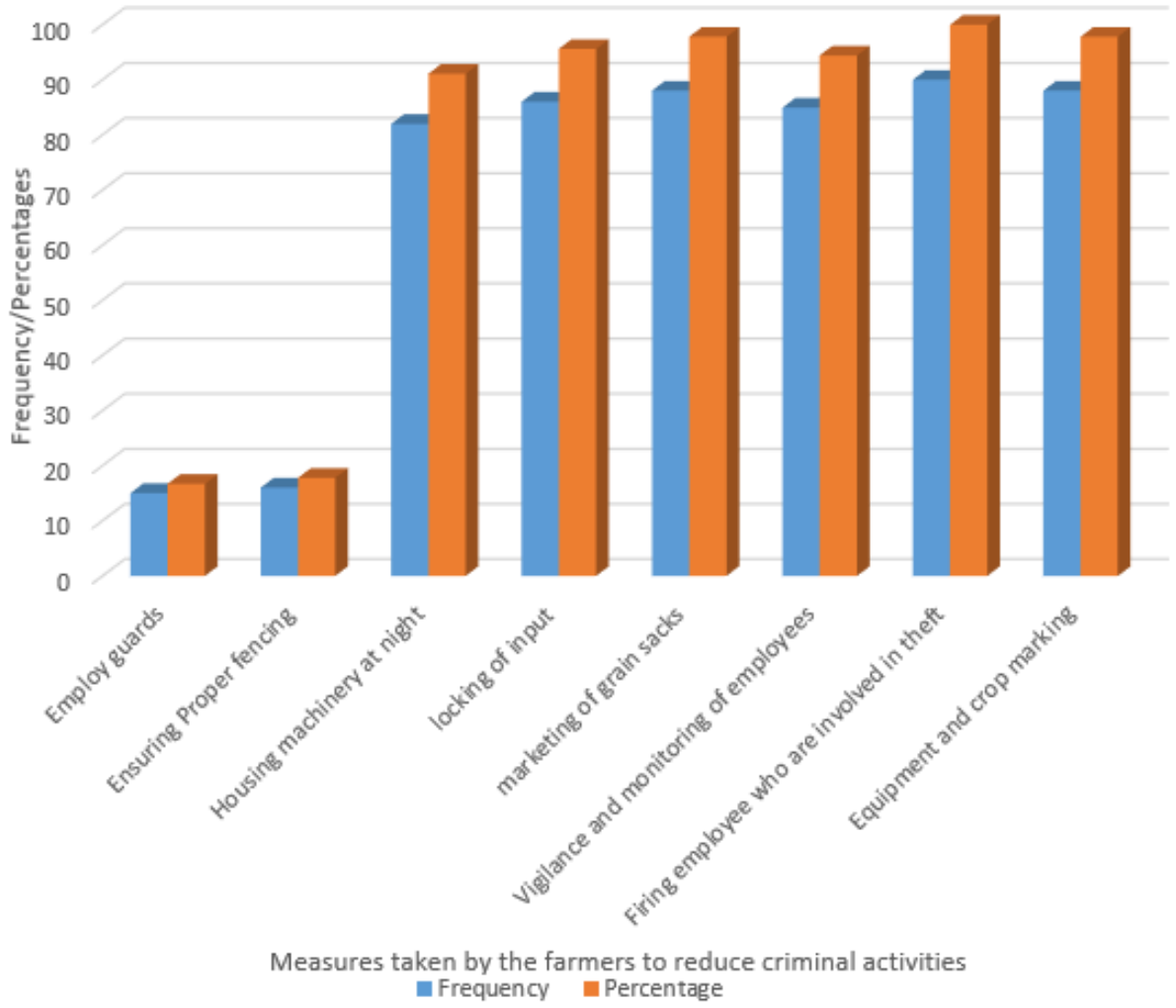

Figure 1. Showing the measures taken by the farmers to reduce criminal activities. Source: Authors, 2025.

3.5 The impact of the crime management institution on reducing criminal acts

The impact of the Crime Management Institution on reducing criminal acts is illustrated in the results presented in Table 5. It shows that 56.7% of the respondents participated in patrols by vigilantes around their farms, which received the highest Weighted Mean Score (WMS) of 1.47. Following closely, 36.7% of respondents reported engaging with security agencies for prompt intervention when needed, earning a WMS of 1.34. Additionally, 30.0% of the respondents reported involvement in the targeting and prosecution of agricultural crime offenders, which received a WMS of 0.67.

Table 5: Crime management institution impact on reducing criminal acts.

Crime Management Institution	Always	Sometimes	Never	WMS	Rank
Targeting and prosecution of agricultural crime offenders	27(30)	6(6.7)	57(63.3)	0.67	3rd
Security agency intervenes promptly whenever they are called upon	33(36.7)	55(61.1)	2(2.2)	1.34	2nd
Patrol of vigilantes around the farm	51(56.7)	31(34.4)	8(8.9)	1.47	1st

Note: Percentages are in parentheses. Source: Field survey 2022.

3.6 Correlation between socioeconomic characteristics and the effect of criminal activities

Table 6 shows that of all the socio-economic factors analysed, only education level showed a robust and significant correlation with the impacts of crime ($r = 0.418$, $p = 0.000$). The variables of age ($r = 0.038$, $p = 0.724$) and household size ($r = 0.106$, $p = 0.320$) exhibited no statistically significant associations.

Table 6. Correlation between socio-economic characteristics and the effect of criminal activities.

Variable	r-value	p-value	Remarks
Age	0.038	0.724	NS
Level of education	0.418**	0.000	S
Household size	0.106	0.320	NS

Note:| NS = Not significant. S = Significant. **= Significant at 1% level. Source: Authors, 2025.

4. Discussion

4.1 Socio-economic characteristics of respondents

4.1.1 Sex

The observed result suggests that agricultural operations require significant energy, resulting in more male participation in production, while women predominantly engage in food processing and commercialization within agriculture (Oyediran et al, 2015). Uzokwe (2009) asserted that women are mostly involved in planting, weeding, irrigation, harvesting, and marketing activities. Additionally, the involvement of women in family labour impedes their access to farm labour (Palacios-Lopez; Christiaensen, 2017). This is consistent with Ayinde (2024), who found that male respondents predominated in cashew farming and that male children are often considered the inheritors of land. Furthermore, a reasonable justification for this predominance might be that women are mostly engaged in off-farm activities such as storing and selling farm products.

4.1.2 Marital Status

According to Ahmed (2016), cultural expectations of married individuals impose the obligation to ensure the welfare of their households, which may lead these individuals to engage in agricultural pursuits as either a primary or secondary career. The findings show that married individuals predominantly conduct cashew cultivation in the study area. This could influence their production and ability to manage dangers related to cashew farming. This indicates that household members were essential for many agricultural activities (Ogunsunmi, 2005).

4.1.3 Age

This data suggests that as respondents age, there may be a correlation with increased expertise in cashew farming,

and this may result in a large expanse of cashew farm, which, assuming all other factors remain constant, can result in older farmers facing more risks than their younger peers (Ogunmefun; Achike, 2015).

4.1.4 Household size

The observation in this study agrees with the earlier findings (Omoare, 2014) that large family size is an indicator of the availability of labour for various farming activities.

4.1.5 The level of education of the respondents

The findings implied that most of the respondents were educated. This agrees with the earlier findings (Ogunsunmi, 2005) that a farmer's level of acquired knowledge through education determines the ability of such a farmer to make profitable decisions on investment and adopt an approach to risk management that best reduces the incidences of production failure, although experiences of farmers with risk management strategies are of more relevance.

4.1.6 Farming experience

The mean farming experience was observed to be twenty-three (23) years. This confirms the report of Ojediran et al. (2021) that experience is an asset that inspires the farmer's decision-making process and rationalizes the farmers' stand.

4.1.7 Source of labour

The report of Ojediran et al. (2021) established that most farmers use both family and hired labour, but hired labour is more than family labour.

4.1.8 Farm size

This result agrees with Ojediran et al. (2023), who reported that Nigerian farmers are commonly small-scale farmers.

4.1.9 Primary occupation

This study shows that most respondents were trading and farming. A few of the respondents were students and, at the same time, practising farmers. This suggests that the respondents had other occupations.

4.1.10 Secondary occupation

This result shows that the respondents were mostly involved in cashew crop farming as a secondary occupation.

4.2 Criminal activities experienced in cashew production

This result conforms to the report of Bunei et al. (2013) that most farmers typically report farm thefts of livestock, machinery thefts, and vandalism incidents occurring during the night. These crimes not only result in financial losses but also create a sense of insecurity among the farming community, leading to increased stress and reduced productivity. Over 80% of livestock thefts and 59% of all machinery thefts were reported, which is much higher than in countries such as Australia and the United States of America (Mears et al., 2007b).

4.3 Effect of criminal activities on cashew crop production

According to these findings, criminal activity has a significant impact on the local agricultural economy since it not only lowers cashew farming's financial returns but also jeopardises the farmers' overall well-being and financial security.

4.4 Measures taken by the farmers to reduce criminal activities

This finding suggests that farmers choose internal control measures, including employee supervision, input labelling, and secure storage, over exterior security systems. This indicates a significant dependence on economic and preventive strategies to prevent theft instead of investing in extensive security measures, such as fences or hiring guards.

4.5 The impact of the crime management institution on reducing criminal acts

Overall, these findings indicate that respondents are actively implementing measures to mitigate criminal activities on their farms by employing patrols by vigilantes and engaging with security agencies for prompt intervention when needed.

4.6 Correlation between socioeconomic characteristics and the effect of criminal activities

The positive correlation, significant at the 1% level, indicates that individuals with elevated educational attainment are more likely to be aware of or impacted by criminal activity. This may be ascribed to their heightened awareness, enhanced access to information, or engagement in higher-risk professions. This conforms to the findings of Ahmed et al. (2016) that better quality education may influence the level of organized violence and could also cause political indoctrination of political ideologies fueled through different educational systems. Furthermore, those with higher education levels may be more predisposed to report crimes and contemplate the ramifications for employment and community health, therefore strengthening this association.

5. Conclusions

The study concluded that the cashew crop farmers in Ogbomoso Agricultural Zone of Oyo State, Nigeria, were mostly men, average age of 50 years old, mostly educated, with 23 years of farming experience on 7 hectares average farm size. They strongly agreed that the crime reduced cashew seeds gathered, resulting in low income and financial difficulties in paying workers. However, the firing of culprits, sack marking, vigilance, and monitoring of employees reduced the crime rate. Also, a patrol of vigilantes and the security agencies' prompt intervention influenced the crime rate. The level of education and the impact of criminal activities were strongly correlated.

This suggests that these factors do not substantially affect the consequences of illegal behaviour on individuals. These findings correspond with prior studies indicating that although age and family size are demographic characteristics affecting socioeconomic position, they may not directly influence criminal behaviour or an individual's exposure to it, especially in rural or agricultural settings. Consequently, education is a vital element in comprehending the socioeconomic dynamics of crime in this analysis.

7. Authors' Contributions

Janet Temitope Ojediran: conceptualisation, designed the experiment, and analyzed the data. *Olasunmbo Kafilat Jubreel* and *Deborah Tosin Fajobi*: experimented and interpreted the data. *Damilola Toluse Adeomi*: wrote the first draft. *Rasheed Gbolagade Adeola*: contributed analysis tools and corrected the draft.

8. Conflicts of Interest

No conflicts of interest.

9. Ethics Approval

Not applicable.

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