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Restructuring Agricultural Extension Practice for Improved Productivity and Livelihoods Among Cocoa Farmers in Osun State

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Abstract: *Cocoa production remained a major livelihood activity in Osun State, Nigeria, however, the level of productivity and household welfare among cocoa farmers are significantly low due to ineffective agricultural extension service delivery. Hence, this study examined the effect of restructuring agricultural extension practices on cocoa productivity and livelihood improvement among cocoa farmers in Osun State. A multistage sampling technique was employed to select 240 cocoa farmers from major cocoa-producing local government areas. Data were collected using structured questionnaires and analyzed using descriptive statistics and multiple regression analysis. Results revealed that restructured extension practices had positive and statistically significant effect on cocoa productivity ($R^2 = 0.62$, $p = 0.000$), and on farmers' livelihoods, ($R^2 = 0.58$, $p = 0.000$). The study concludes that restructuring agricultural extension practices is essential for improving cocoa productivity and livelihoods, and thus recommends increased public and private investment in extension services, adoption of participatory and ICT-enabled extension approaches, and strengthened institutional collaboration to ensure sustainable cocoa sector development.*
Keywords: extension practice, ICT, livelihood, productivity, restructuring.

INTRODUCTION

Agriculture remains a cornerstone of economic development in Nigeria, contributing significantly to employment, food security, poverty reduction, and foreign exchange earnings. Despite the growing importance of the oil sector, agriculture continues to support the livelihoods of the majority of rural households in the country (Osuolale & Ogunniyi, 2015). Among agricultural commodities, cocoa (Theobroma cacao) occupies a strategic position as one of Nigeria's major non-oil export crops and a key source of income for smallholder farmers in the southwestern region.

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Nigeria is among the leading cocoa-producing countries globally, with cocoa production concentrated mainly in states such as Ondo, Osun, Ogun, Ekiti, Cross River, and Oyo. In Osun State, cocoa farming provides employment opportunities and income for thousands of rural households, thereby contributing to rural development and household welfare. However, cocoa production in the state has been characterized by low productivity, declining yields, aging cocoa trees, pest and disease infestations, climate variability, and limited adoption of improved production technologies (Adoiphus & Simon, 2017).

Agricultural extension services have long been recognized as a critical instrument for improving agricultural productivity and rural livelihoods through the dissemination of improved technologies, management practices, and market information (Awuor & Rambim, 2022). Extension systems serve as a bridge between agricultural research institutions, policymakers, and farmers by facilitating knowledge transfer and innovation adoption. In cocoa production, effective extension services are essential for promoting improved varieties, integrated pest management, soil fertility management, post-harvest handling, quality control, and market-oriented production.

Despite their importance, agricultural extension systems in Nigeria have faced persistent challenges that limit their effectiveness. The public extension system, largely implemented through the Agricultural Development Programme (ADP), has been constrained by inadequate funding, shortage of trained extension personnel, weak research–extension–farmer linkages, and limited logistical support (Meludu, *et al*., 2017; Ogundare & Fasina, 2025). As a result, many farmers have limited access to timely, relevant, and practical extension advice. Although agricultural extension services exist in Osun State, their impact on cocoa production has been limited. Extension agents are often too few to effectively serve the large population of cocoa farmers, resulting in infrequent farm visits and limited follow-up. In addition, extension programs are frequently designed using a top-down approach, with minimal involvement of farmers in planning and decision-making processes. This often leads to poor adoption of extension recommendations due to their mismatch with farmers' socio-economic realities (Meludu *et al*., 2017).

Moreover, existing extension services have traditionally focused on production-related advice, with insufficient emphasis on post-harvest handling, quality standards, value addition, market access, and climate resilience. The limited integration of ICT-based extension tools has further constrained farmers' access to timely information on pest outbreaks, weather conditions, and market prices, which are critical for informed decision-making (Adebayo, 2018).

Given these challenges, there is an urgent need to restructure agricultural extension practices to make them more farmer-centered, participatory, market-oriented, and ICT-enabled. However, there is limited empirical evidence on the effectiveness of such restructuring strategies in improving cocoa productivity and farmers' livelihoods in Osun State.

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This study seeks to address this gap by systematically examining existing extension practices, identifying constraints, and therefore examines the restructuring of agricultural extension practices as a pathway to enhancing cocoa productivity and improving the livelihoods of cocoa farmers in Osun State, Nigeria.

METHODOLOGY

The study adopted a descriptive survey research design. This was considered appropriate because it enables the collection of quantitative data from a large number of cocoa farmers in order to examine existing agricultural extension practices, identify constraints, and assess restructuring strategies capable of enhancing cocoa productivity and improving farmers' livelihoods in Osun State, Nigeria. The design also allows for the analysis of relationships between extension service delivery, productivity outcomes, and livelihood indicators.

The study was conducted in Osun State, Southwestern Nigeria, a major cocoa-producing state in the country. Osun State lies between latitude 7° and 8° North and longitude 4° and 5° East. The state is characterized by a tropical climate with distinct wet and dry seasons, annual rainfall ranging between 1,200 mm and 1,500 mm, and fertile forest soils that are suitable for cocoa production.

Cocoa farming constitutes a major source of livelihood for rural households in the state, particularly in local government areas such as Ife East, Ife South, Ilesa East, Ilesa West, Atakumosa East, Atakumosa West, Ayedire, and Boluwaduro. These areas were selected due to their high concentration of cocoa farmers and active extension-related interventions.

The population of the study comprised all registered and non-registered cocoa farmers in Osun State. This included smallholder cocoa farmers who are actively engaged in cocoa production and have at least one year of farming experience.

A multi-stage sampling technique was used. First, cocoa-producing Local Government Areas (LGAs) were purposively selected based on cocoa production intensity. Secondly, cocoa-producing communities within each selected LGA were randomly selected. Thirdly, cocoa farmers were randomly selected from farmer lists obtained from the State Agricultural Development Programme (ADP), farmer cooperatives, and community leaders.
The sample size was determined using Yamane's (1967) formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

- n = sample size
- N = population size
- e = margin of error (0.05)

This resulted in a sample size considered adequate to ensure representativeness and statistical reliability.

Primary data were collected through a structured questionnaire administered to cocoa farmers. The questionnaire covered socio-economic characteristics, access to extension services, existing extension practices, constraints, restructuring strategies, productivity outcomes, and livelihood indicators.

Data collected were coded and analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequency counts, percentages, means, and standard deviations were employed to describe socio-economic characteristics and extension practices, while multiple regression analysis was used to examine the influence of extension practices and restructuring strategies on cocoa productivity, and Correlation analysis to determine relationships between extension services and livelihood indicators.

RESULTS AND DISCUSSION

Table 1 Socio-Economic Characteristics of Cocoa Farmers (n = 240)

Category	Frequency	Percentage (%)	Mean	SD
Age (years)				
Below 30	12	5.0	48.6	10.8
31–40	48	20.0		
41–50	72	30.0		
51–60	66	27.5		
Above 60	42	17.5		
Gender				
Male	182	75.8	–	–
Female	58	24.2		
Marital Status				
Single	18	7.5	–	–
Married	186	77.5		
Divorced	16	6.7		
Widowed	20	8.3		
Educational Level				
No formal education	36	15.0	–	–
Primary education	72	30.0		
Secondary education	96	40.0		
Tertiary education	36	15.0		
Household Size (Persons)				
1 – 3	38	15	6.2	2.7
4 – 6	102	42		
7 – 9	68	28.3		
10 and above	32	13.4		
Farming Experience				
Less than 5 years	18	7.5	18.4	8.6

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5–10 years	48	20.0		
11–20 years	84	35.0		
Above 20 years	90	37.5		
Farm Size (hectares)				
Less than 1 ha	24	10.0	3.8 ha	1.7
1–3 ha	102	42.5		
4–6 ha	78	32.5		
Above 6 ha	36	15.0		
Primary Occupation				
Cocoa farming	144	60.0	–	–
Other crop farming	36	15.0		
Trading	28	11.7		
Civil service	18	7.5		
Others	14	5.8		

Source: Field Survey, 2025

The table above presents the socio-economic characteristics of cocoa farmers in the study area. The age distribution indicates that the majority of respondents were within the economically active age group**,** with 30.0% aged 41–50 years and 27.5% aged 51–60 years, while only 5.0% were below 30 years. The mean age of farmers was 48.6 years (SD = 10.8)**,** suggesting that cocoa farming in the area is dominated by middle-aged and older farmers. This finding implies that while farmers possess considerable farming experience, there may be limited participation of younger individuals in cocoa farming. This trend has been widely reported in cocoa-producing regions of West Africa, where the ageing farming population poses a challenge for the long-term sustainability of cocoa production (Federal Ministry of Agriculture and Rural Development [FMARD], 2015). Similarly, research by Oduntan & Adegbuyi, (2022) emphasises that younger farmers are often more receptive to technological innovations and modern farming practices, which are essential for increasing productivity.

The gender distribution shows that 75.8% of the respondents were male, while 24.2% were female, indicating that cocoa farming in the study area is predominantly male-dominated. This pattern reflects the labour-intensive nature of cocoa production and the traditional land tenure systems that often favour male ownership and control of farmland in rural Nigeria. However, women still play important roles in activities such as harvesting, fermentation, drying, and marketing of cocoa beans. Similar gender patterns have been reported in several cocoa-producing communities in West Africa (FMARD, 2015).

Regarding marital status, the majority of respondents (77.5%**)** were married. Married farmers typically have access to family labour, which is crucial for labour-intensive activities such as weeding, pruning, harvesting, and post-harvest processing. This supports earlier findings that household labour availability significantly influences smallholder agricultural productivity in developing countries (FMARD, 2016).

Educational attainment among farmers showed moderate levels of literacy. While 40.0% had secondary education and 30.0% had primary education**,** 15.0% had no formal education and another 15.0% possessed tertiary education. The relatively high proportion of farmers with at least basic education suggests a reasonable capacity to understand and adopt improved cocoa production technologies introduced through extension services. Previous studies have demonstrated that education enhances farmers' ability to interpret extension messages and adopt improved agricultural innovations (Oduntan & Adegbuyi, 2022).

The mean household size of 6.2 persons (SD = 2.7) indicates moderately large rural households, which may provide family labour for cocoa production activities. Large household sizes have been linked to increased labour availability in smallholder farming systems, thereby reducing reliance on hired labour and lowering production costs.

In terms of farming experience, the results reveal that 37.5% of respondents had more than 20 years of cocoa farming experience, while 35.0% had between 11 and 20 years of experience. The mean farming experience of 18.4 years (SD = 8.6) suggests that most farmers possess substantial practical knowledge of cocoa cultivation. Experienced farmers are often better able to manage pests, diseases, and climatic risks based on accumulated knowledge (Bayissa, 2019).

Farm size distribution shows that the majority of farmers operate small to medium-scale cocoa farms. About 42.5% cultivated between 1–3 hectares**,** while 32.5% managed 4–6 hectares**.** The mean farm size of 3.8 hectares (SD = 1.7) confirms that cocoa farming in the study area is largely dominated by smallholder production systems. This finding is consistent with previous studies indicating that most cocoa farmers in Nigeria operate on small landholdings with limited capital investment (FMARD, 2015).

Finally, the results indicate that 60.0% of respondents identified cocoa farming as their primary occupation**,** while others engaged in additional livelihood activities such as other crop farming (15.0%), trading (11.7%), and civil service (7.5%). Diversification of livelihood activities among cocoa farmers is common in rural communities as a strategy for managing income risks associated with fluctuating cocoa prices and climatic variability (FACU, 1991: FMARD, 2016).

Overall, the socio-economic profile of cocoa farmers in the study area reflects typical characteristics of smallholder farming systems in Nigeria: a predominance of middle-aged male farmers, moderate educational attainment, relatively large household sizes, substantial farming experience, and small to medium farm sizes. These characteristics have important implications for the design and restructuring of agricultural extension services, as extension strategies must consider farmers' demographic attributes, education levels, and resource constraints to effectively promote the adoption of improved cocoa production practices.

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Table 2: Awareness and Access to Agricultural Extension Services among Cocoa Farmers (n = 240)

Category	Frequency	Percentage (%)	Mean	SD
Awareness of extension services				
Aware	206	85.8	–	–
Not aware	34	14.2		
Ever visited by an extension agent				
Yes	158	65.8	–	–
No	82	34.2		
Frequency of extension visits				
Monthly	28	11.7	2.48	0.91
Quarterly	64	26.7		
Occasionally	92	38.3		
Rarely	56	23.3		
Distance to extension office				
Less than 5 km	72	30.0	2.00	0.77
5–10 km	96	40.0		
Above 10 km	72	30.0		
**Sources of Extension Information				
Extension agents	124	51.7		
Fellow farmers	96	40.0		
Farmer cooperatives	72	30.0		
Radio programmes	58	24.2		
Mobile phones / WhatsApp	42	17.5		
NGOs / development projects	36	15.0		

**Multiple responses allowed.
Source: Field Survey, 2025

The results presented above reveal a relatively high level of awareness of agricultural extension services among cocoa farmers in the study area. Approximately 85.8% of respondents indicated that they were aware of the existence of agricultural extension services**,** while only 14.2% reported lack of awareness. This finding suggests that extension programmes and agricultural advisory initiatives have achieved reasonable visibility among cocoa farmers in Osun State.

However, awareness does not necessarily translate into consistent access to extension services. Although 65.8% of respondents reported that they had been visited by an extension agent at least once**,** a substantial proportion **(**34.2%**)** indicated that they had never received direct extension visits. This highlights gaps in extension service coverage and suggests that many cocoa farmers may still lack adequate access to professional agricultural advisory support.

The frequency of extension contact further demonstrates the limitations of the current extension system. Only 11.7% of farmers reported receiving monthly extension visits, while

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26.7% indicated quarterly visits. In contrast, the majority of respondents (61.6%**)** reported that extension visits occurred only occasionally or rarely. The mean score for extension visit frequency **(**2.48±0.91) indicates relatively low levels of extension interaction. This pattern suggests that extension agents may be overstretched, covering large geographical areas with limited logistical resources. Previous studies have noted that the ratio of extension agents to farmers in many developing countries is often inadequate, which limits the effectiveness of agricultural advisory services (Oduntan & Adegbuyi, 2022).

Distance to extension offices also appears to influence farmers' access to extension services. The results show that 40.0% of respondents lived between 5–10 km from an extension office**,** while 30.0% lived more than 10 km away**.** Long distances between farmers and extension service centres may discourage frequent interactions and reduce farmers' ability to seek timely technical advice. The mean score for distance to extension offices **(**2.00 ± 0.77**)** suggests moderate physical accessibility to extension services within the study area.

The analysis of extension information sources indicates that extension agents remain the primary source of agricultural information**,** cited by 51.7% of respondents**.** However, the role of informal information networks is also significant. About 40.0% of farmers reported receiving extension information from fellow farmers**,** while 30.0% obtained information through farmer cooperatives. These findings highlight the growing importance of farmer-to-farmer knowledge exchange in agricultural innovation systems. According to Oduntan & Adegbuyi (2022). farmer networks often complement formal extension systems by facilitating rapid dissemination of locally adapted agricultural practices.

Furthermore, radio programmes (24.2%) and mobile phone platforms (17.5%) were identified as emerging channels for agricultural information dissemination. The increasing use of ICT-based communication tools in agricultural extension has been widely recognised as an effective strategy for expanding the reach of extension services, particularly in rural areas where physical extension coverage is limited. Research has shown that mobile phones and radio programmes can significantly improve farmers' access to agricultural information, market prices, and pest management advice (Akinbode, 1994; Oduntan & Adegbuyi, 2022).

Overall, the findings indicate that while awareness of agricultural extension services among cocoa farmers in Osun State is relatively high, actual access and frequency of extension interaction remain limited**.** The reliance on informal information sources such as fellow farmers and cooperatives further suggests that formal extension services are not sufficiently meeting the needs of cocoa farmers. These results underscore the need for restructuring agricultural extension practices, including strengthening extension agent capacity, improving logistical support, and integrating ICT-based extension approaches to enhance service delivery and farmer outreach.

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Table 3: Need for Restructuring Agricultural Extension Practices (n = 240)

Response Category	Frequency	Percentage (%)
Strongly Agree	136	56.7
Agree	76	31.8
Undecided	12	5.0
Disagree	10	4.2
Strongly Disagree	6	2.5
Total	**240**	**100**

Source: Field Survey, 2025

The results presented in Table 5 reveal that the majority of cocoa farmers perceive the current agricultural extension system as inadequate and in need of restructuring. Specifically, 56.7% of respondents strongly agreed and 31.8% agreed that existing extension practices require restructuring. This represents a combined 88.5% level of agreement, indicating a strong consensus among farmers regarding the need for reform.

Only 6.7% of respondents disagreed or strongly disagreed, while 5.0% remained undecided, suggesting that dissatisfaction with the current extension system is widespread among cocoa farmers in the study area. These findings reflect farmers' concerns about the limitations of traditional extension approaches, including infrequent extension visits, inadequate technical support, and limited responsiveness to farmers' specific needs.

The strong demand for restructuring may also be attributed to the increasing complexity of cocoa production systems, which require farmers to adopt improved technologies, climate-smart agricultural practices, and better pest and disease management strategies. According to Oduntan & Adegbuyi (2022). traditional top-down extension systems are often ineffective in addressing the dynamic challenges faced by smallholder farmers in developing countries. As a result, extension reforms are necessary to ensure that advisory services remain relevant and responsive to farmers' needs.

Similarly, Bayissa (2019) emphasised that modern agricultural extension systems should move beyond the conventional technology-transfer model and adopt participatory and farmer-centred approaches. Such approaches encourage active farmer involvement in extension programme design, implementation, and evaluation, thereby increasing the likelihood of technology adoption and improving agricultural productivity.The findings of this study therefore underscore the urgent need to restructure agricultural extension practices in Osun State in order to improve cocoa productivity and enhance farmers' livelihoods.

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Table 4: Institutional Strategies for Restructuring Agricultural Extension Services

Strategy	Mean	SD	Rank
Strengthening collaboration among government, NGOs, private sector and research institutions	4.41	0.67	1st
Decentralisation of extension services to community level	4.32	0.72	2nd
Strengthening farmer cooperatives as extension platforms	4.18	0.74	3rd
Involving farmers in extension programme planning	4.06	0.79	4th

Source: Field Survey, 2025
(Likert scale: 1 = Strongly Disagree, 5 = Strongly Agree)

The above table shows that farmers strongly supported collaboration among multiple stakeholders**,** including government agencies, non-governmental organisations, private sector actors, and research institutions **(**$\bar{x}$ = 4.41). Such collaboration can strengthen the agricultural innovation system by facilitating knowledge sharing and improving access to agricultural technologies.

Decentralisation of extension services ($\bar{x}$ = 4.32) was also highly rated by respondents. Decentralised extension systems allow local governments and communities to play a greater role in extension planning and implementation, thereby ensuring that extension programmes are tailored to local agricultural conditions.

Farmers also emphasised the importance of farmer cooperatives as platforms for extension delivery ($\bar{x}$ = 4.18)**.** Cooperatives provide opportunities for collective learning, access to credit, bulk purchase of inputs, and improved market access. According to Baah et al (2021), farmer organisations play a critical role in strengthening extension systems by facilitating communication between farmers and extension providers.

Table 5: Human Capacity Development Strategies for Extension Agents

Capacity Development Strategy	Mean	SD	Rank
Specialised training in cocoa agronomy	4.35	0.69	1st
Training in climate-smart agriculture practices	4.29	0.71	2nd
ICT training for extension agents	4.18	0.73	3rd
Recruitment of younger ICT-skilled extension officers	4.12	0.76	4th
Regular refresher training programmes	4.05	0.81	5th

Source: Field Survey, 2025

Table 5 highlights the importance of strengthening the capacity of extension personnel. Farmers strongly agreed that specialised training in cocoa agronomy ($\bar{x}$ = 4.35) is essential for improving extension service delivery. Cocoa production involves complex agronomic practices such as pruning, shade management, pest control, and soil fertility management, which require specialised technical knowledge.

Training in climate-smart agriculture ($\bar{x}$ = 4.29) was also highly rated, reflecting farmers' concerns about the effects of climate variability on cocoa production. Climate-smart practices

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such as improved water management, soil conservation, and climate-resilient crop varieties are increasingly important for sustaining cocoa yields.Additionally, farmers supported ICT training for extension agents ($\bar{x}$ = 4.18) and the recruitment of younger ICT-skilled officers ($\bar{x}$ = 4.12**)**. The integration of digital technologies into agricultural extension systems can significantly improve farmers' access to timely information on weather conditions, pest outbreaks, and market prices (Oduntan & Adegbuyi, 2022).

Table 6: Preferred Participatory and ICT-Based Extension Approaches

Extension Approach	Mean	SD	Rank
Farmer Field Schools	4.36	0.68	1st
Group-based farmer training	4.31	0.71	2nd
Farmer-to-farmer extension	4.25	0.73	3rd
Mobile phone advisory services	4.19	0.76	4th
Radio-based agricultural programmes	4.08	0.81	5th
Individual farm visits	3.74	0.89	6th

Source: Field Survey, 2025

The results in Table 8 indicate that participatory extension approaches were strongly preferred by farmers**.** Farmer Field Schools ranked first ($\bar{x}$ = 4.36)**,** reflecting farmers' preference for interactive and practical learning methods. Farmer Field Schools allow farmers to experiment with improved agricultural practices in real field conditions while learning collectively.

Group-based training ($\bar{x}$ = 4.31) and farmer-to-farmer extension ($\bar{x}$ = 4.25) were also highly ranked. These approaches promote knowledge exchange among farmers and encourage peer learning, which can enhance the adoption of improved agricultural technologies.
ICT-based approaches such as mobile phone advisory services ($\bar{x}$ = 4.19) and radio agricultural programmes ($\bar{x}$ = 4.08) were also perceived as effective tools for improving access to agricultural information. Mobile technologies can provide farmers with timely updates on pest outbreaks, weather conditions, and market prices, thereby supporting informed decision-making.

Overall, the findings highlight the importance of adopting participatory, decentralised, and ICT-enabled extension systems as part of efforts to restructure agricultural extension practices in Osun State.

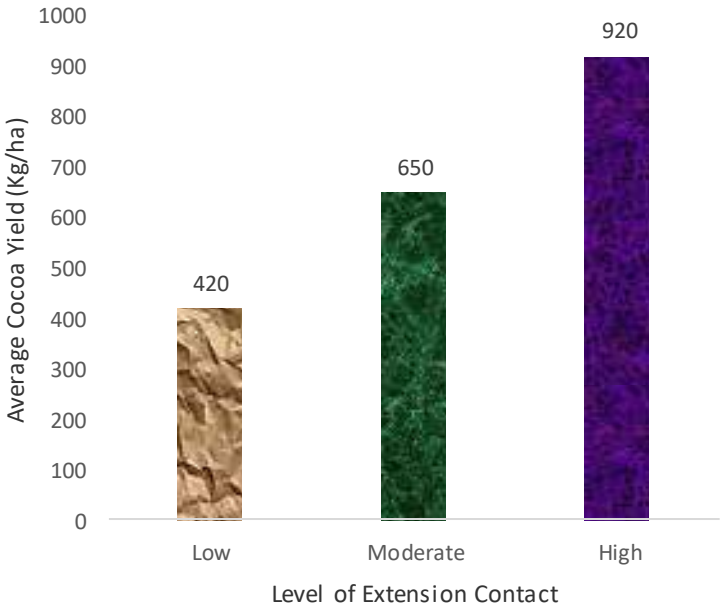

Figure 1: Effect of Extension Contact on Cocoa Yield

This shows the relationship between level of extension contact and cocoa yield. Farmers with high extension contact recorded significantly higher average yields (920 kg/ha) compared to those with moderate (650 kg/ha) and low contact (420 kg/ha). This result confirms that frequent and effective extension contact enhances technology adoption and productivity, consistent with previous studies on cocoa extension systems. This is consistent with existing empirical evidence emphasized by Ogunniyi & Osuolale (2015) that frequent and consistence extension contact significantly enhances technology adoption and farm productivity.

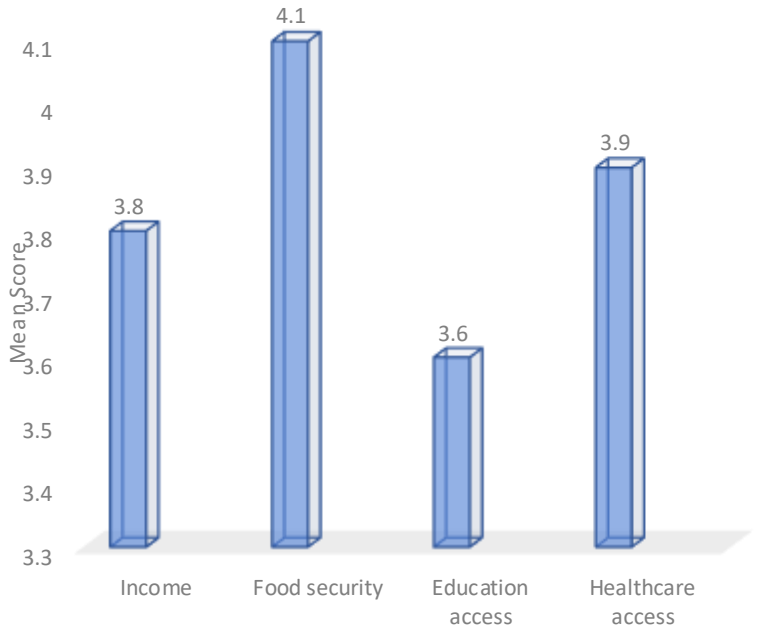

Figure 2: Livelihood Improvement from Restructured Extension Services
This figure presents the perceived effects of restructured extension services on livelihood indicators. Food security recorded the highest mean score ($\bar{x}$ = 4.1), followed by healthcare access ($\bar{x}$ = 3.9), income ($\bar{x}$ = 3.8), and education access ($\bar{x}$ = 3.6). The findings suggest that productivity gains from improved extension services translate into broader welfare benefits for cocoa-farming households. The strong linkage between productivity and livelihood improvement aligns Oyekanmi & Ogunniyi (2021) which emphasizes agriculture-led growth as a pathway to poverty reduction.

Table 7: Distribution of Respondents by Cocoa Productivity Level (n = 240)

Productivity Level	Yield (kg/ha)	f	(%)	$\bar{x}$	SD
Low productivity	Below 500 kg/ha	72	30.0	663	212
Moderate productivity	500 – 800 kg/ha	108	45.0		
High productivity	Above 800 kg/ha	60	25.0		

Source: Field Survey, 2025

The above table shows that cocoa productivity among farmers in the study area varies across different levels, this was measured as the quantity of dried cocoa beans produced per hectare (kg/ha) in the most recent production season. Based on standard productivity benchmarks used in cocoa production studies, farmers' productivity levels were categorised into low, moderate, and high productivity groups The majority of respondents (45.0%) recorded moderate productivity levels (500–800 kg/ha). This suggests that most cocoa farmers in the study area operate at an intermediate productivity level, indicating that while cocoa production is active, there is still substantial potential for improvement.

Approximately 30.0% of respondents recorded low productivity levels (below 500 kg/ha). This relatively high proportion of low-productivity farmers may be attributed to several constraints affecting cocoa production, such as ageing cocoa trees, pest and disease infestations, inadequate farm management practices, and limited access to extension services and improved inputs.

On the other hand, 25.0% of respondents achieved high productivity levels (above 800 kg/ha). These farmers likely benefit from improved farm management practices, regular extension contact, and better access to agricultural inputs such as fertilisers and improved planting materials.

The mean cocoa productivity of 663 kg/ha indicates that the average cocoa farmer in the study area operates within the moderate productivity range. However, this level remains below the potential yields achievable under improved agronomic practices, which can exceed 1,200 kg/ha in well-managed cocoa farms.

The relatively high standard deviation (212 kg/ha) suggests noticeable variation in productivity among farmers. This variation may be explained by differences in farmers' access to extension services, farm management practices, resource endowments, and technology adoption.

These findings are consistent with Ogunniyi & Osuolale (2015) which have shown that cocoa productivity among smallholder farmers in West Africa remains below optimal levels due to structural constraints such as limited access to extension support and improved agricultural technologies. For example, Oduntan & Adegbuyi (2022). emphasised that agricultural extension services play a critical role in improving farm productivity by facilitating the dissemination of improved agricultural technologies and management practices. Similarly, Bayissa (2019) observed that participatory extension approaches significantly enhance farmers' capacity to adopt productivity-enhancing innovations.

Table 8: Distribution of Respondents by Livelihood Improvement Level (n = 240)

Livelihood Improvement Level	Index Range	f	(%)	$\bar{x}$	SD
Low livelihood improvement	1.0 – 2.4	46	19.2	3.36	0.84
Moderate livelihood improvement	2.5 – 3.4	112	46.7		
High livelihood improvement	3.5 – 5.0	82	34.1		

Source: Field Survey, 2025

The results in the above table indicate that cocoa farming contributes significantly to the livelihoods of rural households in the study area. The majority of respondents (46.7%) reported moderate levels of livelihood improvement, suggesting that cocoa production provides a stable source of income and supports the basic welfare of farming households. A substantial proportion of farmers (34.1%) experienced high livelihood improvement, indicating that cocoa farming has had a strong positive impact on their economic and social

wellbeing. These farmers may benefit from higher cocoa yields, better market access, and more effective utilisation of extension services.

However, 19.2% of respondents reported low livelihood improvement, suggesting that some farmers continue to face challenges that limit their ability to fully benefit from cocoa farming. These challenges may include low productivity, poor access to markets, limited extension support, and high production costs.

The mean livelihood index of 3.36 indicates that overall livelihood improvement among cocoa farmers falls within the moderate improvement category. This suggests that while cocoa farming contributes positively to household welfare, further improvements in productivity and extension service delivery are needed to enhance rural livelihoods.
The standard deviation of 0.84 indicates moderate variation in livelihood outcomes among respondents. This variation may reflect differences in farm size, productivity levels, access to extension services, and participation in farmer cooperatives.

These findings support earlier research which indicates that agricultural productivity improvements are closely linked to rural livelihood enhancement. According to Oyekanmi *et al*. (2025), rural livelihoods depend on a combination of income-generating activities, asset accumulation, and access to social services. Similarly, Oluyole (2007) noted that effective agricultural extension services can significantly improve farmers' income, food security, and overall wellbeing. Overall, the results suggest that improving agricultural extension practices can play a crucial role in enhancing both cocoa productivity and the livelihoods of cocoa farmers in the study area.

Table 9: Multiple Regression Analysis of Restructured Extension Practices on Cocoa Productivity (n = 240)

Variable	Unstandardised Coefficient (B)	Standard Error	Standardised Coefficient (β)	t-value	p-value
Constant	0.842	0.214	–	3.93	0.000
Extension contact frequency	0.318	0.072	0.346	4.41	0.000
Participatory farmer training	0.284	0.068	0.298	4.18	0.000
ICT-based extension services	0.201	0.064	0.212	3.14	0.002
Demonstration plots	0.176	0.059	0.187	2.98	0.003
R	0.787				
R^2	0.619				
Adjusted R^2	0.611				
F-value	95.42				
Sig	0.000				

Source: Computed from Field Survey, 2025

The results presented in Table 9 show that restructured agricultural extension practices have a significant effect on cocoa productivity among farmers in the study area. The regression model produced a coefficient of determination (R^2) of 0.619, indicating that approximately

61.9% of the variation in cocoa productivity is explained by the extension restructuring variables included in the model. The model is statistically significant **(**F = 95.42, p = 0.000**),** suggesting that the independent variables jointly influence cocoa productivity.

Among the explanatory variables, extension contact frequency had the strongest positive effect on cocoa productivity (β = 0.346, p = 0.000)**.** This finding implies that farmers who interact more frequently with extension agents are more likely to adopt improved cocoa production practices, resulting in higher yields. Regular contact enables farmers to receive technical guidance on issues such as pest and disease management, pruning techniques, fertiliser application, and post-harvest handling.

Similarly, participatory farmer training showed a significant positive influence on productivity (β = 0.298, p = 0.000)**.** Participatory training approaches such as Farmer Field Schools and group learning platforms enable farmers to learn through observation, experimentation, and peer interaction. These approaches enhance farmers' understanding of improved agricultural practices and increase the likelihood of technology adoption.

The results also indicate that ICT-based extension services significantly influence cocoa productivity (β = 0.212, p = 0.002)**.** ICT tools such as mobile phone advisory services and radio programmes provide farmers with timely information on pest outbreaks, weather conditions, and market prices. These technologies can complement traditional extension methods by expanding the reach of extension services and improving farmers' access to agricultural information.

Finally, demonstration plots also had a positive and statistically significant effect on cocoa productivity (β = 0.187, p = 0.003)**.** Demonstration plots allow farmers to observe the performance of improved technologies under real farming conditions, thereby increasing their confidence in adopting new practices.

Overall, the results provide strong evidence that restructuring agricultural extension practices can significantly improve cocoa productivity among farmers in Osun State. These findings support previous studies that highlight the importance of effective extension systems in promoting agricultural technology adoption and productivity growth (Akinbode, 1994; Adekanye et al, 2023: Issa et al, 2025).

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Table 10: Regression Analysis of Restructured Extension Practices on Livelihood Improvement (n = 240)

Variable	Unstandardised Coefficient (B)	Standard Error	Standardised Coefficient (β)	t-value	p-value
Constant	1.023	0.198	–	5.17	0.000
Extension contact frequency	0.292	0.070	0.311	4.17	0.000
Participatory training	0.246	0.066	0.263	3.73	0.000
ICT-based extension services	0.188	0.061	0.204	3.08	0.002
Demonstration plots	0.164	0.058	0.176	2.83	0.005
R	0.762				
R^2	0.581				
Adjusted R^2	0.573				
F-value	82.76				
Sig	0.000				

Source: Computed from Field Survey, 2025

The regression results presented in Table 4.10 show that restructured agricultural extension practices significantly influence the livelihoods of cocoa farmers. The model produced an R^2 value of 0.581, indicating that 58.1% of the variation in livelihood outcomes among farmers is explained by the extension restructuring variables included in the model.

Extension contact frequency again emerged as a key determinant of livelihood improvement (β = 0.311, p = 0.000). Regular interaction with extension agents provides farmers with knowledge on improved production techniques, pest management strategies, and market opportunities, which ultimately contributes to increased income and improved household welfare.

Participatory training also had a significant positive effect on livelihoods **(**β = 0.263, p = 0.000). Through participatory learning platforms, farmers acquire practical knowledge and skills that enable them to improve farm productivity and diversify their income sources.
Similarly, ICT-based extension services significantly influenced livelihood outcomes (β = 0.204, p = 0.002). Access to timely agricultural information through mobile phones and radio programmes can help farmers make better production and marketing decisions, thereby enhancing their economic wellbeing. The positive effect of demonstration plots (β = 0.176, p = 0.005) further highlights the importance of experiential learning in promoting adoption of improved agricultural technologies.

Overall, the results demonstrate that restructuring agricultural extension practices not only improves cocoa productivity but also contributes significantly to livelihood improvement among cocoa farmers. These findings are consistent with earlier studies which emphasise the critical role of agricultural extension services in improving rural incomes and reducing poverty among smallholder farmers (Jaza & Darr, 2021; Adekanye et al., 2023).

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CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it can be concluded that agricultural extension services play a crucial role in improving cocoa productivity and enhancing the livelihoods of cocoa farmers in Osun State. However, the current extension system faces several structural and operational challenges that limit its effectiveness.

Although awareness of extension services among cocoa farmers is relatively high, actual access to these services remains inadequate due to insufficient extension personnel, limited funding, and logistical constraints. As a result, many farmers rely on informal information networks such as fellow farmers and cooperatives for agricultural advice.

The study also revealed that while several extension practices are currently used in cocoa production, their intensity and coverage are not sufficient to meet farmers' growing needs. Traditional extension approaches such as farm visits and group training remain dominant, while participatory and ICT-based extension methods are still underutilised.

Importantly, the empirical results demonstrate that restructuring agricultural extension practices can significantly improve both cocoa productivity and farmer livelihoods. Extension approaches that promote participatory learning, regular farmer interaction, demonstration-based training, and ICT-enabled communication were found to be particularly effective.

Therefore, strengthening and restructuring agricultural extension systems is essential for revitalising cocoa production and ensuring sustainable livelihood improvement among cocoa farmers in Osun State. A modern extension system that integrates participatory approaches, institutional collaboration, and digital technologies will be critical for supporting smallholder farmers in addressing the challenges of climate change, market competition, and technological innovation. Based on the findings of the study, the following policy recommendations are proposed:

- Government should increase the recruitment and training of extension agents to improve the extension agent-to-farmer ratio. This will enable more frequent farm visits and better farmer support.
- Public investment in agricultural extension services should be significantly increased to support training programmes, demonstration plots, transportation logistics, and ICT infrastructure.
- Government and development partners should promote digital extension platforms to improve farmers' access to timely agricultural information.
- Farmer cooperatives should be strengthened as platforms for agricultural extension delivery, input distribution, and collective marketing. This can facilitate knowledge exchange and improve farmers' bargaining power in agricultural markets.
- Extension programmes should promote climate-smart agricultural practices such as improved soil management, shade management, and pest-resistant cocoa varieties to enhance resilience to climate change.

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