

Adoption Intensity and Inequality among Cocoa Farmers in Ekiti and Ondo States, Nigeria

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Abstract

Over several decades, improved cocoa technologies have been developed and disseminated in Nigeria. These technologies can boost yield, promote food security and improve the income of farmers. Unfortunately, cocoa yield has been on persistent decline. This study therefore examined the intensity and inequalities associated with the adoption of cocoa technologies among farmers in two major producing States (Ondo and Ekiti States) in Nigeria. The study addressed this using cross-sectional survey data from 391 cocoa farmers, analyzed using multiple regression and gini coefficient. The results revealed regular weeding (83.8%), shade cover for seedlings (81.3%), improved seedlings (80.05%), and insecticides/fungicides (85.68%) were the most adopted technologies. Many farmers fall under the moderate adoption intensity category, with an adoption intensity index of 0.73, implying that 73% of the technologies were adopted by the farmers. The cocoa technologies were widely practiced by farmers, with a Gini coefficient of 0.2 which reflects a low inequality in adoption among the farmers. The key drivers of farmers' adoption intensity were extension agents ($\beta = 0.262$), awareness of technologies ($\beta = 0.253$), age ($\beta = 0.132$) and farming experience ($\beta = 0.125$). The study recommends sustained promotion of technology awareness programmes and more regular extension visits to farmers.

Keywords: Adoption, Intensity, Inequality, Cocoa Farmers, Nigeria.

Introduction

Agriculture is a major pillar of the economy of most developing nations, supporting the livelihood of most, especially in Sub-Saharan Africa, where the majority rely, directly or indirectly, on the agricultural sector (Awuni, Azumah and Donkoh 2018; Odegbade, Onemolease and Osifo, 2018). Even in Nigeria, agriculture remains an important backbone of the economy, engaging over 75% of its population (Ogunya, 2024). Given the ever-expanding global population, the need to accelerate agricultural production to continue to support and secure food security, employment, and foreign exchange earnings has become paramount. The increasing population demands a commensurate expansion of food production, especially staple and cash crops, to address lag in food production and supply.

The cultivation of the cocoa crop supports the livelihood of numerous smallholder farming households, globally, including West Africa, Latin America, and Southeast Asia (Kongor *et al.*, 2024). West Africa is responsible for 60% of global cocoa production, with Ivory Coast, the leading producer, accounting for 43% of world production, followed by Ghana which contributes 14%, Nigeria accounting for 6% of world production, and Cameroun (Ogunya, 2024).

Among the cash crops in Nigeria, cocoa is recognised as essential to the economy of the country. In fact, the crop has become a major export in the country, which boasts of over 300,000-350,000 smallholder cocoa farmers, producing more than 250,000 tons of cocoa per annum from about 1.4 million hectares (Adeleye, 2024). In view of the export and foreign exchange earning potential of cocoa, the government established the Cocoa Research Institute of Nigeria at Ibadan in 1964, to research, disseminate and promote the adoption of improved technologies associated with the crop (CRIN, 2021) to improve productivity. This policy was driven by the evidence that indicates the use or application of improved practices/technologies can enhance cocoa productivity.

Available data on cocoa yield in the country revealed a consistent decline over decades. According to data estimated from FAOSTAT (2024), yield declined by 25.7%, from 3,691 in 1991 to 2,743 ton in 2022. This is inspite a 4.5% production increase within the same period, i.e., from 268,000 mt in 1991 to 280,000 mt in 2022. These data reflect a decline in the overall cocoa productivity in the country, and by extension, the study area (southwest Nigeria), areas that are largely responsible for the bulk of cocoa production in Nigeria (Mudiaga, 2022). Over 50% of cocoa produced is from Ondo State alone with substantial quantities produced in Oyo, Ekiti and Osun States (Adeyeye, 2012; Akinagbe 2018). Furthermore, the persistent increase in production of the crop, but decline in yield, suggests that actual increase in cocoa yield in the country comes from of land area expansion instead of intensification even though the latter is recommended as best strategy to raise production on existing farmlands. It is this situation that has pushed Nigeria to the 4th position in Africa as a cocoa producing nation (Johnson *et al.*, 2025). Several reasons have been proffered to account for this decline, including ageing plantations, climate change, soil pest and diseases infestation, declining productivity, soil degradation (Afolayan, 2020; Raju, 2024); however, farmers response to or adoption of improved farm technologies have been identified as a significant factor (Johnson *et al.*, 2025), partly accounting for the establishment of CRIN for this very purpose (CRIN, 2021).

Research Gap

There is plethora of empirical research on farmers adoption behaviour and its determinants in Nigeria; however, there are few data on the intensity of the adoption. These include studies by Ainembabazi *et al.* (2018) in Central Africa who examined the impact of adoption intensity on farmers welfare, Gao *et al.* (2019) who also investigated the relationship between adoption intensity and family welfare, Mensah-Bonsu *et al.* (2017) studied the effects of adoption intensity on land productivity, among tobacco farmers in China. Other

studies examined drivers of adoption intensity among maize and rice farmers in Ghana (Kwawu, *et al.*, 2021; Awuni *et al.*, 2018). These studies did not focus on cocoa.

For a specific technology, adoption intensity refers to the extent or proportion to which a specific technology, practice, or innovation is used by those who have adopted it, often measured as the percentage of land or resources allocated to the adopted practice (Addison *et al.*, 2023). In the context of this study, which addresses a combination or mix of technologies, it refers to the proportion of the technologies in the recommended package utilized by farmers. This according to Addison *et al.* (2023), is distinct from measuring adoption as a discrete choice instead of a continuous measure of the proportion of the selected technologies used by farmers. This later definition highlights the degree to which a farmer has adopted the full complement of the recommended practices/technologies i.e., the adoption package, usually comprising a mix of several technologies, required to effectively and efficiently improve on yield. This lines up with the definition given by Ogunya (2024), who described the intensity of organic cocoa production adoption as an adoption index, which ranged from 0 to 1, with 1 indicating the full use of all the recommended organic farming practices.

When researchers fail to explore the adoption intensity of technological packages, it becomes impossible to truly determine the breadth, or intensity, of adoption of the technologies, and subsequently, its inequality or spread among farmers. It is this research gap this study seeks to address. This aligns with Kwawu *et al.* (2021) view that a more effective approach to boosting productivity is increasing intensity of adoption of the existing agricultural technologies, and not just introducing new or improved agricultural technologies as well as ensuring a widespread utility of the recommended practices/technologies among famers.

There have been few studies on adoption intensity of cocoa technologies. Johnson *et al.* (2025) examines the factors influencing the intensity of adoption of cocoa farm rehabilitation techniques (CRTs) in Ondo State, Nigeria. Ogunya (2024) explored motivations to adoption intensity among cocoa farmers with focus on organic farming and practices, while Ilesanmi and Afoloabi (2021) focused on the determinants of adoption intensity of improved cocoa technologies, but this was limited to Ekiti State. These studies were limited in the technology covered, neither did they examine the how widespread the technologies were adopted across the farmers i.e., the inequality of adoption. This is a key contribution of this paper to existing literature, as it combines adoption intensity and inequality, and thus gives a better understanding of farmers respond to innovation packages in the context of cocoa production.

Objectives of the Study

The overall aim of the study was to assess the adoption intensity and inequality among cocoa farmers in Ekiti and Ondo States, Nigeria. The specific objectives were to:

1. describe the socioeconomic characteristics of cocoa farmers in the study area.

2. examine the farmers' adoption of cocoa technologies in the study area;
3. determine the intensity and inequality of adoption of improved cocoa technologies among the farmers in the study area.
4. Determine the relationship between the farmers socio-economic characteristics and their cocoa technologies adoption intensity

Methodology

Study Area

The study was implemented in Ondo and Ekiti states, two major cocoa growing areas in southwest Nigeria Adeleye, 2024). The 2025 projected population of the States are 4,292,768 (Ekiti state) and 6,079,873 (Ondo state), based on their 2006 national population census figures and an annual growth rate of 3.11% and 3.01%, respectively (NPC, 2010). Cocoa is the principal cash crop produced in these states.

Research Design

The study adopted the cross-sectional survey design for data collection, involving primary data collection from a sample of the target population (cocoa farmers). This was facilitated by use of validated questionnaire and structured interview schedule, for the lettered and non-lettered respondents, respectively. The reliability of the instrument was ascertained using the test-retest method, administered on cocoa farmers outside the selected study sites. The reliability coefficient obtained ($r = 0.886$) was considered a good indicator of reliability (Setyaedhi, 2024).

Population and Sample of the Study

The study population comprised 407,141 registered cocoa farmers in the two States (Ekiti = 172,957 farmers; Ondo = 234,184) (Ministry of Natural Resources, Akure in Ondo State; Ministry of Agriculture in Ekiti State). Adopting a multi-stage sampling process, the first step was to determine the appropriate sample size, a task accomplished using the sample table of proportion which recommended a sample of 400. The next stage was the purposive selection of 3 local governments (LG) per State based on the predominance of cocoa production. Thus, Ondo East, Idanre and Oke-igbo/ Ile-oluji LGs were selected from Ondo State, while Ise/Orun, Oye and Irepodun-Ifelodun LGs were chosen from Ekiti States. In the next stage, 3 communities per LG were purposively selected based on the prominence of cocoa production in these areas. The next step was to apply proportional random sampling to select the appropriate sample of cocoa farmers per community. This gives a total of 170 from Ekiti and 231 from Ondo State.

Data Analytical Techniques and Operationalization of Variables

Data analysis was accomplished using descriptive statistics, multiple regression and gini coefficient. SPSS was used to analyze the data while GenStat was used for the estimation of the gini coefficient.

The regression model analysed the relationship between the socio-economic characteristics of the farmers (independent variables) and the adoption intensity associated with improved cocoa technologies (dependent variable). The model description is given below.

- Y=adoption intensity (adoption index, obtained by dividing the total adoption score of each respondent by the total expected score i.e., number of technologies).
- The independent variables were operationalized as follows.

X ₁ = Age of farmers (in years)	X ₆ = Area of land cultivated (Ha)
X ₂ = Level of education (years)	X ₇ = Annual income (₦)
X ₃ = Sex of the farmer (male=1; female=0)	X ₈ = Experience in cocoa farming (years)
X ₄ = Size of household (number of persons living and feeding together)	X ₉ = Association membership (dummy: member =1; non-member =0)
X ₅ = Extension contact (number of extension visit in the last year)	X ₁₀ = Innovation awareness (proportion of total recommended technologies aware of by farmers)

Different functional forms (linear, exponential, Cobb Douglas, semi-log) of the regression model were tested to select the best-fit model i.e., that best explains the relationship between the independent and dependent variables. The selection criteria adopted were number of significant variables and the magnitude of the coefficient of determination (Akpan et al., 2022).

Adoption inequality (Gini Coefficient): The Gini coefficient is a measure of inequality of a distribution range of 0 and 1. A coefficient of zero expresses perfect equality in distribution i.e., when everyone has exactly equal income or adoption level, with variability among them being zero. A coefficient of one (100 on the percentile scale) expresses the maximum inequality between the values (for example where only one person has all the income or adopted all the technologies and other do not) (Karam and Ryerson, 2023).

For this study, the coefficient was employed to determine the inequality in adoption of cocoa technologies among farmers. A Gini coefficient or ratio closer to unity or 1, implies a greater degree of inequality in adoption of the technologies, suggesting the adoption of the technologies is limited to fewer farmers, which further implies that adoption of the technology is not widespread among the farmers. The Gini coefficient is represented thus:

$$G_1 = \sum_{k=1}^K (x_k - x_{k-1})(y_k + y_{k-1}) \quad (5)$$

where, x_k = the cumulated proportion of the number of cocoa farmers; y_k = the cumulated proportion of the independent (in this case, adoption) variable.

Technology adoption intensity Index: The technologies considered in this study were based on Cocoa Research Institute of Nigeria (CRIN) standard. In line with Ogunya (2024),

this measures the proportion of cocoa technologies used by each farmer out of the total recommended package of technology. The intensity index ranged from 0 to 1, with 1 indicating the full use of all the recommended technologies. The adoption index was computed from equation 1:

$$AI_i = \sum \{AI_i / RT_i\} \dots \dots \dots (equ. 1)$$

Where; AI_i is the adoption index of i th farmer; AT_i is the number of technologies used by i th farmer; RT_i is the total number of recommended technologies a farmer is expected to adopt.

Results and Discussion

Socio-economic Characteristics of Respondents

The sex profile of the respondents, as shown in Table 1, reveals that males are the major cultivators of cocoa in the study area (74.94%), while women constitute 25.06%. Male dominance in cocoa production has been reported by Ilesanmi and Afolabi (2020), who noted that men are the major actors in cash crop production in most parts of Africa, with women playing supporting roles in the post-harvesting value chain, such as fermentation and drying. Almost all the cocoa farmers have formal education (84%), with 15.86% not having such schooling. The modal educational range is primary school (30.18%). The high proportion of respondents with formal education, and especially secondary and tertiary education (53.9%), suggests they will be positively disposed to implementing improved cocoa technologies on their farms, since formal education promotes farmers' understanding and disposition to improved farming practices (Kwawu *et al.*, 2021; Johnson *et al.*, 2025).

Most respondents belong to Cocoa cooperative society (72.38%), which means they stand the chance of learning and gaining other rewards that comes with such membership including training, input purchase, aggregation of produce and shared sales (Odegbade, Onemolease and Osifo, 2018). Many of the respondents are 40-49 years (33.76%), and they averaged 45 years, indicating the farmers are still within the economically age group. The modal family range of the respondents are 1-4 (46.55%) and 5-8 (46.04%), averaging 5. This implies that respondents have access to family labour, which is a costless source of production resource to farmers (Onemolease and Akioya, 2020). Moreover, Omoare *et al.* (2016) reported that farmers having large family members have access to labour, which may serve as an impetus to adopt improved cocoa production practices.

Many of the respondents engaged in cocoa farming as a primary or major occupation (64.71%) while others (35.2%) engage in it on part-time basis, which means they have other income sources such as civil service, trading, artisans. This finding indicates that most respondents depend on cocoa cultivation for their sustenance, which can serve as a motivation to adopt recommended farm practices as a strategy to improve productivity, income and welfare. The respondents operated a modal farm range of 2.0-5.9ha (48.85%) averaging 3.9ha, which implies they are largely small-scale operators, since this is less than 5ha (WCF, 2014). The average figure of 3.9ha is greater than the 3ha reported by Aneani *et al.* (2012) for cocoa farmers in Ghana and the 2.5ha reported for the cocoa farmers in Nigeria by Adeleye (2024). Being small in production scale may discourage adoption as it may

restrict the farmers from implementing recommended practices that requires large scale farming such as mechanical operations (Okoedo-Okojie and Onemolease, 2005; Job *et al.*, 2015).

About 38% of the respondents have been involved in cocoa production for over 20 years, while 62.15% have less than 20 years experience. The average experience cultivating cocoa about 18 years. It has been affirmed that farmers with longer farming experience have a better appreciation of production constrains (Adesomoju *et al.*, 2024) and are likely to take follow up on recommended technologies that can address these challenges (Osarenren *et al.*, 2016). The modal income (perceived profit) of the respondents is N500,000 - 1,000,000 (36.31%) per annum with the average being ₦853,900.26. The average figure is higher than the ₦453,249.34 reported by Odegbade (2017) or the ₦614,460.45 reported by Adebisi and Okunlola (2013) for cocoa producers in Ekiti and Osun States, respectively. Capital (income) is important in cocoa production, and higher incomes is known to enhance farmers' ability to adopt improved technologies, some of which can be capital intensive (Onemolease *et al.*, 2023).

Table 1: Socio-Economic Characteristics of Respondents

Characteristics	Options	Freq (n=391)	%
Age (years)	<40	124	31.71
	40-49	132	33.76
	50-59	91	23.27
	60 & above	44	11.26
Sex	Female	98	25.06
	Male	293	74.94
Household range	1-4	182	46.55
	5-8	180	46.04
	>8	29	7.42
Education level	No formal education	62	15.86
	Primary education	118	30.18
	Secondary education	103	26.34
	Tertiary education	108	27.62
Major occupation	Farming (cocoa)	253	64.71
	Non-farm	138	35.29
Farm range (ha)	<2.0	134	34.27
	2.0 - 5.9	191	48.85
	6.0 - 9.9	46	11.76
	>=10	20	5.12

Table 1 Contd.

Characteristics	Options	Freq (n=391)	%
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Years cultivating cocoa	<20	243	62.15
	20-29 years	75	19.18
	30-39 years	48	12.28
	>=40	25	6.4
Membership of cooperative	Non-member	108	27.62
	Association member	283	72.38
Income (profit) range (₦' million)	<0.5M	128	32.73
	0.5M - 1M	142	36.31
	1M-1.5M	58	14.84
	>1.5M	63	16.11

Farmer - Extension Agent Contact

Based on 337 respondents who affirmed that they have had contact with extension agents. Figure 1 explores the frequency of such contacts. Findings showed 28.78% had monthly contact in the last 12 months, 26.71% had regularly contact, 12.17% had occasional contact, 31.75% had fortnightly contact while 0.59% rarely had contact with extension agents. Contact with extension agents can facilitate access to information on new technology and its adoption by farmers, a fact corroborated by Kwawu *et al.* (2021).

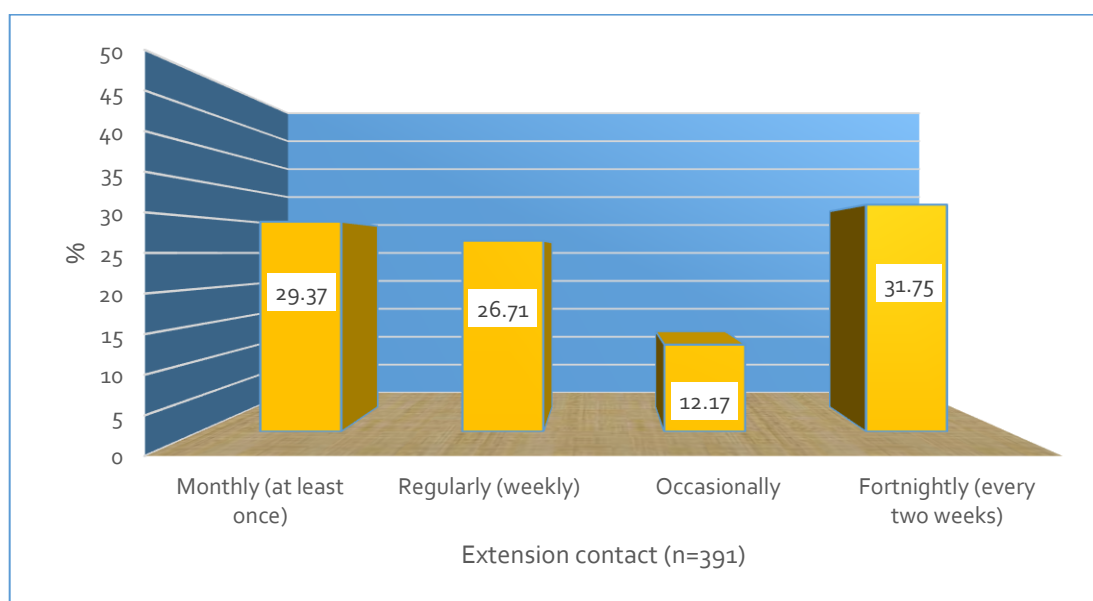


Figure 1: Respondents contact with extension workers

Source: Field Survey Data, 2019

Improved Cocoa Technologies Adopted by Respondents

Table 2 reveals the improved cocoa technologies adopted by the farmers. In nursery practices, 76.02% and 77.49% of the respondents adopted transplanting of seedlings after 5 to 6 months and provision of shade at the nursery, respectively. Under field establishment, 83.89% regularly weed their farm manually or with chemicals, while 81.33% adopted shade cover for cocoa seedlings. The results also show 85.68% adopted

insecticides and fungicides while 82.86% adopted harvesting ripe, healthy pods regularly. For harvesting, 71.36% adopted harvesting with sharpened clean and disinfected hooks while 80.56% adopted fermenting cocoa beans within 5 to 7 days. With respect to packaging and storage technologies, 76.9% kept bagged cocoa beans away from smoke and 73.4% store cocoa beans in clean jute bags.

Studies by Omoare *et al.* (2016) and Oyediran *et al.* (2014) revealed that cocoa farmers' adoption of the cultural practices was good, helping them to obtain good yield. The average adoption score is 16, which means that 16 out of 22 technologies introduced to cocoa farmers in the study areas were adopted, suggesting a high adoption rate. However, the least adopted technology was solar driers (23.79%). A combination of factors could be responsible for this behavior. According to Okonkwo and Ertekin (2022), cocoa farmers in Nigeria show preference for traditional drying methods over solar dryers for several reasons, but mainly because of cost, easier to set up, and the availability of open space for sun-drying. Although solar dryers have significant advantages such as efficient drying and quality preservation, but their higher initial cost and the need for technical expertise constrain their adoption. Furthermore, traditional sun-drying is a well-established practice, and farmers are more comfortable practicing it due to its familiarity and minimal technical requirements.

Table 2: Cocoa technologies adopted by respondents

Technologies	Adopted (still using)		Not adopted		Discontinued	
	Freq	%	Freq	%	Freq	%
Nursery practices						
Transplant seedlings after 5 to 6 months	309	79.03	68	17.39	14	3.58
Provision of shade at the nursery	303	77.49	73	18.67	15	3.84
Locating nursery close to farm Sites /water source.	301	76.98	66	16.88	24	6.14
Fencing the nursery with wire mesh (1 meter high)	212	54.22	146	37.34	33	8.44
Field establishment						
Regular weeding (manually or chemicals)	328	83.89	57	14.58	6	1.53
Provide shade cover for Cocoa seedlings	318	81.33	57	14.58	16	4.09
Planting improved cocoa seedlings	313	80.05	67	17.14	11	2.81
Recommended spacing (3m*3m)	297	75.96	82	20.97	12	3.07
Regular pruning	293	74.94	84	21.48	14	3.58
Mulching of seedlings/young plants	291	74.42	87	22.25	13	3.32
Fire Tracing	275	70.33	102	26.09	14	3.58
Site for new planting should preferably under forest cover	252	64.45	102	26.09	37	9.46
Control of major insect pest						
Use of insecticides and fungicides	335	85.68	50	12.79	6	1.53
Harvest ripe, healthy pods regularly to prevent pod loses to infection	324	82.86	61	15.60	6	1.53
Harvesting						
Harvest with sharpened clean & disinfected hooks/ secateurs	279	71.36	99	25.32	13	3.32
Fermentation						

Fermentation of Cocoa beans in heaps or forwarding boxes	312	79.80	73	18.67	6	1.53
Fermentation done within 5 to 7 days	315	80.56	72	18.41	4	1.02
Drying						
Drying of harvested Cocoa beans immediately after fermentation	310	79.28	73	18.67	8	2.05
Use of solar driers	93	23.79	283	72.38	15	3.84
Packaging and storage						
Storage of Cocoa bean in clean jute bags	301	76.98	86	21.99	4	1.02
Keeping bagged cocoa beans away from smoke	287	73.40	87	22.25	17	4.35
Proper fumigation of stores where cocoa bean is stored	240	61.38	131	33.50	20	5.12

Adoption intensity among respondents

The adoption intensity index reveals 52.69% of the respondents have an index over 0.801 which means that 52.69% of the respondents adopted over 80% of the recommended technologies, 19.69% recorded an index of 0.601-0.800 while 15.35% have an index of 0.401-0.600 (Figure 2). The average adoption index or intensity is 0.731, which suggests that the respondents have adopted about 73% of the technologies, which is relatively high and greater than the average or 50%.

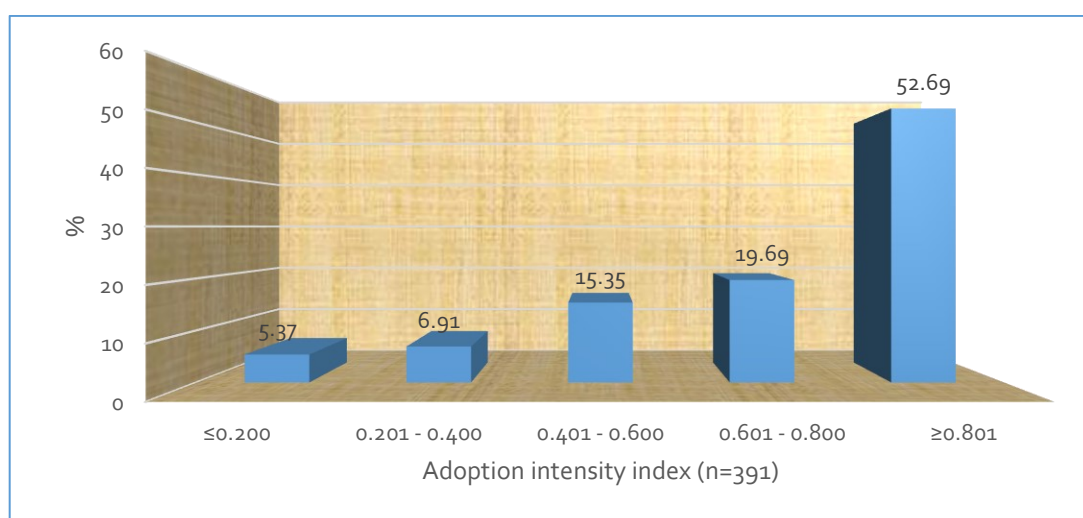


Figure 2: Adoption intensity level respondents.

Source: Field Survey Data, 2019.

Adoption inequality associated with cocoa technologies

Figure 3 shows the Lorenz curve associated with the adoption of cocoa technologies by farmers in the study area. The inequality index (Gini coefficient = 0.2), suggests a low inequality in adoption among the cocoa farmers in the study area, implying that the adoption of the cocoa technologies is relatively widespread among the farmers, and there is high low inequality in adoption rates, indicating that the farmers were generally disposed to application of the technologies.

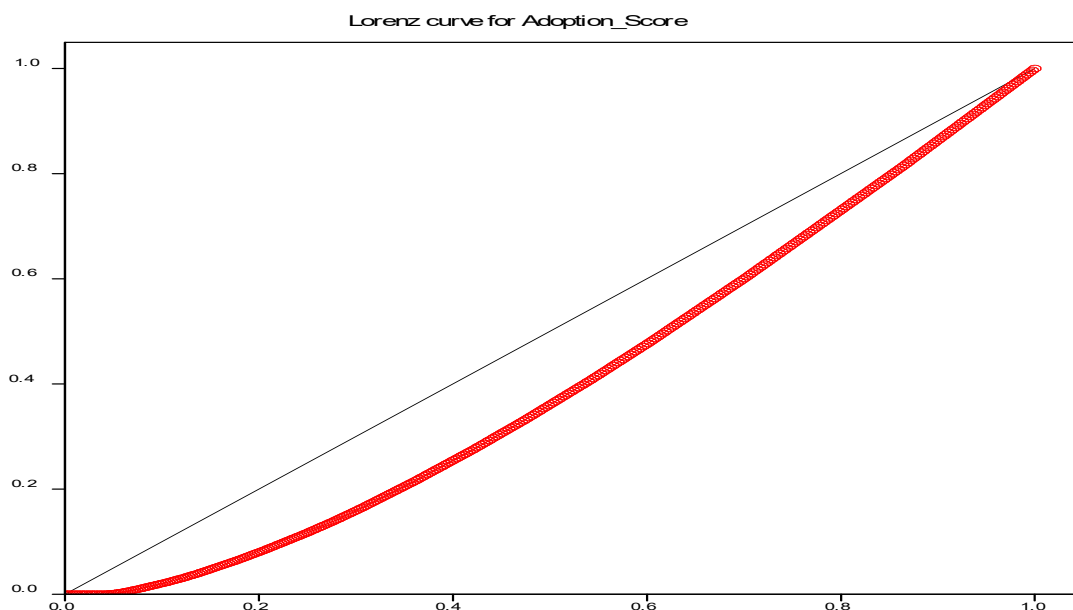


Figure 3: Lorenze curve associated with adoption of cocoa technologies by farmers

Relationship between the socio-economic characteristics of cocoa farmers and their technology adoption intensity

Four regression models were analysed and the linear function chosen as the best-fit model for having the highest adjusted coefficient of determination (R^2) and number of significant variables. The significant F value ($F = 8.31$; $p < 0.01$) means that the combined influence of the independent variables on the dependent variable (i.e., adoption intensity) was significant. The adjusted R^2 of 0.16 implies that the independent variables explained 16% of the adoption intensity among the farmers (Table 3). This value is low and suggests there are other factors that could be considered and incorporated in the model. This limitation is acknowledged. The significant predictors of the intensity of adoption of cocoa technologies are extension contact, technology awareness, age and experience of farmers.

Given the variation in operationalization of the independent variables, the standardized coefficient (beta) was used to explain the correlation between the independent variables (farmers socio-economic characteristics) and the dependent variable (adoption intensity). This approach also has the advantage of comparing the relative importance or contribution of the socio-economic characteristics to the dependent variable. The most important variable, with the highest explanatory rate or beta coefficient, is frequency of extension contact by farmers ($\beta = 0.262$). The positive coefficient means that extension agents frequent contact with farmers will likely promote the intensity of adoption among them by about 26.2%. Similar positive and significant influence of extension contact was reported by Kwawu *et al.* (2021) and Ogunya (2024). The authors acknowledged that contact with extension workers facilitate farmers better understanding and appreciation of improved farming practices, which translates to adoption.

The second most important predictor of adoption intensity was farmers' awareness of cocoa technologies ($\beta = 0.253$). The positive coefficient means that farmers awareness of these technologies can boost adoption intensity by 25.3%. This result agrees with Odegade *et al.* (2018), who reported that farmers with higher awareness of farm innovations record higher adoption scores. The third most significant variable was age of farmer ($\beta = 0.132$; $p < 0.05$), whose positive coefficient means older farmers had higher adoption intensity of about 13.2%. The need to cater for their household may account for this as the apriori expectation was that younger farmers would display higher adoption intensity. This result agrees with the findings of Awuni *et al.* (2018) and Odegade (2017), suggesting that older farmers tend to be more interested in learning about modern farm practices because of need to cater for their families.

The coefficient for farming experience was negative ($\beta = -0.12$; $p < 0.05$), implying that farmers with less experience in the cocoa cultivation had higher adoption intensity than those with longer experience. A positive experience was reported by Awuni *et al.* (2018). However, a negative relationship between farmer experience and adoption intensity was reported by Johnson *et al.* (2025). Less experienced farmers may want to take advantage of the available technologies to make up for their lack of experience, and suggests that less experienced farmers can be more positively disposed to farm innovations and by implication, may produce more and therefore realized greater income.

Table 3: Regression estimates for farmers' socio-economic characteristics and adoption intensity

Parameters	Unstandardized Coefficients		Standardized Coefficients	t value	Prob. level
	B	SE	Beta		
Constant	0.541	0.089		6.06	0.000
Freq of extension contact	0.049	0.01	0.262*	4.97	0.000
Awareness of technology	0.008	0.002	0.253*	4.96	0.000
Age	0.003	0.001	0.132*	2.14	0.033
Farming experience	0.003	0.001	0.125*	-2.12	0.034
Farm size	0.007	0.005	0.071	1.26	0.208
Education	-0.011	0.015	-0.042	-0.72	0.472
Cooperative membership	-0.033	0.029	-0.055	-1.11	0.269
Family size	-0.007	0.005	-0.065	-2.24	0.216
Income	-0.009	0.006	-0.078	-1.58	0.114
Sex	-0.049	0.03	-0.081	-1.64	0.102

F value = 8.31; $p < 0.01$. Adjusted R square = 0.158; *Significant at 5% ($p < 0.05$)

Conclusion and Recommendations

The study established a high level of adoption of cocoa technologies among the farmers with little inequality or variability among them. While this is commendable, it shows some technologies were more favoured by the farmers than others, given the existence of some variability in their adoption behaviour. This provides a basis for intervention by the agricultural extension service agencies or organizations.

While this study examined the socio-economic factors influencing adoption intensity, the regression results, with its low coefficient of determination, suggests some other important variables that could potentially explain intensity of adoption among cocoa farmers were not captured. Future research may follow up on this by exploring other factors in the regression model.

Recommendations

The following recommendations were proposed to further reduce adoption variability and improve on the intensity.

- i. The extension agency should improve on farmers visit, promote awareness of the technologies among the farmers so as to further reduce the level of inequality of adoption among the cocoa farmers.
- ii. Arising from the correlation results, the extension agency as well as the farmers groups or cooperatives should target educational efforts at younger farmers and those with less experience in cocoa cultivation to promote adoption.
- iii. Cocoa farmers should be trained on use of solar dryers to scale up their technical competencies. Farmer cooperatives should be encouraged to establish solar dryers to provide such service to members. To this end, promoting access to funds through cooperatives should be pursued as a means of raising the initial capital required to invest in solar dryers.

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