Original Research Article

Analysis of Effects of Financial Risk on the Welfare Status of Cocoa Farmers in Southwest Nigeria

Abstract

Cocoa farming supports rural livelihoods, yet farmers face financial risks that threaten their welfare. Thus, this study examines the impact of financial risk on the welfare of cocoa farmers in Southwest Nigeria. A multi-stage sampling method was employed to select 396 respondents from two states known for high cocoa production and certification program involvement. Data were analyzed using descriptive statistics and a Seemingly Unrelated Regression Equation (SURE) model to determine the effects of financial risk on welfare indicators such as household income, food security, and poverty status. The findings reveal that 74.5% of respondents were classified as non-poor, with certification program adopters and non-adopters showing similar poverty levels. Key variables influencing welfare included farm size, cooperative membership, education, and financial risk. While larger farms and cooperative memberships positively impacted household income and food security, financial risk was associated with both increased income and heightened food insecurity and poverty risk. The study recommends the need for targeted interventions to mitigate financial risks, including expanded access to credit, financial literacy training, and cooperative support.

Keywords: Cocoa farming, financial risk, food security, poverty reduction, welfare status, Nigeria

Introduction

Cocoa (*Theobroma cacao L.*) is a significant agricultural commodity worldwide, particularly valued for its economic contributions and role in sustaining the livelihoods of millions in tropical regions such as Southeast Asia, Latin America, and West Africa (Montagna et al., 2019). Among these regions, Nigeria ranks as the fourth-largest producer of cocoa globally, with annual production reaching 328,263 metric tons in 2020. Nigerian cocoa farming is predominantly managed by smallholder farmers, who cultivate plots typically under five hectares, making it a primary income source for rural households (Akinwale et al., 2019; International Cocoa Organization [ICCO], 2020). The reliance on cocoa by such a large portion of the rural population underscores its importance, not only to Nigeria's economy but also to the welfare of individual farming households (United Nations Conference on Trade and Development [UNCTAD], 2015).

In recent decades, global market dynamics have increasingly influenced cocoa production, prompting a shift towards quality assurance and sustainable agricultural practices. Certification programs have emerged as crucial tools aimed at promoting best practices in farming, environmental stewardship, and social welfare. These programmes led by organizations such as Fairtrade, Rainforest Alliance, and Universal Trade Zone (UTZ)-offer certification to cocoa farmers adhering to standardized protocols that include reduced agrochemical use, adherence to ecological principles, and compliance with labour laws. Such certifications aim to protect

consumer interests while enhancing farmer welfare and ensuring environmental sustainability (Oseni & Adams, 2013; Akinwale et al., 2019; Andersson et al., 2010).

Despite the potential benefits, the adoption of certification among Nigerian cocoa farmers has been limited. A primary barrier is the financial risk associated with the costs of certification, which is a critical issue as Nigerian farmers are often financially vulnerable. The shift towards crude oil in the late 1970s significantly decreased agricultural investment and support, including in cocoa farming. As a result, cocoa production dropped from its 1970s peak of approximately 420,000 metric tons to lower levels in subsequent decades, with recent fluctuations indicating instability (Adebile & Amusan, 2011; Awoyemi & Aderinoye, 2019; FAOSTAT, 2018). Additionally, policies like the Structural Adjustment Programme (SAP) introduced by the World Bank and the International Monetary Fund (IMF) in the 1980s further exposed Nigerian cocoa farmers to global price volatility, impacting their income stability and market competitiveness (Thomas et al., 2022).

Financial risk remains a critical factor in cocoa farming, encompassing elements such as credit access, cash flow variability, interest rate fluctuations, and market price unpredictability (Escalante & Barry, 2001; Kaen, 2005). These financial risks not only deter farmers from adopting innovations like certification programs but also affect their decision-making on production investments, ultimately impacting their welfare. Studies indicate that financial constraints, such as inadequate credit facilities, high costs of production, and insufficient government support, significantly influence farmers' ability to stabilize their income and invest in farm improvements (Gathiga, 2016; Kioko et al., 2019; Hardaker et al., 2004). As cocoa farmers face growing pressure to meet both domestic and international quality standards, their financial resilience becomes essential to achieving sustainable cocoa production and welfare improvements (Olawole, 2021; Adegoroye et al., 2024).

This study seeks to explore the socioeconomic characteristics of cocoa farmers in Southwest Nigeria and assess how financial risk impacts their welfare. By employing a Seemingly Unrelated Regression (SUR) model, this research will analyze the complex interactions between financial risk factors and welfare outcomes. Specifically, it aims to investigate how financial risks influence farmers' adoption of certification programs and their subsequent welfare status. Understanding these dynamics is crucial for policymakers and stakeholders, as it provides insights that can guide the development of interventions to reduce financial risk and support cocoa farmers in achieving sustainable livelihoods. This research also contributes to the broader discourse on sustainable cocoa production and the role of risk management in agricultural sustainability (Nmadu et al., 2012; Akhtar et al., 2019; Oparinde, 2019).

Materials and Methods

The study was conducted in Southwest Nigeria (Figure 1), a region known for its substantial contribution to Nigeria's cocoa production. Southwest Nigeria consists of six states: Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo, and it plays a critical role in the country's agricultural and economic development. Covering approximately 77,818 square kilometres, the region represents about 8.2% of Nigeria's total landmass. With a population exceeding 35 million, it is a densely populated area that combines rural agricultural communities with bustling urban centres. The climate of Southwest Nigeria is tropical, characterized by distinct wet and dry seasons, with annual rainfall ranging from 1,200 mm to 2,400 mm. Fertile soils and favourable weather conditions in the region support diverse agricultural activities, making agriculture a vital part of the local economy.

Southwest Nigeria primarily falls within the rainforest agroecological zone, with smaller areas transitioning into other ecological zones. The rainforest zone is the dominant ecological area, particularly in Ondo, Osun, and Ekiti states. This zone features dense vegetation, high rainfall, and fertile soils suitable for cultivating crops such as cocoa, oil palm, yam, cassava, and maize.

The region is renowned for tree crop farming, especially cocoa production, which is a major export commodity. The derived savannah zone is present in parts of Ogun, Oyo, and Ekiti states, acting as a transitional area between the rainforest and savannah zones. This zone has mixed vegetation and moderate rainfall, supporting the cultivation of crops such as maize, sorghum, cassava, and millet, along with livestock rearing.

The freshwater swamp zone is located along the coastal areas, particularly in Lagos and parts of Ogun state. This zone is characterized by swampy terrain and wetlands, which are well-suited for growing rice, vegetables, and sugarcane, as well as fishing and aquaculture. Additionally, parts of northern Oyo state extend into the savannah zone, specifically the Southern Guinea Savannah, which features grasslands and scattered trees. This area supports a combination of crop farming and livestock grazing.

Agricultural activities in Southwest Nigeria include the cultivation of staple crops such as yam, cassava, maize, plantain, and rice, as well as tree crops like cocoa, oil palm, kolanut, and rubber. Cocoa remains a significant export crop and an economic mainstay for many rural households. Livestock farming is prominent in the derived savannah and savannah zones, with cattle, goats, poultry, and pigs being reared. Coastal and riverine areas support fishing and aquaculture, providing essential livelihoods for communities in these zones. Agriculture in Southwest Nigeria is not only the backbone of rural livelihoods but also a critical contributor to national food security and export earnings. The diverse agroecological zones in the region create opportunities for both subsistence and commercial agriculture, making Southwest Nigeria a vital part of the country's agricultural landscape.

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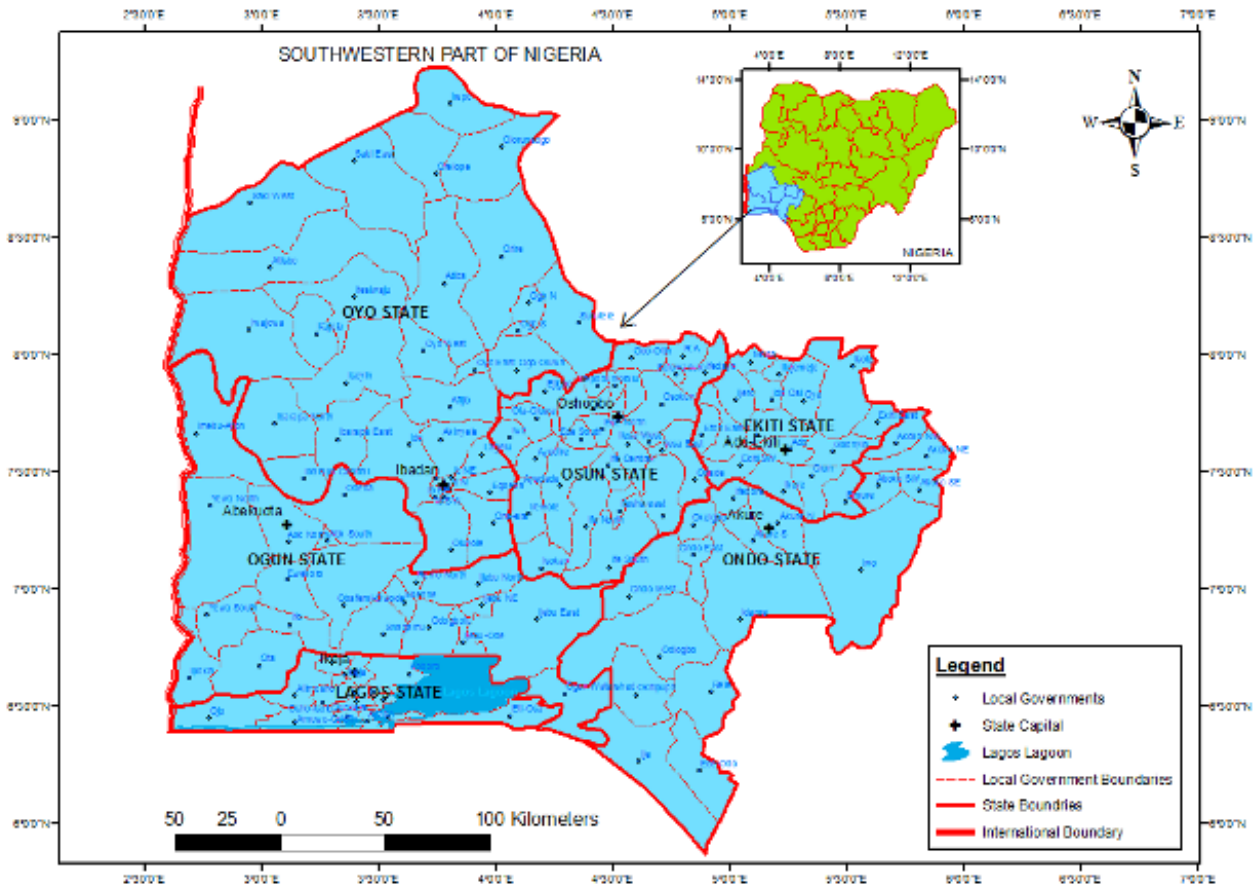

Figure 1: Map of the study areas (South Western, Nigeria)

The data for this research were gathered from cocoa farmers in the study area through structured questionnaires and direct interaction with respondents. These data collection efforts were facilitated by the involvement of the State Agricultural Development Programme (SADP) extension workers, who provided essential information for identifying farmers based on their adoption status of certification programs.

Using the above formula with a 95% confidence level, 50% estimated prevalence, and 5% margin of error, the required sample size is approximately 400, accounting for rounding and potential non-responses.

$$n_0 = \frac{Z^2.p.(1-p)}{e^2}$$

Where:

n_0 is the sample size for an infinite population,
Z is the Z-score,
p is the estimated proportion of the population,
e is the desired margin of error.

Therefore, a multi-stage sampling procedure was employed to select the study's respondents. In the first stage, two States (Ondo and Osun) in Southwest Nigeria were purposively selected due to their high cocoa production capacities and the presence of NGOs that promote certification programs. This purposive selection ensured that the sample represented areas where certification and sustainable practices are actively encouraged. Within each selected state, five Local Government Areas (LGAs) recognized for leading cocoa production were purposively selected. The LGAs include Idanre, Akure South, Owo, Ondo West, Odigbo for Ondo State and Ilesa East, Ilesa West, Atakunmosa East, Atakunmosa West, Irewole for the Osun State. This stage focused on identifying LGAs with a high density of cocoa farmers, while the third stage involved a random selection of four communities from each of the chosen LGAs. The fourth stage involved a simple random sampling approach to select a total of ten respondents from each community. This process culminated in a sample size of 400 respondents, although data from four respondents were excluded due to incomplete information. Consequently, a total of 396 respondents were analyzed in this study. The study employed descriptive statistics and a Seemingly Unrelated Regression Equation (SURE) for the objectives.

Seemingly Unrelated Regression Equation (SURE) Model: To determine the effect of financial risk on the welfare status of the respondents in the study area. The Seemingly Unrelated Regression Equation (SURE) model was selected for the study because it is well-suited for situations where multiple regression equations are modeled simultaneously, and their error terms are correlated. Also, the SURE model was chosen over other econometric models because of its robustness in handling interrelated equations, improving the precision of estimates, and providing deeper insights into the interconnected factors influencing the study's outcomes. The seemingly unrelated regression equation model was used following Oseni et al. (2018) and the variables that were considered for cocoa farmer's welfare were household income, food security, and poverty status. The structural form of the model was expressed as follows:

$$y_i = X_i\beta i + \epsilon_I \qquad (1)$$

For i = 1,…, M, where the matrices y_i, X_i, βi are of dimension (T × 1), (T × Ki), and (K × 1) respectively. The stacked system is:

$$Y = \begin{bmatrix} y1 \\ , \\ , \\ yM \end{bmatrix} = \begin{bmatrix} Xa1 & XaM \\ Xb1 & XbM \\ Xc1 & XcM \\ Xd1 & XdM \end{bmatrix} + \begin{bmatrix} \beta a \\ \beta b \\ \beta c \\ \beta d \end{bmatrix} + \begin{bmatrix} \varepsilon a \\ \varepsilon b \\ \varepsilon c \\ \varepsilon d \end{bmatrix} + X\beta + \varepsilon \quad (2)$$

The equation can be written individually as:

$Y_p = \partial_0 + \partial_1 X_1 + \partial_2 X_2 + \partial_3 X_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \partial_M X_M + \varepsilon_I$ (3)

$Y_q = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_M X_M + \varepsilon_I$ (4)

$Y_r = \varphi_0 + \varphi_1 X_1 + \varphi_2 X_2 + \varphi_3 X_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \varphi_M X_M + \varepsilon_I$ (5)

where,

y* were the dependent variables and they were y_p, for Household Income (HI) in Naira, y_q for Food Security (FS) measured in index, and y_r for Poverty Status (PS) measured as poverty gap, respectively. $\partial, \beta,$ and φ are estimated parameters,

The explanatory variables include:

X_1 = Ages of the respondents (years), continuous (in number)

X_2 = Gender of household head, dummy variable (1 = Male, 0 =Female)

X_3 = Education level, years spent in formal education, continuous (in number)

X_4 = Marital Status, dummy variable (1 = Married, 0 = Otherwise)

X_5 = Household size, (continuous numbers)

X_6 = Years of farming experience, continuous (in number)

X_7 = Farm size in hectares, continuous (in number)

X_8 = Main crop farming, dummy variable (1 = Cocoa main crop, 0 = Otherwise)

X_9 = Membership of cooperative, dummy variable (1 = Member, 0 =Otherwise)

X_{10} = Access to credit, dummy variable (1 = Access, 0 =Otherwise)

X_{10} = Access to market price information, dummy variable (1 = Access, 0 =Otherwise)

X_{11} = Access to extension agent services, dummy variable (1 = Access, 0 =Otherwise)

X_{12} = Financial risk (low = 0 and High = 1)

X_{13} = Income from other sources (Naira), continuous (in number)

X_{14} = Amount of credit received (Naira), continuous (in number)

X_{15} = Total cost of labour (Naira), continuous (in number)

X_{16} = Capital invested (Naira), continuous (in number)

μ_1 = Error term in the model

Results and Discussion

1. Summary of the Socioeconomic Factors Employed in the Regression

The socioeconomic characteristics of cocoa farmers in the area were analyzed to understand the overall welfare of the farmers in the area. As presented in Table 1, about 73.5% of respondents were male, and 26.5% were female, reflecting the labour-intensive and energy-demanding nature of cocoa farming, which is more accessible to men (Akintomiwa, 2017; Adegoroye et al., 2024). The study aligns with prior studies indicating gender sensitivity in cocoa crop farming (Oseni et al., 2018; Olutumise et al., 2019; Adegoroye et al., 2024). The majority (75%) of the sampled respondents were in the age bracket of 31 – 60 years old. The average age was 54 years, indicating an ageing farming population, which may hinder the adoption of innovations due to reduced productivity and economic activity. Similar findings in Nigerian cocoa farming underscore the need for targeted support to sustain future production (Adebiyi & Okunlola, 2013; Olutunmise & Ajibefun, 2019; Odegbade et al., 2021). Educational attainment was relatively high, with 87.6% of respondents having at least primary education, which could positively influence their ability to understand and adopt new

technologies. Education is crucial for the adoption of agricultural innovations, supporting informed decision-making (Oparinde et al., 2014; Oladele et al., 2020). The majority (81.3%) of respondents were married, suggesting a level of stability and maturity conducive to making joint decisions with spouses, which can enhance productivity through family labour contributions. This is consistent with findings that married individuals often engage in diverse economic activities to support family needs (Adegoroye et al., 2024). The average household size was seven members, with 80% having between 4 and 9 members, providing a labour pool advantageous for rural agricultural activities. Larger household sizes have been associated with a greater willingness to adopt labour-intensive practices. The mean farming experience was 33 years, with 63.9% of respondents having between 21 and 40 years of experience. Extensive farming experience can contribute positively to the adoption of new practices, as it correlates with increased skills and knowledge (Oladele et al., 2020; Oluwalade et al., 2023a,b). Most respondents (61.6%) owned between 4 to 6 hectares, classifying them as small to medium-scale farmers, a factor influenced by limited mechanization and land tenure issues. Using a credit-scoring method, the study found that 48.23% of farmers faced low financial risk, while 35.1% of them were at moderate financial risk. The higher financial risk (16.67%) suggests a willingness to engage in potentially beneficial long-term investments, aligning with research on improved financial resilience (Bray & Neilson, 2017). The Household Food Insecurity Access Scale (HFIAS) indicated that 32.58% of cocoa farmers were food secure compared to 67.42% of food insecure households. Again, the poverty status analysis reveals that a substantial proportion of the respondents in the study area are classified as non-poor. Specifically, 74.5% of the total respondents fall within the non-poor category. Conversely, 25.5% of the total sample is classified as poor. This distribution indicates a relatively higher economic stability among cocoa farmers. These findings are consistent with prior studies that highlight other socioeconomic factors, such as access to credit, education, and household labour availability, as pivotal in reducing poverty levels among smallholder farmers (Olutumise & Ajibefun, 2019).

Table 1: Results of the Summary Statistics of the Variables

Variable	Frequency	Percent
Gender		
Female	105	26.5
Male	291	73.5
Age (years)		
≤30	4	1.0
31-60	297	75.0
61-90	93	23.5
>90	2	.5
Educational Level		
No Formal Education	49	12.4
primary Education	125	31.6
Secondary Education	136	34.3
Tertiary Education	86	21.7
Marital Status		
Single	8	2.0
Married	322	81.3
Divorced	1	.3
Widowed	61	15.4
Widower	4	1.0

Household size (numbers)		
≤3	16	4.0
4-6	179	45.2
7-9	138	34.8
10-12	58	14.6
13-15	4	1.0
>15	1	.3
Farming Experience (years)		
≤10	14	3.5
11-20	48	12.1
21-30	146	36.9
31-40	107	27.0
41-50	64	16.2
>50	17	4.3
Farm size (ha)		
≤3	127	32.1
4-6	244	61.6
>6	25	6.3
Poverty status		
Poor	101	25.5
Non-poor	295	74.5
HFIAS		
Food secure	129	32.58
Food Insecure	267	67.42
Financial risk level		
Low	191	48.23
Moderate	139	35.10
High	66	16.67
Total	396	100.00

2. Effect of Financial Risk on the Welfare Status of Cocoa Farmers

The result of the Seemingly Unrelated Regression Equation (SURE) about the effect of financial risk on the welfare status of the sampled cocoa farmers in the study area is presented in Table 2. The variables considered for cocoa farmer's welfare indicators were (Household income, food security, and poverty headcount). The model allows for the joint estimation of multiple regression equations, considering the possibility of correlated error terms across the equations. The result of the chi-square statistic ranged from 1378.52 to 10322.20 and they were statistically significant at a 1% level of significance. This indicates that the null hypothesis of the restrictions of valid homogeneity and symmetry for the system equations was accepted. The R-square of the estimated household income, food security and poverty headcount were 69%, 75%, and 95%, respectively with the poverty headcount having the highest R-squared value. This indicates that the variability in welfare indicators of the respondents was explained by the sixteen (16) explanatory variables included in the model.

Generally, the coefficients of variables that were positive with the regressands (Household income, food security, and poverty status) imply that an increase in the value of any of these variables will increase and have an upward relationship on the dependent variable and vice-versa. The key variables in this model were farm size, education, sex, cooperative membership,

and financial risk. Larger farm sizes and cooperative membership increase income, while education and access to extension services reduce poverty. However, financial risk increases both household income and the likelihood of food insecurity and poverty.

According to Table 2, the coefficients of years of education of the sampled farmers were all negative but statistically significant at 5% and 10% levels with all the dependent variables. This implies that an increase in the number of years spent in school will cause a reduction in poverty headcount and improve food security, while its relationship with household income is negative since most educated individual often had their income indirectly from agriculture-driven economies. This finding is in line with Adetunji (2022), who reported that education was associated with improved food security and lower poverty rates in rural Nigeria. However, education did not always translate to higher household income due to underemployment and informal job markets that pay poorly, even for educated individuals. However, this result also contradicts the research work of Baulch et al. (2016), who found in Bangladesh that education had a positive and direct correlation with both income and food security.

The coefficients of sex had a positive and significant relationship with household income and household food insecurity access scale, while poverty headcount had a negative and not significant coefficient relationship with sex. This indicates that male-headed households tend to have better household income and food security than female-headed households. For instance, research shows that woman-headed households are more likely to experience food insecurity due to structural and socio-economic inequalities differences, allocation of resources and access to other productive assets. However, sex does not have a significant impact on poverty headcount in the study area. This was in line with Olutumise et al. (2019) and Akinrotimi (2024) in their studies in part of the States in Southwest, Nigeria.

Farming experience had a negative but significant relationship with household income, while household food insecurity access scale and poverty headcount were negative and not significant with farming experience, suggesting that other variables like educational level, financial risk, or farm size might have a more substantial impact in determining the welfare outcomes than experience. Similar findings were reported by Oluwalade et al. (2023) and Adegoroye et al. (2024).

The coefficients of farm size were positive and statistically significant at the 1% and 5% levels with household income and food security, while poverty headcount was negative but statistically significant at a 1% level. This reveals that an increase in farm size will significantly increase household income and positively impact food security. Also, increasing farm size will drastically reduce the poverty status of the farmers. Many studies have revealed that larger farm sizes tend to improve household income and food security while reducing poverty. This is in agreement with research findings in rural Pakistan that households with larger farms tend to experience better food security due to increased productivity and better access to markets (Abid et al., 2016; Ali and Erenstein, 2017). However, contrasting research evidence in Ethiopia, highlighted that diversification and intensification of farming, rather than farm size, were more critical in improving household income and reducing poverty, especially in the context of small farms (Mekuria and Mekonnen, 2018; Tadele, 2021).

The coefficient of main crop farming had a positive and significant relationship with household food insecurity access scale and poverty headcount at 1% levels of significance, while household income had a negative and no significant effect on main crop farming. This implies that reliance on main crop farming as a single source of income may have negative effects on both food security and the poverty status of the farmers, therefore, efforts should be channelled

toward income diversification, such as encouraging farmers on off-farm activities or cultivating secondary crops, as a strategy to improve their food security and reduce poverty (Ogunyemi et al., 2022).

The coefficient of farmers' cooperative membership had a positive and significant relationship with household income at a 5% level of significance, while it had no significant effect on food security and poverty headcount. This indicates that cooperative membership significantly improves household income but does not necessarily affect food security or poverty reduction of the farmers. This may be because an increased income was often reinvested into other farming activities rather than improving food security or poverty reduction. However, many studies agreed with this submission, among which is the research work of Fischer and Qaim (2012), who highlighted that although cooperatives provided income benefits, their influence on food security and poverty depended on other factors, such as household size, education, and land access. While several research also disagreed with these findings, but show that cooperative membership improves not only income but also food security and reduces poverty. For instance, Oni and Oladele (2012), concluded that cooperatives play a key role in reducing food insecurity by facilitating access to credit, inputs, and better farming techniques, which in turn improve food availability and access. Furthermore, the collective support provided by cooperatives helped reduce the vulnerability of households to poverty.

The coefficients of credit amount access were negative but significant at 1% and 5% levels with household income and poverty headcount and also negative but no significant relationship with food security. This indicates that increased credit access might lead to a negative impact on household income and an increase in poverty headcount. This reflects the situation when the amount of credit collected is not properly utilized for productive investments intended for initially. For instance, previous studies (Oparinde and Olutuimse, 2022; Olutumise, 2023; Adegoroye et al., 2024) have shown that access to several credits without proper financial literacy or adequate investment opportunities may sometimes worsen poverty levels. In most cases, households may divert the credit to immediate consumption or other sources that might leave them unable to repay loans.

The effects of financial risk were positive and statistically significant at a 1% level of significance with welfare indicators (household income, household food insecurity access and poverty headcount). Indicating that higher financial risks might lead to an increase in household income of the potential farmers, while the household food insecurity and poverty headcount also increased. This could be attributed to the volatility or instability of individual farmer's household income. Moreover, many research work in developing economies agree with this outcome, among them is the work of Rahman and Haroon (2021) in Southeast Asia, who reported that households with higher financial risk may benefit financially in the short term, but the increased exposure to market volatility leaves household more susceptible to long-term poverty. While other research in more economically developed nations disagree, for instance, a study by Ghosh and Chaudhuri (2017) in Bangladesh, highlighted that access to microfinance and other informal financial services helped mitigate the potential downsides of financial risks, allowing households to leverage higher incomes while maintaining food security and research work of Chen and Zhang (2020) in urban China, also reported that financial risk-taking increased household income without a significant effect on food insecurity or poverty. This is attributed to the availability of social safety nets and formal financial services that helped families cope with the instability associated with risk-taking.

Table 2: Effect of Financial Risk on Welfare Status of Cocoa Farmers

Explanatory Variable	Household Income		HFIAS		Poverty Headcount	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Age	-7459.18 (0.334)	0.334	0.001 (0.987)	0.987	-0.001 (0.379)	0.379
Sex	2.24e+5*	0.074	0.137***	0.000	-0.004	0.861
Education	-1.03e+5**	0.018	-0.170*	0.089	-0.016**	0.028
Marital status	98981.31	0.160	-0.127	0.437	-0.010	0.384
Experience	-13333.91*	0.076	-0.001	0.943	-0.001	0.373
Household size	-740.10	0.972	0.041	0.409	0.005	0.147
Farm size	1.67e+6***	0.000	0.014**	0.038	-0.043***	0.000
Main crop farming	-77.32	0.487	0.002***	0.000	0.001***	0.000
Cooperative	2.63e+5**	0.011	0.139	0.562	0.003	0.878
Credit	-3832.50	0.520	-0.007	0.614	0.001	0.409
Annual rent value	0.947	0.243	-9.58e-07	0.609	1.04e-7	0.450
Extension	149304.00	0.141	0.053	0.823	-0.041**	0.017
Credit constraints	-87696.25	0.159	0.101	0.484	-0.015	0.150
Interest rate	-100845.8	0.317	0.154	0.508	0.015	0.397
Credit amount access	-0.718***	0.000	-2.87e-7	0.180	-3.16e-8**	0.045
Financial risk	1.87e+6***	0.000	0.077***	0.000	0.057***	0.001
Constant	5689.15	0.000	0.521	0.001	0.329	0.000
R-square	0.0269		0.0750		0.9542	
Chi2	10322.20		1378.52		72046.96	
Prob.	0.000		0.000		0.000	

Note: *, **, * means significance at 10%, 5% and 1% levels respectively**

Hypothesis Testing

There is no significant relationship between the selected socioeconomic characteristics of the respondents and levels of financial risk.

The result of the chi-square test analysis between the level of financial risks and selected socio-economic characteristics of cocoa farmers in the study area is presented in Table 3. The results show that there are significant relationships between the socio-economic characteristics of cocoa farmers and their levels of financial risk. Specifically, farmers' age, sex, farming experience, number of cocoa farms, farm size, and quantity of cocoa harvested were significant at different levels. However, socio-economic factors like education, family size and marital status have shown no significant relationship. Therefore, we reject the null hypothesis and accept the alternative hypothesis.

Table 3: Hypothesis One: There is no Significant Relationship Between the Selected Socioeconomic Characteristics of the Respondents and the Levels of Financial Risk

Variable	T- Value	Df	Sign.	Decision
Sex	5.627	2	0.060*	Reject Null
Age	114.602	92	0.055*	Reject Null
Educational level	2.919	6	0.819	Accept Null
Marital status	12.159	8	0.144	Accept Null
Family size	27.410	28	0.496	Accept Null

Experience	96.599	64	0.005***	Reject Null
Nos of cocoa farms	38.641	14	0.001***	Reject Null
Farm size	420.410	92	0.001***	Reject Null
Qty of cocoa harvested	327.961	182	0.001***	Reject Null

Note: *, **, * means significance at 10%, 5% and 1% levels respectively**

Conclusion and Recommendations

The study examined the impact of financial risk on the welfare of cocoa farmers in Southwest Nigeria, particularly focusing on the influence of financial risks and the adoption of certification programs on socioeconomic welfare indicators such as household income, food security, and poverty status. The findings indicate that cocoa farming in this region is predominantly conducted by male, ageing farmers with an average age of 54 years, a factor that could influence the adoption of innovations. The socioeconomic profile further revealed that most farmers possess at least primary education, which supports their capacity to process information and potentially adopt new practices.

The Seemingly Unrelated Regression Equation (SURE) model revealed that key variables, such as farm size, education, cooperative membership, and financial risk levels, significantly affect welfare indicators. While larger farm sizes, cooperative membership, and education positively impacted household income and food security, financial risk increased household income but was also associated with greater food insecurity and poverty. This suggests that, while taking financial risks may yield short-term financial benefits, it may also expose households to long-term vulnerabilities, especially when financial buffers or stable market conditions are lacking. The study also highlighted structural barriers, including limited credit access and the labour-intensive nature of cocoa farming, which may deter broader adoption of certification programs and thus limit welfare improvements for farmers. On this note, the study recommends that educational programs targeted at younger farmers should be prioritized to encourage the entry of younger and more economically active farmers into cocoa farming. Training programmes that focus on financial literacy and risk management would also help farmers make informed decisions on credit usage and investment in certification programs. Again, given the significant role of financial risk in shaping welfare outcomes, it is recommended that the government and NGOs enhance farmers' access to affordable credit facilities. Structured credit programmes that incorporate risk management tools, such as crop insurance, could protect farmers against income volatility and support sustainable production practices. Cooperatives play a critical role in increasing household income. Strengthening cooperatives or forming new ones can facilitate collective bargaining, reduce input costs, and provide a platform for knowledge sharing. Cooperative-led initiatives can also improve access to market information, training, and credit facilities. To mitigate the risks associated with dependency on cocoa farming, diversification into other crops or off-farm income sources should be encouraged. Diversification can help stabilize income, enhance food security, and reduce poverty levels by providing alternative sources of revenue during cocoa price fluctuations. Further, policies aimed at improving women's access to farmland and financial resources could address gender disparities in cocoa farming. Targeted support for female farmers can foster gender inclusivity, potentially increasing the labour force and enhancing productivity in cocoa production.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Consent

As per international standards or university standards, respondents' written consent has been collected and preserved by the author(s).

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