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Determinants of Income Growth Among Smallholder Cashew Farmers in Cambodia: The Mediating Role of Farm Performance

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Abstract

Purpose: The primary objective of this study is to examine the determinants of income growth among smallholder cashew farmers in Cambodia, with particular emphasis on the mediating role of farm performance. Specifically, the study aims to: (1) analyze the effects of farm characteristics, demographic attributes, external market conditions, financial access, and management practices on farm performance; (2) assess the direct impact of farm performance on income growth; and (3) test whether farm performance mediates the relationship between these five determinants and smallholder income.

Study Design: This research adopts a quantitative, cross-sectional survey design. The population consists of smallholder cashew farmers in Cambodia. A total of 250 farmers from Kampong Thom, Kratie, and Ratanakiri provinces were selected using multi-stage probability sampling. Primary data were collected through structured questionnaires. The data were analyzed using Multiple Regression Analysis (MRA) to test direct relationships and mediation analysis to examine the indirect effects of farm performance between the independent variables and income growth.

Findings: The results indicate that farm characteristics, financial access, external market conditions, demographic factors, and management practices significantly influence farm performance. Farm performance, in turn, has a positive and statistically significant effect on income growth among smallholder cashew farmers. Mediation analysis confirms that farm performance plays a critical mediating role, transmitting the effects of structural, financial, and managerial factors to household income. Among the determinants, financial access and management practices demonstrate the strongest influence on farm performance and subsequent income growth.

Value: The study strengthens the Sustainable Livelihoods Framework and offers a replicable model for analyzing smallholder systems. Practically, it highlights the need to expand financial access, enhance managerial training, and improve market infrastructure, providing guidance for policymakers and development partners seeking to advance Cambodia's cashew sector toward greater value addition and sustainable rural development.

Keywords: *cashew nut, smallholder farmers, income growth, farm performance*

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Introduction

Agriculture continues to be the cornerstone of Cambodia's economic development, contributing approximately 22% of the nation's GDP and employing more than one-third of the labor force (Royal Government of Cambodia [RGC], 2023). Historically dominated by rice cultivation, Cambodia's agricultural sector has diversified into high-value cash crops such as cassava, mangoes, rubber, and cashew nuts reflecting a strategic response to global market opportunities and domestic livelihood needs (Ministry of Agriculture, Forestry and Fisheries [MAFF], 2024).

Cashew is among Cambodia's most promising exports, supported by favorable agroecological conditions, growing global demand, and the National Cashew Policy 2022–2027 (Royal Government of Cambodia [RGC], 2023). The country is the world's third-largest producer, with main cultivation in Kampong Thom, Kratie, and Ratanakiri (Cashew Nut Association of Cambodia [CAC], 2024). However, over 95% of raw nuts are exported to Vietnam, limiting domestic value addition, job creation, and smallholder incomes (CAC Annual Report, 2024).

Smallholder farmers, producing over 78% of the national crop, face barriers including limited credit, weak post-harvest infrastructure, and inadequate extension services (HEKS/EPER, 2019). The National Cashew Policy highlights these constraints and calls for improved training, processing capacity, and financing (RGC, 2023).

Although descriptive studies exist, few empirical investigations quantitatively examine how farm characteristics, demographic attributes, financial capacity, market access, and management practices jointly influence farm performance and ultimately translate into income growth. More importantly, the mediating mechanism through which these multidimensional support factors operate remains underexplored. While general studies provide a broad overview of agricultural constraints, there is still limited empirical evidence explaining how these factors generate income improvements through the farm performance process namely productivity, efficiency, and profitability. Understanding this mediating role is essential because it reveals whether income growth results directly from external support or indirectly through improvements in farm-level performance. By identifying this transmission pathway, policymakers and development practitioners can pinpoint the precise performance bottlenecks that constrain smallholder incomes, thereby designing more targeted and effective interventions. This study addresses that critical gap by developing and testing an integrated mediation model within Cambodia's cashew sector.

Objectives

The primary objective of this study is

1. To examine the determinants of income growth among smallholder cashew farmers in Cambodia, focusing on the mediating role of farm performance. Specific objectives include:

2. To analyze the effect of farm characteristics, demographic attributes, external market conditions, financial access, and management practices on farm performance.
3. To assess the direct impact of farm performance on income growth.
4. To test whether farm performance mediates the relationship between the five determinants and smallholder income.

These objectives lead to the following research questions:

1. Which factors most significantly influence farm performance among Cambodian smallholders?
2. How does farm performance affect household income growth?
3. Does farm performance mediate the relationship between key determinants and income?

This research provides an empirical contribution to understanding how multidimensional factors shape smallholder outcomes in Cambodia's cashew industry. For policymakers, the findings support the implementation of the National Cashew Policy 2022–2027 by identifying priority intervention areas such as access to credit, training programs, and processing investments. For farmer associations and cooperatives, such as the Cashew Association of Cambodia (CAC), the study offers evidence to strengthen capacity-building and collective marketing strategies. Moreover, the study adds to the global discourse on smallholder livelihoods by empirically testing the mediating role of farm performance bridging resource-based theories with measurable income outcomes (Food and Agriculture Organization of the United Nations [FAO], 2024).

Literature Review

The **Resource-Based View (RBV)** provides a strong theoretical foundation for examining income growth among smallholder farmers. Originally developed by Birger Wernerfelt (1984) and later formalized by Barney (1991), RBV argues that performance differences across firms arise from heterogeneity in valuable, rare, inimitable, and non-substitutable (VRIN) resources. Although traditionally applied to firms, RBV has increasingly been extended to agricultural households, where farms are conceptualized as micro-enterprises that combine tangible and intangible resources to generate productivity and income (Barney, 1991).

In the context of smallholder agriculture, farmers' land size, access to finance, knowledge, experience, networks, and management skills can be understood as strategic resources. Income growth, therefore, does not occur randomly but results from the effective mobilization and configuration of these resources into improved farm performance. RBV thus supports the argument that farm performance functions as the mechanism through which resource endowments translate into income outcomes.

Demographic Factors (DEM)

Demographic attributes such as age, gender, education, and farming experience shape decision-making and technology adoption. Educated farmers are more likely to apply improved inputs and adopt record-keeping practices. Age correlates positively with farming experience but negatively with willingness to adopt innovations, indicating generational differences in risky behavior (Ha et al., 2023). Gender disparities also persist in Cambodia, where female farmers often have reduced access to credit and extension services (Cambodian Agricultural Survey [CAS], 2020).

Although prior research acknowledges the role of human capital in agricultural productivity, most studies examine education or experience in isolation rather than as part of a multidimensional resource framework influencing performance. Furthermore, evidence remains limited on whether demographic advantages improve income indirectly through farm performance rather than directly. This study therefore hypothesizes:

H₁: Demographic factors (DEM) have a significant positive effect on farm performance (PER).

Farm Characteristics (FAR)

Farm characteristics, including land size, soil fertility, water access, and quality planting materials, are fundamental to cashew productivity. Studies in Ghana and Tanzania show land size and improved seeds directly affect yield and profitability (Dubbert et al., 2019). In Cambodia, high-yielding M23 varieties and proper irrigation increased yields by up to 40% (HEKS/EPER, 2022), while soil improvement through composting and mulching also enhances productivity (Chaya et al., 2024).

While existing studies confirm that land and farm assets influence productivity, limited empirical research examines how these structural characteristics collectively affect farm performance within an integrated framework, particularly in Cambodia's cashew sector. Moreover, few studies test whether these structural factors translate into income growth indirectly through performance improvements. Addressing this gap leads to the following hypothesis:

H₂: Farm characteristics (FAR) have a significant positive effect on farm performance (PER).

External Market Factors (MKT)

External market conditions such as infrastructure, market distance, price information, and collective organization affect farm profitability. Improved rural roads raise farm-gate prices (Asian Development Bank, 2022), while access to mobile market information enhances bargaining power (Zant, 2024). Cooperative membership provides economies of scale; Ghanaian cashew farmers in cooperatives earned 12–18% higher prices than non-members (Gomez et al., 2022).

While descriptive reports highlight market barriers faced by Cambodian cashew farmers, few quantitative studies examine how market conditions directly enhance farm-level performance indicators such as productivity and profitability. Moreover, the mediating role of performance between market access and income growth remains largely unexplored. This leads to:

H₃: External market factors (MKT) have a significant positive effect on farm performance (PER).

Financial Factors (FIN)

Financial capital allows farmers to invest in productivity-enhancing technologies. Access to credit and savings supports purchasing inputs, hiring labor, or expanding operations. Formal credit improves smallholder efficiency (Boansi, 2023), and off-farm income provides liquidity and stabilizes consumption (Anang & Apedo, 2023). In Cambodia, limited collateral and high interest rates constrain loan access, increasing reliance on informal lenders (World Bank, 2023).

Although financial access is frequently cited as a major constraint in Cambodia's agricultural policy documents, limited empirical work tests its indirect influence on income via performance enhancement. This study fills that gap by explicitly modeling farm performance as the transmission channel. Therefore:

H₄: Financial factors (FIN) have a significant positive effect on farm performance (PER).

Management Factors (MGT)

Farm management practices improve resource use and productivity. Pruning, pest management, and record-keeping enhance yields and efficiency (Islam et al., 2023). Smallholders with farm records show higher productivity (Azeez & Olabanji, 2024), and CAC training in Cambodia has improved nut quality and output (CAC, 2024).

While agricultural development programs emphasize farmer training, few studies empirically test management practices as measurable determinants of farm performance within a mediation framework. Particularly in Cambodia's cashew sector, evidence remains limited on how management capability translates into income growth through performance improvement. Hence:

H₅: Management factors (MGT) have a significant positive effect on farm performance (PER).

Farm Performance (PER) and Income Growth (INC)

Farm performance measured by productivity (kg/ha) and profitability (net income after costs) acts as the central mechanism linking resources and livelihood outcomes (Ritchie et al., 2022). Higher efficiency enables smallholders to increase revenue without proportional cost rises, boosting income. Studies in Asia and Africa show a strong positive relationship between farm performance and household earnings (Claude et al., 2025).

For Cambodian cashew farmers, performance mediates how inputs, skills, and markets translate into income: improved finance or technology raises earnings via better performance, while weak performance limits income gains a gap this study examines.

While previous studies often treat income as a direct function of structural or financial factors, this approach overlooks the internal mechanism of performance transformation. By positioning farm performance as the immediate predictor of income growth, this study clarifies the transmission pathway from resource endowment to livelihood outcomes. Therefore:

H₆: Farm performance (PER) has a significant positive effect on income growth (INC).

Drawing on the reviewed literature as in figure 1, five determinant categories farm characteristics, demographic, external market, financial, and management factors are hypothesized to affect farm performance, which mediates income growth. This integrated model aligns with prior agricultural livelihood

research (Yeboah et al, 2023) and offers a comprehensive approach for understanding smallholder success in Cambodia’s cashew industry.

Conceptual Framework

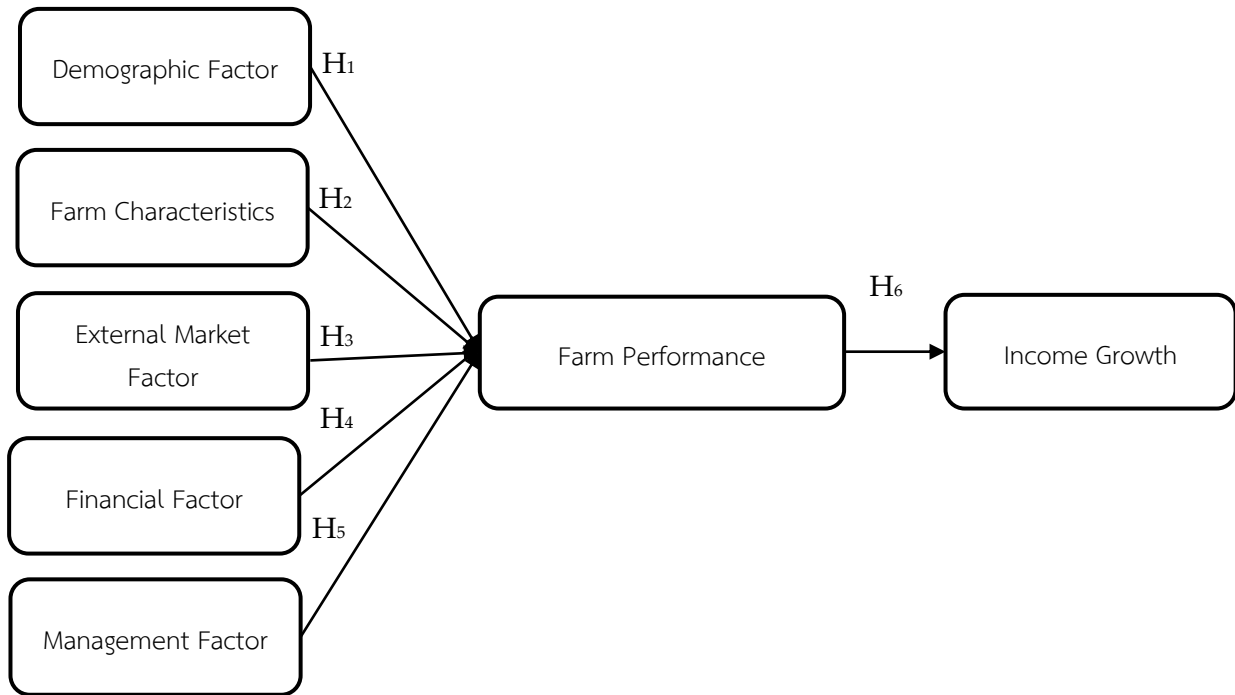


Figure 1 Conceptual Framework

Methodology

This study adopted a quantitative, cross-sectional research design to investigate the determinants of income growth among smallholder cashew farmers in Cambodia and to examine the mediating role of farm performance. A quantitative approach was appropriate as it allows the use of numerical data to identify relationships and test hypotheses using statistical methods (Creswell et al., 2018). The study utilized Multiple Regression Analysis (MRA) to analyze the relationships between independent variables farm characteristics, demographic factors, external market factors, financial factors, and management practices and the dependent variable, income growth. The mediating role of farm performance was analyzed using the Baron & Kenny (1986) mediation framework.

The target population consisted of smallholder cashew farmers cultivating five hectares or less of cashew land in Cambodia, as defined by International Labour Organization, 2024. Three provinces were purposively selected for their high cashew production: Kampong Thom, Kratie, and Ratanakiri, which together represent Cambodia’s major cashew-growing zones (CAC, 2024).

A multi-stage sampling technique was employed to ensure representativeness and minimize bias. This method, widely adopted in agricultural and social science research, effectively balances accuracy with practical feasibility (Saunders et al., 2023). The sampling process comprised four stages: in the first stage, three provinces Kampong Thom, Kratie, and Ratanakiri was purposively selected due to their significant contribution to national cashew production. In the second stage, districts within each province were stratified based on cashew cultivation intensity (high and moderate production zones). From this stratification, two districts were randomly selected in each province, resulting in a total of six districts. In the third stage, villages within each selected district were identified using official commune agricultural records. From each district, three villages with a high concentration of smallholder cashew farmers were randomly selected, yielding a total of eighteen villages across the three provinces. In the final stage, a list of smallholder cashew farmers (≤ 5 hectares) was obtained from village leaders and local agricultural officers. Using simple random sampling, respondents were selected proportionately to the farmer population size in each province. The final distribution of respondents was 110 farmers from Kampong Thom, 75 from Kratie, and 65 from Ratanakiri. The overall sample size was then calculated using Green's (1991) formula for multiple regression analysis:

$$n \geq 50 + 8m$$

Where m represents the number of independent variables. With seven variables, the minimum sample size was 106. However, to ensure robustness, 250 respondents were selected, aligning with recommendations by Kline (2011) for structural modeling and large-scale agricultural studies.

Data were collected using a structured questionnaire consisting of three sections: (1) demographic and farm profile information, (2) independent and mediating variables measured using perceptual scales, and (3) income-related outcomes. Similarly, income growth was measured using objective and comparative indicators rather than agreement-based statements. Respondents were asked to report their annual cashew income for the previous production year and to indicate whether their income had increased, remained stable, or decreased compared to the preceding year. In contrast, latent constructions such as farm characteristics (e.g., perceived adequacy of land and input usage), market access, financial access, management practices, and farm performance were measured using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. These constructs capture perceptions of resource adequacy, accessibility, and operational effectiveness, which are appropriately assessed through scaled responses.

A pilot test with 30 farmers was conducted to refine the instrument. Feedback helped improve clarity and contextual relevance. The reliability of each construct was verified using Cronbach’s Alpha, with all values exceeding the 0.70 threshold, confirming internal consistency (Taber, 2018). Data were collected between August and September 2025, immediately following the cashew harvest season to ensure accuracy in income and yield reporting. The survey was administered online (via Telegram and Facebook) to reach geographically dispersed farmers and ensure inclusivity, consistent with hybrid survey models in agricultural research (ADB, 2022).

The online questionnaire was distributed through Telegram and Facebook farmer groups that are already actively used by cashew farmers, local cooperatives, and provincial agricultural officers. In recent years, smartphone penetration in rural Cambodia has increased significantly, and most cashew farmers use mobile internet for communication with traders, checking market prices, and receiving updates from the Cashew Nut Association of Cambodia (CAC) and local agricultural offices. Before launching the full survey, I conducted a pilot test with 30 farmers from Kampong Thom, Kratie, and Ratanakiri to confirm that respondents were able to access and complete the questionnaire independently via their mobile devices. The pilot results showed that farmers were familiar with online forms and messaging applications, suggesting that internet access was sufficient among the targeted sample.

Table 1 Reliability Analysis

Item	Cronbach's Alpha (Pilot Test)	Cronbach's Alpha
DEM	0.72	0.78
FAR	0.71	0.76
MKT	0.70	0.75
FIN	0.72	0.77
MGT	0.71	0.76
PER	0.70	0.73
INC	0.74	0.79

Table 1 of Construct validity was confirmed through factor analysis, ensuring each item loaded significantly on its respective variable (factor loading > 0.6). Reliability was assessed using Cronbach’s alpha, where all constructs exceeded the acceptable threshold of 0.70 (Taber, 2018). Data analysis was conducted using IBM SPSS Statistics Version 29. Several statistical methods were employed to examine the study’s objectives. First, descriptive statistics were used to summarize the respondents’ demographic characteristics and farm profiles. Next, multiple regression analysis (MRA) was applied to explore the relationships between the five key determinants and farm performance. To further assess the impact of farm performance on income growth, a simple linear regression was performed. Finally, a mediation analysis following

the approach of Baron & Kenny (1986) was carried out to determine the indirect effects of the independent variables on income growth through farm performance.

Table 2 of the thesis presented the correlation coefficients among the seven constructs. Moderate associations were found between Decision-Making and Management ($r = 0.43$) and between Decision-Making and Performance ($r = 0.46$). Financial and Farm-related variables also showed a moderate relationship ($r = 0.48$). Income (INC) displayed low correlations ($r = 0.00$ – 0.15) with all other constructs, suggesting that income is not directly explained by any single determinant, but rather through intermediary pathways such as performance. These results indicate clear construct distinctiveness, confirming discriminant validity (Kline, 2011).

Table 2 Correlation Matrix

	DEM	FAR	MKT	FIN	MGT	PER	INC
DEM	1						
FAR	0.03	1					
MKT	0.12	0.05	1				
FIN	0.04	0.48	0.15	1			
MGT	0.43	0.18	0.14	0.18	1		
PER	0.46	0.23	0.33	0.44	0.43	1	
INC	0.09	0.08	0.15	0.01	0.00	0.48	1

Results

Out of 250 respondents, 96% were male and 4% were female, reflecting male dominance in cashew farm management. The majority (38.4%) were aged between 48 to 57 years, and 38.4% had 6 to 10 years of farming experience. About 64.8% owned 1 to 5 hectares of land, and the most common household expenditure was between USD 300 to 399 per month (38%). These statistics demonstrate that most respondents are experienced middle-aged smallholders with moderate financial stability.

Table 3 Summary of Descriptive Statistics of Respondents (N = 250)

Characteristics	Categories	Frequency	Descriptive Statistics
Gender	Male	240	(96.00%)
	Female	10	(4.00%)
Age	18–27 years	7	(2.80%)
	28–37 years	47	(18.80%)
	38–47 years	68	(27.20%)
	48–57 years	96	(38.40%)
	58 years and above	32	(12.80%)
Farming Experience	Less than 3 years	33	(13.20%)
	3–5 years	93	(37.20%)

Characteristics	Categories	Frequency	Descriptive Statistics
	6–10 years	96	(38.40%)
	11–20 years	28	(11.20%)
	More than 20 years	0	(0.00%)
Land Size	Less than 1 hectare	20	(8.00%)
	1–5 hectares	162	(64.80%)
	6–10 hectares	55	(22.00%)
	11–20 hectares	9	(3.60%)
	More than 20 hectares	4	(1.60%)
Household Expenses	Less than 100 USD	4	(1.60%)
	100–199 USD	18	(7.20%)
	200–299 USD	66	(26.40%)
	300–399 USD	95	(38.00%)
	400–499 USD	50	(20.00%)
	500 USD or more	17	(6.80%)

Based on table 4, the regression analysis shows that the combined independent variables explain approximately 59.5% of the variance in farm performance ($R^2 = 0.595$; Adjusted $R^2 = 0.570$). Financial factors were the most significant predictor (Beta = 0.920), followed by demographic, management, market, and farm characteristic factors. This indicates that financial access and effective resource allocation play a critical role in improving productivity and profitability.

Table 4 Multiple Regression Analysis

Variable	B	Std. Error	Beta	t	Sig.
Constant	1.200	0.500	–	2.400**	0.043
DEM	0.550	0.200	0.620	2.750**	0.025
FAR	0.460	0.180	0.610	2.556**	0.034
MKT	0.490	0.190	0.580	2.579**	0.033
FIN	0.600	0.200	0.920	3.000**	0.016
MGT	0.420	0.180	0.470	2.333**	0.048

Notes: Dependent Variable: PER, R Square = 0.595, Adjusted R Square = 0.570, F value = 264.44. Sig. = 0.000,

** $p < 0.05$

The high beta value for Financial Factors (Beta = 0.920) indicates that access to affordable credit, savings, and off-farm income opportunities most strongly enhance performance. These findings are consistent with IFAD (2022), who reported that liquidity constraints are a major determinant of smallholder efficiency.

The regression model was structured as follows:

$$PER = 1.200 + 0.550(DEM) + 0.460(FARM) + 0.490(MKT) + 0.600(FIN) + 0.420(MGT)$$

Where:

- PER = Farm performance
- DEM = Demographic factors
- FAR = Farm characteristic
- MKT = External Market factors
- FIN = Financial factors
- MGT = Management factors
- 1.200 = Intercept, representing the expected performance when all predictors are zero

This equation allows you to predict performance by plugging in the values for each independent variable.

A separate regression assessed the effect of farm performance on income growth. The model was significant ($F = 38.22$, $p < 0.001$), with Std. Error = 0.72, showing a robust positive relationship:

Table 5 Linear Regression

Model	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t	Sig.
	B		Beta		
1	(Constant)	1.500	0.400	3.75**	0.002
	PER	0.720	0.145	4.97**	0.000

Notes: Dependent Variable: INC, R Square = 0.639, Adjusted R Square = 0.556, F value = 267.44. Sig. = 0.000, ** $p < 0.05$

$$INC = 1.500 + 0.720(PER)$$

A simple linear regression revealed that had shown in table 5, farm performance strongly predicts income ($B = 0.720$, $p < 0.001$), explaining 63.9% of income variance ($R^2 = 0.639$). This confirms that improved performance directly translates into higher farmer income.

In table 6, the mediation results indicate that farm performance mediates the relationship between all independent variables and income. Financial ($B = 0.432$) and demographic factors ($B = 0.396$) exhibit the strongest indirect effects, followed by marketing ($B = 0.353$), farm characteristics ($B = 0.331$), and management ($B = 0.302$). This confirms that structural and behavioral improvements enhance income primarily through better farm performance.

Table 6 Mediation Analysis

Variable	B (V→PER)	B (PER→INC)	Indirect Effect (B)
DEM	0.550	0.720	0.396
FAR	0.460	0.720	0.331
MKT	0.490	0.720	0.353
FIN	0.600	0.720	0.432
MGT	0.420	0.720	0.302

All six hypotheses (H1–H6) were supported as table 7 as below:

- H1–H5: Demographic, farm characteristics, market, financial, and management factors significantly affect farm performance ($p < 0.05$).
- H6: Farm performance significantly affects income ($p < 0.001$).

This underscores that income growth among smallholder cashew farmers depends largely on improving performance through access to finance, technical knowledge, and market engagement.

These results provide empirical confirmation that farm performance mediates the influence of all five determinants on income growth, offering a robust quantitative foundation for understanding smallholder development in Cambodia’s cashew sector.

Table 7 Summary of Hypothesis Testing Results

Hypothesis	Relationship	B	t-value	Sig. (p)	Result
H ₁	DEM → PER	0.550	2.750	0.025	Supported
H ₂	FAR → PER	0.460	2.556	0.034	Supported
H ₃	MKT → PER	0.490	2.579	0.033	Supported
H ₄	FIN → PER	0.600	3.000	0.016	Supported
H ₅	MGT → PER	0.420	2.333	0.048	Supported
H ₆	PER → INC	0.720	4.970	0.000	Supported

Notes: DEM = Demographic Factor, FAR = Farm Characteristics, MKT = External Market Factor, FIN = Financial Factor, MGT = Management Factor, PER = Farm Performance, INC = Income Growth

Discussion

The study found that five key determinants farm characteristics, demographic factors, external market factors, financial factors, and management factors collectively explain a significant portion of the variance in farm performance, which in turn strongly influences income growth among smallholder cashew farmers. The results confirm that farm performance acts as a mediating variable linking resource availability and managerial capacity to income improvement.

H₁: Demographic Factors → Farm Performance: Demographic factors including age, education, and household labor positively affect farm outcomes. Experienced and educated

farmers exhibit stronger management and adoption of modern techniques, consistent with previous studies linking human capital to higher technical efficiency (Lukurugu et al., 2022).

H₂: Farm Characteristics → Farm Performance: Farm characteristics such as land size, soil fertility, and access to quality inputs significantly influence performance. Farmers with larger landholdings and improved planting materials demonstrate higher productivity. This aligns with prior findings emphasizing resource endowment as a foundation for efficiency (Lukurugu et al., 2022).

H₃: External Market Factors → Farm Performance: Access to reliable buyers, market information, and cooperatives has a significant impact on performance. Farmers connected to stable markets and transparent pricing tend to invest more, resulting in better yields, echoing findings from Yeboah et al. (2023) on smallholder market access.

H₄: Financial Factors → Farm Performance: Financial capacity especially access to affordable credit and savings strongly influences performance. The study validates that financial inclusion enables timely investment in farm inputs, consistent with Haryanto et al. (2023) who found that credit access enhances smallholder efficiency.

H₅: Management Factors → Farm Performance: Effective management practices such as pruning, pest control, and record-keeping positively affect performance. Farmers who adopt systematic practices and apply technical training achieve higher efficiency, confirming Lukurugu et al. (2022).

H₆: Farm Performance → Income Growth: Improved farm performance directly leads to higher income. Enhanced productivity and profitability translate into better household welfare, in line with Yeboah et al. (2023).

Conclusion

Theoretical Contributions

This study advances theoretical understanding of smallholder farm development by empirically validating a multidimensional model linking demographic, resource, market, financial, and managerial factors to farm performance and income growth. Unlike prior studies that focused on single determinants such as input use or credit access, the findings demonstrate that farm performance emerges from the synergistic interaction of human capital, financial capacity, market participation, and management quality.

By positioning farm performance as a mediating mechanism between structural and behavioral determinants and economic outcomes, the study strengthens the theoretical integration of the resource-based view and human capital theory within an agricultural context. It confirms that both tangible assets (e.g., land, inputs, facilities) and intangible assets (e.g., skills, experience, decision-making) jointly enhance productivity and income. This multidimensional perspective provides a more holistic

framework for understanding smallholder farm success and the pathways through which various resources and capabilities influence economic performance.

Managerial Contributions

Managerial Implications (For Farmers and Farm Owners): From a managerial perspective, the findings provide practical guidance for improving the productivity, competitiveness, and long-term sustainability of smallholder cashew farms in Cambodia.

First, the strong influence of financial capacity on farm performance suggests that farmers should strengthen their financial management practices. This includes maintaining proper farm accounting records, preparing regular budgets, monitoring cash flow, and carefully managing credit. Transparent financial management enables farmers to allocate resources efficiently, reduce unnecessary expenses, and improve investment decisions.

Second, the significance of demographic capacity indicates that farmers should continuously enhance their knowledge and skills. Investing in training programs, technical workshops, and peer-learning networks can improve decision-making ability, production planning, and problem-solving skills. Farm owners who actively seek new knowledge are more likely to adopt improved farming techniques and innovative management approaches.

Third, strengthening market linkages is essential. Farmers should proactively build relationships with reliable buyers, cooperatives, and processors to secure stable demand and better prices. Diversifying marketing channels and reducing dependence on middlemen can help mitigate price volatility and increase bargaining power.

Finally, improving day-to-day management practices such as production planning, record-keeping, labor supervision, and process monitoring can significantly enhance operational efficiency. Consistent monitoring of farm activities contributes to higher yield stability and better overall farm performance.

Policy Recommendations (For Government and NGOs): In addition to managerial improvements at the farm level, the findings also suggest several policy-level interventions to support smallholder cashew farmers.

First, given the dominant role of financial factors, the government and financial institutions should expand access to affordable agricultural credit. This may include interest rate subsidies, flexible repayment schemes aligned with harvest cycles, and simplified loan application procedures tailored to smallholders.

Second, public agencies and NGOs should strengthen agricultural extension services by providing structured capacity-building programs. Technical training, financial literacy education, and farm management workshops can improve farmers' competencies and enhance productivity across rural communities.

Third, policymakers should promote stronger market integration by supporting farmer cooperatives, facilitating contract farming arrangements, and improving access to export markets.

Investment in rural infrastructure, such as storage facilities and transportation networks, can also reduce post-harvest losses and transaction costs.

Finally, national agricultural policies should prioritize value addition within Cambodia's cashew sector by encouraging local processing and strengthening supply chain coordination. Such initiatives can increase farmers' income, reduce dependency on raw exports, and enhance the overall competitiveness of the industry.

Limitations and Future Research

This study offers valuable insights into the determinants of income growth among smallholder cashew farmers in Cambodia, yet several limitations should be acknowledged. First, the research was confined to Kampong Thom, Kratie, and Ratanakiri, which, although major cashew-producing provinces, may not represent the full diversity of farming conditions nationwide. Variations in soil quality, infrastructure, and market access in other regions could lead to different outcomes. Broader geographic coverage in future studies would improve generalizability (Tambo & Wünscher, 2017).

Second, the study relied on self-reported survey data, which may be affected by recall bias or misreporting, especially regarding income and yield. Prior research indicates discrepancies between self-reported and field-measured agricultural data (Fermont & Benson, 2011). Combining surveys with field observations or verified records in future research would enhance accuracy.

Third, the use of Multiple Regression Analysis (MRA) enabled identification of associations but limited the examination of complex causal pathways. More advanced statistical approaches such as Partial Least Squares Structural Equation Modeling (PLS-SEM) or Hierarchical Linear Modeling (HLM) could better capture indirect effects and multi-layered relationships among determinants (Hair et al., 2021).

Finally, some potentially influential variables such as climate resilience, digital technology adoption, farmer attitudes, and cooperative membership were not included due to data limitations. As agricultural livelihoods increasingly depend on innovation, collective action, and adaptive capacity, future studies should integrate these variables to expand the explanatory power of the model. As emphasized by Kassie et al. (2015), excluding behavioral or institutional dimensions can weaken the robustness of agricultural productivity models. Addressing these gaps will allow future research to provide a more holistic and policy-relevant understanding of how to sustainably enhance smallholder farmers' income and performance in Cambodia's growing cashew industry.

Suggestion

To optimize income growth for Cambodian smallholder cashew farmers, interventions must prioritize enhancing farm performance as a central mediating mechanism. Specifically,

development strategies should focus on expanding financial inclusion through affordable microcredit and subsidized input financing, as financial factors were found to be the strongest driver of performance. Simultaneously, policymakers and farmer associations should invest in human capital development focusing on training in pruning, pest control, and record-keeping to bridge the gap between resource availability and realized productivity. Finally, strengthening market connectivity and price transparency through cooperatives is essential to ensure that improvements in farm efficiency translate directly into stable, increased household income.

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