

THE DEVELOPMENT OF GREEN CREDIT IN THE AGRICULTURAL SECTOR AT COMMERCIAL BANKS IN HO CHI MINH CITY: IMPLICATIONS FOR SUSTAINABLE AGRICULTURAL FINANCE AND FOOD SECURITY

Nguyen Duc Phuc*, Nguyen Van Tuan

Ho Chi Minh City University of Industry and Trade

*Email: 6023260001@huit.edu.vn

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ABSTRACT

Despite increasing attention to green finance and sustainable agricultural development, empirical studies on green credit development in emerging economies remain limited, particularly in Vietnam. This study investigates the factors influencing green credit development in the agricultural sector at commercial banks in Ho Chi Minh City using an integrated C-TAM-TPB framework. The study employs Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM) based on survey data collected from 249 Agribank staff members. The findings reveal that Perceived Benefits (PB), Environmental Concern (EC), Green Products (GP), Stakeholder Pressure (SP), Banking Technology (BT), Bank Brand (BB), and Banking Policies (BP) positively influence green credit development. Among these factors, Bank Brand exerts the strongest effect, while Stakeholder Pressure shows the weakest influence. The study contributes to the green finance literature by extending the integrated C-TAM-TPB framework to sustainable agricultural finance in Vietnam and provides practical implications for promoting green credit toward sustainable agricultural development and food security objectives.

Keywords: Green credit, sustainable agricultural finance, commercial banks, Vietnam, food security.

1. INTRODUCTION TO THE RESEARCH TOPIC

Economic development coupled with environmental protection is becoming a central objective of countries around the world. According to the United Nations Environment Programme [1], approximately 70% of global greenhouse gas emissions originate from production activities, of which the agricultural sector accounts for more than 18% of total global CO₂ emissions. Therefore, “greening” the economy and the financial system is considered a key solution for realizing sustainable development goals. Many countries have launched a “green revolution,” in which economic activities are encouraged only when they do not cause adverse environmental impacts [2], [3].

In this process, the financial system plays a central role as it is the primary source of funding for development investment projects. Credit institutions are considered an important instrument for allocating financial resources toward green objectives through green credit products. Green credit not only serves as a bridge between enterprises and the market, but also functions as a tool to regulate production behavior in an environmentally friendly direction. First, for enterprises, green credit is an essential source of capital that enables production expansion and investment in clean technologies when internal funds are insufficient [4].

Second, for the market, commercial banks act as payment intermediaries, facilitating the efficient circulation of capital flows while also guiding investors toward sustainable financial activities [5].

The State Bank of Vietnam issued Directive No. 03/CT-NHNN dated March 24, 2015, to promote green credit growth and manage environmental and social risks in credit activities. According to statistics released by the State Bank of Vietnam [6], outstanding green credit across the banking system reached approximately VND 670 trillion, accounting for nearly 5% of total outstanding loans in the economy, with an average annual growth rate of more than 20% during the 2018 – 2023 period. Among these, the Vietnam Bank for Agriculture and Rural Development has been one of the pioneering banks in implementing green financial products and services, with a particular focus on green agriculture, which accounts for a significant proportion of its total lending portfolio.

However, the scale of green credit at Agribank remains modest compared with its total outstanding loans, and most of its green financing is still concentrated in small-scale, dispersed projects, thus failing to generate broad spillover effects. In addition, green credit activities in Vietnam as a whole are still at an early stage of development and face numerous constraints in terms of legal frameworks, awareness, and technology. Therefore, studying the factors influencing the development of green credit, particularly in the agricultural sector, which is highly vulnerable to climate change, is highly necessary.

Despite the growing body of literature on green finance and sustainable banking, several important research gaps remain. First, existing studies have primarily focused on green banking practices and green finance in general contexts, while limited attention has been given to green credit development in the agricultural sector, particularly within emerging economies such as Vietnam. Second, prior studies have often examined financial, environmental, technological, or policy-related determinants separately, resulting in limited integration between behavioral, institutional, and technological perspectives in explaining green credit development. Third, empirical evidence regarding the relationship between green credit, sustainable agricultural finance, and broader food security objectives remains insufficient, especially in transitional banking markets. Therefore, this study seeks to address these gaps by applying an integrated C-TAM-TPB framework to investigate the determinants of green credit development in the agricultural sector within the Vietnamese banking context.

Based on the research background and the existing gaps in the literature, this study seeks to address the following research questions:

RQ1: What factors influence the development of green credit in the agricultural sector at commercial banks in Ho Chi Minh City?

RQ2: How do perceived benefits, environmental concern, green products, stakeholder pressure, banking technology, bank brand, and banking policies influence green credit development?

RQ3: Which factors exert the strongest influence on green credit development within the Vietnamese banking context?

RQ4: How can commercial banks promote green credit development to support sustainable agricultural finance and broader food security objectives?

This study makes several important contributions to the existing literature on green finance and sustainable banking. First, the study contributes theoretically by extending the integrated C-TAM-TPB framework to the context of green credit development in sustainable agricultural finance within an emerging economy. Second, the study contributes empirically by providing evidence from Vietnam, where research on green credit in the agricultural sector remains relatively limited compared with developed economies. Third, the study offers

practical and policy implications for commercial banks and policymakers in promoting green credit development to support sustainable agricultural development and broader food security objectives. Finally, the study contributes to the understanding of how behavioral, technological, institutional, and policy-related factors jointly influence green credit development within transitional banking markets.

To avoid overgeneralisation, this study positions green credit development as an indirect supporting mechanism for sustainable agricultural development and national food security objectives, rather than as a direct determinant of food security outcomes. In addition, although the empirical data were collected from Agribank staff in Ho Chi Minh City, the findings are interpreted within the sampled banking context and should be regarded as indicative rather than fully representative of all commercial banks in Ho Chi Minh City or the Vietnamese banking system.

Building on this practical context, this study investigates the determinants of green credit development in the agricultural sector within commercial banking activities in Ho Chi Minh City. The study aims to provide empirical evidence and practical implications for promoting sustainable agricultural finance and supporting broader food security objectives in Vietnam.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

2.1. Concept of Green Credit and Food Security

2.1.1. Concept of Green Credit

The development of green credit is considered an important financial instrument for promoting sustainable economic growth in association with environmental protection objectives. According to the World Bank [7], green credit refers to a form of lending provided for projects or production and business activities that are environmentally friendly, contributing to the reduction of greenhouse gas emissions, the efficient use of resources, and adaptation to climate change.

For commercial banks, green credit not only supports enterprises in transitioning toward a green development model, but also helps banks manage environmental and social risks, enhance their reputation, and strengthen their competitiveness in the market [8]. Accordingly, green credit can be understood as the allocation of capital by credit institutions in a manner that encourages environmentally friendly projects, thereby contributing to the achievement of sustainable economic development and the reduction of negative impacts on natural ecosystems [9].

2.1.2. Concept of Food Security

According to the Food and Agriculture Organization of the United Nations (FAO), food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to maintain a healthy and active life [10], [11]. Food security is commonly understood through four fundamental dimensions: food availability, food access, food utilization, and food stability. Food availability refers to the sufficient supply of food through domestic production or imports. Food access emphasizes individuals' ability to obtain food through income, prices, and distribution systems. Food utilization relates to the proper biological use of food, requiring adequate nutrition, clean water, sanitation, and healthcare. Finally, food stability ensures that these three dimensions are maintained consistently over time, without being disrupted by economic, environmental, or social shocks [11]. In the context of sustainable development and climate change, ensuring food security has become increasingly complex, particularly in the agricultural sector, which is highly vulnerable to environmental risks. Therefore, promoting green credit in agriculture plays a

crucial role in supporting sustainable farming practices, enhancing productivity, and ultimately contributing to long-term food security.

In the context of Vietnam, the agricultural sector plays a strategic role in ensuring national food security, particularly under increasing pressures from climate change, environmental degradation, and resource scarcity. Green credit contributes indirectly to food security by facilitating access to financial resources for environmentally sustainable agricultural projects, clean technologies, renewable energy applications, and climate-resilient farming models. Through supporting sustainable agricultural production and improving long-term productivity and resource efficiency, green credit can help strengthen the stability and sustainability of food supply systems. Therefore, although this study does not directly measure food security outcomes, the development of green credit in the agricultural sector is considered an important supporting mechanism for achieving national food security objectives within the broader framework of sustainable development.

2.2. Theoretical Foundations Applied

The research model of this study is developed on the basis of an integrated model combining the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), known as the C-TAM-TPB model developed by Taylor and Todd [12]. In this model, two key elements of TPB, namely subjective norm and perceived behavioral control, are added to TAM in order to expand its explanatory and predictive power regarding technology acceptance and usage behavior.

The integration of TAM and TPB not only helps overcome the limitations of applying each model separately, but also provides a more comprehensive theoretical framework that simultaneously reflects individual cognitive factors, social factors, and behavioral control capabilities. Within the scope of this study, the C-TAM-TPB model is applied to analyze the factors influencing decisions to participate in and develop green credit in the agricultural sector, thereby clarifying how perceived benefits, environmental attitudes, banking technology, and green credit policies affect the acceptance and expansion of green credit by commercial banks.

The integration of the C-TAM-TPB framework in this study provides a more comprehensive theoretical explanation for green credit development by simultaneously incorporating cognitive perceptions, technological readiness, behavioral orientation, and institutional influences within commercial banking activities. Compared with prior studies that primarily focused on financial, environmental, or policy-related determinants separately, the integrated framework adopted in this study contributes to the green finance literature by extending the applicability of C-TAM-TPB to the context of sustainable agricultural finance in an emerging economy.

More specifically, the model enables the simultaneous examination of perceived benefits, environmental concern, banking technology, stakeholder pressure, bank brand, and banking policies as interconnected determinants influencing green credit development. This integrated approach helps explain how both internal organizational factors and external contextual conditions jointly shape the adoption and expansion of green financial practices in Vietnam. Therefore, the study contributes not only to the green credit literature but also to the broader theoretical understanding of sustainable banking behavior in developing and transitional economies.

2.3. Research Hypotheses

According to [13], the potential benefits of adopting green credit not only help banks reduce risks and operating costs but also enhance financial performance and corporate image. The study by [13] also indicates that green credit generates profitability through cost savings

and improved operational efficiency. Therefore, perceived benefits are considered an important factor driving the development of green credit.

Hypothesis H1: Perceived benefits have a positive impact on the development of green credit in the agricultural sector.

The study by [14] confirms that banks' awareness of and commitment to environmental issues are key drivers in providing green financial products. As banks and enterprises increasingly emphasize sustainable development, green credit is more likely to be prioritized and widely implemented.

Hypothesis H2: Environmental concern has a positive impact on the development of green credit in the agricultural sector.

The study by [13] indicates that diversifying green products enables banks to expand their market, enhance competitiveness, and improve financial performance. In addition, [15] recommends expanding the portfolio of green credit products to increase their proportion in total outstanding loans.

Hypothesis H3: Green products have a positive impact on the development of green credit in the agricultural sector.

According to [8], pressure from stakeholders such as the government, shareholders, customers, and the community can encourage commercial banks to expand green credit activities. These stakeholders require banks to fulfill their social responsibilities, thereby influencing their credit strategies.

Hypothesis H4: Stakeholder pressure has a positive impact on the development of green credit in the agricultural sector.

According to [14], the application of advanced technologies helps banks reduce transaction costs, improve management efficiency, and facilitate customers' access to green credit. Similar findings are reported by [8], showing that banking technology has the strongest impact on the development of green credit.

Hypothesis H5: Banking technology has a positive impact on the development of green credit in the agricultural sector.

Reputation, image, and bank branding play a crucial role in building customer trust. From the perspective of signaling theory, a strong green banking reputation can reduce customer uncertainty and enhance trust in sustainable financial products. According to [16], banks with a strong orientation toward sustainable development tend to achieve higher financial performance, thereby strengthening their brand in the market.

Hypothesis H6: Bank brand has a positive impact on the development of green credit in the agricultural sector.

Previous studies [8], [17] demonstrate that support policies from banks and the government are decisive factors in expanding green credit. Preferential interest rates, green project approval criteria, and environmental risk control mechanisms all contribute to promoting the stronger development of green credit.

From the perspective of institutional theory, supportive banking policies and regulatory frameworks can encourage commercial banks to adopt and expand green credit activities by reducing uncertainty, providing strategic direction, and strengthening compliance incentives for sustainable financing practices.

Hypothesis H7: Banking policies have a positive impact on the development of green credit in the agricultural sector.

Table 1. Measurement Scales.

Variable	Code	Description	Source
Perceived Benefits	PB1	The implementation of green credit helps banks reduce operational costs.	[13], [14]
	PB2	Green credit contributes to increasing banks' income and profitability.	
	PB3	Green credit helps minimize environmental-related risks for banks.	
	PB4	Green credit enhances capital efficiency and return on equity for banks.	
	PB5	Green credit provides long-term benefits for banks' development strategies.	
Environmental Concern	EC1	Banks pay attention to environmental issues during the credit approval process.	[14], [9]
	EC2	Banks have clear programs/strategies regarding environmental responsibility.	
	EC3	Bank leadership demonstrates strong commitment to sustainable development.	
	EC4	Bank employees are trained in environmental risk management.	
	EC5	Banks regularly assess the environmental impact of their lending activities.	
Stakeholder Pressure	SP1	Pressure from regulators encourages banks to expand green lending.	[8], [16]
	SP2	Customer demand drives banks to provide green financial products.	
	SP3	Shareholder pressure requires banks to adopt sustainable policies.	
	SP4	Public and community pressure increases banks' focus on green credit.	
	SP5	Relationships with international partners/donors promote the development of green products.	
Green Products	GP1	Banks have developed various credit products for environmentally friendly projects.	[13], [14], [15]
	GP2	Green credit products are suitable for agricultural customers' needs.	
	GP3	Loan conditions (interest rates, terms) for green products are more competitive than conventional ones.	
	GP4	Banks offer preferential policies for customers borrowing for green projects.	
	GP5	Banks provide a diverse range of green financial products.	
Banking Technology	BT1	Banks apply digital technologies to support green credit approval processes.	[8], [14]
	BT2	Banks' risk management systems integrate environmental indicators.	
	BT3	IT applications help reduce time and costs for customers accessing green credit.	
	BT4	Banks use technological tools to monitor the environmental performance of loans.	
	BT5	Banks have data platforms to evaluate and classify projects based on green criteria.	
Bank Brand	BB1	The bank's reputation in the market helps attract customers to green products.	[16]
	BB2	The "green bank" image enhances trust among customers and partners.	
	BB3	Participation in sustainable development programs strengthens the bank's brand.	

	BB4	The bank's brand influences firms' decisions to choose green loan products.	
	BB5	The bank has a strong reputation in environmental risk management.	
Banking Policies	BP1	Banks have preferential policies (interest rates, fees) for green loans.	[8], [17]
	BP2	Banks have clear approval criteria for green projects.	
	BP3	Banks have mechanisms to monitor and assess environmental risks in lending activities.	
	BP4	Banks cooperate with regulators to implement green credit programs.	
	BP5	Banks have internal training and incentive policies to promote green credit.	
Green Credit Development	GCD1	The scale of outstanding green credit in the agricultural sector is increasing.	[13], [9]
	GCD2	Green credit is widely applied to environmentally friendly agricultural projects.	
	GCD3	The development of green credit has significantly contributed to the bank's sustainable development goals in the agricultural sector.	

Source: Author's compilation from [8], [9], [13]-[17].

2.4. Research Model

To achieve the research objectives, the author develops a research model based on the integration of relevant theoretical frameworks and empirical studies, aiming to capture both behavioral and institutional factors influencing green credit development. The model also provides a comprehensive foundation for examining the causal relationships among variables and testing the proposed research hypotheses. Accordingly, the proposed model illustrates the relationships between green credit in the agricultural sector and seven independent variables (see Figure 1).

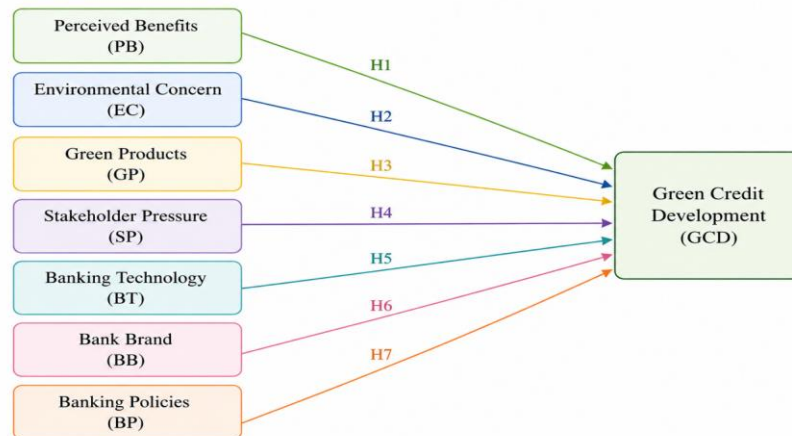


Figure 1. Proposed Research Model. Source: From the author's research results

3. RESEARCH METHODOLOGY

3.1. Sample Size

In this study, the authors employ Exploratory Factor Analysis (EFA) to examine the structure of the measurement scales. According to the recommendation of [18], the minimum sample size should be at least five observations per measured variable. The research model

consists of 38 observed variables; therefore, the minimum required sample size is 190 observations (38×5). To improve data reliability and support empirical analysis, 280 questionnaires were distributed, of which 249 valid responses were collected and used for data analysis.

3.2. Research Method

This study adopts a quantitative research approach to identify and measure the impact of factors on the development of green credit in the agricultural sector. Primary data were collected through a structured questionnaire using a five-point Likert scale, ranging from “strongly disagree” to “strongly agree.” The sample was selected using a convenience sampling method, targeting credit officers and staff involved in lending activities at the Vietnam Bank for Agriculture and Rural Development. A total of 280 questionnaires were distributed, with 249 valid responses retained for analysis.

The study focuses on the Vietnam Bank for Agriculture and Rural Development (Agribank) because this bank is considered one of the leading commercial banks in Vietnam in implementing green credit programs, particularly in the agricultural and rural sectors. Agribank has a large lending portfolio dedicated to agriculture and rural development, which makes it an appropriate empirical context for examining green credit development in the agricultural sector. In addition, the bank has actively participated in government-oriented green finance initiatives and sustainable agricultural financing programs in recent years.

Although the data were collected from a single bank, Agribank was selected due to its strategic role and extensive experience in agricultural lending activities in Vietnam. Therefore, the case provides valuable practical insights into the factors influencing green credit development in the banking sector. Nevertheless, the findings should be interpreted with caution, as the use of a single-bank sample may limit the generalizability of the results to the entire commercial banking system in Ho Chi Minh City and Vietnam.

Although the study was conducted using data collected from Agribank staff, the bank operates under the same regulatory framework and green credit orientation established by the State Bank of Vietnam that applies to other commercial banks in Ho Chi Minh City. In addition, Agribank shares several operational characteristics with major Vietnamese commercial banks, including credit appraisal procedures, environmental risk management requirements, and the implementation of green finance policies. Given Agribank’s extensive involvement in agricultural lending activities and its strategic role in sustainable rural development, the findings may provide indicative insights into green credit development within the broader commercial banking sector. However, the results should not be interpreted as fully representative of all commercial banks, and future studies are encouraged to expand the sample across multiple banking institutions and geographical areas.

The data were processed using SPSS and AMOS software. The study employs Exploratory Factor Analysis (EFA) to identify the underlying structure among observed variables, followed by Confirmatory Factor Analysis (CFA) to assess the goodness-of-fit of the measurement model. Finally, Structural Equation Modeling (SEM) is applied to test the research hypotheses and determine the impact level of each factor on green credit development. The combined use of these methods enables a comprehensive assessment of causal relationships among variables, ensuring the reliability and scientific validity of the research findings.

Although the study employs SEM analysis to examine the causal relationships among variables, several methodological limitations related to potential endogeneity and common method bias should be acknowledged. Since the study is based on cross-sectional survey data and self-reported responses collected from bank employees, the possibility of reciprocal relationships and response bias cannot be entirely eliminated. Nevertheless, the study applies

validated measurement scales, reliability testing, CFA, SEM, and Bootstrap procedures to enhance the robustness and reliability of the estimation results. Future studies may consider longitudinal data, multi-source data collection, or alternative modeling approaches to further address potential endogeneity concerns and improve causal inference.

4. RESEARCH RESULTS AND DISCUSSION

4.1. Research Results

4.1.1. Reliability Analysis of the Measurement Scales

Based on Cronbach's Alpha analysis, any observed variable with a corrected item–total correlation of less than 0.3 is excluded from EFA, and each construct must achieve a Cronbach's Alpha coefficient greater than 0.6 to be considered reliable. The results show that all eight constructs have Cronbach's Alpha values exceeding 0.6 (see Table 2). Additionally, the corrected item–total correlations for all variables are greater than 0.3; therefore, all variables are retained for subsequent EFA analysis.

Table 2. Reliability Test Results of Measurement Scales.

No.	Independent and Dependent Variables	Number of Items	Cronbach's Alpha	Highest Cronbach's Alpha if Item Deleted	Lowest Item–Total Correlation
1	Perceived Benefits	5	0.763	0.755	0.485
2	Environmental Concern	5	0.865	0.745	0.476
3	Green Products	5	0.729	0.796	0.608
4	Stakeholder Pressure	5	0.708	0.785	0.527
5	Banking Technology	5	0.698	0.776	0.503
6	Bank Brand	5	0.689	0.763	0.523
7	Banking Policies	5	0.759	0.837	0.629
8	Green Credit Development	3	0.786	0.797	0.706

Source: Author's calculation from survey data using SPSS

4.1.2. Exploratory Factor Analysis (EFA)

The EFA for the independent constructs was conducted with 35 observed variables. The results showed that these items were extracted into seven factors with an Eigenvalue of 1.242 (>1). Separately, the dependent construct, Green Credit Development, consisting of three items, also satisfied the reliability and factor loading criteria. The cumulative variance explained reached 58.048%, indicating that these seven factors account for 58.048% of the total variance in the data. The Kaiser-Meyer-Olkin (KMO) measure is 0.900, and Bartlett's Test of Sphericity is significant (Sig. = 0.000), confirming that the data are suitable for factor analysis. All factor loadings exceed 0.5, ensuring the convergent validity of the observed variables. The reliability test conducted after EFA shows that all scales meet the required thresholds, confirming their reliability and suitability for inclusion in the research model.

4.1.3. Confirmatory Factor Analysis (CFA)

Based on the EFA results, the identified factors, measured using Likert scales and quantitative variables, were included in the Confirmatory Factor Analysis (CFA) to assess the goodness-of-fit of the measurement model and to evaluate the relationships between independent and dependent variables. All observed variables met the required criteria and were retained in the model. The CFA results indicate that the model demonstrates a good fit with the data, as presented in detail in Table 3.

Table 3. Results of Confirmatory Factor Analysis (CFA).

Fit Indices	Value
CMIN/df	1.316
GFI	0.855
TLI	0.946
CFI	0.943
RMSEA	0.037

Source: Compiled by the author from AMOS 24 output.

To evaluate the goodness-of-fit of the model and to test the discriminant validity among the research constructs, the measurement model was examined using CFA. The results indicate that the model fit indices meet the required thresholds: $p = 0.000$; $\text{CMIN/df} = 1.316 \leq 2$, indicating a good model fit; $\text{GFI} = 0.855 \geq 0.8$, which is acceptable according to [20], [21]; $\text{TLI} = 0.946 \geq 0.9$, $\text{CFI} = 0.943 \geq 0.9$, and $\text{RMSEA} = 0.037 \leq 0.06$, all suggesting that the model fits the survey data well. Factor loadings of all observed variables are greater than 0.5, and the relationships between independent and dependent variables are statistically significant ($p < 0.05$). Therefore, it can be concluded that the identified factors have significant effects on the development of green credit in the agricultural sector, and the model is appropriate for SEM analysis.

4.1.4. Assessment of Convergent and Discriminant Validity

Table 4. Results of Convergent and Discriminant Validity of the Model.

	CR	AVE	PB	EC	GP	SP	BT	BB	BP	GCD
PB	0.778	0.605	0.776							
EC	0.769	0.633	0.548	0.797						
GP	0.824	0.607	0.452	0.444	0.778					
SP	0.806	0.608	0.543	0.582	0.424	0.783				
BT	0.794	0.533	0.449	0.350	0.453	0.418	0.731			
BB	0.789	0.575	0.575	0.458	0.405	0.509	0.461	0.757		
BP	0.863	0.631	0.535	0.518	0.454	0.450	0.547	0.455	0.795	
GCD	0.849	0.648	0.678	0.705	0.679	0.680	0.630	0.658	0.705	0.806

Source: Compiled by the author from AMOS 24 output.

The results presented in Table 4 indicate that the model demonstrates strong convergent validity. Specifically, the composite reliability (CR) of all constructs exceeds 0.7, and the average variance extracted (AVE) for all latent variables is greater than 0.5, satisfying the criteria for convergent validity. Regarding discriminant validity, the results in Table 4 show

no violations, as the square root of AVE for each latent construct is greater than its correlations with other constructs, in accordance with the criterion proposed by [19]. Overall, the findings confirm that the model exhibits a high level of fit and ensures reliability, convergent validity, and discriminant validity of the measurement scales used in the study.

4.1.5. Structural Equation Modeling (SEM) Analysis

The results of the Structural Equation Modeling (SEM) fit assessment, as illustrated in Figure 2, indicate that the number and nature of relationships in both the CFA and SEM models are consistent, with seven primary relationships retained. Although the model fit indices of the two models are similar, the regression weights among the relationships exhibit certain differences, reflecting the distinct capability of SEM in examining causal relationships.

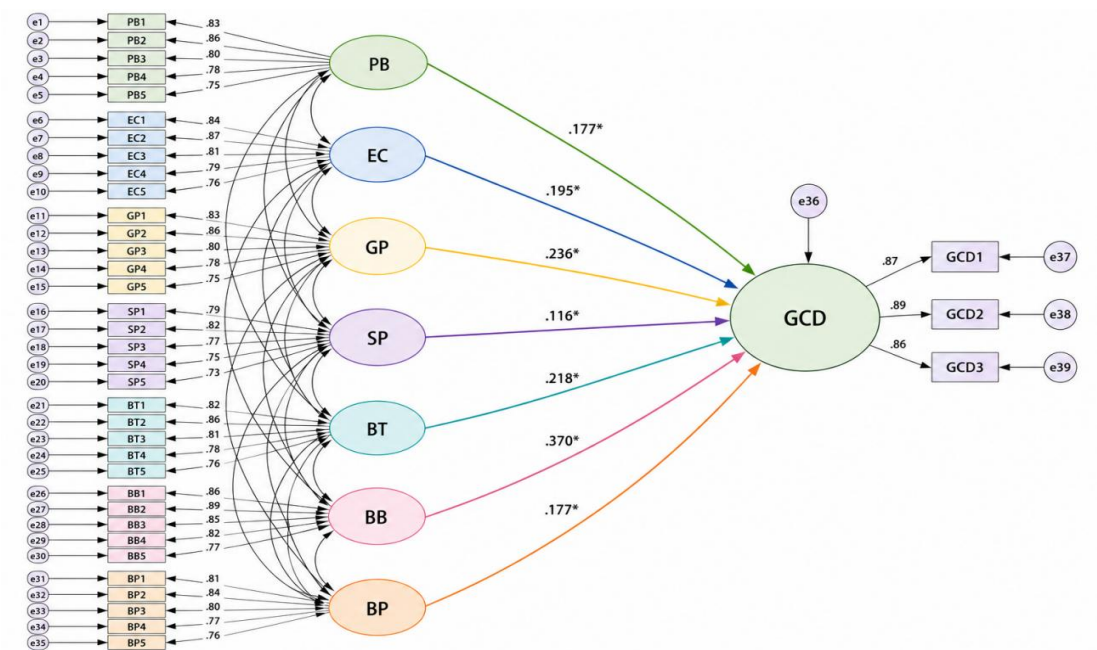


Figure 2. Results of SEM. Source: Compiled by the author from AMOS 24 Output.

Detailed results presented in Table 5 show that all regression weights and hypothesized relationships are statistically significant at the level of $p < 0.05$, with values marked (**) indicating significance at $p < 0.001$. Accordingly, all seven factors are identified as having positive impacts on the development of green credit in the agricultural sector. However, Stakeholder Pressure exhibits the weakest effect among the examined determinants.

Table 5. Results of Structural Equation Modeling (SEM).

Relationship			Standardized Beta	p-value	Conclusion
GCD	<---	PB	0.177	0.003	Accepted
GCD	<---	EC	0.195	***	Accepted
GCD	<---	GP	0.236	***	Accepted
GCD	<---	SP	0.116	0.013	Accepted
GCD	<---	BT	0.218	***	Accepted
GCD	<---	BB	0.370	***	Accepted
GCD	<---	BP	0.177	0.003	Accepted

Source: Compiled by the author from AMOS 24 output.

4.1.6. Bootstrap Estimation of the Model

The results presented in Table 6 indicate that the Bootstrap method was applied with 770 resamples to assess the reliability of the parameter estimates in the model examining factors influencing the development of green credit in the agricultural sector. The findings show that all C.R. values (Bias/SE-Bias) are less than 1.96 and the p-values are greater than 0.05, indicating that the bias is not statistically significant at the 95% confidence level. This confirms that the initial model estimates are highly reliable, and the application of the Bootstrap method demonstrates that the estimation results are stable and robust.

Table 6. Results of Bootstrap Estimation (770 Resamples).

	Relationship		Bias	SE-Bias	C.R. (t-value)	p-value
GCD	<---	PB	-0.003	0.003	-1	0.32
GCD	<---	EC	0.007	0.004	1.75	0.08
GCD	<---	GP	0.001	0.003	0.33	0.74
GCD	<---	SP	0.002	0.003	0.67	0.50
GCD	<---	BT	0.001	0.002	0.5	0.62
GCD	<---	BB	-0.002	0.003	-0.67	0.51
GCD	<---	BP	-0.005	0.003	-1.67	0.10

Source: Compiled by the author from AMOS 24 output.

4.2. Discussion of Research Findings

The SEM analysis results indicate that all seven factors have a positive and statistically significant impact on the development of green credit in the agricultural sector, including: Perceived Benefits (PB), Environmental Concern (EC), Green Products (GP), Banking Technology (BT), Bank Brand (BB), Banking Policies (BP), and Stakeholder Pressure (SP). Meanwhile, although Stakeholder Pressure (SP) has a statistically significant effect on green credit development ($\beta = 0.116$; $p = 0.013$), its influence remains relatively weak compared with other determinants such as Bank Brand, Green Products, and Banking Technology. This finding suggests that external stakeholder influence has not yet become a dominant driving force for green credit expansion in Vietnam. Instead, green credit development in the Vietnamese banking sector continues to be driven more strongly by internal strategic orientation, government policy direction, and institutional priorities than by market-based stakeholder demands.

These findings are consistent with international studies such as [14], which show that green banks achieve better financial and environmental performance through the development of green credit products and the application of advanced banking technologies. Similarly, [13] confirm that green credit generates economic benefits through cost savings and increased profitability. In addition, the results align with [14], who emphasize that perceived benefits are a key factor influencing the adoption of green banking, as they help reduce operational costs while improving risk management efficiency.

The factor of Banking Technology (BT) has a significant impact ($\beta = 0.218$; $p < 0.001$), indicating that investment in digital technologies and data analytics platforms is crucial for banks to expand green product portfolios, enhance customer accessibility, and improve risk management efficiency. This finding is consistent with [8], who identified banking technology as the most influential factor in the development of green credit within Vietnam's commercial banking system.

The factor of Bank Brand (BB) exhibits the strongest impact ($\beta = 0.370$; $p < 0.001$), highlighting the important role of bank reputation and image in encouraging agricultural projects to access green financing. This is in line with the findings of [16], who argue that competitiveness and brand reputation are key drivers in expanding sustainable financial products.

Among all examined determinants, Bank Brand (BB) was found to exert the strongest influence on green credit development. This finding suggests that reputational legitimacy and sustainable brand positioning play a particularly important role in promoting green financial activities within emerging banking markets such as Vietnam. In contexts where green financial awareness among customers and enterprises is still developing, a strong “green banking” image may function as a signaling mechanism that enhances customer trust, reduces perceived uncertainty, and encourages participation in sustainable financing activities.

In addition, the relatively stronger effect of Bank Brand compared with Banking Technology and Banking Policies indicates that reputation-based factors may currently exert a more immediate influence on green credit adoption than technological or regulatory considerations. This finding reflects the institutional characteristics of transitional economies, where trust, credibility, and organizational reputation remain highly influential in shaping customer perceptions and banking decisions. Therefore, strengthening sustainable brand identity and environmental credibility may represent an important strategic priority for commercial banks seeking to expand green credit activities in Vietnam.

In addition, Banking Policies (BP) also show a positive effect ($\beta = 0.177$; $p = 0.003$), which is consistent with the studies of [8], [17], emphasizing that supportive policies and regulatory frameworks play a crucial role in directing credit flows toward green projects and achieving sustainable development goals.

5. CONCLUSION AND MANAGERIAL IMPLICATIONS

5.1. Conclusion

This study was conducted to identify the factors influencing the development of green credit in the agricultural sector within the context of commercial banking activities in Ho Chi Minh City. Using a quantitative research approach combining EFA, CFA, and SEM analysis based on survey data collected from Agribank staff, the study confirms that all seven factors positively influence green credit development, including Perceived Benefits, Environmental Concern, Green Products, Banking Technology, Bank Brand, Banking Policies, and Stakeholder Pressure. Among these factors, Bank Brand was found to exert the strongest impact, while Stakeholder Pressure exhibited the weakest positive effect among the examined determinants.

Overall, the study highlights the strategic importance of integrating behavioral, technological, and institutional dimensions in promoting sustainable agricultural finance and advancing green banking transformation in Vietnam.

The findings contribute to the existing literature on green finance by extending the application of the integrated C-TAM-TPB framework in the context of sustainable agricultural finance in Vietnam. In particular, the relatively weak effect of Stakeholder Pressure suggests that green credit development in Vietnam is currently driven more strongly by internal strategic orientation and policy direction than by external stakeholder demands. In this regard, green credit is considered an important supporting mechanism for sustainable agricultural development and broader national food security objectives.

5.2. Managerial Implications

Based on the empirical findings, several managerial and policy implications are proposed to support the development of green credit in the agricultural sector.

Enhancing investment in banking technology: Commercial banks should continue to promote the application of digital technologies, data management systems, and artificial intelligence in the appraisal and monitoring of green credit. This not only helps reduce transaction costs but also improves transparency and the effectiveness of credit risk management.

Developing and diversifying green credit products: Banks need to design credit packages tailored to the specific characteristics of the agricultural sector, particularly products supporting organic agriculture, renewable energy, and sustainable agricultural value chains.

Building and strengthening green bank branding: Enhancing reputation, image, and commitment to sustainable development will help banks attract customers and investors, while creating competitive advantages in the green finance market.

Improving internal mechanisms and policies: Banks should establish clear guidelines on green credit procedures, criteria for evaluating green projects, and preferential interest rate mechanisms to encourage enterprises to engage in environmentally friendly activities.

Strengthening macro-level policy coordination: The government should develop a clear legal framework to encourage and support banks in implementing green credit, while integrating green development objectives into national agricultural policies.

Raising stakeholder awareness: Communication and training programs on green credit should be intensified to improve the awareness of customers, enterprises, and the community, thereby creating positive social pressure to promote sustainable financial practices.

5.3. Limitations and Future Research

Despite its contributions, this study has several limitations that should be acknowledged. First, the research was conducted only within Ho Chi Minh City, which may limit the applicability of the findings to other regions with different economic and banking conditions. Second, the study collected data exclusively from Agribank staff, and therefore the results may not fully represent the perspectives and practices of all commercial banks in Vietnam. Consequently, the findings should be interpreted with caution when generalizing to the broader banking sector.

Given the single-city and single-bank research design, the findings should not be generalized uncritically to all commercial banks in Ho Chi Minh City or the Vietnamese banking system. Moreover, national food security is discussed in this study as a broader policy objective associated with sustainable agricultural finance, rather than as a directly measured outcome variable. Future studies should expand the sample to multiple banks and regions and incorporate direct food security indicators to provide stronger empirical evidence on the linkage between green credit and food security outcomes.

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