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The impact of economic restructuring on the development of circular economy in agriculture and green growth

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Abstract This study examines the impact relationship of economic restructuring on the development of a circular economy in agriculture and green growth within the context of Vietnam. The quantitative research method is used by investigating and surveying and SPSS and AMOS-based data processing. The survey scale encompasses 538 samples, including individuals, households, and agricultural organizations and cooperatives distributed across the Northern, Central, and Southern regions of Vietnam. The research results have provided valuable scientific contributions by demonstrating the intermediary role of both factors: efficiency in mobilizing and utilizing capital and linkages in the production and consumption of agricultural products within the impact relationship of economic restructuring on the development of a circular economy in agriculture. Furthermore, the development of a circular economy has been proven to have a positive impact on green growth in agriculture. Concurrently, linkages in the production and consumption of agricultural products positively impact the efficiency in mobilizing and utilizing capital. Based on these findings, the study proposes several recommendations to contribute to the development of a circular economy and promote green growth in the agricultural sector in Vietnam.

Keywords: economic restructuring, efficiency in mobilizing and utilizing capital, linkages in production and consumption of products, development of a circular economy, green growth, agriculture

1. Introduction

The global economy has entered an era of restructuring following the 2008–2009 financial crisis. The science and technology revolution is blooming, influencing all aspects of society as well as economic development process of nations worldwide. The adoption of circular economy is emerging as a strong trend due to its anticipated economic, environmental, and social benefits: economic growth opportunities, job creation, and environmental impact reduction, aligning with sustainable development goals and climate change adaptation. Environmental issues, such as biodiversity loss, pollution (water, air, land), resource depletion, and overuse of land are increasingly threatening Earth's life-support systems (Jackson, 2009). Economic challenges, including supply risks, problematic ownership structures, unregulated markets, and flawed incentive systems, are leading to more frequent financial and economic instability for companies and national economies (Jackson, 2009). Modern management methods and the oriented economic restructuring have enabled many countries to create high-quality employment and improve living standards within a short period (Coxhead & Li, 2008). Kelbore (2014) discovered a Granger causality relationship between trade openness (a proxy for globalization) and economic restructuring in several African countries from 1981 to 2010.

The circular economy creates an economic system that helps reduce the pressure from fluctuations in factors and promotes economic growth by replacing traditional production processes with circular production, where waste is transformed into resources (Pla-Julian & Guevara, 2019; Skawińska & Zalewski, 2018; Sanguino et al., 2020). Previous studies have proposed several models relating to the circular economy and green growth in line with sustainable development goals of the economy, have been proposed in the past (Wu & Wang, 2005; Engelmann et al., 2019). However, these models are often generalized and do not directly address the relationships among factors, especially in the context of a developing country with significant potential for circular economy development in agriculture, such as Vietnam.

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Green growth is an emerging approach in global economic development, emphasizing not only economic benefits but also the restoration and preservation of natural ecosystems. It focuses on creating economic growth through investments in natural environmental protection or restoration activities (Brust et al., 2014). Notably, green growth is a crucial aspect of sustainable development, ensuring effective and sustainable economic progress while contributing significantly to climate change response. Previous analyses have shown that economic development and resource use depend on the complex interplay between formal and informal institutions (North, 1990), economic and environmental policies (Bleischwitz & Bringezu, 2011; Ekins & Speck, 2011).

In fact, among national standards, Vietnam has developed 750 standards aimed at promoting green growth, contributing positively to the implementation of the "National Strategy on Green Growth for the period 2011-2020 with a vision to 2050." Notable achievements in green growth in Vietnam during the 2011-2020 period can be listed as the widespread implementation of greenhouse gas emission reduction measures across all sectors, resulting in a 12.9% reduction in greenhouse gas emissions in energy activities compared to the conventional development scenario; the average annual decrease of 1.8% in energy consumption per GDP; the increase in the proportion of industrial enterprises' awareness on cleaner production from 28% in 2010 to 46.9% in 2020; and the forest coverage rate reaching 42% in 2020. The greening of production activities, ensuring environmentally friendly principles, investing in natural capital development, and actively preventing and addressing pollution have been emphasized. Awareness of the role of green growth has been elevated, creating a wave of green investments in wind energy, solar energy, and waste-to-energy projects.

Currently, in Vietnam, agricultural production has not only scaled at household farming but also expanded to mass production, which requires high-quality products, follows the stringent criteria on food safety and environmental standards, especially agricultural products for exporting to demanding markets like the EU, the US, Japan, Australia, and New Zealand, as well as traditional markets like China. Thus, the circular economy model in agriculture presents an opportunity to redesign and newly-design the agricultural production, to minimize inputs while ensuring better product quality and quantity, and maintaining the competitiveness in the market, particularly for the land use and water resources in agricultural production when the circular economic model is applied.

This study aims to examine the impact of economic restructuring on the development of the circular economy in agriculture and green growth in Vietnam. The research findings indicate that two factors—effective mobilization and utilization of capital, as well as linkages in agricultural production and consumption—serve as intermediaries in the impact relationship between economic restructuring and the circular economy development in agriculture. Concurrently, the development of the circular economy positively impacts green growth in agriculture. These findings contribute valuable scientific insights and provide a foundation for further research on circular economy and green growth in agriculture. Based on these insights, the study also proposes recommendations to support the development of the circular economy and promote green growth in Vietnam's agriculture sector.

2. Literature Review and Hypotheses

2.1. *Literature review*

Economic restructuring: Economic restructuring is the process of altering the proportion and position of sectors and industries within an economy in according to objective and subjective conditions to ensure economic development (Nguyen et al., 2021). The research by Puatwoe and Piabuo (2017) indicates that the economic restructuring is both necessary and crucial for maintaining stable economic growth. Similarly, Muhamad et al. (2017) pointed out that many countries have achieved sustainable economic growth through economic restructuring; however, the nature of growth differs between developed and developing countries. Additionally, Muhamad et al. (2017) observed that over the past three decades, some countries have experienced high economic growth rates, particularly stable income growth due to continuous technological innovation and structural changes in economic sectors. Economic development history has shown that there is a very close and complex relationship between economic growth and the economic restructuring of sectors (Henry & Dawley, 2011). Specifically, economic growth can lead to changes in the structure of economic sectors, or economic restructuring can impact economic growth. This is because economic restructuring reflects the capacity of an industry, region, or economy to respond to new competitive pressures and opportunities (Henry & Dawley, 2011).

Efficiency in mobilization and utilization of capital: According to Cvetkoska and Savic (2017), efficiency is a performance indicator that measures the ability to achieve the highest possible output with the minimal use of inputs. Many economic issues arise from the scarcity of resources. Therefore, the efficient use, production, and distribution of these resources are crucial. Efficiency pertains to the rational utilization of limited economic resources (Cvetkoska and Savic).

Mobilizing and utilizing capital is an essential function of financial institutions, enabling them to enhance financial performance and contribute to the stability of rural financial markets (Andrews et al., 2006). The development, operation, and optimization of mechanisms for mobilizing and using financial resources are significantly influenced by organizational structure and technical infrastructure (Ammons et al., 2001). Organizations increasingly collaborate to manage supply chains and

distribution channels efficiently, aiming to optimize costs, enhance customer satisfaction, and improve profitability and competitiveness of participating organizations (Lee & Whang, 2000).

Linkages in the production and consumption of products: Nash (2009) identified that the utilization of resource and available technology, product design, and consumer demand are the main challenges in achieving sustainable production and consumption. Studies by Scheel et al. (2020) and Mont and Dalhammar (2005) highlighted the importance of national eco-labels in developing a more comprehensive approach, integrating social sustainability into sustainable consumption tools, as well as in developing user-friendly databases that provide information on the socio-economic and environmental impacts associated with the product life cycle. Similarly, Sanguino et al. (2020) shows that consumers' awareness on environment is a key driver for sustainable consumption and underscores the need for stronger policies in this area.

The study by Adedoyin et al. (2020) has shown that expenditure on research and development (R&D), particularly those aimed at enhancing renewable energy, improves environmental sustainability; while Zafar et al., 2021 highlights the significance of the government's role in developing Sustainable Consumption and Production (SCP) models through investment and incentives for R&D. Likewise, private investment in R&D can make a significant contribution to sustainable economic growth (Ravselj & Aristovnik, 2018).

Development of circular economy in agriculture: The concept of a circular economy, as defined by MacArthur (2012), is currently widely recognized as a restorative and regenerative system through proactive planning and design. It replaces traditional concepts on economic development which relies on internal capabilities, shifting towards renewable energy, avoiding harmful chemicals that hinder reuse, and minimizing waste through the design of materials, products, technical systems, and business models within the scope of that system. Haas et al. (2015) highlight the importance of enhancing the circular economy, whose targets are on strategies like recycling and reusing, transitioning from fossil fuels to renewables, and reducing overall resource consumption. In the context of a changing world and climate change, for the recent years, the circular economy gathers much attention from many countries as resource depletion and waste are significantly impacting human health and the environment (Reike et al., 2018).

Green growth: Green growth is a broad concept with various approaches, depending on the specific goals and visions of each country. Terms like green growth, green economy, and circular economy have become increasingly common, though their usage lacks consistency. Georgeson et al. (2017) analyzed different global perspectives on these terms and suggested a developmental sequence: starting with green growth, progressing to a green economy, and ultimately achieving sustainable development.

The World Bank (WB) states: "Green growth is efficient in the use of natural resources, clean in minimizing pollution and environmental impacts, and resilient in its ability to adapt to natural hazards, environmental management, and natural capital in disaster prevention." (World Bank, 2012). According to the Organization for Economic Co-operation and Development (OECD), green growth involves "fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To achieve this, green growth must act as a catalyst for investment and innovation, which will underpin sustainable growth and create new economic opportunities." (OECD, 2014).

According to the United Nations Environment Programme (UNEP), green growth is economic growth that aims to improve human well-being and social equity while significantly reducing environmental risks and the degradation of natural ecosystems. Green growth emphasizes promoting economic growth while maintaining a balanced harmony with the ecological environment—specifically, avoiding pressures that could disrupt environmental balance (EEA, 2016). Measures to improve efficiency in rural financial markets are particularly beneficial for the rural poor, as they promote income expansion and poverty reduction in the context of sustainable and resilient economic growth.

2.2. *Research hypothesis*

2.2.1. Economic restructuring and circular economic development in agriculture

Agricultural economics, an inseparable branch of the global economy, encompasses the entire agricultural supply chain, including cultivation, processing, distribution, and consumption. It plays a crucial role in realizing a sustainable circular economy and ecological development. To promote the circular development of the agricultural economy, several countries in Europe, the Americas, and Asia, such as China, have increased their investment in the circular agricultural economy to strengthen their activities focused on green economy practices and environmental protection (Xia & Ruan, 2020).

Agriculture is closely linked to natural ecosystems, integrating the agricultural economic system into the harmonious material circulation within natural ecosystems. It provides a pathway for developing a circular economy in agriculture. The ecological degradation caused by agricultural development and inappropriate agricultural development methods make the ecological environment more fragile and severely restricts the sustainable development of agriculture (Wu & Wang, 2005). The emergence of a new era based on environmental technology suggests that the core characteristic of natural resource productivity must be optimized when implementing new sustainable strategies (Scheel et al., 2020). In studying the relationship

between economic restructuring and the circular economy development in agriculture in Vietnam, the authors propose the following hypothesis:

H1: Economic restructuring positively impacts the development of circular economy in agriculture in Vietnam.

2.2.2. Economic restructuring and efficiency in mobilization and utilization of capital

The effectiveness of capital mobilizing and utilizing for economic development must align with the perspectives, orientations, and development goals of the nation and localities (Scoones, 1998). In the construction, operation, and perfection of mechanisms for capital mobilization and utilization, organizational structure and technical infrastructure are considered crucial factors (Ammons et al., 2001; Andrews et al., 2006). The study by Acemoglu et al. (2012) shows that good institutions are essential for ensuring the effective use of investment capital, and that investing in institutions, administrative, and legal reforms can promote economic restructuring in a right direction. Lin & Celestin (2010) propose that economic development should be based on each country's comparative advantages, and investing in industries that leverage these advantages will help maintain economic growth and development pace. Thus, in the context of Vietnam, considering the relationship between economic restructuring and the effectiveness of capital mobilization and utilization, the hypothesis is formulated as follows:

H2: Economic restructuring positively impacts the efficiency in the mobilization and utilization of capital in agriculture in Vietnam.

2.2.3. Efficiency in the mobilization and utilization of capital and the development of circular economy in agriculture

Investment in agricultural ecological capital aims to achieve the integrated and sustainable development of agricultural and rural ecology, and socio-economy through a series of inputs into a specific scope of agricultural ecological resources, ecological environment, and ecological service capacity (Zou & Li, 2022). Agricultural ecological capital investment affects the development of the green circular economy through a series of material or monetary inputs into a specific range of agricultural ecological resources, ecological environment, and ecological service capacity (Belt & Blake, 2015). At the same time, green credit from banking institutions is an important policy-oriented measure that helps businesses and social groups meet environmental inspection standards, achieve pollution control efficiency and ecological protection which contribute to ecological governance (Li et al., 2021). Effective capital allocation and meeting the needs of economic entities will lead to growth in the overall output of the economy (Puatwoe & Piabuo, 2017). Therefore, the authors posit that the effectiveness of capital mobilization and utilization, and the circular economy development in agriculture are interrelated; the effectiveness of capital mobilization and utilization will be a crucial factor contributing to the growth and development of a circular economy in agriculture. The hypothesis is proposed as follows:

H3: Efficiency in capital mobilization and utilization positively impact the development of circular economy in agriculture in Vietnam.

2.2.4. Economic restructuring and linkages in the production and consumption of products

Economic restructuring, generally defined as the continuous redeployment of production factors toward higher-value activities, has contributed to poverty alleviation and plays a crucial role in job creation in sectors that are relatively more dynamic than agriculture (Norbu et al., 2021). Any economic sector that can generate more added value per unit of investment through backward and forward linkages is considered a key sector for stimulating economic growth (Aroca, 2001; Lenzen et al., 2003). Economic restructuring toward modernity and efficiency will be the foundation for market expansion and for creating sustainable linkages in the production and consumption of agricultural products. In the research context of Vietnam, the authors propose the following hypothesis:

H4: Economic restructuring positively impacts the linkages in production and consumption of agricultural products in Vietnam.

2.2.5. Linkages in the production and consumption of products and development of circular economy in agriculture

Circular economy in agriculture is identified as a production process following a closed-loop system, from input to output. The production and consumption linkage chain in agriculture comprises various stages, from input suppliers and cultivation to the end consumer (Tran et al., 2021). This chain includes suppliers of diverse goods and services essential for agricultural processes on farms, as well as companies involved in processing and marketing food and other derived products (Cucagna & Goldsmith, 2018). The manner in which countries can promote agricultural production involves creating linkages between production and consumption, thereby driving economic development and transitioning from inefficient production models to a sustainable economy, achieving green growth and improving resource management (Brust & Sarkis, 2012). The linkage in the production and consumption of products must be promoted to establish a solid foundation for the development of a circular economy in agriculture. Therefore, this research hypothesizes that...

H5: Linkages in the production and consumption of products positively impact the development of circular economy in agriculture in Vietnam.

2.2.6. Development of circular economy in agriculture and green growth

Currently, the general trend in developing a green and sustainable economy is to create a circular economy. In fact, agricultural output is significantly benefiting from the development of the circular economy (Tran et al., 2021). In the context of increasing population, rising food demand, inefficient resource use, and food waste at various stages of the food supply chain, there is a pressing need to shift towards more sustainable practices in agriculture (Dey et al., 2022). Implementing the principles of the circular economy brings numerous environmental and social benefits, such as reducing resource use, minimizing waste discharge, and limiting energy consumption, while directly fostering sustainable growth prospects (Fellner et al., 2015; Gregson et al., 2015). The circular economy development in agriculture in Vietnam will represent a new and effective trend towards achieving a green economy, green growth, and sustainable development. Therefore, this research hypothesizes that...

H6: The development of circular economy positively impacts the green growth in agriculture in Vietnam.

2.2.7. Linkages in the production and consumption of products and efficiency in mobilization and utilization of capital

The global economy is facing numerous crises of a global nature: exceeding ecological limits and worsening climate change, widespread scarcity and unmet human needs, growing inequality, and increasing social exclusion (Lenzen et al., 2003). Humanitarian and social crises are largely driven by unequal access to energy and materials, as well as unequal opportunities to meet needs and desires. Therefore, successfully addressing these threats requires a restructuring of production and the strengthening of linkages between production and consumption (Akenji et al., 2016).

Reike et al. (2018) describes a sustainable consumption system as one that connects goods and environmental services, individuals, households, organizations, and the state through linkages where energy and materials are transformed, utility is created, and relationships are established. A sustainable consumption and production system is one in which the transformation of energy and materials maintains or enhances human well-being without irreversibly depleting or degrading environmental resources (Milanovic, 2016). The development of a circular economy aims to drive innovation, improve labor productivity, and upgrade the environment, moving towards a green economy, green growth, and sustainability. Therefore, regarding the current situation in Vietnam, this study hypothesizes that...

H7: Linkages in production and consumption of products positively impact the efficiency in mobilization and utilization of capital in agriculture in Vietnam.

In the research model, these determinants were identified on the basis of the relevant theories outlined in Figure 1.

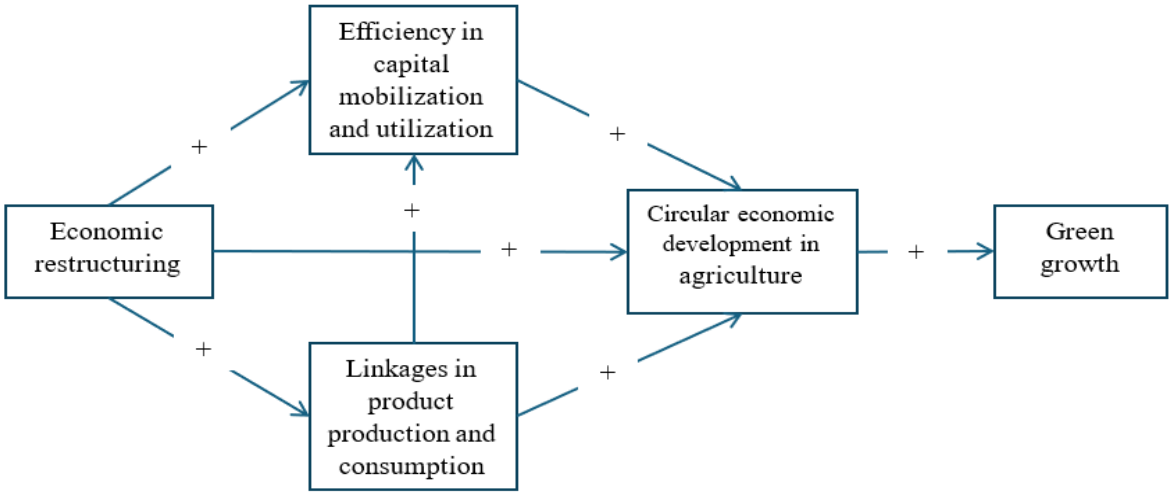

Figure 1 The proposed research model.

3. Methods

3.1. Research scale

Based on an overview of theoretical foundations and related research works, this study proposes a model with five variables. Wherein, the dependent variable is green growth in agriculture, and the independent variable is economic

restructuring; the intermediary variables include: (1) Efficiency in mobilizing and utilizing capital; (2) Linkages in production and consumption of products; (3) Development of a circular economy in agriculture. The data used in the study are primary data collected through survey methods. The questionnaire for the survey was designed based on research scales adjusted from previous studies. The measurement scale used in the study is the Likert scale with five levels corresponding to the evaluation scores: (1) - Strongly disagree; (2) - Disagree; (3) - Neutral; (4) - Agree; (5) - Strongly agree. Table 1 presents the synthesis of all this information.

Table 1 Source of Variable Scales.

No	Variable	Symbol	No. of observations	Source of scale
1	Economic restructuring	ECR	7	Bradshaw et al. (1994)
2	Efficiency in Capital Mobilization and Utilization	MUC	6	Doan (2017); Hoang (2018)
3	Linkages in production and consumption of products	LIN	5	Zhao et al. (2013)
4	Development of Circular Economy in Agriculture	DEA	5	Cao et al. (2011)
5	Green Growth	GRG	6	Hallegatte et al. (2012)

3.2. Research samples

The sample for the study was selected using a non-probability sampling method, specifically convenience sampling. The survey units in the study were individuals/households and agricultural organizations/cooperatives located in the northern, central, and southern regions of Vietnam and are described in Table 2. After estimating the number of samples needed to ensure the analysis requirements, the study determines the expected number of samples to be investigated. The survey samples will be distributed to individuals and organizations in localities across the three regions of the North, Central and South, with an expected sample size of 300 samples. During the data collection process, both direct and online survey methods were employed. Regarding the direct survey method, 500 questionnaires were distributed, 341 were returned, and 326 valid responses were used for analysis. Regarding the online method, the survey and data collection were conducted using the Google Form survey tool, with 400 questionnaires sent out, 237 returned, and 212 valid responses used for analysis. Thus the total number of valid responses used in the analysis was 538. According to Hair et al. (2010) for reference basis on sample size, the minimum sample size should be five times the total number of observed variables. Mentioning 29 observations in the study, the sample size of 538 ensures sufficient data for analysis. The data collection had been carried out from October 2023 to May 2024.

3.3. Data collection techniques and instruments

This study employed three primary data-collection techniques: semi-structured interviews, observations, and document analysis (Kościelniak, 2022). These methods were selected to provide a comprehensive understanding of the implementation of social pedagogy and its impact on student tolerance in elementary schools. The interviews with teachers and students aimed to explore their understanding of social pedagogy, the challenges in its application, and its influence on their attitudes toward tolerance. The interview frameworks are presented in Tables 1 and 2.

Table 2 Distribution of Research Survey Sample.

No.	Survey region	Planned Surveys	Collected samples	Samples used in analysis	Percentage (%)
1	Northern Vietnam	300	189	172	31.97
2	Central Vietnam	300	236	219	40.71
3	Southern Vietnam	300	153	147	27.32
	Total	900	578	538	100

3.2. Data processing

The quantitative methodology was employed in this study. The collected data was cleaned and processed using SPSS and AMOS software. The data cleaning process includes: (i) collecting survey data from the response forms; (ii) reviewing inappropriate survey forms because the evaluation results between the questions do not match the evaluation level on the 5-level rating scale (1: Completely disagree; 5: Completely agree). In addition, for some survey questions, we reversed the evaluation order to check the transparency, accuracy and reliability of the respondents. The process of reviewing data from the response forms shows that most of the response forms show the reliability of the data results. However, some of the response forms have unreasonable evaluation results because the respondents do not pay attention and focus on the details of the questions. Therefore, with these forms, the author team will proceed to eliminate them. The number of forms eliminated due to not meeting this requirement is 40. (iii) Synthesize the remaining data and code the data according to 5 evaluation levels corresponding to the 5 determined scale levels for analysis. After being cleaned and synthesized, the data is processed through the following steps.

Initially, the reliability of the measurement scales was assessed, requiring the corrected item-total correlation to be greater than 0.3 and Cronbach's Alpha to be greater than 0.7. Additionally, if the Cronbach's Alpha If Item Deleted value was higher than the Cronbach's Alpha for a particular variable, the observed variable was considered for removal. Next, Exploratory Factor Analysis (EFA) was conducted to determine the "convergent validity" and "discriminant validity" of the scales, requiring factor loading to be greater than 0.5, KMO coefficient to be between 0.5 and 1, Sig. value to be less than 0.05, and the percentage of variance extracted to be greater than 50%. The used factor extraction method was Varimax rotation. Subsequently, AMOS software was utilized to assess the model's appropriateness with the research data through Confirmatory Factor Analysis (CFA). Finally, the research hypotheses were tested using Structural Equation Modeling (SEM) with the following criteria: chi-square/df < 5 (Hair et al., 2010), P < 0.05, GFI, TLI, CFI > 0.8 (Segars & Grover, 1993), and RMSEA < 0.08 (Taylor et al., 1993).

4. Research Results and Discussion

4.1. Evaluation of measurement scale reliability

The results of the Cronbach's alpha reliability test analysis in table 3 indicate that the measurement scales used in the analysis are reliable, as all variables have Cronbach's alpha coefficients greater than 0.7, and the corrected item-total correlation are greater than 0.3. However, the indicator GRG64 has a Cronbach's alpha if Item Deleted of 0.872, which is higher than the Cronbach's Alpha coefficient of the GRG variable (0.804). Therefore, to enhance the appropriateness of the measurement scale, this indicator was removed from the analysis.

Table 3 Reliability Assessment of Scales through Cronbach's Alpha Coefficient.

No.	Variable	Symbol
1	Economic restructuring	ECR
2	Efficiency in capital mobilization and utilization	MUC
3	Linkage in production and consumption of products	LIN
4	Development of circular economy in agriculture	DEA

4.2. EFA analysis

After testing the appropriateness of the measurement scales, the study proceeded with exploratory factor analysis (EFA) for both independent variables, mediating variables, and the dependent variables (this information is present in Table 4). The results indicated that the data met the conditions for analysis, as the factor loadings were greater than 0.5; the KMO values were between 0.5 and 1; the significance value was less than 0.05; the percentage of variance extracted was greater than 50%, and both conditions of "convergent validity" (observed variables converge on the same factor) and "discriminant validity" (observed variables of one factor are distinct from those of another factor) were satisfied.

Table 4 EFA Analysis Results.

EFA Analysis	KMO Coefficient	P-value	Extracted variance	Factor Loadings	Conclusion
Independent and Mediating Variables	0.937	0.000	76.057	All > 0.5	Meets analysis requirements
Dependent Variable	0.858	0.000	66.299	All > 0.5	Meets analysis requirements

4.3. CFA analysis

The confirmatory factor analysis (CFA) is a subsequent step following exploratory factor analysis (EFA), designed to establish, test, and adjust measurement models independently. The purpose of CFA is to establish well-fitting measurement models used to test structural models. The results of the CFA indicated that the measurement model fit well with the following indices: Chi–square = 1425.692; df = 340; Chi–square/df = 4.193 (< 5); P = 0.000 (< 0.05); GFI = 0.855 (> 0.8); TLI = 0.911 (> 0.9); CFI = 0.920 (> 0.9); RMSEA = 0.077 (< 0.08).

4.4. SEM analysis

The Structural Equation Modeling (SEM) analysis was conducted to test the hypotheses. The results in figure 2 indicated that all aggregate indices met the requirements. Specifically, the indices were as follows: Chi–square = 1479.779; df = 339; Chi–square/df = 4.365 (< 5), P = 0.000 (< 0.05); GFI = 0.849 (> 0.8); TLI = 0.906 (> 0.9); CFI = 0.916 (> 0.9); RMSEA = 0.079 (< 0.08).

The results of the SEM analysis regarding the relationships in the model indicate the reliability and appropriateness of the data used in the analysis. All initial hypotheses included in the model were accepted (see table 5).

Specifically, for hypothesis H1 testing the impact of ECR on DEA, the results indicated that the hypothesis was accepted with statistical significance (P < 0.05) and a regression weight of 0.443, which is greater than zero. Therefore, it can be concluded that economic restructuring positively impacts the development of circular economy in agriculture in Vietnam. These findings are somewhat consistent with and support results from previous research studies of Wu and Wang (2005); Xia and Ruan (2020); Scheel et al. (2020).

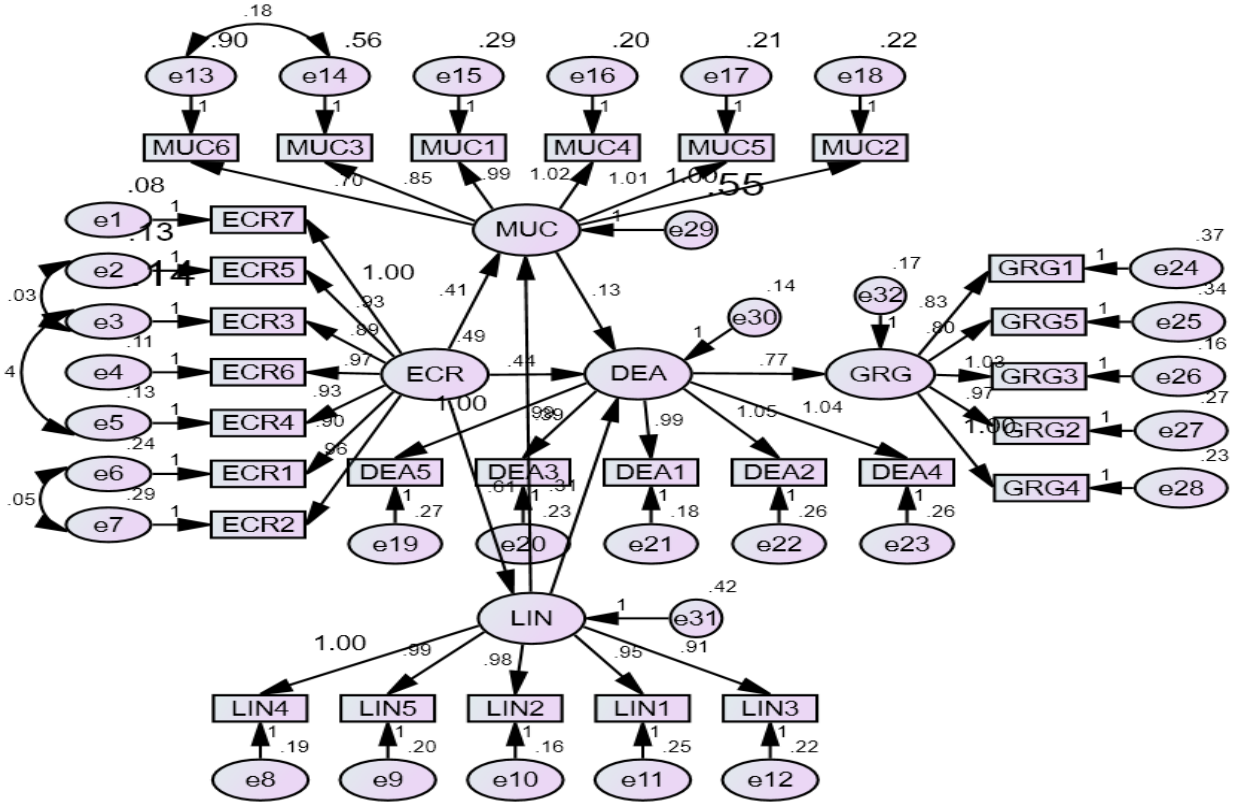

Figure 2 SEM Analysis.

Regarding hypotheses H2 (testing the impact of ECR on MUC) and H3 (testing the impact of MUC on DEA), the test results show that the regression weights are positive and significant with P < 0.05; thus, both hypotheses H2 and H3 are accepted. This indicates that economic restructuring positively impacts the efficiency in capital mobilization and utilization, and this efficiency, in turn, positively impacts the development of the circular economy in agriculture in Vietnam. These results are consistent with previous studies by Ammons et al. (2001); Andrews et al. (2006); Acemoglu et al. (2012); Lin & Celestin (2010). This implies that the efficiency in capital mobilization and utilization is proven to play an intermediary role in the relationship between economic restructuring and the development of the circular economy in agriculture.

Similarly, hypotheses H4 and H5 are also accepted with a significance level of P < 0.05 and positive regression weights. Thus, economic restructuring positively impacts linkages in the production and consumption of products, and these linkages, in turn, positively impact the development of the circular economy in agriculture in Vietnam. These conclusions support the findings of studies by Aroca (2001); Lenzen et al. (2003); Brust and Sarkis (2012); Cucagna and Goldsmith (2018); Norbu et al. (2021). In other words, linkages in production and consumption of products serve as an intermediator in the relationship between economic restructuring and the development of the circular economy in agriculture.

Regarding hypothesis H6, which examines the impact of DEA on GRG, the results indicate that with a significance level of less than 0.05 and a regression weight of 0.047 (>0), hypothesis H6 is accepted. Therefore, it can be concluded that the development of the circular economy positively impacts green growth in the agricultural sector in Vietnam. This result is consistent with the findings of previous studies by Fellner et al. (2015); Gregson et al. (2015); Tran et al. (2021); Dey et al. (2022).

Furthermore, the research results also imply that hypothesis H7, which examines the impact of LIN on MUC, is accepted. Thus, linkages in the production and consumption of agricultural products are also demonstrated to positively impact the efficiency of capital mobilization and utilization. This conclusion is in line with the studies by Lenzen et al. (2003); Akenji et al. (2016); Reike et al. (2018).

Therefore, by accepting all hypotheses from H1 to H7, the research outcomes have demonstrated the accuracy and appropriateness of the proposed model along with the data used in the study. These conclusions highlight valuable contributions both scientifically and practically.

In terms of scientific contribution, the study has demonstrated the intermediary role of two key factors: the efficiency of capital mobilization and utilization, and the linkages in the production and consumption of agricultural products in the impact relationship between economic restructuring and the development of a circular economy in agriculture. Additionally, the development of a circular economy has been shown to positively impact green growth in agriculture.

In terms of practical contributions, the research has produced valuable findings that can be used to propose recommendations aimed at contributing to the development of circular economy and promoting green growth in Vietnam's agriculture-a developing nation sharing many similarities with agricultural sectors in other developing countries within the region and globally.

Table 5 SEM Analysis Results for the Relationships in the Model.

Hypothesis	Relationship	Weight	S.E.	C.R.	P	Conclusion
H1	DEA <--- ECR	0.443	0.039	11.362	0.000	Accepted
H2	MUC <--- ECR	0.405	0.061	6.630	0.000	Accepted
H3	DEA <--- MUC	0.134	0.028	4.880	0.000	Accepted
H4	LIN <--- ECR	0.611	0.046	13.189	0.000	Accepted
H5	DEA <--- LIN	0.312	0.035	8.910	0.000	Accepted
H6	GRG <--- DEA	0.772	0.047	16.360	0.000	Accepted
H7	MUC <--- LIN	0.388	0.056	6.910	0.000	Accepted

5. Conclusions and Recommendations

5.1. Conclusions

This study examines the impact of economic restructuring on the development of a circular economy in agriculture and green growth. Based on a comprehensive review of relevant theories and studies, the research proposes a model and tests hypotheses through surveys and data analysis using SPSS and AMOS software. In the context of Vietnam, the results indicate that both factors, the efficiency of capital mobilization and utilization and the linkages in the production and consumption of agricultural products act as mediators in the impact relationship between economic restructuring and the development of a circular economy in agriculture. Moreover, the development of a circular economy positively impacts green growth in agriculture. Additionally, the linkages in the production and consumption of agricultural products are shown to have a positive impact on the efficiency of capital mobilization and utilization.

5.2. Recommendations

Based on the research findings, the authors propose several recommendations for the development of a circular economy and promotion of green growth in Vietnam's agricultural sector:

Firstly, regarding economic restructuring, it is necessary to continue to innovate and improve macroeconomic policies such as tax policy, interest rates, and bank credit, especially the economic legal system, to vigorously develop a multi-sector economy. It is essential to encourage and facilitate the autonomous and efficient operation of various economic sectors. Efforts should be made to effectively address employment for agricultural workers. Additionally, there should be an increase in activities to disseminate, guide, use, and transfer new technological processes with appropriate solutions and models in the development of a circular economy and green growth in Vietnam's agricultural sector.

Secondly, concerning the efficiency in mobilizing and utilizing capital, which is a crucial factor in economic development, it is essential to enhance the effectiveness of capital mobilization and utilization for agricultural development. This can be achieved by thoroughly and accurately reviewing localities with development potential to implement prioritized investment policies during specific periods, thereby preventing capital loss and improving capital usage efficiency. Investment initiatives must ensure focused and targeted investment principles, considering the implementation capacity of localities and their ability to mobilize funding from other resources to meet the objectives set in the local circular economy development strategy for agriculture over different periods. Additionally, standards and regulations need to be established for the team of capital management officials, emphasizing the leadership and directive roles of management personnel within organizations.

Thirdly, concerning the linkage in the production and consumption of agricultural products, it is necessary to support organizations and enterprises in supply chains to effectively exploit opportunities for boosting the consumption of agricultural products both domestically and globally (export). Emphasis should be placed on developing markets for key export products. Administrative procedures should be reformed to make it easier for businesses to access and benefit from preferential policies. Concurrently, successful linkage models should be expanded to form concentrated production areas, with a focus on building and promoting corporate and product brands. This should be combined with developing markets for the main agricultural products of localities, both for domestically use and for export. Increasing the application of advanced technology and techniques in production and processing is necessary to enhance product quality, added value, and competitiveness, and to

adapt to market fluctuations both domestically and internationally, and to aims to the development of a circular economy, and the fostering of green and sustainable growth.

5.3. Limitations and future research

Aside from its contributions, the study also has certain limitations. Firstly, there are limitations in the employed sampling method. The use of non-probability sampling, specifically convenience sampling, offers convenience and helps overcome certain difficulties in the sampling process; however, this method may compromise the overall representativeness of the sample used in the study. Furthermore, the study is confined to the context of Vietnam, a developing country with agricultural potential and similarities to other developing countries in the region and globally. Nevertheless, Vietnam also possesses distinct characteristics, particularly factors significantly affecting agriculture such as climate, natural features, resources, and societal perceptions. Therefore, while the findings are valuable, the study suggests avenues for further research that considers contexts in other countries within the region and globally, especially those with different institutional frameworks than Vietnam. Additionally, the relationship between economic restructuring, circular economic development in agriculture, and green growth could also be explored through other mediating or moderating variables.

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Ethical Considerations

The authors affirm that they have obtained consent from participants in research articles utilizing the questionnaire.

Conflict of Interest

The authors declare no conflicts of interest.

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