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International Journal of Engineering Technology Research & Management (IJETRM)
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PROMOTING GREEN AGRICULTURE TOWARD SUSTAINABLE DEVELOPMENT IN VIETNAM

Tran Thi Anh Nguyet
PH.D. Program for Infrastructure Planning and Engineering,
College of Construction and Development, Feng Chia University, Taichung 40724, Taiwan

ABSTRACT
Under the increasingly evident impact of climate change, the dwindling of natural resources, and the international market's growing demand for high-quality agricultural products, developing green agriculture has become an objective necessity and a strategic direction for Vietnam's agricultural sector. As a country with strong agricultural advantages, Vietnam needs to shift from the traditional growth model heavily dependent on resource exploitation to an environmentally friendly production model that conserves resources and enhances added value. This paper analyzes the current state of the promotion of green agriculture in Vietnam, as well as the opportunities and challenges involved, thereby proposing several solutions to promote green agriculture in line with the broader goal of sustainability.

Keywords:
Green agriculture, sustainable development, Vietnam.

1. INTRODUCTION

The global agricultural sector is currently facing unprecedented challenges associated with climate change, biodiversity loss, environmental degradation, and increasing pressure on food security. Agriculture contributes significantly to greenhouse gas emissions while simultaneously being one of the sectors most vulnerable to climate-related risks such as droughts, floods, salinity intrusion, and extreme weather events. According to the Food and Agriculture Organization (FAO, 2025), global agrifood systems account for nearly one-third of total greenhouse gas emissions and consume more than 70% of global freshwater resources. Consequently, many countries are shifting from conventional agricultural models toward greener and more sustainable agricultural systems.

Green agriculture has emerged as an important development orientation that seeks to balance economic growth, environmental protection, and social welfare. The model emphasizes efficient resource use, reduced chemical inputs, biodiversity conservation, circular economic practices, and the application of environmentally friendly technologies. Recent international studies have shown that green agriculture not only contributes to climate adaptation and emission reduction but also improves long-term productivity and strengthens market competitiveness (Pretty et al., 2018; El Bilali, 2019; Searchinger et al., 2019).

As an agricultural country with strong export advantages, Vietnam has increasingly recognized the strategic importance of green agricultural transformation. Agriculture continues to play a vital role in ensuring food security, creating employment, and contributing to export earnings. However, the traditional agricultural growth model in Vietnam has relied heavily on natural resource exploitation, chemical fertilizers, pesticides, and low-value production expansion. This has generated multiple environmental and socio-economic problems, including land degradation, water pollution, biodiversity loss, and reduced sustainability of agricultural production.

At the same time, Vietnam is considered one of the countries most vulnerable to climate change. Salinity intrusion in the Mekong Delta, droughts in the Central Highlands, floods in Central Vietnam, and changing rainfall patterns have negatively affected agricultural productivity and rural livelihoods. Furthermore, major export markets such as the European Union, the United States, and Japan are increasingly imposing strict standards related to food safety, carbon emissions, environmental sustainability, and traceability.

In response to these pressures, the Vietnamese Government has introduced numerous policies and strategic programs to promote green agricultural development, including the Strategy for Sustainable Agriculture and Rural Development 2021–2030, the Organic Agriculture Development Scheme, the National Green Growth Strategy, and the commitment to achieve net-zero emissions by 2050 at COP26.

Although several studies have examined sustainable agriculture and agricultural restructuring in

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Vietnam, limited research has comprehensively analyzed the relationship between green agriculture and sustainable development from economic, environmental, and social perspectives simultaneously. Therefore, this study aims to analyze the current situation of green agricultural development in Vietnam, identify major achievements and challenges, and propose solutions to strengthen sustainable agricultural transformation.

The study contributes to the existing literature in three main ways. First, it systematizes the theoretical relationship between green agriculture and sustainable development. Second, it provides an updated analysis of Vietnam's green agricultural transition based on recent policy and statistical data. Third, it proposes integrated policy implications for promoting sustainable agricultural development under the context of climate change and international economic integration.

2. THEORETICAL FRAMEWORK

2.1. Green Agriculture's concept

Green agriculture refers to an agricultural development model that promotes the efficient and sustainable use of natural resources, minimizes negative environmental impacts and greenhouse gas emissions, and enhances economic and social benefits. It is a production approach aimed at balancing agricultural growth with the protection of natural ecosystems, creating safe, high-quality products that are competitive in the market.

According to FAO, green agriculture is associated with activities such as organic farming, circular agriculture, the use of renewable power, sustainable land and water resource management, biodiversity conservation, and the application of environmentally friendly technologies (FAO, 2025). Therefore, green agriculture should not be understood merely as "clean production," but also as a process of restructuring the entire agricultural value chain toward sustainability.

2.2. Sustainable Development's concept

In 1987, the World Commission on Environment and Development introduced the concept of sustainable development in the Brundtland Report. According to this report, sustainable development is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. This perspective emphasizes the harmony between economic growth, social progress, and environmental protection, aiming for long-term and sustainable development.

In essence, sustainable development is built upon three fundamental pillars. First is economic sustainability, reflected in maintaining stable growth, improving labor productivity, increasing resource-use efficiency, and raising people's incomes. Second is social sustainability, which aims to ensure social equity, reduce poverty, improve quality of life, create employment opportunities, and expand access to essential services for all groups in society. Thirdly, environmental sustainability focuses on protecting natural resources, limiting pollution, adapting to climate change, and maintaining ecological balance.

In agriculture, sustainable development is defined as a production process that generates long-term economic value and ensures stable livelihoods for farmers, improves the living standards of rural residents, and maintains the regenerative capacity of resources such as land, water, forests, and natural ecosystems. This requires the agricultural sector to transform toward a modern, efficient, environmentally friendly model with strong adaptability to market and climate changes.

2.3. Relationship Between Green Agriculture and Sustainable Development

Green agriculture is both an important component and an inevitable pathway for achieving sustainable development in the agricultural sector. If sustainable development is considered the overall objective aimed at balancing economic, social, and environmental goals, then green agriculture is the specific method for realizing that objective within agriculture. In other words, green agriculture is not only a new development trend but also a strategic solution for restructuring the agricultural sector toward efficiency, environmental friendliness, and long-term viability.

The relationship between green agriculture and sustainable development is clearly reflected in three key dimensions. From an economic perspective, green agriculture helps increase added value through high-quality and safe products that meet international standards. It also reduces long-term input costs through efficient resource use, reuse of by-products, and reduced dependence on chemical inputs. Moreover, compliance with green standards creates favorable conditions for expanding export markets and enhancing the competitiveness of Vietnamese agricultural products in international markets.

From a social perspective, green agriculture creates more stable employment opportunities in rural areas, increases farmers' incomes, and helps narrow the development gap between urban and rural regions. In addition, the production of clean and safe agricultural products contributes to improving quality of life, protecting public health, and raising social awareness of sustainable consumption.

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From an environmental perspective, green agriculture plays an important role in reducing soil, water, and air pollution by limiting the use of harmful chemicals. It also contributes to lowering greenhouse gas emissions, protecting biodiversity, and maintaining the balance of natural ecosystems. This is particularly significant in the context of climate change, which is increasingly affecting agricultural production.

Therefore, promoting green agriculture is an important foundation for building a modern agricultural sector that is resilient to climate change, economically efficient, and oriented toward long-term sustainable development in Vietnam.

2.4. Literature Review

Recent international studies have increasingly emphasized the importance of green agriculture in achieving sustainable development goals. Pretty et al. (2018) argued that sustainable agricultural systems improve environmental performance while maintaining long-term productivity through reduced dependence on chemical inputs and improved ecosystem management. Similarly, El Bilali (2019) highlighted that green agriculture contributes significantly to climate resilience, food security, and rural livelihood improvement in developing countries.

Searchinger et al. (2019) emphasized that sustainable agricultural transformation requires stronger integration between environmental protection policies, technological innovation, and market-based mechanisms. Their study showed that climate-smart agriculture and circular agricultural systems can significantly reduce greenhouse gas emissions while improving resource efficiency.

In Asia, several studies have examined the role of digital transformation and green technology in agricultural sustainability. Thu Thao (2025) argued that Vietnam's agricultural sector has begun transitioning toward greener production models through organic farming, high-tech agriculture, and export-oriented quality improvement.

Studies related to Vietnam have mainly focused on agricultural restructuring, climate adaptation, and export competitiveness. However, many previous studies remain fragmented and primarily examine individual aspects such as organic farming, climate-smart agriculture, or digital transformation separately. Limited research has comprehensively integrated economic, environmental, and social dimensions to evaluate the contribution of green agriculture toward sustainable development in Vietnam. Therefore, this study seeks to fill this research gap by providing a more integrated assessment of green agricultural development in Vietnam within the broader framework of sustainable development.

3. RESEARCH METHODOLOGY

This study employs a qualitative research methodology combined with descriptive, comparative, and analytical approaches to examine the promotion of green agriculture toward sustainable development in Vietnam. The qualitative approach is considered appropriate because the study focuses on analyzing policies, development trends, practical implementation, and the relationship between green agriculture and sustainable development from economic, environmental, and social perspectives. Through this approach, the research aims to provide a comprehensive understanding of the current situation, achievements, challenges, and development orientation of green agriculture in Vietnam in the context of climate change and international economic integration.

The study mainly uses secondary data collected from reliable and official sources. These sources include reports and statistical publications issued by the Ministry of Agriculture and Environment of Vietnam, the Food and Agriculture Organization (FAO), government decisions and strategies related to sustainable agricultural development, and recent peer-reviewed journal articles concerning green agriculture, climate-smart agriculture, circular economy models, and sustainable development. In addition, statistical data on agricultural exports, organic farming, high-tech agriculture, and environmental issues during the period 2015–2025 are synthesized to support the analysis. The use of multiple sources helps improve the reliability, objectivity, and comprehensiveness of the study.

Several analytical methods are applied throughout the research process. First, descriptive analysis is used to present the current situation of Vietnam's agricultural sector and identify major trends in green agricultural development. Second, comparative analysis is employed to evaluate changes in agricultural performance across different periods and to compare traditional agricultural practices with green agricultural models. Third, policy analysis is used to assess the effectiveness of governmental strategies, programs, and institutional frameworks supporting sustainable agricultural transformation. Furthermore, synthesis and interpretative methods are applied to integrate statistical evidence, policy information, and findings from previous studies in order to clarify the relationship between green agriculture and sustainable development.

The scope of the study focuses primarily on Vietnam's agricultural sector during the period 2015–2025,

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with particular attention to organic agriculture, circular agricultural models, digital transformation, high-tech farming, green exports, and climate adaptation measures. The analysis is conducted mainly at the national level, while some practical examples from localities and agricultural industries are included to illustrate the implementation of green agricultural practices in reality. Through this methodological approach, the study seeks to provide both theoretical and practical implications for promoting sustainable agricultural development in Vietnam in the coming years.

4. CURRENT SITUATION OF PROMOTING GREEN AGRICULTURE TOWARD SUSTAINABLE DEVELOPMENT IN VIETNAM

4.1. Overview of Agricultural Development in Recent Years

In recent years, agriculture has continued to affirm its crucial role as a pillar of the economy, particularly in the current economic context where international supply chains are disrupted and the impacts of climate change are becoming increasingly severe. The growth rate of the agriculture, forestry, and fisheries sector has remained relatively stable. Many agricultural products have maintained strong positions in the global market, including rice, coffee, pepper, cashew nuts, tropical fruits, and seafood. Agricultural exports have continuously increased, making positive contributions to the national trade balance.

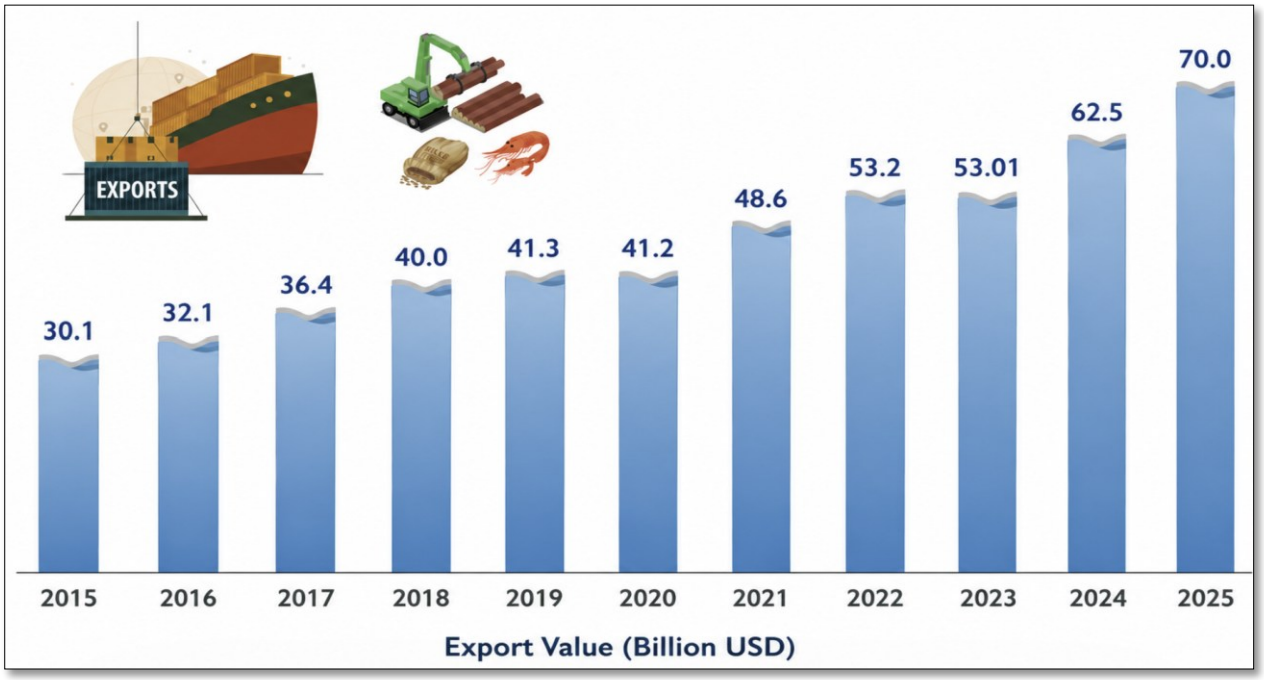

Figure 1. Vietnam's Export Turnover of Agriculture, Forestry, and Fishery Products in the Period 2015–2025
(Source: Ministry of Agriculture and Environment, 2026)

The export revenue of agriculture, forestry, and fishery products during the period 2015–2025 showed a clear upward trend, demonstrating the essential role of agriculture in the national economy as well as in international trade. In 2015, export turnover reached USD 30.1 billion and increased to USD 32.1 billion in 2016, equivalent to a growth rate of approximately 6.6%. By 2017, export value continued to rise to USD 36.4 billion, indicating relatively positive growth in the early stage thanks to market expansion and improved production capacity (Ministry of Agriculture and Environment, 2026).

The period 2018–2020 recorded slower growth and signs of stagnation. In 2018, export turnover reached USD 40 billion, marking a strong increase compared to the previous year. However, in 2019 it only rose slightly to USD 41.3 billion, and in 2020 it declined marginally to USD 41.2 billion. This reflected the impacts of global economic fluctuations, international trade conflicts, and especially the COVID-19 pandemic, which disrupted supply chains, logistics, and global consumer demand.

From 2021 onward, exports of agriculture, forestry, and fishery products recovered strongly, achieving

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USD 48.6 billion, an increase of more than USD 7 billion compared to 2020. In 2022, it continued to rise to USD 53.2 billion and remained high at USD 53.01 billion in 2023. These results demonstrate the strong adaptability of Vietnam's agricultural sector in the face of difficulties, its ability to take advantage of the benefits offered by free trade agreements such as EVFTA, CPTPP, and RCEP, and improved product quality to meet international market requirements.

In particular, the period 2024–2025 shows very positive growth prospects, with export turnover projected to reach USD 62.5 billion in 2024 and USD 70 billion in 2025. If this target is achieved, export value in 2025 will be more than 2.3 times higher than in 2015. This indicates that Vietnam's agriculture is gradually shifting from extensive growth to intensive growth, focusing on deep processing, higher value-added products, and sustainable export market expansion.

The year 2025 witnessed strong breakthroughs in many key export products, especially those with competitive advantages and high added value. Coffee exports reached 1.5 million tons, generating export revenue of US$8.5 billion, representing a 52% increase in value. This confirms coffee's key position among major export product groups. Meanwhile, the fruit and vegetable sector recorded an average export price exceeding US$5,630 per ton, with total export value reaching US$8.5 billion, representing a nearly 20% increase. Cashew nuts, generating US$5 billion, while pepper, despite a slight decline in export volume due to strong price increases, still recorded approximately US$1.6 billion.

However, due to market fluctuations or global market prices changes, some products such as rice and rubber experienced a decline in export volume and value. In 2025, rice exports are projected to reach 7.9 million tons, generating USD 4.1 billion in revenue, representing a 29.1% decline in value compared with the previous year.

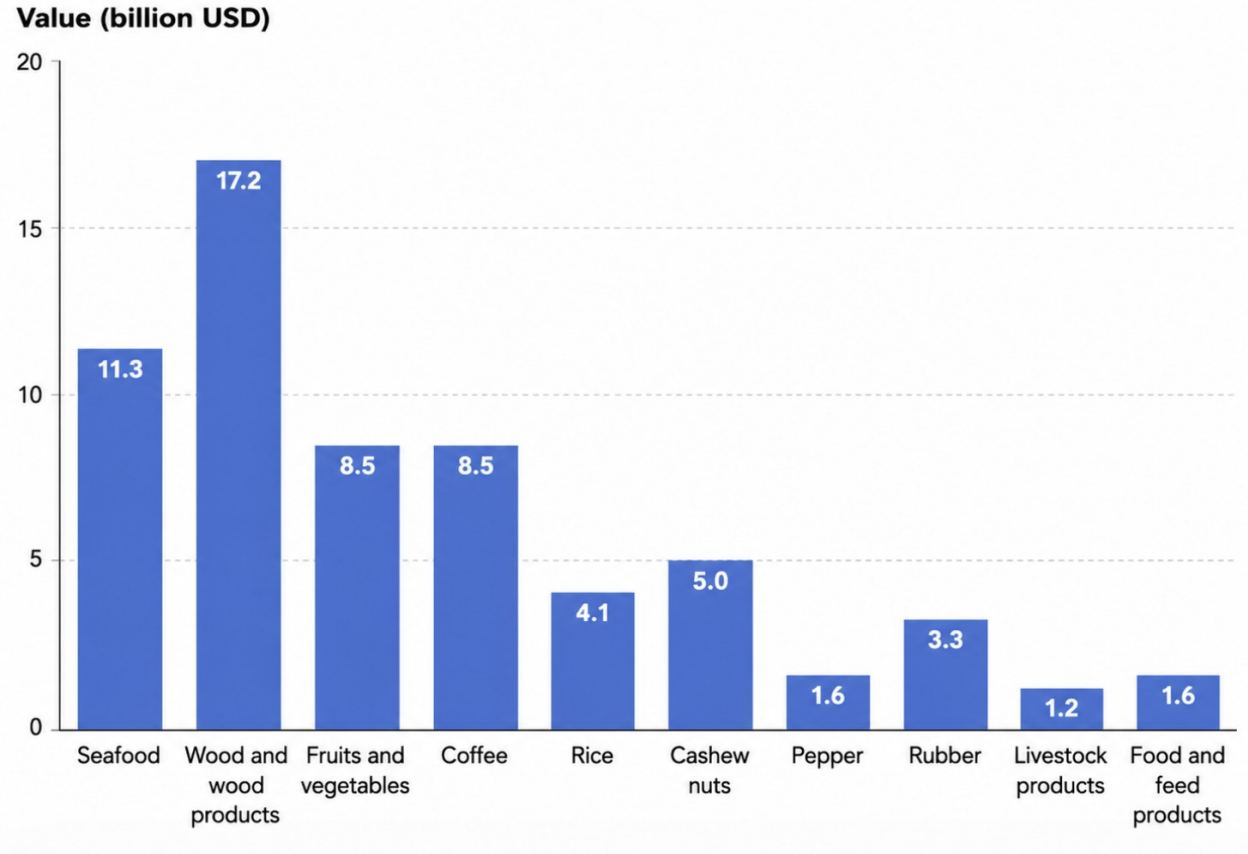

Figure 2. Vietnam's Top 10 Agriculture, Forestry, and Fishery Export Products Exceeding USD 1 Billion in 2025

(Source: Ministry of Agriculture and Environment, 2026)

Figure 2 shows that the structure of Vietnam's 10 agriculture, forestry, and fishery export products exceeding USD 1 billion in 2025 is quite diversified, reflecting the increasing competitiveness of the agricultural

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sector. Among them, wood and wood products ranked first with USD 17.2 billion, confirming the prominent role of the wood processing industry in exports. Seafood ranked second with USD 11.3 billion, continuing to be a key export sector thanks to advantages in aquaculture and processing. Fruits and vegetables, together with coffee, each reached USD 8.5 billion, demonstrating strong growth in high-value agricultural products and expanding access to international markets.

Other traditional export products such as cashew nuts reached USD 5 billion, rice reached USD 4.1 billion, and rubber reached USD 3.3 billion, maintaining their important positions. Meanwhile, pepper, cassava and cassava products, as well as animal feed and raw materials, recorded export values ranging from USD 1.2 billion to USD 1.6 billion, contributing to the diversification of the export structure (Ministry of Agriculture and Environment, 2026). Overall, the data indicate that Vietnam's agriculture is shifting toward a higher share of deeply processed products, greater added value, and the expansion of multiple key export product groups.

4.2. Achievements in Promoting Green Agriculture in Vietnam

In recent years, together with the restructuring of the agricultural sector and the growing demand for sustainable development, Vietnam has achieved many positive results in promoting green agriculture. Important progress has been made in awareness, institutional frameworks, production organization, and market expansion. Many environmentally friendly production models have been widely implemented, gradually laying the foundation for the transition from traditional agriculture to an ecological, modern, and high-value agricultural system.

4.2.1. Improvement of Policies and Guidelines for Green Agricultural Development

One of the most notable achievements is the increasingly comprehensive system of policies and guidelines for green agricultural development. The Government has issued many important strategies, programs, and projects to orient agricultural development toward sustainability. Typical examples include the Strategy for Sustainable Agriculture and Rural Development for the period 2021–2030 with a vision to 2050; the Organic Agriculture Development Scheme; the National Target Program on New Rural Development; the National Green Growth Strategy; the National Environmental Protection Strategy; together with the commitment to achieve net-zero emissions by 2050 at COP26.

These policies clearly demonstrate Vietnam's determination to reform the agricultural growth model, shifting from development heavily dependent on resource exploitation to development based on science and technology, aiming for efficient resource utilization and sustainable environmental protection. In the meantime, support mechanisms for credit access, scientific and technical advancement, raw material zone development, cooperative development, and incentives for enterprises investing in agriculture have gradually been improved.

In many localities, action programs on green agriculture, organic agriculture, and digital transformation in agriculture have been concretized in accordance with local conditions. This has created an important legal foundation for promoting agricultural restructuring toward an ecological, modern, and highly competitive sector in the context of international integration.

4.2.2. Development of Organic and Clean Agriculture

Organic and clean agriculture in Vietnam has achieved considerable progress in both production scale and market awareness. The area of organic farmland has continuously expanded across many regions. Several localities have established specialized production zones for organic vegetables, organic tea, organic rice, safe fruit production, sustainable coffee, and biologically oriented livestock farming.

Production standards such as VietGAP, GlobalGAP, HACCP, USDA Organic, and EU Organic are increasingly being adopted by enterprises, cooperatives, and farming households. As a result, the quality of agricultural products has significantly improved, better meeting the requirements of domestic and international consumers. Some Vietnamese organic products such as rice, cinnamon, star anise, tea, coconut, fruits, vegetables, and spices have gradually gained a foothold in notoriously demanding markets, including South Korea, Japan, and China in Asia, the United States, and countries in the European Union.

In addition, green and safe consumption trends are becoming more popular in society. Consumers are increasingly concerned about health, food quality, and environmental factors in production. This serves as a key driver for enterprises to increase investment in the green agricultural value chain, from production and processing to preservation and distribution. The development of organic agriculture not only enhances product value and generates economic benefits but also contributes to ecosystem protection and safeguards the health of both producers and consumers.

4.2.3. Application of High Technology and Digital Transformation in Agriculture

The application of high technology and digital transformation is creating a strong momentum for green agricultural development in Vietnam. Many modern agricultural models have been implemented in localities, such

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as greenhouse vegetable production, automated net-house flower cultivation, smart livestock farming, high-tech aquaculture, and precision farming.

Technologies being applied are increasingly diverse, including drip irrigation systems for water saving, sensors for monitoring soil moisture and nutrients, farm surveillance cameras, unmanned aerial vehicles (drones) for spraying and crop monitoring, farm management software, and artificial intelligence for weather and disease forecasting. Many enterprises have adopted QR codes, blockchain, and digital platforms for product traceability, thereby enhancing transparency and consumer confidence.

In addition, agricultural e-commerce has grown rapidly, especially after the COVID-19 pandemic. Vietnamese agricultural products are increasingly present on domestic and international e-commerce platforms, helping expand distribution channels and reduce dependence on traditional selling methods.

These applications help reduce input costs, minimize post-harvest losses, improve labor productivity, strengthen product quality control, and lessen negative environmental impacts.

4.2.4. Promoting the Circular Economy in Agriculture

The circular economic system in agriculture has attracted increasing attention from many localities and enterprises, contributing to more efficient resource use and waste reduction. Instead of treating agricultural by-products as waste, many models have transformed them into valuable economic resources.

Rice straw after harvest is used for mushroom cultivation, organic fertilizer production, or animal feed. Rice husks, sawdust, and wood residues are processed into biomass pellets for clean energy purposes. Livestock waste is treated through biogas systems to generate household fuel and electricity, while also producing organic fertilizer for crops. In aquaculture, many water recirculation systems and the reuse of processing by-products have been applied to reduce environmental pollution.

Several ecological VAC models (garden, pond, livestock) and integrated closed-loop farms have generated high economic efficiency by reducing input costs while increasing farmers' incomes. This development direction is well suited to Vietnam's conditions and contributes to realizing the goals of green growth and sustainable development.

4.2.5. Strengthening Green Agricultural Exports

Vietnam's green agricultural exports have shown many positive developments in recent years. Instead of focusing only on volume and low prices, many enterprises have shifted strongly toward emphasizing quality, environmental standards, traceability, and social responsibility throughout the supply chain.

Many key export products such as high-quality rice, sustainable coffee, fresh fruits and vegetables, processed seafood, wood products with sustainable forest certification, and organic products are increasingly appreciated in international markets. The effective use of free trade agreements such as EVFTA, CPTPP, and RCEP has created major opportunities for Vietnam's green agricultural products to access high-value markets.

In addition, enterprises have invested heavily in preservation technology, deep processing, environmentally friendly packaging, and international quality management systems. Consequently, the value added of agricultural exports has steadily increased, farmers' incomes have improved, and Vietnamese agriculture's position in international markets has been enhanced. It can be affirmed that this is an important transition from an export model based on quantity to one based on quality, branding, and sustainability.

4.3. Limitations and Remaining Challenges

Although Vietnam has achieved many positive results in promoting green agriculture, the development process still faces several significant limitations and challenges. These issues have slowed the pace of transformation and prevented green agriculture from expanding more broadly across the entire agricultural sector.

4.3.1. Small-Scale and Fragmented Production

One of the most common challenges is the small-scale and fragmented nature of agricultural production. Most farming households cultivate on limited land areas with scattered plots, making it difficult to organize large-scale production zones or establish stable raw material regions. This fragmentation creates obstacles to the uniform application of advanced technologies, mechanization, and green production standards. It also weakens supply chain efficiency and reduces the market competitiveness of agricultural products in both domestic and international markets.

4.3.2. Continued Dependence on Chemical Agricultural Inputs

In many localities, chemical fertilizers application, pesticides, and other inorganic inputs remains relatively high. While these inputs may help increase short-term productivity, excessive or improper use can lead to soil degradation, water pollution, and biodiversity loss. In addition, chemical residues may negatively affect food safety and reduce the reputation of Vietnamese agricultural products in export markets with strict environmental and health requirements.

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4.3.3. Lack of Capital and Limited Access to Green Finance

Investment in green agriculture often requires substantial initial capital and a relatively long payback period. Farmers need funds for organic inputs, modern irrigation systems, renewable energy equipment, greenhouse facilities, certification processes, and digital technologies. However, many farming households, cooperatives, and small enterprises still face difficulties in accessing preferential loans or green credit programs. Limited collateral, complicated loan procedures, and unstable income streams remain major barriers to investment.

4.3.4. Uneven Scientific and Technological Capacity

The level of technological development remains uneven among regions. While some provinces have successfully applied smart farming, digital traceability, and high-tech production models, many rural, mountainous, and remote areas still face shortages in digital infrastructure, technical knowledge, and access to innovation. As a result, the benefits of green agriculture have not been distributed equally, and many farmers remain dependent on traditional production methods.

4.3.5. Unstable Consumption Markets

Although demand for green and safe agricultural products is increasing, consumption markets are still not fully stable. Green products often have higher production costs and therefore higher selling prices than conventional products. However, distribution channels remain limited, branding is still weak, and many consumers are not yet ready to pay higher prices for sustainable products. This creates uncertainty for producers and discourages long-term investment.

4.3.6. Strong Impacts of Climate Change

Climate change continues to pose serious risks to agricultural development in Vietnam. Saltwater intrusion in the Mekong Delta, drought in the Central Highlands, floods and storms in Central Vietnam, and outbreaks of crop and livestock diseases have caused significant damage to production activities. These impacts reduce productivity, increase costs, and create uncertainty for farmers, making sustainable agricultural development more difficult.

4.4. Causes of the Limitations

The above limitations stem from multiple causes. First, policy support mechanisms are still scattered and sometimes lack consistency among sectors and administrative levels. Second, linkages among farmers, enterprises, and cooperatives remain weak, reducing the effectiveness of value chain development. Third, investment in research, innovation, and technology transfer has not yet matched the practical needs of agricultural transformation.

In addition, Vietnam still faces a shortage of highly qualified human resources in agriculture, especially professionals with expertise in biotechnology, digital agriculture, environmental management, and agribusiness. Logistics systems, cold storage, and post-harvest preservation infrastructure also remain underdeveloped, resulting in high losses and reduced product value. Furthermore, awareness of green consumption and sustainable lifestyles has not yet become widespread in society, limiting domestic demand for green agricultural products.

4.5. General Assessment

It can be affirmed that Vietnam has initially established an important foundation for the transformation towards clean agriculture through policy improvement, the expansion of clean production models, technological application, and the enhancement of export quality. These achievements demonstrate that the transformation toward a greener agricultural sector is both feasible and necessary.

However, the transition process is still at an early stage. Progress remains uneven among regions, and the transformation has not yet created deep and comprehensive changes across the entire agricultural sector. Many structural barriers related to land scale, finance, technology, market systems, and human resources still need to be addressed. Therefore, for green agriculture to truly become a driving force for sustainable development, Vietnam needs stronger and more comprehensive solutions in the coming period. These should focus on improving institutions, expanding access to capital, accelerating technological innovation, developing stable markets, and building a high-quality agricultural workforce.

5. SOLUTIONS TO PROMOTE GREEN AGRICULTURE TOWARD SUSTAINABLE DEVELOPMENT IN VIETNAM

Based on the achievements that have been attained, while also considering the current limitations and challenges, the promotion of green agriculture in Vietnam needs to be implemented in a comprehensive and coordinated manner with a long-term vision. This process needs to prioritize a green-oriented model transformation, with farmers and businesses as the main actors, applying and developing science and technology,

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and aiming for sustainability as the overarching goal..

First, improve mechanisms and policies to support green agricultural development.

The Government should continue reviewing, revising, and supplementing policies related to organic agriculture, high-tech agriculture, the circular economy, and green growth in a synchronized, consistent, and practical direction. At the same time, preferential policies on taxation, credit, land access, agricultural insurance, and support for certification costs of green standards should be introduced thereby encouraging businesses, cooperatives, and farmers to confidently invest in environmentally friendly production models. In addition, integrating green agricultural development goals into the socio-economic development strategies of each locality should receive greater attention in order to ensure consistency and effectiveness during implementation.

Second, accelerate the application of science, technology, and digital transformation in agriculture.

This is a key solution for improving productivity, product quality, and minimizing negative environmental impacts. Greater investment is needed in research and the transfer of high-yield crop and livestock varieties with strong resilience to climate change. At the same time, the use of water-saving irrigation systems, smart greenhouses, environmental monitoring sensors, drones for crop care, and blockchain technology for product traceability should be strongly encouraged. Alongside this, digital infrastructure in rural areas should be expanded, agricultural e-commerce platforms should be promoted, and farmers should be supported in accessing digital tools to improve management efficiency and product distribution.

Third, improve the quality of human resources for green agricultural development.

In the context of modern agriculture requiring increasingly advanced technical skills, workforce training has become an urgent necessity. Vocational training for rural laborers should be strengthened, focusing on safe production methods, efficient resource use, and the application of new technologies. At the same time, management skills should be enhanced for cooperative leaders and agricultural enterprises. Young intellectuals, agricultural engineers, and innovative entrepreneurs should be encouraged to start businesses in rural areas. Transforming traditional production thinking into an agricultural economic mindset centered on market demand will create an important foundation for sustainable development.

Fourth, strengthen value chain linkages in the production and consumption of green agricultural products.

In practice, fragmented and small-scale production remains one of the largest barriers to green transformation. Therefore, stronger cooperation among farmers, cooperatives, processing enterprises, distributors, banks, and scientists is necessary to build complete value chains from production to consumption. Through such linkages, farmers can receive high-quality inputs, access advanced techniques, obtain stable purchasing contracts, and reduce market risks. At the same time, enterprises can develop standardized raw material zones, improve competitiveness, and expand exports.

Fifth, expand investment capital sources and develop green finance for agriculture.

Green agriculture often requires high initial investment costs and long capital recovery periods. Therefore, suitable financial mechanisms are essential to support producers. The Government should cooperate with financial institutions to introduce preferential credit packages specifically designed for clean agriculture, organic farming, and high-tech agricultural projects. In addition, innovation funds for agriculture should be established to attract private enterprises, foreign direct investment, and international financial resources into the sector. Public-private partnership (PPP) models for investing in green agricultural infrastructure should also be prioritized.

Sixth, strongly develop domestic and international markets for green agricultural products.

For green agriculture to develop sustainably, products must have stable markets and provide appropriate profits for producers. Therefore, Vietnam should build a national brand for green agricultural products, strengthen trade promotion activities, advertise products on digital platforms, and expand modern distribution systems such as supermarkets and specialized clean food stores. Meanwhile, enterprises should be supported in meeting international standards on food safety, carbon emissions, and traceability to expand exports to demanding markets. Raising domestic consumer awareness about the health and environmental benefits of green products is also highly important.

Seventh, promote the circular economy in agriculture.

This model is highly suitable for modern development trends and Vietnam's practical conditions. Agricultural by-products for example rice straw, rice husks, sugarcane bagasse, and livestock manure should be reused to produce organic fertilizers, animal feed, biofuels, or industrial raw materials. In livestock farming, biogas systems should be expanded to treat waste and provide clean household energy. The development of ecological VAC models and closed-loop circular farms will help reduce production costs, increase added value,

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and minimize environmental pollution.

Eighth, proactively adapt to climate change and protect natural resources.

Climate change has been and continues to have severe impacts not only on nature but also on the lives of Vietnamese people; therefore, green agricultural development must be closely linked with improving the resilience of production systems. Crop and livestock restructuring should be promoted according to the specific conditions of each region. Drought-resistant and salt-tolerant varieties should be developed, while land and water resources must be managed more effectively. In addition, reforestation, ecosystem restoration, and the establishment of early warning systems for natural disasters should be strengthened. Agricultural insurance programs should also be expanded to help farmers reduce losses caused by natural disasters and disease outbreaks.

CONCLUSION

In the context of the world's strong transition toward green growth models and sustainable development, green agriculture has become an inevitable trend for many countries, including Vietnam. As a nation with strong agricultural advantages and one that is increasingly affected by climate change, Vietnam needs to accelerate the transformation from traditional agriculture to an ecological, modern, efficient, and environmentally friendly agricultural system. This is not only an objective requirement of international integration but also an important solution for ensuring food security, increasing rural incomes, and protecting natural resources for future generations. The study shows that Vietnam has achieved many positive results in promoting green agriculture in recent years. These include gradually improving policies, expanding organic production, applying high technology, promoting digital transformation, developing a sustainable circular economy, and increasing the export value of agricultural products. Many green production models have demonstrated effectiveness in both economic and environmental terms, creating new development directions for the agricultural sector in the period of reform. However, the process of transitioning to green agriculture in Vietnam still has many issues that need to be discussed, particularly fragmented production scale, limited investment resources, uneven technological capacity, weak value chain linkages, unstable consumption markets, and the increasingly severe impacts of climate change. These issues require more comprehensive, long-term, and breakthrough solutions in the coming years. For green agriculture to truly become the foundation of sustainable development, Vietnam needs to continue improving institutions, promoting innovation, developing high-quality human resources, expanding green finance, strengthening the efficiency of production-consumption linkages, and building domestic as well as international markets for green agricultural products. At the same time, agricultural development must be closely associated with environmental protection, efficient resource use, and stronger resilience to climate change. It can be affirmed that promoting green agriculture toward sustainable development is not only a strategic choice but also an inevitable path for boosting the competitiveness of agriculture in the new era. If opportunities are effectively utilized, resources are mobilized efficiently, and the right policies are implemented, Vietnam is fully capable of building a green, smart, high-value, and sustainable agricultural sector that contributes positively to the country's socio-economic development goals.

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