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The impact of sustainable supply chain management practices on environmental performance of Vietnamese agricultural enterprises

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A B S T R A C T

The objective of the paper is to assess the impact of sustainable supply chain management practices on environmental performance of Vietnamese agricultural enterprises. The study conducted a survey of management leaders of Vietnamese agricultural enterprises. After 3 months, 328 surveys were obtained, after cleaning the data, there were 283 valid surveys for analysis. The results show that sustainable supply chain management practice has a positive impact on environmental performance and environmental regulations are not enough grounds to affirm a moderating role in the relationship between sustainable supply chain management practice and environmental performance of Vietnamese agricultural enterprises. From there, the study makes recommendations for Vietnamese agricultural enterprises.

1. Introduction

Polluted and degraded natural environment poses many risks and challenges and has become one of the most discussed topics on a global scale (Das et al., 2021). As a developed country, Vietnam is also one of the countries with the most worrying levels of air pollution in the world (The World Bank, 2019). The depletion of natural resources and environmental degradation has caused business organizations across the globe to work towards implementing green business strategies (El Saadany et al., 2011).

As one of the 10 key export sectors of Vietnam, fishery has a lot of potential for development when the demand for this commodity in the world is constantly increasing (in 2018 is 155.8 million tons, forecast to 2030 is 180.6 million tons) (FAO, 2020). Along with China, Bangladesh, Chile, Egypt, India, Indonesia and Norway, Vietnam is among the main seafood processing countries exporting for seafood trade in the world (FAO, 2020). Moreover, new-generation trade agreements (FTAs) such as CPTPP, EVFTA,..... will open up more opportunities for seafood exports (Verma, 2014). However, when these FTAs come into effect, Vietnamese agricultural enterprises will face great challenges not only to meet labor regulations and standards but also to meet the environmental commitments of importers, and increasingly the environmental commitments of actors in the imported seafood supply chain. In the United States, for example, retail importers and contract meal companies have the highest levels of commitment to environmental friendliness. In Europe, the commitment to environmental friendliness is

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even higher, with retail supermarket chains, followed by fast food chains playing the most important role in requiring seafood products to be environmentally friendly through eco-labels and sustainability certifications (FAO, 2008).

In addition to the first introduction to research, the article is structured into four sections: Part 2 focuses on clarifying concepts and developing research hypotheses; Section 3 describes the research scales, survey subjects and pre-surveys and how data are collected and processed; Section 4 interprets the results of data processing; and finally, Part 5 presents the discussions through the study, the implications for macro and micro managers, the limitations and some further directions of the research.

2. Literature review

2.1. Sustainable supply chain management practice

Over the course of the past few years, the term "green supply chain" has acquired an increasing amount of attention. The phrase "sustainable supply chain" has been used in conjunction with it, along with other words such as "sustainable green supply chain", "environmental supply chain", and "ecological supply chain" (Ageron et al., 2012; Fahimnia et al., 2015; Jia et al., 2018). Zhang (2008) developed ecotourism products by applying the fundamental principles of green supply chain management to the process of product development. Zhou et al. (2018) have proposed a concept for a green supply chain that has the potential to contribute to the development of rural tourism by redistributing tourism resources. More recently, Xu and Gursoy (2005) have developed a sustainable tourist supply chain. In this chain, tier 1 and tier 2 suppliers are renamed as upstream suppliers, midstream suppliers, and retailers, respectively. SSCM's simplest strategy regarding inter-institutional investment resource development is one of risk mitigation models (King, 2008). Melnyk et al., 2003, have shown that the benefits of using the Risk-based strategy (RBS) model include: (a) Established environmental benefits, (b) Improved productivity and governance efficiency, (c) Create a system that is globally recognized by other organizations. Meanwhile, Klassen and Vachon (2003) show that the efficiency-based strategy (EBS) brings environmental efficiency benefits to the supply chain more than the RBS model. According to Zhu and Sarkis (2007), Green Supply Chain Management (GSCM) covers from green procurement to an integrated supply chain from supplier to manufacturer, to customer and vice versa, meaning a closed loop. These jobs require the promotion of relationships between partners in the implementation of green projects including: The direct involvement of suppliers, customers in the implementation of new production processes or product modifications. According to Adams et al. (2021), the SSCM practice is an essential component in the functioning of the supply chain to the industry. The coordination of resources such as material, capital, people, and information among the various SCM firms is referred to as supply chain management (SSCM). According to Hong et al. (2018), these companies have made a commitment to ensuring long-term sustainability by preserving environmental, economic, and social stability among its stakeholders. In the efforts of businesses to reduce the adverse effects of their actions on society and the environment, as well as to improve their financial, market, and operational performance (Acquah et al., 2020, 2021; Panigrahi & Sahu, 2018; Afum et al., 2020), the procedures and activities that take place along the supply chain play a significant role.

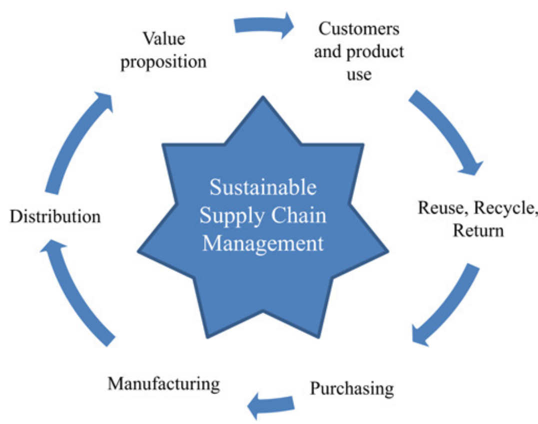

Fig. 1. Sustainable supply chain management

Source: Authors

2.2. Environmental performance

Environmental sustainability is considered one of the most important goals in our country's economic, social and environmental development policies. The evaluation of the implementation of the SDGs from the content of these development policies as well as environmental protection policies will be the foundation for the process of planning, adjusting and monitoring progress in policy implementation by competent authorities.

Around the world, methods for assessing environmental performance based on data collected with a high level of confidence have been developed and conducted experimentally at the national level, which will be the approach to develop an assessment method at the local level, and one of these is the EPI Global Environmental Performance Index.

The Environmental Performance Index (EPI, environmental performance index, environmental performance index, environmental management capacity index) (Darnall et al., 2008) is a type of composite index developed by Columbia University's Yale Center for Environmental Law and Policy (YCELP) for the purpose of assessing environmental sustainability in countries around the world.

EPI is calculated from many component indicators, and these components are divided into two broad groups:

- Group I: Measures efforts to reduce environmental pressure on human health, known as the Environmental Health group.
- Group II: Measures the reduction of loss or decline of ecosystems and natural resources, included in the Ecosystem Vitality index.

There are several indicators of environmental performance (EP) since in some cases, there are no established standard metrics for EP, and environmental challenges can have intangible characteristics (Al-Ghwayeen & Abdallah, 2018). Due to this factor, the assessment of EP becomes challenging and intricate (Russo & Fouts, 1997; Datta et al., 2012). In spite of the presence of EP performance metrics, differences continue to exist inside a company, among companies operating in the same industry or in other industries (Lüdeke-Freund et al., 2013; Al-Ghwayeen &; Abdallah, 2018). EP indicators encompass a range of factors, such as energy consumption, adherence to environmental regulations, mitigation of air pollution, and the influence on soil and water quality due to the transfer of hazardous chemicals (Abdallah & Al-Ghwayeen, 2019). EP indicators encompass several factors such as lowered atmospheric emissions, a company's environmental reputation, and the responsible use of resources, including the avoidance of hazardous or toxic products and the reduction of solid and liquid waste (Diab et al., 2015; Scur & Barbosa, 2016; Al-Ghwayeen &; Abdallah, 2018; Govindan et al., 2020).

2.3. Relationship between Sustainable supply chain management practice and Environmental performance

It is defined as the creation of a coordinated supply chain through voluntary economic, environmental, and social integration with key organizational business systems that are designed to efficiently and efficiently manage raw material resources, information, and capital flows related to the procurement, production, and distribution of products or services. This is what is meant by the term "sustainable supply chain management" (SSCM) in the English language. As a result, in order to fulfill the requirements of the stakeholders and to enhance the organization's competitiveness and resilience in the near term as well as the long term (Ahi & Searcy, 2014). The term supply chain management (SSCM) is often understood to refer to the incorporation of economic, social, and environmental principles into supply chain management. Although there are numerous perspectives and definitions of SSCM, there are also numerous common opinions that agree on this definition. According to Carter and Roger (2008), sustainable supply chain management is defined as the strategic, transparent, and successful achievement of an organization's social, environmental, and economic goals through the systematic coordination of interorganizational business processes. The goal of this coordination is to improve the long-term economic performance of each company and its supply chain. According to Karmaker et al. (2023), industries have the power to improve their sustainability with the development of effective strategies to address specific areas, ultimately leading to the achievement of long-term triple bottom line sustainability. In the existing body of research, there is a substantial body of evidence indicating that Sustainable Supply Chain Management Practices (SSCMPS) in a variety of organizations and industries have a positive impact on Environmental Performance (EP) (Diab et al., 2015; Dubey et al., 2017; Das et al., 2021; Al-Ghwayeen & Abdallah, 2018).

2.4. Theories

Due to the broad subject of study, resource-based theory is considered appropriate to explain the relationship between green supply chain management and business performance. Resource-based theory was developed by Acedo et al. (2006). Businesses will create and maintain competitive advantage only by possessing inimitable as well as irreplaceable resources. Acedo et al. (2006) have shown the existence of three main tendencies in this theory: resource-based view, knowledge-based view, and relational view. The resource-based perspective comes from Barney and Clark (2007), specifically the resources mentioned in this view are internal resources including: (i) tangible assets such as labor, capital, land, (ii) intangible assets such as skills, knowledge, reputation, corporate culture. It implies that all activities of the enterprise are mainly based on internal resources while external resources are only a small part. The knowledge-based perspective adds that if construction businesses do a good job of creating, accumulating and widely sharing knowledge about green supply chain management within the organization, they will achieve higher operational results. The view of relationships is contrary to the resource-based view, i.e. based on the external environment, businesses seize objective opportunities and advantages and take them as the basis for designing action strategies (Younis et al., 2016). It suggests that businesses with the same view of applying the principles of green supply chain management will suggest or encourage partners to share the same view. Specifically, they look to suppliers specializing in the production and supply of green materials. Similar to customers, these construction businesses will also target buyers here who are individuals/units with “green awareness”, the trend of “green consumption”. As such, a resource-based perspective and a knowledge-based perspective support explains how green practices inside the business impact performance while a relationship perspective underpins the impact of external practices (including environmental cooperation with suppliers, environmental protection cooperation with customers, supplier environmental monitoring and environmental monitoring from customers) to business performance.

This is a more complex strategy and has been evolving in recent years. With an 'eco-efficient' or 'lean and green' approach to green supply chain management. This strategy brings environmental efficiency benefits to the supply chain over the RBS model, specifically beyond mere regulatory compliance by requiring suppliers to meet environmental performance targets based on activities. Much of the environmental benefit from specific manufacturing operations has been shown to provide deeper benefits. In addition, the availability of dual economic and environmental benefits to the supply chain has led to the requirement for a higher level of commitment between customers and suppliers. A performance-based strategy aligns environmental performance with operational processes in the supply chain, and it enables the expansion of productivity requirements into the supply chain in order to maximize economic efficiency and environmental benefits through waste reduction and resource use. This strategy requires specific performance specifications and more comprehensiveness of the supply chain than a simple risk-based strategy. This strategy also requires a higher level of engagement between supply chain partners arising from the use of more complex operational requirements between companies. Using this strategy to facilitate greater efficiency in the supply chain does not require the development of specialized resources specific to environmental performance. However, it requires specific practicality and efficiency in the context of waste reduction and recycling requirements (Klassen &; Vachon, 2003). This strategy can provide a cost-reducing advantage to the supply chain and easily align with pre-existing organizational optimization goals. But a performance-based supply chain strategy does not allow for more knowledge-intensive environmental management activities such as product design, material substitution, or innovation. Product recalls due to the wrong selection of low-cost but poor-quality materials represent the inherent risk of focusing solely on efficiency in the supply chain. Performance-based strategies are considered technically weak but more socially complex than risk-based strategies.

3. Method

3.1 Research sample

Due to the nature of the survey variables at the strategic level, the respondents in this study were CEOs of agricultural enterprises with more than 5 years of operation. Before the official survey, in order to collect opinions on the suitability, clarity, understandability, and correct understanding of the content of the survey questions, the pre-survey was directly conducted by the author with 5 CEOs of agricultural enterprises. After collecting comments, the author corrected spelling errors, sentences and Vietnameseization according to the suggestions of the pre-survey participants. Basically, the survey participants all said that the content of the question is clear and easy to understand and the survey subject is the CEO is completely suitable. The study uses a combined data collection method both face-to-face and online via email to ensure the convenience of participation of all target survey subjects. The live survey with paper questionnaires is conducted in advance. With the support of the Vietnam Association of Seafood Exporters and Processors (VASEP), paper questionnaires are directly delivered to VASEP's member enterprises – which focus on export activities. With 283 survey sheets obtained valid when the author checks and rejects invalid votes such as enterprises operating for less than 5 years, the votes have a defect rate of more than 5%; As a next step, the data is fed into Smart PLS 4.1 software to assess the reliability of the measurement model and the structural model is evaluated to test the research hypothesis. Parametric bootstrapping is used to test hypotheses and evaluate research models.

3.2 Research Model

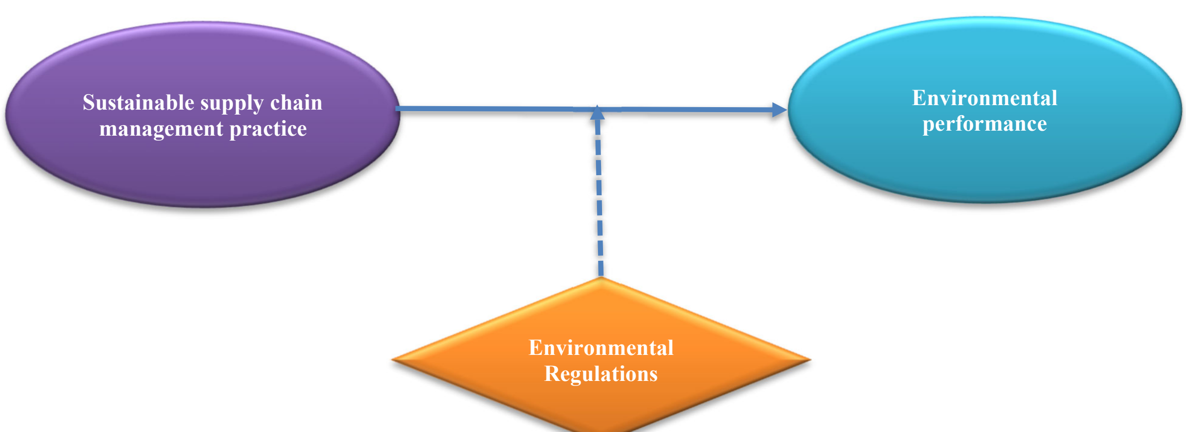

Fig. 1. Research model

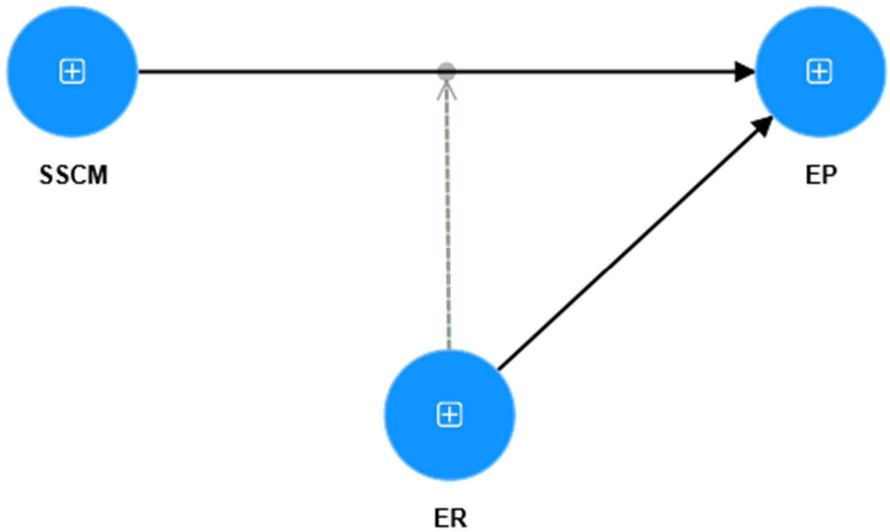

Fig. 2. Research model in Smart PLS 4.1

where:

The practice of sustainable supply chain management is inherited from the studies of Yang et al. (2013), Esfahbodi et al. (2016), Laari (2016), Das (2018), Hamdy et al. (2018) measure through variables as follows in Appendix.

Environmental regulations developed from studies by Zhu and Sarkis (2007) and Zhu et al. (2007; 2012) through the following variables in Appendix.

Environmental performance developed from studies by Abdallah & Nabass, (2018); Abdallah and Al-Ghwayeen (2019) adopted the following scales in Appendix.

3.3 Data analysis techniques

An analysis technique known as PLS-SEM, which stands for partial least squares structural equation model, is utilized by the author in order to carry out factor regression analysis. Because of its capacity to validate theoretically supported linear and additive causal models, the PLS-SEM analysis approach is a multivariate data analysis technique of the second generation that is frequently utilized in business research. According to the principle of model loading, the degree to which the load factor is closer to the value 1 is directly proportional to the degree to which it signals the reliability of the underlying variable. According to Hensler et al. (2012), an appropriate load factor is one that surpasses or equals 0.7.

This demonstrates the reliability of the scale when it is employed with the PLS-SEM approach. Composite Reliability measures this reliability. The composite reliability coefficient can range from 0 to 1, with the value being closer to 1 indicating a better level of dependability in the PLS-SEM model. For an exploratory model, it is considered acceptable if the coefficient is greater than or equal to 0.6. On the other hand, for an affirmative model, it is deemed proper if the coefficient is greater than or equal to 0.7 (Henseler, Ringle, & Sarstedt, 2012).

AVE stands for “average variance extracted”, and it is a factor that determines whether or not the model is convergent or inconsistent. According to Hock and Ringle (2006), a model that is considered to be of high quality should possess an AVE coefficient that is equal to or greater than 0.5.

Standardized Root Mean Square Residual (SRMR) indication: This indicator indicates whether or not the study model is appropriate for the research to be conducted. According to Hu and Bentler (1998), an appropriate model will often have an SRMR value that is lower than 0.08.

(VIF) stands for the Variance Inflation Factor. The index provides an indication of the probability that the model contains a linear multi-plus equation. A valuation index (VI) rating that is less than 10 is considered acceptable; however, in order to guarantee reliability, the VIF index should not exceed 5 (Hair et al., 2011).

PLS Bootstrapping: Bootstrapping analysis is utilized to remove standard errors and evaluate the significance level of the PLS model at a significance level of 5%. It is possible for the number of Bootstrapping times to reach 5000 times while the experimental level is being used. Nevertheless, throughout the phase of comprehensive analysis, there is a requirement to increase the number of bootstrapping.
Inner Model p-value (T-Value) and Outer Model p-value (TValue): The T-Value must be less than 0.05 (1.96).

4. Results

With the initial study model full of scales, the results of the analysis showed that the load index, confidence index (Cronbach's Alpha) and aggregate confidence level (CR) all scored 0.71 or higher, and none of the variables had an average deduction variance value (AVE) lower than 0.5. This represents scales that have ensured confidence standards and variables that ensure convergence. This result ensures the consistency and convergence of the scale as well as calculates the value of the variable for subsequent use for correlation analyses.

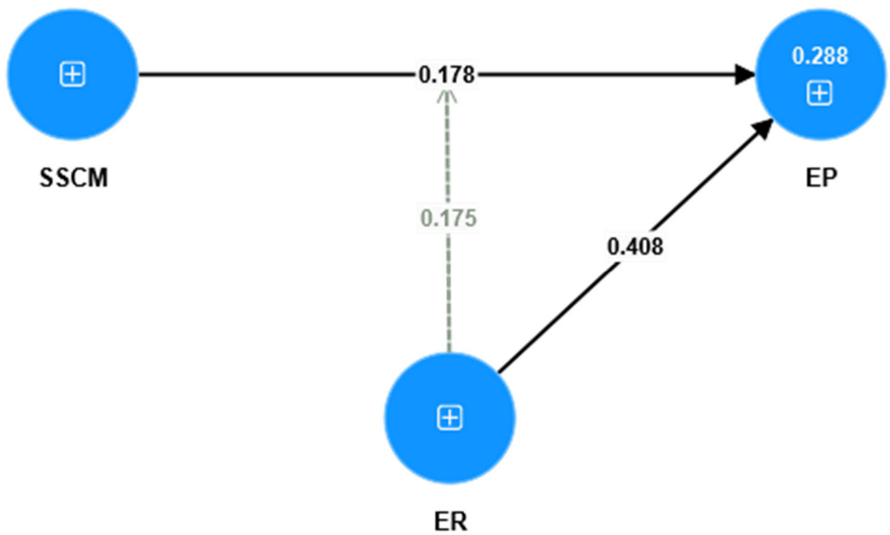

Fig. 3. PLS results

Table 1
Discriminant validity (Heterotraite-monotrait ratio (HTMT) - Matrix)

	EP	ER	SSCMP	ER × SSCMP
EP				
ER	0.525			
SSCMP	0.531	0.622		
ER × SSCMP	0.071	0.355	0.431	

The results showed that all variables satisfied the differential value to conduct research hypothesis testing.

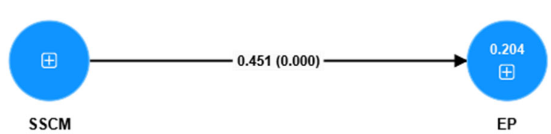

Fig. 4. Direct effect results

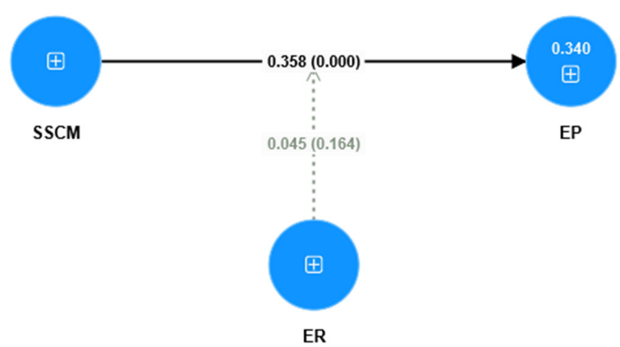

Fig. 5. Moderating effect results

The results showed that sustainable supply chain management practices had a positive impact on the environmental performance of Vietnamese agricultural enterprises at a meaningful level of 1% (P_value = 0.000) at an impact level of 0.358 when environmental regulation variables were regulated. However, environmental regulations do not have sufficient grounds to affirm a regulatory role in the relationship between sustainable supply chain management practices and environmental performance of Vietnamese agricultural enterprises.

The following is a summary of the results of testing the research hypotheses:

Table 2
The results of path coefficient

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ER→ EP	0.457	0.459	0.041	11.104	0.000
SSCMP → EP	0.406	0.408	0.047	8.603	0.000
ER × SSCMP → EP	0.053	0.054	0.047	1.131	0.258

The results show that sustainable supply chain management practices have a positive impact on the environmental performance of Vietnamese agricultural enterprises. At the same time, environmental regulations also had a statistically significant impact on environmental performance at a significant level of 1% (P_value = 0.000). However, the regulatory role of environmental regulations is not statistically significant in the relationship between sustainable supply chain management practices and the environmental performance of Vietnamese agricultural enterprises.

5. Conclusion

However, reality shows that the development of green agricultural models, safe agriculture associated with environmental protection often has very high costs, while the selling price of safe agricultural products is still precarious. Therefore, every year, the agricultural sector, related units and localities often coordinate to organize training courses, improve production levels according to VietGAP process, and safe production. At the same time, encourage and support people to develop sustainable agricultural production models, transform the structure of crops and livestock to adapt to climate change; strictly control the circulation and use of pesticides. In addition, districts, towns and cities also focus on developing livestock and aquaculture according to the plan, taking livestock farms out of residential areas; replicate models of cultivation, animal husbandry and aquaculture according to VietGAP process.

In order to develop agricultural production in association with environmental protection, the agricultural sector has been coordinating with functional sectors and localities to propagate good experiences, effective creative methods and ways for people to learn. At the same time, the province also has many "opening" mechanisms, creating open corridors to attract businesses to invest in the agricultural sector, especially high-tech agriculture. Along with the application of science and technology in production, localities also strengthen the management and supervision of the implementation of the law on agricultural environmental protection. Raise awareness of the roles and responsibilities of all levels and each citizen in environmental protection in agricultural production.

Develop agriculture in the direction of ecological, organic, circular and low carbon emissions in order to improve the quality of growth, added value, competitiveness and sustainable development; reduce pollution of agricultural and rural environments, use energy efficiently and save natural resources towards a carbon-neutral economy by 2050. Harmonize the goals of sustainable growth, environmental protection, adaptation to climate change and reduction of greenhouse gas emissions, actively participate in the implementation of Vietnam's international commitments on reducing greenhouse gas emissions. In addition, continue to improve efficiency and add value of competitiveness; linking green growth with the implementation of agricultural and rural sustainable development goals. With the responsibility to reduce emissions to contribute to mitigating climate change, towards a green economy, Vietnam's agriculture is gradually transforming production models to meet green growth and consumption.

Green agriculture aims to improve the competitiveness of agricultural products, develop technologies to treat and reuse by-products, waste, stabilize the economy and help farmers have a better quality of life, protect agricultural resources and ecosystems. ensuring sustainable agriculture on both socio-economic and environmental pillars, contributing to green economic development. Green growth in agriculture is a matter of great urgency today, with previous studies pointing to major impacts related mainly to climate change. To realize green growth in agriculture, it is essential to change the perspective of environmental protection from the factors that promote growth in agriculture, and at the same time from the actions of government agencies, corporations and society and the relationships of industry stakeholders.

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Appendix

SSCM
Internal environment management
Green sales
Green Procurement
Green design
Reverse transport system
Investment recovery

Environmental Regulations
The company complies with local environmental regulations
The company complies with government regulations on the environment
The company respects international environmental agreements
Respect regulations related to the operation of the agricultural sector

Environmental performance

1. Minimization of solid/liquid waste and emissions
2. Minimization of the use of hazardous and poisonous substances
3. Decrease in the occurrence rate of environmental accidents
4. Minimization of electricity use
5. Adherence to environmental regulations
6. Enhanced the company's ecological reputation
7. Restricted utilization of resources