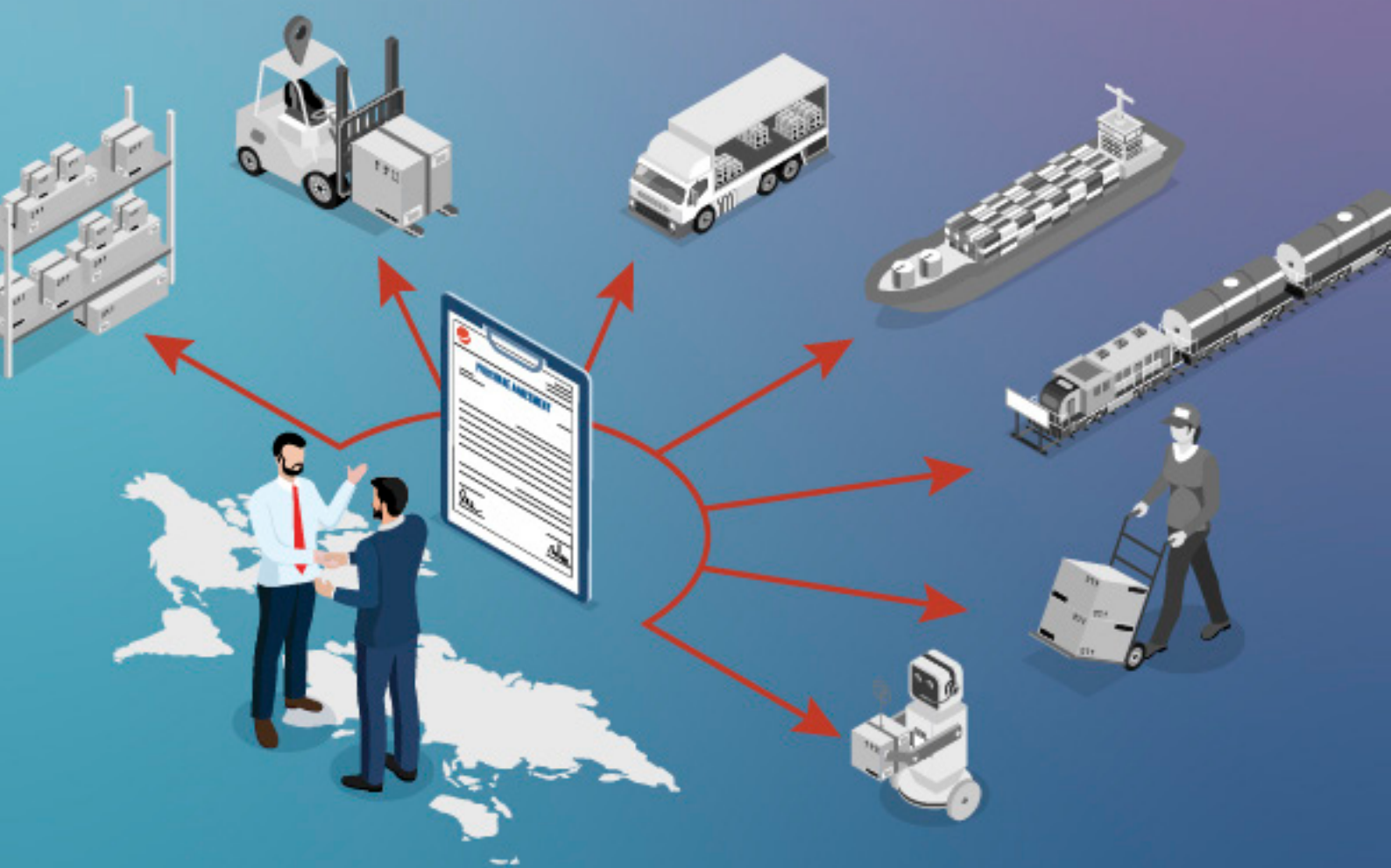




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Significance of Sustainable Supply Chain for Economic Development: A Study on Agricultural Industry

Md. Robeul Islam^{1*}, Md Alomgir Hossain², Mohammad Shofiqul Islam Chowdhury³, Md. Halimuzzaman⁴

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ABSTRACT

With increasing consumer awareness pertaining to safe, traceable and eco-friendly agricultural products, sustainable supply chain innovation has emerged as a popular research topic amongst companies in the global organic agro-business landscape. This study aimed to analyze which sustainable supply chain innovations can positively impact economic, business, environmental and social sustainability performance in this field. This study employs a quantitative methodology with a descriptive-explanatory research design. A structured questionnaire was utilized, and primary data were gathered from 400 randomly selected respondents of organic agro-business. Based on descriptive statistics, Pearson correlation analysis, one-sample t-test and Bayesian one-sample analysis were used to analyzing the collected data. The theoretical basis of this study was the Natural Resource-Based View theory. The research proved that sustainable practices in the supply chain at least partly effort the costs associated with daily operations, can have a decisive impact on profitability of business, export process market competitiveness and operational efficiency. The results also demonstrated favorable environmental and social benefits such as waste reduction, wildlife conservation, improvement of farm income, and consumer health safety. The study suggests that sustainable supply chain innovation is a key driver of global organic agro-business competitiveness, efficiency and sustainability as well as economic development.

INTRODUCTION

Internationally, the demand for natural and herbal products is growing rapidly as consumers are increasingly turning to traditional, plant-based health products. The value of global exports of medicinal and aromatic plants increased 97.8% (about USD 4.18 billion) while the value of global imports grew by 98.1% (up to about USD 4.25 billion), from up to 2010 to the year 2023, respectively (Zamani *et al.*, 2025). The medicinal plant sector is an important interface between agriculture, health, trade and rural livelihoods. In agriculture, it encourages the production of indigenous and drought-tolerant species through the use of advanced technologies to enhance productivity and quality. Medicinal plants provide health-related benefits and therefore depend on safe collection, processing, and compliance with international guidelines. Trades are essential export products for the more than 20 countries (Shariatzadeh *et al.*, 2025). Supply chains play a key role in modern industry because they connect all stages of the value creation process in a seamless network of sourcing, production, processing, transportation and distribution. An efficient supply chain delivers raw materials to the manufacturer, transforms those raw materials into finished goods and distributes them to customers in a timely manner in as coordinated a fashion as possible. Technologies such as IoT, AI, blockchain and automation improve visibility, traceability and decision making across these stages enabling real time monitoring of inventory levels in warehouses, production schedules

and logistics (Zahid *et al.*, 2025). E-traceability is pivotal to the efficient, transparent and sustainable operations of the agri-food supply chain as it enables tracking of products, enhancing product quality and safety. Electronic systems enable compliance with regulations, minimize food waste and monitor environmental and social impact. Major challenges would be cost, data privacy and coordination among participants. Technologies such as blockchain, AI & IoT enhance traceability and building trust with consumers alongside broader access to market making robust supply chain management pivotal towards remaining competitive, resilient and sustainable for the industry (Krstić *et al.*, 2023). The agri-food supply chains have been increasingly global, complex and impossible to control as well thus sustainable supply chain innovation should also be included. It states that it can increase transparency throughout the supply chain from production to distribution and is ethical sourcing while decreasing food fraud and increasing safety as well as developing consumer trust with better digital traceability systems applying technologies such as AI, IoT, blockchain, RFID, NFC and analytical tools. And by enabling quicker recalls, also making cold-chain monitoring and shelf-life prediction better, plus reducing waste through logistics efficiency (Rossi *et al.*, 2025). Sustainable Innovations increase productivity if firms reduce material, energy & or production waste. Innovation enhances export-led firm growth. Sanitation: Eco-innovation has a higher export effect than standard

¹ Department of Management, Uttara Town College, Dhaka, Bangladesh

² Department of Accounting, Uttara Town College, Dhaka, Bangladesh

³ Department of Finance and Banking, Uttara Town College, Dhaka, Bangladesh

⁴ School of Business, Galgotias University, Delhi, India

* Corresponding author's e-mail: t13158@nu.ac.bd

innovation (Caravella *et al.*, 2025). For agricultural businesses, digitalization strengthens supply chains (e.g. smart agriculture), logistics and online sale channels, promotes value-chain upgrading (from production to processing, services and market integration) (Peng *et al.*, 2026). Therefore, the main objective of the study is to examine how sustainable supply chain innovations contribute to economic development and enhance the competitiveness, efficiency, and long-term sustainability of the global organic herbal agro-business industry.

LITERATURE REVIEW

Vasileiou *et al.* (2025) stated that the improvement of sustainable supply chain innovation really supports economic development strongly by yielding practice-based learning menu, transparency, traceability in production and distribution, product safety, and consumer trust in the global organic herbal agro-business industry as well. Digital assistance: Blockchain, Internet of Things, QR code, smart contracts and AI can assist to validate organic source (avoiding food fraud), detect waste and assure standardization (quality monitoring) and verify certification. This augments export competitiveness, enhances brand strengths and market access for herbal businesses leading to a greater value for farmers. Aladaileh *et al.* (2024) also stated that sustainable supply chain innovation is growing exponentially as businesses have to manage greener, more efficient, and resilient supply chains. This indicates that innovation based on digital technology, circular economy, green production, co-operation between different stakeholders and sustainable food systems can help in waste reduction, resource be efficiency improvement, decrease impact environmentally by producing more sustainably with competitive advantage. These results indicate that, for the global organic herbal agro-business sector, sustainable supply chains can provide economic development opportunities through product quality improvement, traceability enhancement, export growth facilitation and increased income generation functionality for smallholder farmers leading to value addition at the brand level and longer lasting market expansion. Wang *et al.* (2024) also expressed that sustainable supply chain innovation is growing exponentially as businesses have to manage greener, more efficient, and resilient supply chains. This indicates that innovation based on digital technology, circular economy, green production, co-operation between different stakeholders and sustainable food systems can help in waste reduction, resource be efficiency improvement, decrease impact environmentally by producing more sustainably with competitive advantage. These results indicate that, for the global organic herbal agro-business sector, sustainable supply chains can provide economic development opportunities through product quality improvement, traceability enhancement, export growth facilitation and increased income generation functionality for smallholder farmers leading to value addition at the brand level and longer lasting market expansion.

(Wang *et al.*, 2024). Meshram *et al.* (2026) claimed that organic agriculture supports the sustainable economic development of rural and farming communities through soil health, biodiversity and environmental sustainability, while also presenting market opportunities with higher value-added for farmers. The growth of the organic sector across regions like Europe, US, India and Malaysia has been fueled by supportive policies, certification systems and innovative supply-chains. On the other hand, organic farms typically yield less than conventional farms but are often more profitable due to selling at a higher price and consumer demand. Support for community-supported agriculture, participatory certification systems, short food supply chains and areas where digital technology such as AI or precision farming increases supply-chain efficiency, market access and the incomes of farmers. (Meshram *et al.*, 2026). Zhu *et al.* (2026) argued that global organic herbal agro-business industry will now have to adopt a more resilient supply chain management. In this case, a Monte Carlo simulation in combination with expert validation (Delphi) was employed, and the authors highlighted that by selecting only one low-cost supplier costs can be minimized but high supply-chain risk is present. It led to higher costs (4.5% approximately) for slightly diversifying suppliers but made more resilient and reduced shortages. Conclusion The findings underscore the enhancement of supply chains, product availability and long-term economic development in the herbal sector based on sustainable sourcing and choices for supplier diversification enhanced by digital technologies (AI, IoT, blockchain) and risk management strategies as supportive measures.

This research is not the first that discussed sustainable supply chain innovation. Vasileiou *et al.* (2025) emphasized how blockchain, IoT, QR codes, smart contracts and AI could be used to enhance traceability, product safety, political trust of consumers and competitiveness in exports. Aladaileh *et al.* (2024) and Wang *et al.* (2024) pointed out that the wide implementation of green production, digital empowerment, circular economy practices and stakeholder cooperations has great potential in resource efficiency by eliminating waste. Meshram *et al.* (2026) on organic agriculture revealed that certification systems, digital tools, short food supply chains, and policies can help facilitate market access and generate farmer incomes. Zhu *et al.* (2026) conducted a survey in Africa regarding supplier diversification and resilient sourcing; he found out that even though diversity may increase the premium, it is associated with reduction of supply chain risk and improving product availability. Nevertheless, these authors did not explore sustainable supply chain innovation from an integrated perspective within the global organic herbal agro-business industry. Earlier studies have primarily focused on disparate issues like digital traceability, green logistics, organic farming, supplier risk or market competitiveness. Hence, the current study will bridge this gap; how sustainable supply chain innovations of a global organic herbal agro-

business industry jointly focuses on business profitability, export growth, market competitiveness, operational efficiency, environmental sustainability, farmer income and consumer health safety economic development.

Based on the background the objectives of the study are:

1. To examine the adoption of sustainable supply chain innovations in the global organic herbal agro-business industry.
2. To assess the impact of sustainable supply chain practices on economic development and business performance within the industry.
3. To evaluate the environmental and social benefits resulting from sustainable supply chain management in organic herbal agro-businesses.
4. To identify the challenges and opportunities associated with implementing sustainable supply chain innovations and propose strategies for improving industry sustainability and competitiveness.

Theoretical Framework

The Natural Resource-Based View (NRBV) Theory, developed by Stuart L (1995) . Hart, upon which this study is based. The theory further explains how organizations have the potential to attain ecological long-term competitive advantage and sustainable economic development through environmentally friendly practices and efficient management of natural resources. Meanwhile, NRBV expands the conventional Resource-Based View focusing on environmental sustainability and eco-innovation and using limited resources responsibly. The theory is particularly pertinent to the global organic herbal agro-business sector as sustainable supply chain innovation is dependent on; environmentally friendly production, ethical sourcing, waste reduction and digital technologies (AI/IoT/blockchain). The introduction of such innovations enhances transparency, traceability and operational efficiency throughout the entire supply chain. Sustainable innovations improve product quality, increase market competitiveness and offer more attractive export opportunities while promoting income generation by the farmers and business. NRBV also reports other social and environmental benefits like the protection of biodiversity, lower pollution levels, or improved rural livelihoods. The theory also acknowledges implementation costs, technological hurdles, and so on. But the sustainability of the organic herbal agro-business sector to be competitive can provide tangible benefits by formulating successful strategic innovation and building partnerships with stakeholders.

MATERIALS AND METHODS

This study used quantitative research to analyze the role of sustainable supply chain innovation on economic development of global Organic herb agro-business industry. The nature of the study required a descriptive and explanatory research design because the aim was to describe sustainable supply chains currently practiced at enterprises and then to explain the impact on business

performance, environmental sustainability, and social development. The investigation was developed with people who were business, professional and supply chain actors in the organic herbal agro-business sector. In this case, 400 people were selected from Dhaka, Bangladesh in order to have relevant and diverse information for the study.

Data was collected using a structured questionnaire designed to measure respondents construct regarding sustainable supply chain innovation, business outcome, sustainability benefit and challenges in implementing sustainable practices. The questionnaire was designed in a simple and systematic manner so that people were able to fill out the correct information based on their exposure / experience. The responses were well categorized and analyzed using appropriate statistical tools following the data collection. The demographic profile of the respondents was presented using descriptive statistics. To investigate associations between relevant study factors, we performed Pearson correlation analysis. Data pertaining to sustainable supply chain practices and their contribution towards the business performance was analyzed here by means of a one-sample t-test or otherwise Bayesian analysis for those outcomes related to sustainability. The Natural Resource-Based View theory informed the overarching theoretical framework of the research.

RESULTS AND DISCUSSIONS

Demographic Information

The demographic of the 400 respondents who were part of this study is presented in Table 1. 52 of the subjects were female and 50 were male (share of males in the sample to be the majority of participants were aged between 26-35 years (40%), possessed a Bachelor's degree (38%) or Master's degree (36%), and had between 1–20 years of work experience (74%). Such characteristics lead to a more diverse and richer sample of respondents, making it suitable for analysis of sustainable supply chain innovation within the global organic herbal agro-business industry.

The study included 400 respondents. Sample describes 203 (50.75%) male and 197 (49.25%) female respondents provides a nearly balanced gender distribution. The age group was the 26-35 years in which the most participated to answer with 160 respondents (40.0%) and aged 36-45 years with 103 respondents (25.8%). The smallest group was those 55 years and above, represented by only 18 respondents (4.5%); aged 46–55 years represented the next largest group with a total of 48 respondents (12%). 71 participants were aged between the age range of 18–25 years old (17.8%). As for qualification, 152 (38%) of respondents had a Bachelor's which was also the largest educational category. This included 144 (36 percent) respondents held a Master's degree, 71 (17.8 percent) respondents with a PhD and 33 (8.3%) diploma holders. For work experience, 150 respondents (37.5%) were in the range of 11–20 years, while 146 responders

Table 1: Demographic Information

		Frequency	Percentage
Gender	Female	197	49.25%
	Male	203	50.75%
Age	18-25 years	71	17.8%
	26-35 years	160	40%
	36-45 years	103	25.8%
	46-55 years	48	12%
	55+ years	18	4.5%
Education	Bachelor	152	38%
	Diploma	33	8.3%
	Master	144	36%
	PhD	71	17.8%
Experience Years	1-10 years	146	36.5%
	11-20 years	150	37.5%
	21-30 years	55	13.75%
	30+ years	49	12.25%

(36.5%) were between 1 and 10 years. Moreover, 55 respondents (13.75%) had more than 21–30 years of experience and 49 respondents (12.25%) had above 30 years of experience in their respective fields. These results suggest that respondents had relatively extensive professional experience, with nearly three in four having 1–20 years of work experience.

Adoption of Sustainable Supply Chain Innovations

The Pearson correlation analysis results among four pertinent types of sustainable supply chain innovation, AI, blockchain, IoT and green logistics is depicted using Table 2. Results show practically non-existent correlations between variables (correlations 0.05). This indicates that these innovation practices drive within the global organic

Table 2: Correlations among Innovation Adoption Variables

		Adoption AI	Blockchain Traceability	IoT Integration	Green Logistics
Adoption AI	Pearson Correlation	1	-.003	-.062	-.003
	Sig. (2-tailed)		.950	.215	.957
	N	400	400	400	400
Blockchain Traceability	Pearson Correlation	-.003	1	.046	-.073
	Sig. (2-tailed)	.950		.362	.143
	N	400	400	400	400
IoT Integration	Pearson Correlation	-.062	.046	1	-.011
	Sig. (2-tailed)	.215	.362		.824
	N	400	400	400	400
Green Logistics	Pearson Correlation	-.003	-.073	-.011	1
	Sig. (2-tailed)	.957	.143	.824	
	N	400	400	400	400

herbal agro-business industry relatively separate to each other.

Correlation analysis was performed to analyze the relationship between AI adoption, blockchain traceability, IoT integration and green logistics practices. The outcomes demonstrated a completely negligible negative association between AI Adoption, Blockchain traceability ($r = -0.003$, $p = 0.950$), IoT Incorporation ($r = -0.062$, $p = 0.215$), and green logistics ($r = -0.003$, $p = 0.957$). Blockchain traceability, likewise showed a very weak positive correlation with IoT integration ($r = 0.046$, $p = 0.362$; $v = -0.073$) and was also revealed as having a low negative association with green logistics. Additionally, the relationship between IoT integration and green logistics was either almost zero ($r = -0.011$), but not significant ($p = 0.824$). In conclusion, since all p-values were above 0.05 none of the relations reach statistical significance and hence these sustainable supply chain innovations are not jointly taken by firms in the study. This is not what previous studies have found. For example, Vasileiou *et al.* (2025), Aladaileh *et al.* (2024), and Wang *et al.* (2024) that AI, blockchain, IoT and green logistics are essentially interconnected to promote traceability transparency

operational efficiency sustainability and competitive ability. Similarly, Meshram *et al.* (2026) focused on the impact of digital technologies helping companies to improve their supply chain performance and access markets. Thus, whereas the literature illustrates a strong interrelation between sustainable supply chain innovations to demonstrate synergies in achieving sustainability objectives, this research finding highlight a joint adoption of the technologies which occurs as an isolated application instead through an integrated sustainability framework.

Supply Chain Practices on Economic Development and Business Performance

Table 3 shows one-sample t-test for the impact of sustainable supply chain practices on key business performance outcomes. Higher than one means scores with corresponding p-values < 0.001 reveal that sustainable supply chain innovations significantly contribute towards organizational and economic performance within the global organic herbal agro-business industry through business profitability, export growth market-competitiveness and operational efficiency.

Table 3: One-Sample t-Test Analysis of Business Performance Indicators

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Business Profitability	42.409	399	.000	3.088	2.94	3.23
Export Growth	42.599	399	.000	2.945	2.81	3.08
Market Competitiveness	43.728	399	.000	3.040	2.90	3.18
Operational Efficiency	43.794	399	.000	2.990	2.86	3.12

The One-Sample t-test indicates that respondents believe sustainable supply chain innovations improved business performance. The mean difference of 3.088 ($t = 42.409$, $p < 0.001$) for Business profitability showed strong agreement respondents using Sustainable Supply Chain practices increase profits. Likewise, export growth reported a large positive effect with a mean difference of 2.945 ($t = 42.599$, $p < 0.001$). The mean difference for market competitiveness was 3.040 ($t = 43.728$, $p < 0.001$); for operational efficiency, it was 2.990 ($t = 43.794$, $p < 0.001$). The 95% CI for all variables were positive, with none crossing zero, thus confirming the statistical significance of these findings.

These findings are consistent with the literature review. Previous studies found that sustainable supply chain innovations, including AI, blockchain, IoT, and green

logistics, improve operational efficiency, product quality, transparency, and market access, ultimately enhance profitability and competitiveness. Vasileiou *et al.* (2025) reported that digital technologies strengthen traceability, consumer trust, and export competitiveness, while Aladaileh *et al.* (2024) and Wang *et al.* (2024) emphasized their role in improving resource efficiency and competitive advantage. Similarly, Meshram *et al.* (2026) found that digital innovations increase supply chain efficiency and market opportunities. Therefore, the current findings support the existing literature by demonstrating that sustainable supply chain practices significantly contribute to business profitability, export growth, market competitiveness, and operational efficiency in the global organic herbal agro-business industry.

Environmental and Social Benefits Resulting from Sustainable Supply Chain Management

Analysis of Bayesian posterior distribution for key sustainability and social impact indicators (Table 4) The output includes estimates of posterior mean and 95% credible intervals for waste reduction, biodiversity

conservation, and improvement of farmer income and consumer health safety based on diffuse priors for both the mean and variance. These results suggest that sustainable supply chain innovations are effective in contributing positively to individual indicators along with economics.

Table 4: Bayesian One-Sample Analysis of Sustainability and Social Impact Outcome

	N	Posterior			95% Credible Interval	
		Mode	Mean	Variance	Lower Bound	Upper Bound
Waste Reduction	400	3.08	3.08	.005	2.94	3.22
Biodiversity Conservation	400	3.01	3.01	.005	2.87	3.15
Farmer Income Improvement	400	2.93	2.93	.005	2.79	3.06
Consumer Health Safety	400	2.83	2.83	.005	2.69	2.97
Prior on Variance: Diffuse. Prior on Mean: Diffuse.						

The Bayesian posterior distribution analysis shows that respondents believe sustainable supply chain innovations have been socially and environmentally impactful in the global organic herbal agro-business industry. The highest posterior mean at 3.08 (95% credible interval: 2.94–3.22) for the theme Waste reduction indicated a strong agreement that sustainable practices help to minimize waste, Sustainable supply chain management had a posterior mean of 3.01 (95% credible interval: 2.87–3.15) for biodiversity conservation, meaning that respondents believed it was environmentally beneficial The posterior mean was 2.93 (95% credible interval: 2.79–3.06) for improvement in farmer income and 2.83 (95% credible interval: 2.69–2.97) for consumer health safety, respectively translated to a benefit level of qualitative farming system stories as higher than average across the other dimensions of stakeholder benefits . Narrow credible intervals and low variance (0.005) speaks to the consistency of respondents in perceiving these benefits. These observations corroborate the literature review. In earlier studies, it has been found that sustainable supply chain innovations favour waste reduction, environmental sustainability of a product, conservation of biodiversity and benefits farmers with better livelihoods. Vasileiou *et al.* Digital traceability systems were identified as an enabler enhancing product safety and consumer trust by Kim *et al.* (2025). On the other hand, Aladaileh *et al.* (2024) and Wang *et al.* (2024) focused on resource efficiency and lower environmental impacts. Similarly, Meshram *et al.* Sustainable and organic agricultural practices are (2026) For example, sustainable and ecological agriculture practices resulted in better income to farmers, biodiversity conservation, habitat reconstruction and rural economic development. The material findings therefore corroborate

with the current literature by providing evidence that sustainable supply chain innovations play an important part in waste minimization, environmental conservation and increasing social welfare as well as economic viability of global organic herbal agro-business industry.

Challenges and Opportunities Associated with Implementing Sustainable Supply Chain Innovations

Table 5: Pearson correlation analysis among major barriers and support factors related to high implementation cost, technological barriers, stakeholder collaboration, sustainable supply chain practice as well as government policy. These findings reveal very weak and statistically insignificant relations between the variables ($p > 0.05$) that illustrate that these factors act in isolation within global organic herbal agro-business industry.

Correlation analysis of sustainability-related internal/policy factors: The relationships between high implementation cost, technological barriers, stakeholder collaboration and government policy support are examined. The results indicated extremely weak negative correlations between the high implementation cost and both the technological barriers ($r = -0.015$, $p = 0.766$) and the stakeholder collaboration ($r = -0.088$, $p = 0.080$), as well as a very weak positive correlation with government policy support ($r = 0.038$, $p = 0.443$). In a parallel manner, technological barriers were found with minimal negative associations with stakeholder collaboration ($r = -0.029$, $p = 0.567$) and government policy support ($r = -0.016$, $p = 0.754$). Also, stakeholder collaboration was very weakly positively correlated with government policy support ($r = 0.013$, $p = 0.788$). Because none of the 7 p -values were smaller than 0.05, we interpreted that for “these challenges and support mechanism, work independently

Table 5: Correlation Analysis of Implementation Challenges and Support Factors

		High Implementation Cost	Technological Barriers	Stakeholder Collaboration	Government Policy Support
High Implementation Cost	Pearson Correlation	1	-.015	-.088	.038
	Sig. (2-tailed)		.766	.080	.443
	N	400	400	400	400
Technological Barriers	Pearson Correlation	-.015	1	-.029	-.016
	Sig. (2-tailed)	.766		.567	.754
	N	400	400	400	400
Stakeholder Collaboration	Pearson Correlation	-.088	-.029	1	.013
	Sig. (2-tailed)	.080	.567		.788
	N	400	400	400	400
Government Policy Support	Pearson Correlation	.038	-.016	.013	1
	Sig. (2-tailed)	.443	.754	.788	
	N	400	400	400	400

rather than being closely associated with one another”. The following findings are only partially in line with the literature review. Recent literature related to the successful adoption of eco-innovation / sustainable supply chain innovations indicates that implementation cost, technological challenges and stakeholder cooperation as well as policy support are interrelated. Aladaileh *et al.* (2024) and Wang *et al.* (2024) highlighted the role of collaboration and support along with essential policies to overcome sustainability challenges and argued that NRBV theory at first glance seems to readily argue implementation costs and technology can be key barriers to innovation. The current study found no sufficient relationships between these factors, meaning that the current study organizations met their respective challenges and support factors independently of each other rather than reinforcing one another.

Findings

The core findings are stated below:

1. The demographic results suggest the study was performed on a balanced and experienced sample of demographic. Notably, most participants were educated and had relevant work experience, which helps to enhance the validity of responses obtained on sustainable supply chain innovation.
2. The correlations results reveal the weak connection of AI adoption, blockchain traceability, IoT integration and green logistics. Instead, this implies that firms are doing fragmented supply chain innovations for sustainability instead of digitally integrated digital

sustainability systems.

3. The business performance results provide empirical evidence that sustainable supply chain practices have positive effects on profitability, export growth, market competitiveness and operational efficiency. This growing business perspective makes global environmental sustainability practices as a driver for organizational and economic development dimensions.

4. The environmental and social results indicate that sustainable supply chain management promotes waste reduction, biodiversity conservation, farmer income increase, and consumer health safety. Hence, the previous things help not only businesses but also social and environmental value.

5. Cost, technological challenges, stakeholder collaboration and government policy support have not shown a strong correlation within implementation findings. This means that with investments, technical support, partnerships and action at the policy level, each challenge can be addressed independently.

Recommendations

Based on the findings the recommendations are given below:

1. Rather than applying artificial intelligence, blockchain and IoT and green logistics separately, firms in the global organic herbal agro-business industry should adopt an integrated digital supply chain system to solve its arguments.
2. Businesses should increase investments in sustainable supply chains underpinned by evidence showing

positive effects on profitability, export growth, market competitiveness and operational efficiency

3. Improve traceability and certification systems to enhance product transparency, consumer confidence, export quality and international market acceptance; organic herbal agro-businesses should follow these measures.

4. Implementation challenges appear to operate independently, and distinct types of support can help reduce costs, provide training for new technologies or creative social arrangements, stimulate collaboration among industries and business stakeholders, as well as industry policy development.

Limitations

This study has some limitations. The study is based on survey responses from just 400 respondents, so the results might not completely reflect the global organic herbal agro-business industry. Second, this research relies heavily on survey reports and could be influenced by responder bias or subjective views. The third is that through the analysis of effective sustainable supply chain innovations including Artificial Intelligence, Blockchain technology, Internet-of-Things (IoT) and Green Logistics but does not truly analyze firm technical capacity on technology implementation. Fourth, this study is cross-sectional and therefore cannot disambiguate the snapshot of one time period with long-term changes or a cause-effect relationship. Fifth, this study is primarily centered on supply chain innovation, socio-economic performance, and sustainability outcomes leaving the examination of external factors like economic instability and climate change as well as international trade barriers and regulatory discrepancies within a region uninvestigated. Thus, future studies should be conducted with longitudinal data, larger geographical area analysis, and more industry level variables to understand the process of sustainable supply chain innovation in organic herbal agro-business industry.

CONCLUSION

This study aims to explore the shared role of sustainable supply chain innovation in facilitating economic growth, business competitiveness and sustainability across organic herbal agro-business sector globally. The findings revealed that sustainable supply chain practices impact positively on business profitability, export growth market competition and operational efficiency. The findings imply sustainability is not only an environmental duty but also a significant strategy for enhancing the firm performances and promoting economic transformation on organic herbal industries. The research study also highlighted that sustainable supply chain management gives valuable environmental and social dividends waste reduction, conservation of biodiversity, enhancement of farmer income and improved consumer health safety. These results point to the potential for sustainable innovation to generate value across multiple stakeholders, including firms, farmers, consumers and environment.

As such, engaging in sustainable practices of the supply chain can contribute to economic development as well as harmonize long-run ecological balance in the global organic herbal agro-business industry. At the same time, the findings also show that there is still fragmentation in the adoption of technologies such as AI, Blockchain, IoT and green logistics. Likewise, the implementation aspects faced like cost barriers and technology are found to work separately from stakeholder engagement and government policy support. This suggests a need for a more coherent yet interrelated approach to sustainable supply chain innovation. Firms should deliberate on an amalgamation of digital technologies, enhance traceability systems, bolster stakeholder partnerships and get stronger policy and institutional supports. The research revealed that sustainable supply chain innovation is a strong metric towards enhancing competitiveness, efficiency, sustainability and economic development of the global organic herbal agro-business industry. For businesses to provide benefits over the long term, they will need to go beyond siloed practices and adopt an integrated sustainability framework that fuses digital innovation, environmental accountability, social betterment, and business strategy in a single vision. Future research should employ broader geographical coverage, longitudinal data analysis and more industries level variables in order to investigate the long-term effects of sustainable supply chain innovation in this emerging sector.

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