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Green Supply Chain Management Practices in Manufacturing-Linked Agribusiness Enterprises

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Abstract - Sustainability has become a critical consideration in modern agribusiness, particularly in enterprises linked to manufacturing processes. Green Supply Chain Management (GSCM) integrates environmental thinking into supply chain operations, including product design, material sourcing, manufacturing processes, and distribution, with the aim of reducing environmental impact while enhancing operational efficiency. This conceptual review examines the adoption of GSCM practices in manufacturing-linked agribusiness enterprises, analysing their role in promoting environmental sustainability, operational efficiency, and competitive advantage. Drawing on existing literature, the paper categorizes key practices such as eco-design, green procurement, waste management, energy-efficient production, and reverse logistics. The study highlights the challenges faced by agribusinesses in implementing GSCM, including high initial costs, technological constraints, and lack of regulatory support. Finally, the review emphasizes the sustainability implications of GSCM adoption, demonstrating that these practices not only contribute to environmental stewardship but also enhance economic performance and long-term resilience in agribusiness supply chains.

Key Words: Green Supply Chain Management; Agribusiness; Manufacturing-linked enterprises; Sustainability; Eco-efficiency; Reverse logistics

1. INTRODUCTION

Global concerns about environmental degradation, climate change, and resource scarcity have forced organizations to rethink traditional supply chain models. In agribusiness, where manufacturing processes such as food processing, packaging, and distribution are closely integrated with primary agricultural production, sustainability challenges are particularly pronounced. Manufacturing-linked agribusiness enterprises are faced with environmental issues such as excessive energy consumption, waste generation, water usage, and carbon emissions. Green Supply Chain Management (GSCM) offers a strategic framework to address these challenges by incorporating environmental considerations into supply chain operations. By adopting GSCM, agribusinesses can reduce their ecological footprint, comply with environmental regulations, meet consumer demand for sustainable products, and enhance operational efficiency. This paper presents a conceptual review of GSCM practices in manufacturing-linked agribusiness enterprises, exploring their implementation, benefits, challenges, and sustainability implications

2. Objectives

The primary objectives of this study are:

1. To examine the concept and significance of Green Supply Chain Management in manufacturing-linked agribusiness enterprises.
2. To review and categorize key GSCM practices adopted in agribusiness supply chains.
3. To analyze the operational, environmental, and economic benefits of GSCM adoption.
4. To identify challenges and barriers to the effective implementation of GSCM practices.
5. To explore the sustainability implications and long-term impact of GSCM on agribusiness enterprises.

3. Research Methodology

This study adopts a conceptual and review-based methodology, relying entirely on secondary data to synthesize insights into GSCM practices in manufacturing-linked agribusiness. The review involved a systematic collection of data from peer-reviewed journals, books,

government and industry reports, and publications from international organizations such as FAO, UNIDO, and the World Bank. Keywords used for literature search included *Green Supply Chain Management*, *sustainable agribusiness*, *manufacturing-linked agribusiness*, *eco-efficiency*, *reverse logistics*, and *environmental supply chain practices*. The collected literature was analyzed using qualitative content analysis, with findings organized thematically to highlight GSCM practices, benefits, challenges, and sustainability implications. This approach provides a comprehensive understanding of the conceptual frameworks and empirical evidence in the field, suitable for guiding future research and policy recommendations.

Literature review

Several studies have highlighted the growing importance of GSCM in agribusiness. Sarkis et al. (2011) emphasize that GSCM integrates environmental considerations into all supply chain activities, from procurement to end-of-life product management, leading to enhanced environmental performance and competitive advantage. Srivastava (2007) notes that the adoption of green practices such as eco-design, green procurement, and waste minimization can significantly reduce environmental impact and improve resource efficiency in manufacturing-linked agribusinesses.

Recent research by Zhu et al. (2019) indicates that agribusinesses implementing GSCM practices achieve not only environmental benefits but also operational and economic advantages, including cost reduction, improved product quality, and increased market competitiveness. However, studies by Govindan et al. (2020) highlight barriers to GSCM adoption, such as high initial investment, lack of technical expertise, and weak regulatory enforcement. Other authors, such as Awasthi and Chauhan (2018), have stressed the role of stakeholder collaboration, including suppliers, distributors, and policymakers, in successfully implementing green practices in agribusiness supply chains.

The literature consistently demonstrates that GSCM practices can enhance the sustainability performance of agribusiness enterprises, while also contributing to long-term economic resilience and compliance with environmental regulations.

Green Supply Chain Management Practices in Agribusiness

Key GSCM practices in manufacturing-linked agribusiness can be categorized as follows:

1. Eco-Design: Designing products with minimal environmental impact, using biodegradable or recyclable materials, and optimizing packaging.
2. Green Procurement: Sourcing raw materials from environmentally responsible suppliers and prioritizing sustainable inputs.
3. Energy-Efficient Manufacturing: Implementing energy-saving technologies, renewable energy sources, and process optimization.
4. Waste Management and Recycling: Reducing waste generation, promoting recycling, and managing by-products efficiently.
5. Reverse Logistics: Establishing systems for product return, recycling, and disposal to minimize environmental impact.
6. Environmental Performance Monitoring: Using metrics and reporting frameworks to track ecological impact and resource usage.

These practices collectively enable agribusiness enterprises to reduce their ecological footprint, improve supply chain efficiency, and align operations with sustainable development goals.

Sustainability Implications

The adoption of GSCM practices in manufacturing-linked agribusiness has several sustainability implications:

- Environmental Sustainability: Reduces carbon emissions, energy consumption, and waste generation, contributing to climate change mitigation.
- Economic Sustainability: Enhances operational efficiency, reduces costs, and improves profitability in the long term.
- Social Sustainability: Promotes safe and responsible practices for workers, improves community relations, and aligns with consumer expectations for environmentally friendly products.
- Regulatory Compliance: Facilitates adherence to environmental regulations and international sustainability standards, reducing legal risks.

Overall, GSCM practices foster a balance between ecological responsibility, economic performance, and social well-being, reinforcing the strategic importance of sustainable supply chain management in agribusiness.

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