Sinergi International Journal of Management and Business
E-ISSN: 2988-6252
Volume. 2, Issue 4, November 2024
Page No. 198-210

Reverse Logistics Analysis of Chips Products Towards Green Supply Chain Management in MSMEs

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Received : September 8, 2024
Accepted : September 30, 2024
Published : November 30, 2024

Citation: Meilenda, P., Syarif, A. (2024). Reverse Logistics Analysis of Chips Products Towards Green Supply Chain Management in MSMEs. Sinergi International Journal of Management and Business, 2(4), 198-210.

ABSTRACT: The food industry has the nature of perishable goods, so there is always the possibility of products being returned to the manufacturer, namely reverse logistics. Reverse logistics include collection, sorting, recycling, redistribution, and disposal. One of the main challenges MSMEs face is accumulating unsold or damaged products. Chip products not sold out in the stores where they are kept often have to be recalled, resulting in a buildup of products in the warehouse. This study aims to analyze the practice of reverse logistics of banana chip products in one MSME called A3 and evaluate the extent to which they are based on Green Supply Chain Management (GSCM). The research method used is descriptive qualitative; data collection is done through interviews, direct observation, and analysis of related documents. The results showed that A3 had implemented reverse logistics practices by considering environmental aspects such as production waste management. However, some areas can still be improved further to maximize the contribution to Green Supply Chain Management. The implication of this study is to provide a deeper understanding of reverse logistics practices in the context of MSMEs and provide recommendations for other MSMEs to improve the conformity of their practices with the concept of Green Supply Chain Management.

Keywords: Reverse Logistics, Banana Chips, Green Supply Chain Management, MSMEs, Sustainability.

INTRODUCTION

The industry faces solid environmental issues such as natural resource depletion, climate change, waste management, increasingly stringent environmental regulations, and consumer demand for environmentally friendly products (Amaranti et al., 2017). With the development of industry, increasing consumer concern for the environment, and problems with the concept of environmentally sound industry, the industry must adopt Green Industries in every business process (Lima et al., 2022; Pushpamali et al., 2021; Zatrochová et al., 2021). This concept then developed into green supply chain management (GSCM) (Fortuna, 2014 in Chalarhena & Hendayani, 2022). To improve competitiveness and reduce environmental impacts, green supply chain management (GSCM) integrates environmentally friendly practices into the supply chain (Puglieri & Saavedra, 2021).

Green supply chain management covers all phases in the product life cycle, from design, manufacture, and distribution to the use of the product by the end user and its disposal at the end of the product life cycle (borage and Bansod, 2007 (Fahim & Mahadi, 2022; Gautam et al., 2021; Sarkis et al., 2021; Xie et al., 2022). Environmental management principles are applied in all aspects of the supply chain, such as design, manufacturing procurement, assembly, packaging, logistics, and distribution, in GSCM practices (Chiu et al., 2017; Masudin et al., 2019; Wang et al., 2018). However, in developing countries, especially in terms of small and medium-sized enterprises, GSCM practices have yet to be widely implemented. The rate of GSCM implementation is lower in small-scale enterprises than in large and medium-sized enterprises (Brilliana et al., 2020).

The process of withdrawing products from end users to increase value and proper disposal is known as Reverse Logistics.Reverse Logistics include collection, sorting, recycling, redistribution, and disposal (Heriyanto, et al., 2019). Reverse Logistics reflects a strategic concept in modern supply chain management that integrates collecting, processing, and returning unsold or unused products into the production or distribution cycle (Ermes & Niemann, 2023; Gu et al., 2021a, 2021b).

The food industry requires reverse logistics to deliver high-quality and safe food to customers without harming the environment and people (Brindley & Oxborrow, 2014; Gao et al., 2021; Jell-Ojobor & Raha, 2022; Zhang et al., 2022). Volatile food markets, shorter product life cycles, returns of damaged products, non-compliance with good manufacturing practices, poor maintenance of food processing plants and equipment, and non-compliance with standard operating procedures (SOPs) and environmental laws are some of the main reasons why the food industry needs reverse logistics (Son et al., 2022). Another critical issue in the food industry is the packaging material waste from foodstuffs that manufacturers must deal with to fulfill their obligations to society and the environment. Therefore, food companies need to have a structured mechanism that can handle product recalls (returning products to the manufacturer), product waste, and packaging materials (Waseem, 2020).

The food industry has the nature of perishable goods, so there is always the possibility of products being returned to the manufacturer, i.e., Food Recall. Another area of concern for food companies is food waste, which must be handled efficiently. Another critical issue in the food industry is the waste of packaging materials from food that manufacturers must handle to fulfill their obligations to society and the environment. Therefore, food companies need a structured mechanism to handle product recalls(returning products to the manufacturer), waste, and packaging materials (Waseem, 2020).

Large and medium-sized companies are not the only ones contributing to environmental improvement. Many small-scale industries depend on government subsidies to operate, which is one of the causes of industrial pollution. They often ignore environmental regulations and release highly toxic gases into the atmosphere. Environmental management principles are applied in all aspects of the supply chain, such as design, manufacturing procurement, assembly, packaging, logistics, and distribution, in GSCM practices. However, GSCM practices have yet to be widely applied in developing countries and small and medium-sized enterprises. The rate of GSCM implementation is lower in small-scale enterprises than in large and medium-sized enterprises (Brilliana et al., 2020).

The snack food industry is a growing sector in Indonesia. Popular snack products include chips, especially banana chips. A3 is one of the most widely recognized MSME brands, producing

banana chips with various flavors. However, as in any other food industry, waste and supply chain management are significant concerns to maintaining environmental sustainability.

One of the main challenges faced by A3 is accumulating unsold or damaged products. Chips not sold out in the stores where they are kept often have to be recalled, resulting in a buildup of products in the warehouse. In addition, damaged products also increase the amount of waste that needs to be managed.

While many studies highlight the application of green supply chain management (GSCM) in various industries, particularly in the large manufacturing sector, research focusing on applying GSCM and reverse logistics in the micro and small-scale snack food industry is limited. Moreover, there needs to be in-depth studies that explore how small businesses such as A3 manage unsold or damaged products through reverse logistics practices and how this contributes to the achievement of GSCM.

This study aims to explore and analyze the implementation of reverse logistics practices in MSME A3, particularly in handling unsold or damaged banana chip products, and how these practices contribute to the implementation of green supply chain management. In addition, this study also seeks to identify the challenges faced by MSME A3 in managing a sustainable supply chain and provide recommendations to improve business efficiency and sustainability.

Some preliminary studies show that GSCM implementation in large industries has been done quite a lot. However, the implementation at the scale of MSMEs still faces various obstacles, such as limited resources, knowledge, and technology. Examples of related research, such as those conducted (by Zhou et al., 2023), revealed that MSMEs need to pay more attention to reverse logistics due to additional costs and lack of awareness of environmental impacts. Therefore, this study will fill the gap by focusing on implementing GSCM through reverse logistics in the context of the micro-scale snack food industry, which is expected to provide new insights for developing sustainable practices in this sector.

Definition of Reverse Logistics

According to (Sharma, 2019), Reverse logistics is an essential component of the supply chain that includes a series of actions that occur after the sale of a product to restore the value of the product and end its life cycle. Reverse logistics is a process that includes all the actions of effective planning, implementation, and control, cost-efficient flow of raw materials, inventory processes, final results, and related information from the point of consumption to the point of origin. Reverse logistics also includes managing damage-related returns, recycling, recalls, seasonal inventory, and restocking (Zsakay, 2023).

Forward and reverse supply chains are the two main categories associated with any distribution (Noviardy et al., 2019). According to Rogers and Tibben Lembke in 1999, Reverse logistics is a new type of logistics that differs from conventional logistics in that it returns goods from the retailer or customer to the manufacturer. The planning and execution of the flow of raw materials, work-in-process, finished goods, and related information from the point of consumption to the point of origin to create value or cost-effective disposal of products or goods is known as reverse logistics (Febika, 2017).

Reverse Logistics Concept

The 5 R's concept in reverse logistics includes Return, Repairs, Repackaging, and Recycling. Here are the details:

1. Returns

   This process is the first step in the reverse logistics flow. There are many reasons for product returns, including defects, damage, seasonality, failure to meet expectations, or excess inventory. An efficient returns process includes receiving, inspection, product testing, and return verification and tracking systems.

2. Repairs

   Not all returned products are directed to landfills. If the damage is mild, the product may be repaired, refurbished, or returned to stock. This practice is becoming more common as manufacturers increasingly realize the importance of reusing materials from returned goods.

3. Repackaging

   Products returned and deemed "no problem" will usually be repackaged and returned to stock as soon as possible. In addition, products with minor defects may be repaired, refurbished, and repackaged for resale.

4. Recycling

   Recycling focuses on components, parts, or products that are returned to encourage sustainable practices across all industries. For example, manufacturers often engage external recycling companies for electronic products to find safe, cost-effective, and environmentally friendly disposal options.

5. Reselling

   This process involves selling products that are returned, repaired, or repackaged. This practice generates revenue, reduces waste, and contributes to the sustainability and operational efficiency of the company.

Definition of Green Supply Chain Management

Srivastava (2007) defines green supply chain management as integrating environmental elements into supply chain management, such as product design, raw material selection, manufacturing processes, delivery of finished products to customers, and end-of-life product management. According to Dheeraj (2012), one of the innovations in environmentally-based supply chain strategies is green supply chain management (GSCM), which includes actions such as reduction, recycling, reuse, and material substitution.

On the other hand, Toke (2010) argues that GSCM is the integration of environmental perspectives into supply chain management, which includes product design, selection and selection of raw materials, manufacturing processes, delivery of final products to consumers, and management of end-of-life products (bonus university, 2020). The main objective of GSCM is to eliminate or minimize the negative impacts of operational activities, such as the extraction and acquisition of raw materials and the use or disposal of products(Chengedzai Mafini, 2018).

Green Supply Chain Management Concept

The 3Rs in the procurement process are activities that minimize the use of plastic and paper

materials during the purchasing or procurement process. The 3R's concept (reduce, reuse, recycle) is one of the GSCM sustainability concepts. Reduce, which is reducing waste or eliminating unnecessary or inefficient use of resources. Reuse finding other uses for waste, such as turning it into other products. Recycle, which means turning waste into something new. Items such as cans, glass, paper, plastic, and cardboard can be recycled and turned into new items (Pramesti et al., 2020).

METHOD

Object of Research

The object of this study is the focus that underlies the selection, management, and interpretation of data and information related to the study's objectives. According to Spradley, the social situation is the object of qualitative research, which consists of three components: place, actors, and activities. The object of this research is A3, MSMEs that produce Chips as their Products, with the business owner as the primary source.

Research Design

According to Arikunto (2010), the research design is the operational engineering of how the research will be carried out to minimize errors. Based on Andani (2019). This research is designed as qualitative descriptive research. This study aims to provide a systematic, factual, and accurate description of the data in the field about the reverse logistics of chip products against green supply chain management (GSCM).

Data Source

This research uses primary and secondary data. Primary data is collected directly from the primary source through interviews, surveys, and experiments. Meanwhile, secondary data is obtained through library research from books, journals, and articles.

Data Collection Methods

In this study, three data collection methods were used, namely:

Observation: In this study, researchers will conduct participatory observation, which means that researchers will be directly involved in every production process.

Interviews: The interview method used is a free-lead interview, which means that the interview is conducted by asking free questions while still following established interview standards. During the interview, questions will evolve.

Documentation: Documentation is used to collect data and information in the form of books, archives, documents, written figures, and pictures, as well as reports and information that can support the research.

Data Analysis

Data analysis systematically searches and compiles data through observation, interviews, and

documentation. This process includes organizing data, selecting what is essential and what needs to be studied, and making conclusions that are easy to understand. The data in this study is described descriptively and qualitatively to provide an overview and explanation of the actual situation. This research uses the Miles and Huberman (1984) data analysis model, which includes data reduction, data display, and conclusion drawing/verification (Sugiyono, 2021).

Operational variables

Table 1 Operational Variables

Variables	Definition	Dimensions	Indicator
Reverse Logistics	Reverse Logistics is the process of planning, implementing, and controlling the flow of raw materials, semi-finished goods, and finished products from the point of consumption to the point of origin to recover value or proper disposal. Rogers and Tibben Lembke(1999).	Planning	a. Raw material utilization planning b. Types of raw materials used
		Collection	a. Withdrawal of unsold products b. Sorting of withdrawn products
		Responsible disposal	Management of products that cannot be reused
Green Supply Chain Management	GSCM is defined as the integration of environmental aspects into supply chain management, including product design, raw material selection, manufacturing processes, delivery of finished products to customers, and end-of-life management Srivastava (2007).	Sustainable Procurement	Selecting suppliers that adhere to environmentally friendly practices
		Product Design	Eco design packaging
		Green Manufacturing	Reducing waste and emissions during the production process with environmentally friendly practices.

RESULT AND DISCUSSION

Business Profile

A3 is a home industry that focuses on producing banana chips; this business is located on Kemang Street, Wonosari Village, Prabumulih City, and was established in 2020. Since its inception, A3 has successfully distributed banana chips to various shops around the area. Product distribution is

carried out every two weeks to ensure the exchange or replacement of old products with new ones. However, in practice, there are often product returns from stores because the returned products are damaged or smelly, even though the expiry date is still quite long. This causes a buildup of returned products in the production warehouse, which in turn causes losses for the business.

Research limitations:
Several limitations in this study need to be considered. First, this research is limited to observations and analysis conducted in one MSME, A3. Therefore, the results and conclusions may differ from those of other MSMEs in the same sector. Second, the data obtained related to product returns and waste management at A3 relied heavily on interviews, which may have limitations in terms of completeness and accuracy. This study must also include an in-depth analysis of external factors, such as market conditions or government policies, that may affect reverse logistics and green supply chain management practices at A3. These factors may limit the generalizability of the research results to a broader or different context.

Reverse Logistics Practice of A3

1) Raw Material Planning

The researchers asked the A3 business owner questions about the planning of raw materials used, and he stated that the production of banana chips in UMKM A3 is adjusted to the level of product sales. However, production is usually carried out once every two weeks, coinciding with the product checking schedule at supplier stores. Each production A3 uses one large banana bunch or two small banana bunches. One bunch of bananas can produce around 20-25 packets of banana chips, each weighing 120 grams.

2) Processing of Unsold Products

Damaged or expired products are withdrawn and collected at the production site for sorting.

3) Responsible Disposal

In this section, researchers can conclude that A3 has tried to manage unsold products responsibly by withdrawing damaged products to ensure that products that do not meet standards do not remain on the market— to distribute products that are still suitable for consumption as a form of social care and to reduce waste, as well as the final disposal of products by burning to ensure that irresponsible parties do not misuse product waste.

Green Supply Chain Management Practices in A3

1) Sustainable Procurement

In this case, A3 does not have an official supplier or subscription banana plantation. Due to the need for more banana farmers in their area, they have to look for other alternatives by relying on available private plantations.

2) Design and Packaging

The analysis shows that A3 still uses plastic packaging to package its products; the reason for using this plastic is that the price is low, and packaging chip products using a standing pouch can make the product more durable and pleasing to the eye. However, when viewed from an environmental perspective, the use of plastic is not recommended because this material is not easily decomposed.

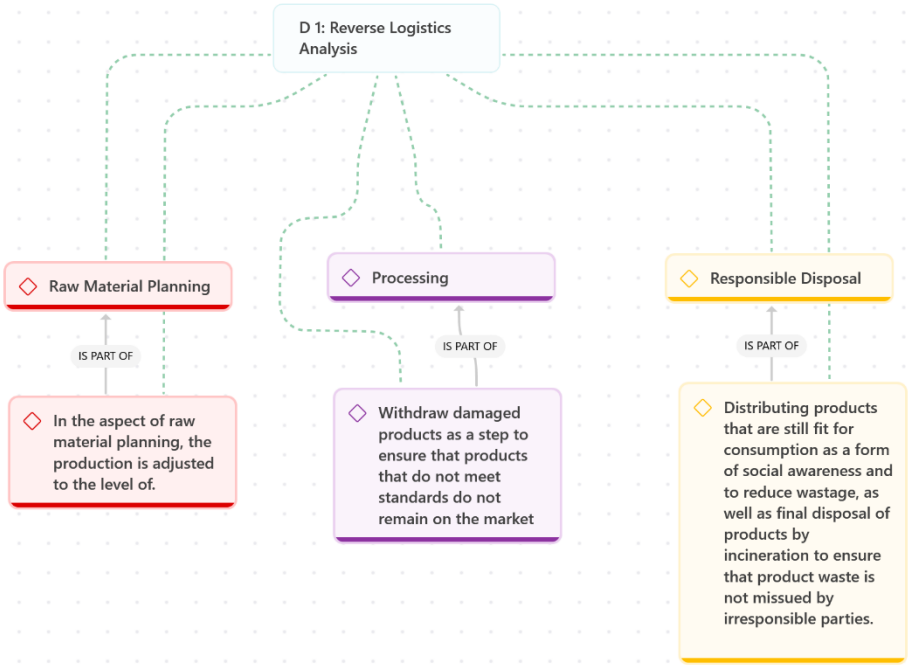
3) Green Manufacturing

In this case, if in large quantities, production waste management, such as banana peels, will be processed into fertilizer but directly disposed of in small quantities. Meanwhile, environmental management around the production site is exceptionally well maintained. For example, the equipment for producing chips is differentiated/not used for personal use.

Table 2 Reverse Logistics Analysis of Green Supply Chain Management

Variables	Indicator	Analysis Result
Reverse Logistics	Raw material planning	There is no planned raw material planning; production is adjusted to the level of product sales.
	Processing	Damaged or expired products are pulled and collected back at the production site for sorting.
	Responsible disposal	Products that are still fit for consumption will be distributed, while those that have been damaged will be collected for incineration.
Green Supply Chain Management (GSCM)	Sustainable Procurement	A3 still needs formal suppliers or subscriptions and cannot ensure the availability of suppliers who pay attention to the environment in every agricultural process.
	Eco design and packaging	Product packaging still uses plastic
	Green Manufacturing	Production waste, such as banana peels, if in large quantities, will be processed into fertilizer but directly disposed of in small quantities.

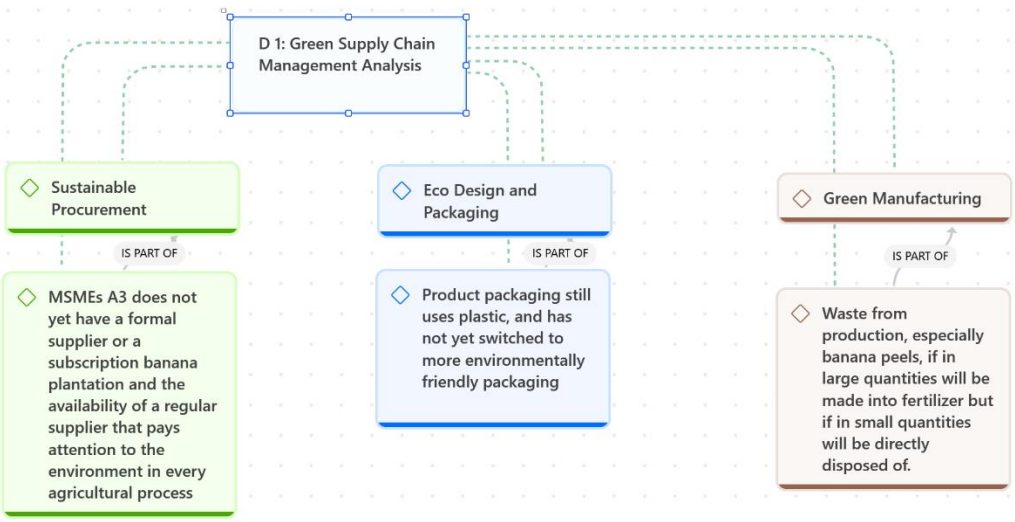
Graph 1 Reverse Logistics Practices in A3



Source: Data is processed using the application Atlas.ti

Based on the graph, the practice of Reverse Logistics in MSME A3 cannot be said to implement reverse logistics in its business activities even though several aspects follow the concept of reverse logistics. Because products that are not sold are directly managed by distributing or disposing of them, this is not by the reverse logistics aspect, which aims to regain value by recycling products. To fulfill the reverse logistics concept, MSME A3 needs to implement a more structured product return system focusing on recycling and reprocessing products or materials to reduce waste and environmental impact.

Graph 2 Results of Analysis of Green Supply Chain Management Practices in A3



Source: Data is processed using the application Atlas.ti

Based on the graph regarding the Green Supply Chain Management Analysis of A3, It has adopted several practices that support the concept of GSCM by using environmentally friendly materials and managing production waste properly. However, important aspects still need to be fulfilled, such as managing damaged products by burning, which is still not ideal when viewed from an environmental perspective because the combustion process can produce harmful emissions. Moreover, the use of packaging that is not environmentally friendly is also not by GSCM principles.

Therefore, A3 is not yet fully compliant with all GSCM standards. Further and consistent implementation of GSCM principles is required to achieve this status; with improvements in packaging use and waste management, A3 can move closer to the overall GSCM principles.

CONCLUSION

According to the results of the research and discussion that has been carried out regarding the Reverse Logistics Analysis of Chips Products towards Green Supply Chain Management, it can be concluded that:

Overall, A3 has implemented several practices that support the concept of GSCM by using environmentally friendly materials and managing production waste well. However, it still needs to meet all GSCM standards fully.

Overall, the MSME has taken some initial steps close to the Reverse Logistics concept, such as collecting and sorting unsold products. However, practices such as burning damaged products without recycling indicate that implementing reverse logistics has not been optimal and needs to be in line with GSCM principles.

A3 has taken a positive step by making liquid fertilizer or compost from production waste. However, this practice is carried out inconsistently as small production waste is disposed of directly.

Plastic packaging indicates that these MSMEs must fully implement Green Supply Chain Management practices. Environmentally friendly packaging should be essential to GSCM to reduce environmental impacts.

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