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The Analysis of the Influence of Green Supply Chain Management and Low-Cost Strategies on Environmental Performance

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ABSTRACT

This study aims to analyze the effect of green supply chain management and low-cost strategies on environmental performance. This study used a descriptive quantitative methodology. It surveyed 78 KWTs (Women's Farmers Group) in Sewon Regency, Bantul. The sampling technique was simple random sampling. The results indicate that green supply chain management has a positive effect on environmental performance, and the low-cost strategy has a positive effect on environmental performance.

Keywords: Green Supply Chain Management, Low-Cost Strategy

INTRODUCTION

In this globalization era, environmental damage occurs in all places. Factory exhaust fumes extremely containing carbon dioxide (CO2) pollute the air and its solid and liquid waste dumped in river flows head out to the sea, while excessive chemical fertilizers and pesticides rot the soil and poison the groundwater. The increasing environmental pollution disturbs nature preservation and the health of all living things. This could not give instant effects on humans, however, it may harm their health in the future as harmful substances accumulate in their body.

Air pollution has been proven to damage the human respiratory, pulmonary, cardiovascular, and cerebrovascular systems, lead to cancer, and harm woman's and children's health. To minimize the effect, all stakeholder's participation is necessary (Perhimpunan Dokter Paru Indonesia, 2019).

As our knowledge increases, more people are aware of the importance of environmental sustainability. They began to strive to save the environment. In fact, it starts to become their new lifestyle since they switch to consume organic food. To satisfy the changes in people's lifestyles, stakeholders began competing to make environmentally friendly products and services produced with environmentally friendly processes. In the industrial world, environmental sustainability promotes resource efficiency (Sehgal et al., 2020).

The Indonesian Organic Alliance (AOI) found that the increase and decrease of the certified organic land area were caused by many factors. For example, from 2008 to 2010 there have been seven certification bodies accredited, raising the number of certified land. However, in 2011-2014 the land area fluctuated, as several farmer groups,

cooperatives and companies did not renew their certification. The increase in the total area of organic farming from 2016 to 2017 was around 39.4% and it increased by 17.3% in 2017 and 2018.

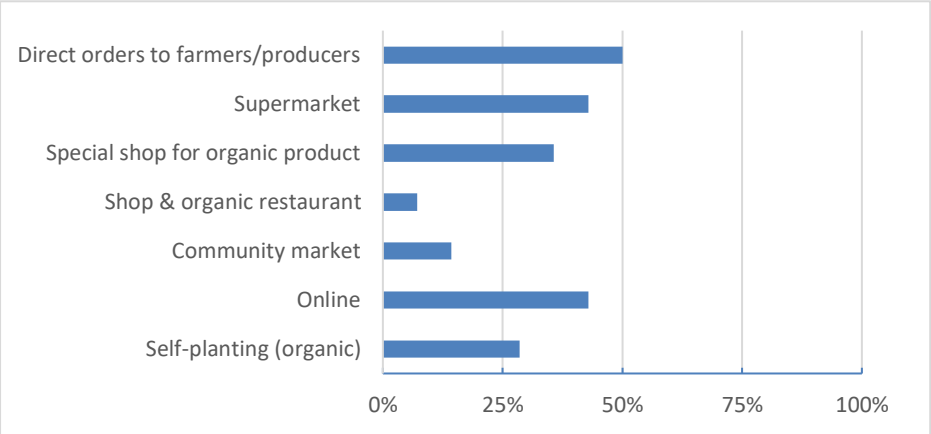

Figure 1. Consumer Access to Purchase of Organic Products

Source: Organic Institute, Yayasan Alifa dan Kombas.id (2020)

Consumer access to organic products indicates the distribution patterns of organic products. Figure 1 shows the results of AOI's survey on consumer's preferred access to organic products. It shows that online and direct purchases reached nearly 50% while the others prefer offline purchases, such as at supermarkets, organic specialty stores, community markets, organic restaurants in addition to self-planting.

Green supply chain management integrates supply chain management with environmental sustainability within the product design and development processes, supplier selection and procurement processes, high-tech manufacturing processes, product distribution, and the recycling process (Jain & Sharma, 2014). By reducing air emissions, liquid and solid waste disposal, and the use of hazardous and toxic materials in the production process, without sacrificing the quality, cost reliability and energy efficiency, green supply chain management could reduce the ecological impact (Carvalho, Duarte, & Machado, 2011).

However, organic farming in Indonesia has not been able to develop properly due to several factors, one of which is the lack of government concern. It was only in 2002 that the government issued the Indonesian National Standard (SNI) of Organic Food 6729-2002. In 2010 the government through the Ministry of Agriculture launched "Go Organic 2010", a program intended to support the development of organic agriculture. The vision is to integrate the organic system and the commodity market system at the international level targeted to be achieved in 2010.

The organic farming empowerment program was continued during President Jokowi's administration term, in one of his Nawacita's agenda, namely "Development of 1000 Organic Farming Villages". This marks a change in policy direction from previously focused on increasing production, quality competitiveness, and competition at the global

level towards the development of organic agriculture based on food sovereignty at the village level. This program focuses on implementing environmentally-friendly agricultural practices by accelerating the implementation of Law Number 41 of 2009 concerning the Protection of Sustainable Food Agricultural Land and its derivative regulations (Aji, Wangsit, & Ningrum, 2019)

The low-cost strategy is a strategy that emphasizes efficiency. This strategy makes a company more efficient by producing larger volume products enabling the company to gain some advantage. This strategy requires the consideration of market advantages, and easy access to raw materials, components, labor, or other essential inputs. As there is no advantage in this strategy, what companies do will be more easily imitated by competitors (Porter, 1985).

To apply green supply chain management, adopting the right business strategy is essential. It highly will increase the management effectiveness leading to good environmental performance. To evaluate it, a reasonable business perspective is necessary by identifying cost, quality, delivery, and flexibility as the main dimensions to consider (Büyüközkan & Çifçi, 2012). Adopting green supply chain management practices will involve setting costs so that organizations without significant financial resources may not be able to finance the implementation (Wu & Pagell, 2011). The statement illustrates that organizations with a strategy that focuses on low costs can find it difficult to adopt green supply chain management practices and influence the results achieved. As stated by Laosirihongthong, Adebanjo, & Tan (2013), there is a relationship between low-cost strategies and environmental performance.

Hervani, Helms, & Sarkis (2017) added a "green" component to supply chain management to highlight the relationship of supply chain management with nature. According to Jain and Sharma (2014), green supply chain management is integrating supply chain management with the idea of saving the environment.

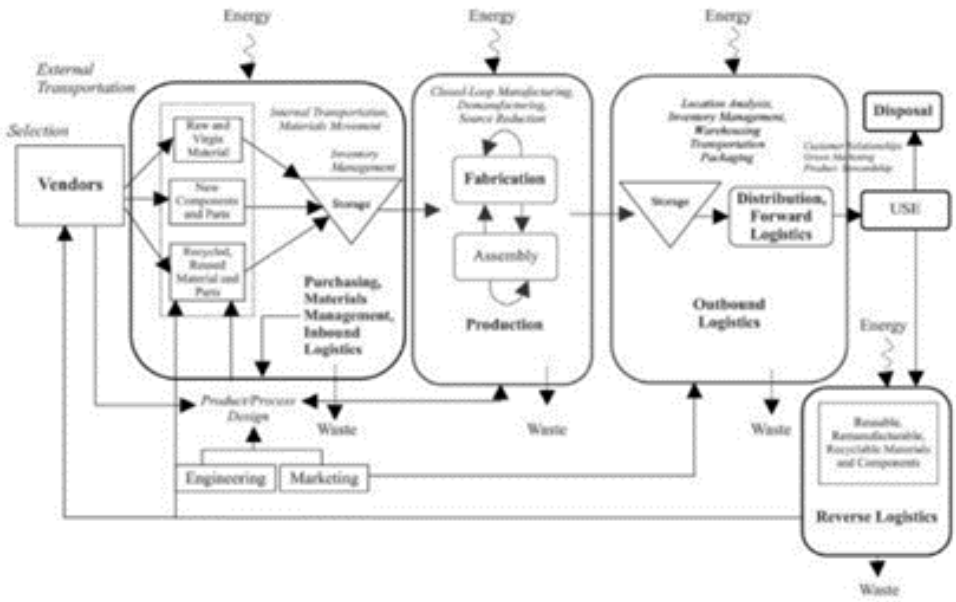

Figure 2. Green Supply Chain Management Model

Hervani et al. (2017) described a working model of green supply chain management (see Figure 2). This model is the general structure of the implementation of green supply chain management in the internal supply chain. It comprises four main parts of eco-friendly purchasing, eco-friendly production, green marketing, and reverse logistics.

Eco-friendly purchasing deals with supplies that include new raw materials, components, and spare parts reused and recycled from vendors. Eco-friendly production refers to the manufacturing and assembly process. Green marketing means the final product will be stored and distributed elsewhere. Reverse logistics is the "closing loop" of a specific forward supply chain. It includes reusing, remaking, and/or recycling materials into new materials or other products of market value. The idea is to eliminate or minimize waste (energy, emissions, chemicals / hazardous, solid waste)

Eltayeb, Zailani, & Ramayah (2011) classified green supply chains into five categories. First, it is eco-design. It refers to actions taken during product development to minimize a product's environmental impact during its whole life cycle. Second, it is green purchasing. It is the purchase of products or materials by ensuring that the goods can reduce sources of waste, promote recycling, reusing, reduction of resources, and replacement of materials. Third, it is supplier environmental collaboration. It is an activity to improve the environmental performance and capabilities of suppliers who join the project. Fourth, it is customer environmental collaboration. It deals with the activities to improve environmental performance and the capabilities of buyers who join the project. Lastly, it is reverse logistics. It is about the activity of taking materials or products for reusing or recycling.

According to Ninlawan (2010), green procurement refers to environmental purchasing consisting of involvement in activities that include the reducing, reusing, and recycling of materials in the process of purchasing. He defined green manufacturing as production processes that use inputs with relatively low environmental impacts, which are highly efficient, and generate little or no waste and pollution. Green distribution is a combination of eco-friendly packaging and logistics. Reverse logistics is the process of retrieving the products from end consumers to capture value or proper disposal.

According to Porter (1985), the cost leadership strategy or low-cost strategy is an emphasizing-efficiency strategy. This strategy allows a company to make more benefits by producing a larger volume than standard products. Nandakumar, Ghobadian, & O'Regan (2010) argued that a cost leadership strategy is suitable for a stable and predictable environment. Organizations that implement strategic cost leadership place an emphasis on highly efficient and low-cost production systems to minimize prices. Their research contended that a cost leadership strategy is more profitable for improving financial performance in a very dynamic environment.

Nevertheless, Miller (1988) suggested that this strategy users tend to face the least uncertainty and environmental changes. They are looking for customers who care more about price than a novelty, so that product innovation will often be redundant and inefficient for the company and its direct competitors, making for tremendous stability.

Nandakumar et al (2010) proposed several indicators of the low-cost strategies. They are the efficiency of securing raw materials or components (bargaining of purchase

prices), finding ways to reduce costs (standardizing products or increasing economic scale), operating efficiency (productivity in production or efficiency in outbound logistics), utilization of production capacity, price competition (competitive unknown prices), and tight control of sales/general/administrative costs.

Lankoski (2000) stated that environmental performance is related to the level of harmful environmental impacts due to company activities. This implies that the more eco-friendly a company is, the better its environmental performance. Conversely, the more environmental damage it causes, the worse its environmental performance. It is further argued that environmental performance served as an absolute level of emissions, waste, and the use of company land and resources. The smaller the emissions, the better the environmental performance.

The increasing pressure from environmental problems has also urged companies to set key environmental performance indicators. Judge & Douglas (1998) concluded that environmental performance is company's effectiveness in meeting and exceeding community expectations for the natural environment concern and the entire organization's commitment to environmental excellence relative to other industries in various fields.

Ditz & Ranganathan (1997) suggested four main categories of environmental performance. In contrast to most compliance-oriented EPIs (Environmental Performance Indicators), this performance measure has little in common with most of the regulatory requirements of material use, energy consumption, nonproduct output, and pollutant release. This study measures the environmental performance by six indicators developed by (Zhu, Sarkis, & Lail, 2008). They include reducing air emissions, reducing liquid waste, reducing solid waste, reducing consumption of hazardous or toxic materials, reducing environmental damage, and improving the company's environmental condition.

On that basis, this study illustrates the research model as in Figure 3, and formulates the hypotheses as follows:
H1: Green supply chain management has a significant positive effect on environmental performance in organic cultivation practices
H2: Low-cost strategies have a significant positive effect on environmental performance in organic cultivation practices

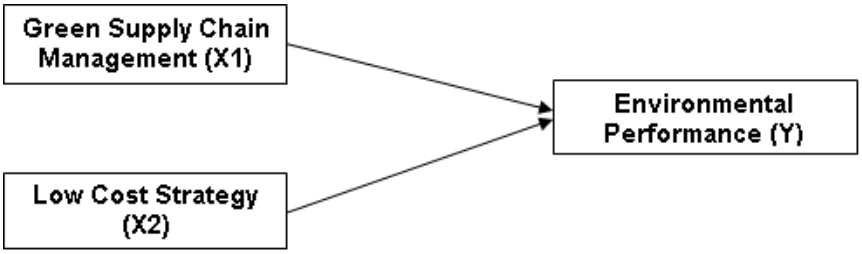

Figure 3. Research Model Framework

RESEARCH METHOD

This paper made use of a descriptive quantitative methodology. The survey was conducted by distributing questionnaires to KWT members in Sewon Regency, Bantul, involving totaling 83 respondents, selected by simple random sampling, of three KWTs implementing an organic farming system. The questionnaire was sent to all members. As they completely filled out, the collected data proceeded to further analysis.

This research distributed a questionnaire to analyze and measure the variables involved in the study. The responses were rated by the Likert scale of 1 (strongly disagree) to 5 (strongly agree).

Table 1. Reliability Test Results

Variabel	Cronbach's Alpha	Criteria	Information
Green Supply Chain Management	0.918	≥ 0.6	Reliable
Low Cost Strategy	0.938	≥ 0.6	Reliable
Environmental Performance	0.863	≥ 0.6	Reliable

Green supply chain management is measured by fourteen questions (for example, "In providing a special planting medium labeled organic"). The results of the validity and reliability tests show that the scale is valid (Pearson correlation for all indicators ranges from 0.471 to 0.825 and significant at 0.01) and reliable (Cronbach's Alpha = 0.918) (see Table 1).

Low-cost strategies are measured by scales developed by Nandakumar et al. (2010). It consists of eight question items (e.g., "KWT members are always learning more effective farming/livestock methods to produce more product"). Respondents were asked to rate how far they agreed or disagreed with each item by a Likert scale of 1 (strongly disagree) to 5 (strongly agree). The results of the validity and reliability tests indicate that the scale is valid (Pearson's correlation for all indicators ranges from 0.567 to 0.825 and significant at 0.01) and reliable (Cronbach's Alpha = 0.931).

Environmental performance is measured by the scale developed by Zhu et al (2008). It comprises six question items (for example, "In farming/raising KWT does the processing of rotten fruit and vegetable waste"). Respondents were asked to rate how far they agreed or disagreed with each item by a Likert scale of 1 (strongly disagree) to 5 (strongly agree). The results of the validity and reliability tests indicate that this scale is valid (Pearson's correlation for all indicators ranges from 0.471 to 0.694) and reliable (Cronbach's Alpha = 0.838).

RESULTS AND DISCUSSION

Of the 83 questionnaires distributed, 78 questionnaires were returned and fit to be processed. The questionnaire return rate was 95%. By age, the respondents below 30 years were 3 (3.8%), 31-40 years were 18 (23.1%,) 41-50 years were 36 (46.2%), 51-60 years were 19 (24.4%), and over 60 years were 2 (2.6%).

Table 2. Regression Equation Test Results

Model	Regression Coefficient	Standard Error	t-statistics	Sig.
Constant	0.326	1.908	0.171	0.865
Green Supply Chain Management	0.355	0.044	8.076	0.00
Low Cost Strategy	0.119	0.049	2.406	0.19
R2: 0.812				

Table 2 presents the regression equation test results. It shows that green supply chain management variable (X1) has a positive regression coefficient direction. This indicates its positive effect on environmental performance (Y) with a regression coefficient of 0.355. Also, low-cost strategy variable (X2) has a positive regression coefficient highlighting its positive effect on environmental performance (Y) with a regression coefficient value of 0.119.

The coefficient of determination is a measurement to what extent the model's ability to explain the dependent variables. Based on Table 1, it is known that the coefficient of determination (R2) is 0.728 (72%). This implies that the management of green supply and low-cost strategies affect environmental performance by 72%, while the rest (28%) is influenced by other variables outside the model.

The t test aims to test each dependent variable (green supply chain management and low-cost strategy) individually whether they have a significant effect on the dependent variable (environmental performance). As shown in Table 1, the t test analysis shows that Green Supply Chain Management variable (X1) regression coefficient is 0.355 with a significance level of 0.000, lower than 0.05, Thus, H0 is rejected and Ha is accepted; Green Supply Chain Management has a positive and significant effect on Environmental Performance. Also, the tcount value of Low-Cost Strategy variable (X2) is 0.119 with a significance level of 0.19, lower than 0.05. Hence, H0 is rejected and Ha is accepted; Low-Cost Strategy has a positive and significant effect on environmental performance.

The results signify that green supply chain management and low-cost strategies have a significant relationship on environmental performance. This suggests KWT collect the remaining rotten agricultural products to be processed into organic fertilizer and inert medium. This highly reduces the use of hazardous materials and waste in agriculture by reusing and ensuring the use of organic materials on their farms.

The low regression coefficient value of low cost strategy (0.119) implies that the capacity for low-cost cultivation practice effectiveness should be increased as the field observation revealed that some KWTs squandered a lot of money for farming.

For cost efficiency, the KWTs could apply for village funds for the empowerment of village communities at *Musrenbangdes* (village development meetings). Another alternative is to apply for guidance from the agricultural office of Sewon District, Bantul, through Sewon Agricultural Extension Center, the main office of agricultural extension. Additionally, adding their product value by not simply selling their fresh vegetables yet processing them into other products such as healthy food or drinks highly will give them a slight competitive advantage for it will attract more consumers and increase KWT's profit.

This study is in line with Zhu & Sarkis (2004) contending that companies with a higher level of adoption of green supply chain management practices will have better environmental performance improvements. Laosirihongthong et al (2013) and Green, Inman, Sower, & Zelbst (2018) suggested that green supply chain management is positively related to environmental performance. However, it is inconsistent with Laosirihongthong et al 2013.

CONCLUSIONS

Based on the analysis results, several conclusions can be drawn. There is a significant effect of green supply chains on environmental performance in a positive direction. This implies that the better the green supply chain, the greater the environmental performance.

Addedly, there is a significant effect of low-cost strategies on environmental performance in a positive direction. This shows that the better the low-cost strategies, the better the environmental performance. As the coefficient of determination (R2) is 0.728 (72%), it underlines that green supply chain management and low-cost strategies affect environmental performance by 72%, and the rest (28%) is influenced by other variables outside the model.

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