

GREEN WAREHOUSING INITIATIVES TOWARDS ENVIRONMENTAL SUSTAINABILITY: ADOPTION AND PERFORMANCE IN THE MALAYSIAN FOOD-BASED INDUSTRY

Nitty HirawatyKamarulzaman, Hilda Hussin, Amin Mahir Abdullah¹, and AzmawaniAbdRahman²

Abstract

Manufacturing industry is reported to be responsible for most of environmental effects because of its operation characteristics. Warehousing as one of the entities in the manufacturing industry supply chain is a place where the unwanted emission normally produced. In many warehouse operations, lighting is one of the biggest facility costs and between 75-90 percent of warehouse operations costs tend to be attributed to lighting. Green initiatives such as introduction of lights with motion sensors and educating employees to turn off lights when not in use can give significant improvement of energy savings up to 50 percent from the total warehouse operations costs. The objectives of this paper are to investigate the level of green warehousing initiatives among Malaysian food-based manufacturers and to measure the performance level of food-based manufactures towards green initiatives. The finding suggested that the adoption level of Malaysian food-based manufacturers towards green initiatives in warehousing was categorized as 'light green' which implied that these manufacturers have applied environmental practices in their warehousing. The results also indicated that green initiatives in warehousing give significant impacts towards manufacturers' business performance.

Keywords: *sustainability, environment, green initiative, green ranking, warehousing, food-based manufacturers.*

Introduction

In the last few years, environment impacts such as climate change and pollution havebecomemajor issues in most of the places around the world. Government and environmental agencies have put greatefforts in order to improve the impacts. At the same time, the greater understanding and risingknowledge about environment protection haveswitched customers' demand for more environmental friendly activities. Furthermore, continuous increase incosts of energy and inputs hasforced companies to find new alternatives to reduce energy use in order to mitigate costsand remain competitive in the market[9].Concern for environmental issues has entered the agenda in many companies within the manufacturing industry [6].The food services, food retail industries and food manufacturing industries are more tendencies to expose to the pressure since these

¹ Department of Agribusiness and Information Systems, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

² Department of Management and Marketing, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

*Corresponding author: nitty@putra.upm.edu.my

industries represent the active component of industrial systems. Besides, the pressure also comes from customers, regulators and suppliers. This has made green initiatives as a strategic tool to force out all the bad perception. Within all aspects of a business, the supply chain of food manufacturing industries represents the major area for improvement on the environment. Warehousing as the crucial element of supply chain has been given more attention since almost 80% of the supply chain activities take place in the warehouse. Introduction of green or environmental initiatives in warehousing is a potential strategy to improve the sustainability of environment and the supply chain itself. Green initiatives within warehouses are typically centred on optimizations around energy and waste which focus on energy savings, use of alternative energy and production of environmental-friendly energy. The initiatives also focus on avoiding waste, recycling and re-using materials and appropriate disposal. The objectives of this paper are to investigate the level of green warehousing initiatives among Malaysian food-based manufacturers and to measure the performance level of food-based manufactures towards green initiatives.

Literature Review

A. Green Initiatives in Warehousing

Going green refers to the adoption of environmental-friendly practices which focus on protection efforts, finding alternative fuel sources, using natural resources wisely and making cost-effectively responsible decisions. The concept of going green evolves to get a better understanding of the impact of human behaviour and lifestyles on the environment [10]. The need for analysing environmental alternatives and quantifying the sustainable performances especially among company is more vital [12, 14]. This is because businesses operations such as sourcing, logistics and manufacturing are believed to be the major sources of environment adverse impacts [5]. Warehousing is typically viewed as a place to store inventory that consume more energy in the production of waste disposal and surplus CO₂ emission. Many companies are struggling to discover alternative ways to improve performance of their warehouse operations where the main focus of most companies is to gain maximum efficiency at the minimum cost and at the same time reduce environmental impacts. Application of green initiatives in warehouses is important because a sustainable warehouse activity will help companies to lower their utility bills and reduce carbon emissions. [1] believed that environmental impact of warehouses is primarily connected to energy consumption and as an indirect effect to the CO₂ emitted for energy

production. In fact, activities or procedures performed within a warehouse, such as air conditioning or heating, material handling operations and lightning require electrical energy to operate. Green initiative such as turn off lights in unoccupied warehouse areas can give significant reduction in electricity expenses, which is 60-80% from overall energy consumption[3]. Besides, reduction in energy consumption can be achieved by incorporated warehouse with barriers such as close-fitting door locks, plastics strip barriers or fast acting doors especially in areas frequented by forklift trucks give a significant saving in energy consumption. [13] suggested that green initiatives in warehousing are also related to materials used as well as considering heating and cooling facilities and using natural light. The implementation of green warehousing initiative such as using both fuel-cell and battery-powered forklifts will give generally lower impacts compared to those using forklifts powered by IC engines[4]. Both fuel-cell and battery-powered forklifts help to reduce energy use and Green House Gases (GHG) emission. [11] described other energy saving initiatives in warehouses may involve having lots of windows, sky lighting and using translucent building materials and these initiatives are able to reduce energy consumption in the warehouses by 20%.

One of the major activities in warehousing is packaging process. To manage unbalance waste disposal management, company can recycle or reuse containers or packaging materials[15]. Besides, in 2010, the Industry Council for Packaging and the Environment suggested that the companies packaged their products in the lighter packaging to gain benefits such as reduced warehouse space and lorry movements, save money and have probability to stack more unit product in a warehouse or loaded onto a vehicle.[7] proposed that modern green initiative in warehousing such as application of paperless tracking system is very useful to avoid from uses a ton of paper. Further, [7] suggested initiatives such as recycled and reused RFID and Radio Identification Tags are also great ideas for green initiatives. Green initiative in warehousing is not all about reduce energy cost and consumption but also involved in green human harmful effects. Systematic operation, age of vehicle, driver behaviour, forklift maintenance, the nature of enforcement of safety regulation in warehousing must take into account by warehouse managers to avoid workers accident or product damages[8].

Methodology

The sample size of this study consisted of 318 food-based manufacturers located in all states in Malaysia and their addresses were obtained from the list of Federation of Malaysian Manufacturers (FMM) Directory 2010. Census method was used to collect data to ensure sufficient participation and a high response rate as well as to cater for the missing non-responses from the target manufacturers. A structured questionnaire was the main research instrument and it was distributed to the manufacturers through postal. The questionnaire was developed into two main sections where closed-ended questions and open-ended questions were the main type of the questions. Section one consisted of questions on manufacturers profiles while questions on warehousing initiatives were developed in Section two. From 318 self-administered questionnaires distributed, only 155 were returned and analysed. Descriptive analysis was used to determine the profile background of the food-based manufacturers. Green ranking analysis was used to find out to what extent green warehousing initiatives have been adopted among Malaysian food-based manufacturers. Green ranking provides manufacturers with individual scores for each initiative and an overall score linked to a colour banding system ranging from white to green (white, pale light green, light green, green). The significant of the different colour bands is summarized in Table 1 below:-

Table 1: Green Ranking Indicator

Colour Band	Colour Name	Range Percentage (%)	Significant of Colour Band
	White	0-5	The company needs to change by applying more green initiative to achieve some significant improvement.
	Pale Light Green	6-50	At least one of the environmental aspects has been more or less met, which mean the company still need to adopt more green warehousing initiative.
	Light Green	51-85	Some environmental aspects have been met. The company is well on the way to operating “green warehousing initiative” but still need to adopt the remaining initiatives.
	Green	86-100	Congratulation. The company has implemented the green initiative in their warehousing.

Source: Adapted from Green Manual Ranking with EU Guideline (2007)

Manufacturers' scores for the whole initiatives were converted into a percentage of maximum possible score available for the initiative and four colour bands were assigned. Table 2 shows the colour band.

Table 2: Colour Band Based on Percentage of Total Possible Score

Colour Band	White		Pale Light Green		Light green		Green	
	From	To	From	To	From	To	From	To
Percentage of total possible score	>0	≤5	>5	≤50	>50	≤85	>85	≤100

Source: Adapted from Green Manual Ranking with EU Guideline (2007)

Overall colour band for the whole initiative for each manufacturer was then calculated. Finally, the initiatives score values were summed to indicate overall average score and overall colour band for the whole food-based industry (Table 3).

Table 3: Colour Band Based on Assigned Value

Colour Band	White	Pale Light Green	Light green	Green
Assigned Value	1	2	3	4

In order to investigate the impact of green warehousing initiatives towards manufacturers' performance, correlation analysis was used. In this analysis, annual sales turnover were used as the dependent variable and green ranking warehousing initiative was used as the independent variable.

Results and Discussion

A. Descriptive Analysis

The results showed that majority of the respondents (26.5%) were inventory and logistics managers. About 23.2% of the manufacturers were established around 1991-2000. Most of the manufacturers (41.9%) have more than 150 fulltime employees and about 51% of the manufacturers have more than RM25,000,001 annual sales turnover. The results also showed that most of the manufacturers (60%) were local company business entities and they are originated from Selangor (54.8%).

B. Green Ranking Analysis

Table 4 summarizes the adoption level of green warehousing initiatives among Malaysian food-based manufacturers. The result showed that only 13% of the manufacturers put efforts on green warehousing initiatives whereby the majority of the manufacturers (52%) were still less involved in green warehousing initiatives (light green). The remaining manufacturers (36%) were categorized as low level of green warehousing initiatives (pale light green).

Table 4: Summary Of Green Warehousing Initiative Level Among Malaysian Food-Based Manufacturers

Warehousing Initiative Colour Band	Greenness Level	No of Manufacturer
Pale Light Green	36%	55
Light Green	52%	80
Green	13%	20
Total	100%	155

Table 5 shows the overall green warehousing initiative level within the Malaysian food-based industry. The overall level indicated by Overall Average Score (Stage 1), Overall Assigned Value (Stage 2) and Overall Colour Band (Stage 3). Overall, the Malaysian food-based industry was assigned light green colour band to show that the industry players have adopted medium level of green warehousing initiatives.

Table 5: Overall Green Warehousing Initiative Level Within The Malaysian Food-Based Industry

Stages	Stage 1	Stage 2	Stage 3
Overall Score/Assigned Value/Colour Band	430	2.8	Light Green

Table 6 shows details on green initiatives that were adopted in the warehouse activities. From the results, policy on turn light off in warehouses when not occupied showed the highest level of green ranking (green colour band). This means that it was the 'greenest' initiative made by the Malaysian food-based manufacturers compared to other initiatives. While the other green warehousing initiatives such as use only fluorescent lights for lighting in the warehouse, applied cross docking system, segregated intake or dispatch areas in warehouse, apply incorporated barriers such as close-fitting door locks, apply integrated communication, used online procurement and sourcing in

warehouse activities were indicated by light green colour band. These colour bands revealed that manufacturers in the Malaysian food-based industry have adopted several initiatives in their warehousing which met some environmental aspects. The remaining activities were less initiated by the manufacturers.

Table 6: Green Initiatives Ranking in Warehousing

Item	Overall Green Warehousing Initiatives in Malaysian Food-based Industry	Score	Stage 1	Stage 2	Stage 3
1	Used only fluorescent lights for lighting in warehouse	103	66	3	Light Green
2	Used fuel cell forklift in warehouse	74	48	2	Pale Light Green
3	Applied cross docking system in logistics activities	111	72	3	Light Green
4	Warehouse segregated intake or dispatch areas from other areas	121	78	3	Light Green
5	Warehouse has incorporated barriers such as close-fitting door locks, plastics strip barriers or fast acting doors	114	74	3	Light Green
6	Used paperless communication methods in managing logistics operations	52	34	2	Pale Light Green
7	Applied integrated communication in managing logistics operation	117	75	3	Light Green
8	Used online procurement and sourcing activities	105	68	3	Light Green
9	Have policy to turn lights off in warehouse when it is unoccupied.	144	93	4	Green
10	Install and use green technology to freeze or chilled product in storage area	57	37	2	Pale Light Green
Overall Total Score and Colour Banding		998	64	3	Light Green

C. Correlation Analysis

Correlation analysis was used to investigate the relationship between company's annual sales turnover and green warehousing initiatives level. The result indicated that company's annual sales (independent variable) has associated positively with level of green warehousing initiatives (dependent variable). The more green warehousing initiatives, the higher annual sales turnover will be generated. Pearson product moment coefficient

correlation in Table 7 summarizes the results of the correlation analysis. The dependent variable (green warehousing initiatives) has a fair strength of relationship with independent variable (annual sales) with $r = 0.308$ [2].

Table 7: Summary of Results: Correlation Between Annual Sales and Level of Adoption Green Initiative in Warehousing

Independent Variables		Annual Sales
Green Warehousing Initiatives Level	Pearson	0.308**
	Significant	0.000

Note: Significant at 1% level of significance

Conclusion

In general, food-based manufacturers in Malaysia have adopted medium level of green warehousing initiatives. This shows that these manufacturers have some understanding of environmental friendly activities in their businesses. Besides, the positive correlation between green warehousing initiatives and manufacturers' business performance (which represented by annual sales) indicated that the Malaysian manufacturers are aware about the benefits that they can gain such as reduce costs and increase the operation efficiency through those initiatives. Continuous adoption of green warehousing initiatives will give significant benefits towards the industry as well as the environment.

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