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## Analysis of the Relation between Green Logistics Management Practices and Export Intensity for Thai Food and Drinks SMEs

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### ABSTRACT

This paper aimed to examine the relationship between green logistics management (GLM) practices and export intensity of Thai SMEs in food and drinks manufacturing. The research involved carrying out in-depth interviews with ten experts to shed light on factors of GLM practices. The authors used a questionnaire to survey the data amongst 89 SME exporters through purposive sampling with valid 52 responses. The managerial issues related to export intensity, GLM practices, with regards to whether firms followed ISO 14001 and whether they had an employee(s) responsible for environmental management. The findings suggest that greater GLM practices being applied lead to higher export intensity in SME. The results indicate that most SMEs apply GLM practices in all dimensions to gain the benefits from the export market. It also emerged that those following ISO 14001 and/or having an employee(s) were associated with having higher export intensity than those who did not engage in these practices.

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### 1. Introduction

Green logistics management (GLM) has an important role when intending to operate a business with environmental concern. The objective of GLM is to reduce waste and to preserve the consumption of natural resources according to logistics activities (Sbihi and Eglese, 2007). GLM is an application with regard to sustainable development, which uses technology and environmental practices to increase efficiency, to reduce cost and to improve competitive advantage (Lam et al., 2015). Manufacturing industries need to engage in environmental issues owing to their high consumption of both energy and natural resources. Most enterprises have recognised the benefits of GLM for enhancing competitive advantage as well as for reducing logistics cost (Ilbery and Maye, 2005; Zhu et al., 2010b) and consumers in developed countries are concerned about the environmental impact of products imported from exporters (Schuler and Cording, 2006). Many firms are aware of applying GLM for their profitability (Lai and Wong, 2012). Previous research (e.g. Madsen and Ulhøi, 2016) has found that a major share of physical environmental impact comes from industrial production. Consequently, GLM is one practice for the manufacturing sector that can help address the current global environment problem through collaboration with stakeholders, including producers, carriers, shareholders, suppliers and customers (Visvanathan and Kumar, 1999; Wattanapinyo and Mol, 2013). Some logistics activities, such as production and process development as well as flow management have been studied in terms of the relationship between the environment and international trade (Ramanathan and Yunfeng, 2009).

International market is considered by firms for surviving to higher competition in domestic market (Santini and Rabino, 2012). However, most SME exporters in emerging economies are restricted by size, reach and access (Ayob and Senik, 2015). The change of competition have driven players to adopt aggressive strategies with the consequence of gaining market share in the international market (Galati et al., 2014). Hence, understanding international market by SMEs

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is important for creating strategies (Melen, 2010). The use of firm's export strategy, defined any form of planning and organising for exporting, is positively related to the export performance (Dhanaraj and Beamish, 2003; Jalali, 2012).

Thai SMEs make a significant contribution to international trade with the value of the export market at 55.4 billion USD covering 27.4% of the total number of enterprises in 2015, an increase 2.98% when compared with 2014 (The Office of SMEs Promotion, 2016). Regarding the manufacturing sector, it was found that the food and drinks industry produces the greatest proportion of GDP, standing at 17.01% of the total manufacturing sector in 2015 (The Office of SMEs Promotion, 2016). But, the growing role of SMEs in international trade has inevitably had a negative impact on the environment (Biondi et al., 2002; Hillary, 2000) in that it has unbalanced the natural cycle, in particular, through the inefficient exploitation of natural resources (UNEP, 2004). King and Lenox (2000) reported that entrepreneurs running businesses involving international trade generally do not pay attention to environmental concerns. A focus on SMEs is imperative since they produce more than two-thirds of global pollution, which is higher than for large enterprises (Hillary, 2000) and they comprise approximately 90% of the total private sector in most industrialised nations (Schaper, 2002).

Environmental management is mainly being pursued by larger enterprises rather than SMEs (Madsen and Ulhøi, 2016). That is, the corporate sector is becoming aware of sustainability and environmental aspects, whereas SMEs are lagging behind (Jansson et al., 2017). Taylor et al. (2003) highlighted that SMEs have poor knowledge of the natural environment and lack of expertise in environmental management. Moreover, many SME owner-managers consider their firms to have no impact on the environment (Lewis et al., 2015). A report by the European Commission shows that large enterprises are more likely to commit to sustainability than SMEs (European Commission, 2012). As a consequence, SMEs need to be convinced of the need to follow paths towards sustainable development, if the environment is to be protected and resources are not be over depleted (Jansson et al., 2017). In addition, environmental strategies was also investigated which related to enhance firms' performance. Managerial commitment in good environmental practices contributes to higher profits in the industry (Barba-Sanchez et al., 2012).

In the context of the challenge of sustainable transition in the export market, this research has two key parts. First, the authors develop indicators of GLM practices with regards to SME exporters in food and drinks manufacturing. This is to ascertain the level of GLM practices in food and drinks SME manufacturing. Second, the factors underpinning GLM practices that are appropriate to this industry are identified their interrelations are subsequently investigated. Specifically, the managerial issues that are investigated relate to export intensity, GLM practices, with regards to whether firms followed ISO 14001 guidelines and whether they had an employee(s) responsible for environmental management in their SMEs. It is anticipated that the results will generate recommendations for improvement the export intensity of SMEs in the food and drinks sector. In the section that follows, a review of the literature relating to GLM is provided. Next, Section 3 presents the methodological approach with questionnaire design for measuring and analyzing the GLM practices of Thai SME food and drinks exporters. Subsequently, the empirical analysis and results are presented and discussed in Section 4. Finally, Section 5 presents the conclusion including limitations and proposals for further research in this area.

## **2. Literature review**

### *2.1 Green logistics management*

According to researchers, green logistics has two strands: 1) the operations in all the processes of environmental performance and 2) effective activities as a means for improving organisational or social environment performance (Tissayakorn and Akagi, 2014). Others have contended that GLM pertains all activities relating to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption, with the purpose being to meet or even exceed customer demands on this matter (Pannirselvan et al., 2016). GLM proponents emphasise changing production and distribution in support of sustainability, which involves such activities as reducing waste and protecting resources (Sbihi and Eglese, 2007). It covers the management, evaluation, reporting and controlling of the environmental impact of product lifecycles (Sroufe, 2003). Specifically, the three steps of GLM expected of an enterprise are: 1) formal implementation; 2) performance evaluation; and 3) communication to stakeholders regarding logistics activities (Lai and Wong, 2012). GLM is considered as being one part of a green supply chain that includes planning, operation and flow control to meet stakeholder demands and to minimise the impact on the environment (Xia et al., 2013).

Interest in the concept of GLM has been growing over the last 20 years (Fahimnia et al., 2015). Application and integration of environmental management can nowadays be seen throughout supply chain activities, whereby the design, procurement, production, packaging, transportation and logistics, as well as recycling, have become associated with protecting the environment (Handfield et al., 1997; Hsu et al., 2013; Sarkis et al., 2011). Regarding which, Srivastava (2007) defined GLM as an integration between the environment and supply chain management involving product design, selection, production, transportation and product management. In addition, GLM has also been considered in terms of reverse logistics, reuse, remanufacturing and recycling (Hervani et al., 2005; Wells and Seitz, 2005).

### *2.2 Thai SME exportation of food and drinks manufacturing*

SMEs are a key driving force of Thai enterprise, producing 41.1% of the total GDP in 2015. As aforementioned, they penetrated the export market to the tune of 59.55 billion USD in 2015, an increase of 2.98% when compared with the previous year. SMEs make a substantial contribution to international trade in terms of export intensity, defined as the value of exports as a fraction of total sales (Verwaal and Donkers, 2002), standing at 27.4% in 2015 (The Office of SMEs Promotion, 2016). The number of SME exporters stands at around 25,788 enterprises, which represents 68.51% of their total (The Office of SMEs Promotion, 2016). Regarding the manufacturing sectors in SMEs, the food and drinks industry created the most value of GDP, standing at 6.27 billion USD or 28.59% of the total for the SME manufacturing sector in 2015, followed by the furniture industry and chemical products (The Office of SMEs Promotion, 2016). Thailand is the leading country in terms of food production and exports to South East Asia (Laotanathaworn, 2013). There are around 117,632 enterprises in this sector, of which 99.68% are SMEs (The Office of SMEs Promotion, 2016). In 2015, the export value of Thai processed food stood at 13.84 billion USD (Kasikorn Research Center, 2015). The main international markets for Thai food are in Asia (59.8%), North America (13.2%), the EU (11.7%) and Africa (10.2%) respectively (National Food Institute, 2016). Major examples of exported products include condiments, processed meats, milk, noodles along with vegetables and fruits (Kasikorn Research Center, 2015).

### 2.3 GLM practices

Previous studies regarding GLM practices include Wang et al. (2013), who developed standard indicators for the green supply chain in food and drinks production for restaurants, from their origin to post consumption, which cover green purchase, green design and marketing, green storage, packaging, green cooking and green post-treatment. Yang et al. (2013) studied the impact of green supply chain management on performance in terms of competitiveness in the transportation industry in Taiwan, with the focus being on green policy, green marketing and green collaboration. The relationship between GLM practices and the performance of enterprises was investigated by Green Jr et al. (2012) and Lee et al. (2012), using five dimensions, comprising: 1) internal management; 2) green information system; 3) green purchasing; 4) collaboration; and 5) eco-design. Lai and Wong (2012) examined green logistics and export performance in China, for GLM features covering environmental management, operation and evaluation. Lau (2011) used green logistics indicators to compare the logistics performance of electrical industries in China and Japan, namely, a developing and a developed country, according to three dimensions: green purchasing, packaging and transportation. Rao (2007) explored the green supply chain of SMEs in the Filipino food and drinks industries. The study concentrated on green production, inbound logistics, outbound logistics and reverse logistics. Murphy and Poist (2003) made a comparison between the green logistics practices of enterprises in the USA and Non-USA countries (Canada and West European countries).

From the reviewed, six dimensions of GLM practices were identified, as shown in Table 1. The first dimension of GLM practices, which pertains to strategies and planning for environmental management, covering: training, evaluation, communication, expertise regarding environment management within organisations, including obtaining ISO 14001 certification. Purchasing is the second dimension, which relates to supplier standards, raw materials and mutual collaboration with suppliers regarding environmental management. The third dimension is design and packaging, which pertains to ensuring that these support the promotion of an eco-friendly environment. Transportation is the fourth dimension, regarding which the aim is to guarantee the efficiency of transportation through planning. The fifth dimension is in relation to production being linked to product standards, efficient consumption of energy and resource as well as waste management. Finally, the sixth dimension is marketing, in that is essential that marketing activities take into account environmental concerns and social responsibility.

**Table 1.** Dimensions of green logistics management

Dimension	Source
Policy	
Purchasing	
Design and packaging	Green Jr et al. (2012), Lai and Wong (2012), Lee et al. (2012), Lau (2011),
Transportation	Murphy and Poist (2003), Rao (2007), Wang et al. (2013), Yang et al. (2013)
Production	
Marketing	

### 2.4 GLM practices, enterprises and international trade

Despite the growing importance of SMEs in international trade, which can impact negatively on the environment, the studies of the GLM practices in relation to export performance have paid little attention the specific characteristics of SMEs (Linder et al., 2014). Extant literature has shown a positive relationship between export intensity and environmental strategies by SMEs in relation to the Spanish food industry. Firms that thrive in international trading, often gain international acknowledge in form of environmental certification, such as ISO 14001, leading to better reputation and influencing to do business in the international trade (Martín-Tapia et al., 2010). Wu and Ma (2016) elicited that local

Chinese suppliers with high levels of export intensity are more likely to adopt positive environment strategies (e.g. using chemicals and packaging with lower environmental impacts) in response to the environmental requirements of multinational enterprises. Zeng et al. (2011) found a positive relationship between environmental management (e.g. clean production technologies, product re-design, change of production process and improvement of resource utilization) and economic performance in their study of SMEs in China. Lai and Wong (2012) reported that Chinese manufacturing exporters have gained benefit from deploying GLM as the management practice that takes account of the environmental impact of the physical flows of satisfying the environmental demands of the international export market. Zhu et al. (2010a) found that the international market pressure rises manufacturers to meet customer requirements with regards to green packaging and cleaner production.

In addition, there is little evidence of a link between operation of environmental management, as represented adherence to the ISO 14001 guidelines and the export intensity of SMEs. Arimura et al. (2016) have pointed out that one of the most widely used means for certifying a firm's environmental management system as being effective is called ISO 14001 certification, which is a standard process that encourages facilities to manage the environmental impacts. Chavez et al. (2014) showed that customer pressure (e.g. ISO 14001 certification being required by the customer) is significantly associated with have a green supply chain, referring as the direct involvement of firm with customers in planning together for environmental management. Pannirselvan et al. (2016) elicited that most of the food manufacturing firms in Malaysia practice green logistics, for example, reusing or re-utilization of plastic item, planning backhauling in logistics activities, and those firms that had obtained ISO 14001 certification produced their goods safely. Yadav et al. (2015), when reviewing the literature of Cañón-de-Francia and Garcés-Ayerbe (2009), found ISO 14001 certification has a negative effect on the market value of certain firms. However, the results did not provide evidence on the impact of ISO 14001 certification for internationally oriented firms. In contrast, Jacobs et al. (2010) produced evidence showing that ISO 14001 certification engenders a positive market reaction associated with announcements of environmental performance. Oelze et al. (2016) suggested that some firms rely on environmental certification (e.g. ISO 14001) to ensure that their supply chain practices are socially and environmentally geared towards the development of sustainability as well as having significant implications for their competitive advantage.

Research into having employees working on environment management, which is one of the GLM practice dimensions mentioned above, has elicited that this is positively associated with sustainability and performance. However, this perspective has also paid little attention in relation to the export intensity of SMEs. For example, Dangelico (2015) discovered that the development of voluntary green team made up of employees, such as in Silicon Valley corporations, with Yahoo and eBay, where employees are self-organizing to promote sustainability, working to reduce environmental problems significantly positively influences both environmental performance and environmental reputation. Steinz et al. (2016) explained that hiring an advisor/or a consultant to provide advice or help in start-ups is a strategy for alleviating environmental problems, which led to sustainability development in China. In New Zealand, it was found that when SMEs engaged with environmental information and expertise this had a positive effect on sustainability. (Lewis et al., 2015). Lee and Klassen (2008) proposed the practice of environmental management capabilities (EMCs), which involves providing effective training and education for employees as well as the assignment of environmental responsibility to specific staff as a team. It has been contended that employee involvement within the firm on environmental matters improves manufacturing performance. For example, the Boston Scientific Corporation, are forming local employees to work together to reduce the impact on the environment. The San Jose Green Team has been educating employees of Boston Scientific to realize the benefits of waste management and to adopt green practices into daily operations, (Dangelico, 2015). Similarly, Winston (2009) highlighted how involving everyone in greening business can keep people motivated (e.g. using less water, eliminating plastic water bottles, forming green team to control environmental concern) and thus, help a company to achieve better environmental performance and higher profits. In addition, Govindarajulu and Daily (2004) argued that employee involvement in environmental issues, for example, a Dusquesne Light company at Southwestern Pennsylvania, management's commitment to environmental training across the organization, results in improved company performance and competitiveness.

## *2.5 Research hypotheses*

According to some of the literature reviewed above, it indicates that there is a possibility that the higher the level of GLM practices engagement by SMEs, the higher the export intensity. In addition, the relationship between operation of environmental management, represented by the ISO 14001 guidelines and the export intensity of SMEs has been discussed a little. Furthermore, there remain few empirical studies that have analysed the employee GLM working practices of SMEs, in particular, based on measures of export performance. To address this gap, the following hypotheses are proposed:

- H1:** The higher level of GLM practices by SMEs, the higher export intensity.
- H2:** There is a relationship between operation of environmental management, as represented adherence to the ISO 14001 guidelines and the export intensity of SMEs.
- H3:** There is a relationship between having employees working for environment management and the export intensity of SMEs

The findings based on these hypotheses will provide contributions for more understanding the importance of GLM practices in food and drinks manufacturing for SME exporters, specifically in emerging country. The results will indicate whether SMEs in the industry should focus more on GLM practices for their competition in the international trade. In addition, the outcomes will show SME exporters how they obtain the benefits of ISO 14001 guidelines and having employees working for environment management in their SMEs towards the export performance in this regard.

### 3. Questionnaire design and response

First, the factors for each dimension of GLM practices were captured from the literature. Subsequently, the authors conducted qualitative inquiry to gain an in-depth understanding of GLM practice dimensions. Specifically, in-depth interviews were held with ten experts from the agriculture industry, food manufacturing, international food trading, department of logistics, department of environment and private entrepreneurship, as summarised in Table 2, with the aim being to review the identified factors and to modify them where appropriate. The authors identified the experts for in-depth interviews by considering their experience and job position/description which showed strong links with logistics management, food and drinks manufacturing and/or environmental management. Data were collected by conducting semi-structured interviews and by attending seven business meetings in Bangkok, Thailand. The sample of interviewees consisted of only Thais. The interviewees included scholars (2), entrepreneurs (2) and public specialists (6). The authors spent two months collecting the data, discussing and modifying the indicators of GLM practices regarding food and drinks SME manufacturers involved in international trade.

**Table 2.** In-depth interviews

Institution	Frequency	Job position
1. Thai Food Processors Association	2	President and specialist
2. Bureau of Logistics, Ministry of Industry	1	Specialist (PhD)
3. Department of Strategic Development and Project management, National Food Institute	2	Deputy director and specialist
4. The Industrial Environment Institute, The Federation of Thai Industries	1	Director
5. Faculty of Agro-industry, Kasetsart University	2	Associate professor and lecturer (PhD)
6. SMEs in food and drinks manufacturing	2	Entrepreneur and factory manager
Total	10	

During the interviews, the experts were shown the six dimensions of GLM and a list of factors taken from the literature. They were asked to consider which were salient and which of them were not. As a result of these discussions, the GLM practices in food and drinks SME manufacturing were summarised based on the six identified dimensions, with 38 factors, as shown in appendix. These were the dimensions and factors that were included in the questionnaire survey and the data collected from these were subject to subsequent analysis.

#### 3.1 Data collection

The questionnaire was employed through purposive sampling of Thai SME exporters in food and drinks manufacturing to collect data regarding GLM practices. The researcher collected the survey data directly from entrepreneurs and representatives of SME exporters by attending two seminars in Bangkok, and Chiang Mai, Thailand, held on the topic of food and drinks manufacturing. The questionnaire contained three parts. The first pertained to the demographics of the respondents, whilst the profiles of the SMEs in relation to international trade, their export intensity, their engagement with the ISO 14001 guidelines and having an employee(s) working on environment management in their company, were probed in the second part. The third part involved surveying the level of GLM practices through closed questions with multiple-choice answers on a five-point Likert scale, ranging from hardly practised (1) to very highly practised (5).

#### 3.2 Statistical analysis

The number of questionnaires returned was 89, but only 52 or 58% of the total were completed by those who were SME exporters in the food and drinks industry. Cronbach’s alpha coefficient was calculated to examine the reliability analysis among all the constructs of GLM practices, with the outcomes being provided in Table 3. As can be seen, this ranged from 0.846-0.964 for the six dimensions, which is higher than the widely accepted rule of thumb of 0.70, thus indicating adequate reliability of the measurement scales (Nunnally et al., 1967).

**Table 3.** Reliability analysis

GLM practice	Cronbach's alpha	Number of items
Policy	0.964	10
Purchasing	0.938	8
Design and packaging	0.932	6
Transportation	0.944	5
Production	0.846	4
Marketing	0.932	5

### 3.3 Descriptive statistics

A profile summary of the respondents in food and drinks SMEs manufacturing is presented in Table 4. The main export markets and products for international trade of the sample SMEs are East Asia, ASEAN and North America, involving rice, grains, flour, spices, seasoning, tea, coffee, and cacao. In Table 5, the characteristics of the sample selection of the 52 SMEs are shown. 54% of the SMEs reported export values of ranged from 41% to 100% of total sales. Approximately half of the SMEs were engaging in environmental management with ISO 14001 certification or at least following its guidelines and 59% of them reported having an employee(s) tasked with this management in their SMEs.

**Table 4.** Profile summary of the respondents

Functions	Frequency	%	Work experience (years)	Frequency	%
Management	12	23.08	< 1	1	1.92
Production	14	26.92	1-5	17	32.69
Marketing	5	9.61	6-10	9	17.31
Human resource	2	3.85	> 10	25	48.08
Purchasing	2	3.85	Total	52	100
Trading	2	3.85			
R&D	12	23.08			
N/A	3	5.76			
Total	52	100			

**Table 5.** SME characteristics

		Frequency	%
Export intensity	<40%	23	44
	41%-100%	28	54
	N/A	1	2
Adoption of ISO 14001 guidelines and/or certification	Yes	26	50
	No	26	50
Have an employee(s) working on environment management	Yes	30	59
	No	20	39
	N/A	2	2

The data of GLM practices were therefore analyzed using the t-test to compare groups of export intensity to the level of GLM practices in six dimensions for significant differences (H1). A cross-tabulation procedure, namely, Pearson's  $\chi^2$ -test, was used to investigate the association between the operation of environment management, as measured by ISO 14001 certification or adherence to the guidelines, and export intensity in the SMEs (H2). The association between having an employee(s) working on environment management and export intensity in the SMEs was also tested using Pearson's  $\chi^2$ -test (H3).

## 4. Empirical analysis and results

Recall, the literature in relation to GLM practices identifies six identified dimensions, namely: 1) policy 2) purchasing 3) design and packaging 4) transportation 5) production and 6) marketing, as shown in Table 1. After review and discussion with the elite informants at interview in Table 2, the factors of GLM practices were modified and the finalized list, as shown in appendix, was prepared for application to the questionnaire for primary data collection. While the reliability analysis among all the constructs of GLM practices was shown in Table 3. The results in Table 4 and Table 5 provide summary profile of the respondents and the participant SME characteristics, respectively.

### 4.1 GLM practices in food and drinks manufacturing SMEs

The descriptive statistics in Table 6 are measured by average scores from all respondents regarding each factor and these subsequently being aggregate as overall averages for each of the six dimensions, with a final GLM score figure for the industry being found by averaging these score. The average score of GLM practices is divided into five categories: 1) Hardly practised (1.000-1.800) 2) Low (1.801-2.600) 3) Medium (2.601-3.400) 4) High (3.401-4.200) 5) Very highly practised (4.201-5.000). The results show the overall average across the factors and dimensions regarding GLM practices in the focal industry is (3.063), thus being situated in the medium category. Regarding each dimension, the findings reveal that the SMEs’ production function adheres to GLM practices better than all the others, with the overall average being in the high level category, followed by transport and policy, respectively, at the top end of the medium category. Design and packaging, purchasing, and marketing come close behind these, but still all well into the medium category. The results regarding production in our appendix show that all of them perform at a high practice level, ranging from 3.404 to 3.788, with the only exception being in relation to recycled product or waste to remanufacture, which is at the medium practice level. The factor most highly reported as part of a company’s operation under all dimensions is having GMP and HACCP standards for production. Marketing is the dimension with the lowest GLM scores, ranging from 2.769 to 2.923, with the lowest practised factor being using the environmental concept in the marketing budget. The least engaged with factor across the surveyed firms is in relation to using raw materials from recycling under the purchasing dimension.

**Table 6.** GLM practices in food and drinks SME manufacturing

Dimension	Number of items	Range	Mean	S.D.
Policy	10	2.750-3.365	3.108	0.978
Purchasing	8	2.462-3.308	2.937	0.947
Design and packaging	6	2.731-3.250	2.987	0.907
Transport	5	2.885-3.442	3.115	0.933
Production	4	3.096-3.788	3.447	0.909
Marketing	5	2.769-2.923	2.854	0.938
Total of GLM practices			3.063	0.851

#### 4.2 Comparison analysis between export intensity and GLM practices in food and drinks manufacturing SMEs

The t-test was employed to examine the first hypothesis as to whether higher level of GLM practices lead to higher export intensity in Thai food and drinks manufacturing SMEs (H1). In Table 7, the results of the Shapiro-Wilk test to ascertain whether the constructs regarding GLM practices were normally distributed show that all significantly were (*p-value* > 0.05). The Levene (1960) test was used to determine whether there equal variances amongst the identified groups in relation to the level of export intensity regarding their GLM practices and according to the results in Table 8, there was homogeneity of these variances (*p-value* > 0.05 ).

**Table 7.** Testing of normality and homogeneity of variance

GLM practice	Shapiro-Wilk	<i>p-value</i>	Levene Statistics	<i>p-value</i>
Policy	0.971	0.240	0.243	0.625
Purchasing	0.963	0.108	0.091	0.764
Design and packaging	0.975	0.345	0.010	0.919
Transportation	0.972	0.267	0.013	0.909
Production	0.956	0.053	1.196	0.279
Marketing	0.973	0.284	1.397	0.243
Total	0.969	0.186	0.011	0.917

Whilst, the evidence based on first hypothesis in Table 8 shows that there is a significant difference (*p* < 0.05) in the level of GLM practices in all dimensions, according to the two levels of export intensity (1–40%, 41–100%). The outcomes of the pairwise comparison regarding Group I and Group II, thus indicating that higher level of GLM practices in policy, purchasing, design and packaging, transport, production, and marketing leads to higher export intensity of SMEs in food and drinks manufacturing.

#### 4.3 Association of adhering to the ISO 14001 guidelines and export intensity for the SMEs

As aforementioned, Pearson’s  $\chi^2$ -test was applied to test the second hypothesis (H2). The results in Table 9 show that the *p-value* was below 0.05 (*p* = 0.008), which indicates support for this hypothesis. Therefore, it can be concluded that there is, in fact, a positive association for the focal SMEs between the operation of environment management through adherence to the ISO 14001 guidelines and export intensity. Hence (H2) purporting that the more adoption of environment management in the form of adherence to ISO 14001 by Thai food and drinks SME manufacturers, the higher export intensity in international trade is accepted.

**Table 8.** Different degrees of export intensity (for two groups) and pairing of the level of GLM practices (for six dimensions)

GLM practice	Export intensity (%)				<i>p-value</i>
	(1) 1–40 (n=23)		(2) 41–100 (n=28)		
	Mean	S.D.	Mean	S.D.	
Policy	2.527	0.869	3.600	0.858	0.000*
Purchasing	2.424	0.899	3.384	0.744	0.000*
Design and packaging	2.673	0.815	3.316	0.800	0.007*
Transport	2.817	0.930	3.407	0.844	0.022*
Production	2.924	0.820	3.911	0.724	0.000*
Marketing	2.409	0.977	3.250	0.725	0.001*
Total	2.603	0.781	3.477	0.688	0.000*

**Table 9.** Pearson's  $\chi^2$ -test for independence of operation regarding ISO 14001 adherence and export intensity

Adoption of ISO 14001 certification or adherence to the guidelines	Export intensity (%)		Total
	(1) 1–40	(2) 41–100	
(1) Yes	7	19	26
(2) No	16	9	25
Total	23	28	51
Pearson's $\chi^2$ -test	7.076		
degree of freedom	1		
<i>p-value</i>	0.008*		

\* Significant at  $p < 0.05$

#### 4.4 Association between having an employee(s) working on environment management and export intensity for SMEs

As previously explained, in order to test the third hypothesis (H3), Pearson's  $\chi^2$ -test was applied to determine whether there were any statistical associations between having an employee(s) in SMEs who work on environmental management and export intensity. The  $\chi^2$ -test was performed for a significant level of 0.05 and the results in Table 10, reveal a *p-value* of substantially less than this ( $p = 0.001$ ), which thus provides support for H3. That is, the outcomes strongly suggest that those Thai food and drinks manufacturing SMEs who have an employee(s) working on environmental management also have high export intensity in international trade.

**Table 10.** Pearson's  $\chi^2$ -test for independency regarding having an employee(s) working on environment management and export intensity

Having an employee(s) working on environment management	Export intensity (%)		Total
	(1) 1–40	(2) 41–100	
(1) Yes	8	22	30
(2) No	15	5	20
Total	23	27	50
Pearson's $\chi^2$ -test	11.286		
degree of freedom	1		
<i>p-value</i>	0.001*		

\* Significant at  $p < 0.05$

## 5. Conclusions

This paper has probed GLM practices in the context of food and drinks manufacturing for SMEs in Thailand. The aim was to shed light on SME exporters' current GLM practices in this industry. After reviewing the literature and subsequently conducting in-depth interviews with ten highly informed experts in related fields with regards to GLM, a questionnaire was carried out with Thai SMEs. The results have shown that the highest score for GLM practices in terms of six identified dimensions was production, followed by policy and transportation, respectively, while marketing and purchasing are somewhat lagging behind. Three hypotheses regarding the relationship between GLM practices and export intensity were tested. The outcomes have shown that the higher the level of GLM practices in terms of six dimensions the higher the export intensity of SMEs in food and drinks manufacturing, thus allowing for support of H1. Moreover, evidence was found that adherence to ISO 14001 guidelines and having an employee(s) working on environment management are positively related, thereby supporting of H2 and H3, respectively. Hence, the main contribution of this paper is that evidence has been provided that the more that SMEs in food and drinks manufacturing want to penetrate the



export market, then the greater their engagement with GLM practices.

One limitation of this paper is that the survey was conducted in two major cities of the country based on purposive sampling techniques and hence, generalisability to the entire country is not possible without further investigation. Nevertheless, one of the surveyed cities, namely Bangkok, is the dominant area in Thailand with 30.8% of the national GDP in 2013 (Office of the National Economic and Social Development Board, 2013) and hence, could be said to be fairly representative of the country as a whole. Regarding future research, the nature of the relationship between GLM practices and performance for Thai SMEs in food and drinks manufacturing involved international trade still needs to be investigated to ascertain whether engagement in the sustainability can be profitable for these firms. In addition, research into GLM practices examining other exporting industries using the same methods, for example, apparel manufacturers in Thailand, might allow for the findings of the current research to be generalised.

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## Appendix

**Table1.** Survey items of GLM practices in food and drinks SME manufacturing

Dimension	Factor	Mean	S.D.
Policy	A1- Announcing environment strategies and management plan	3.231	1.131
	A2- Having unit or person responsible for supporting environment management	3.115	1.060
	A3- Communication and realisation of green logistics management	3.365	1.103
	A4- Training about environment management for staff	3.192	1.085
	A5- Collaboration with other institutes to manage and solve environmental problems	3.212	1.091
	A6- Operation of environment management with regards to ISO 14001	3.058	1.349
	A7- Having a process of environment management in a published formal document or report	2.750	1.135
	A8- Tracking, reviewing and evaluating environmental information	3.020	1.174
	A9- Reporting environmental performance formally and widely	2.846	1.242
	A10- Supporting and collaborating with public institute(s) (including regulatory compliance	3.288	1.054
Purchasing	A11- Using raw material from suppliers that undertake environmental management or follow ISO 14001	2.808	1.269
	A12- Using eco-friendly raw materials	3.154	1.161
	A13- Using raw materials from recycling	2.462	1.038
	A14- Using raw materials from suppliers who meet the criteria based on environmental consciousness and action	3.020	0.990
	A15- Using raw materials from the local area and not violating forest cover	3.308	1.076
	A16- Using raw materials certified to an organic standard	2.981	1.146
	A17- Collaboration with supplier(s) (over environment management	2.904	1.107
	A18- Checking and evaluating supplier(s) (environmental operations	2.865	1.253
Design and packaging	A19- Using eco-friendly packaging	3.038	1.102
	A20- Using clean technology for efficient packaging	3.250	1.135
	A21- Using biodegradable or recycling packaging	2.731	1.031
	A22- Designing eco-products with efficient energy consumption	3.077	0.946
	A23- Designing eco-products with regards to recycling, reusing or remanufacturing	3.038	1.083
	A24- Collaboration with customer for mutually created eco-product design	2.784	0.945
Transport	A25- Using smart vehicle(s) (for efficient energy consumption	3.019	1.038
	A26- Having an efficient distribution process: route and time schedule	3.250	1.082
	A27- Having transport consolidation to manage freight	3.442	0.998
	A28- Using eco-friendly technology for transport	2.981	0.918
	A29- Having efficient reverse logistics to reduce empty backhaul	2.885	1.114
Production	A30- Having eco-friendly production (resource, energy and clean(	3.404	0.975
	A31- Improvement of production to reduce waste and to comply with environmental standards	3.500	1.076
	A32- Using recycled product or waste to remanufacture	3.096	1.225
	A33- Having GMP and HACCP standards	3.788	1.109
Marketing	A34- Using the environment concept in the marketing budget	2.769	1.059
	A35- Supporting customers who exhibit good behaviour towards the environment	2.904	1.071
	A36- Having label of carbon footprint on their products	2.827	1.061
	A37- Providing useful environment information for the customer	2.923	1.045
	A38- Supporting and collaborating with customers around environmental activity	2.846	1.055