

## Research Paper

**A STUDY ON SUITABLE BULK PACKAGING FOR FRESH AGRICULTURAL PRODUCTS**

Noh Nik Wan <sup>a</sup>, Siti Mariam Abd Ghani <sup>b</sup>, Mohd Fadzli Mohamed <sup>c</sup>, Rusmawati Said <sup>d\*</sup>, Sarina Abdul Halim Lim <sup>e</sup>, and Nitty Hirawaty Kamarulzaman <sup>f</sup>

<sup>a</sup>, <sup>b</sup>, <sup>c</sup>Federal Agricultural Marketing Authority, (FAMA), Malaysia; <sup>d</sup> School of Business and Economics, Universiti Putra Malaysia, (UPM), Malaysia; <sup>e</sup> Faculty of Food Science and Technology, Universiti Putra Malaysia, (UPM), Malaysia; <sup>f</sup> Faculty of Agriculture, Universiti Putra Malaysia, (UPM), Malaysia.

\*Corresponding author: [rusmawati@upm.edu.my](mailto:rusmawati@upm.edu.my)

**ABSTRACT:**

This paper aims to investigate suitable packaging for large and bulky agricultural products and to suggest recommendations to enhance packaging-based types of products. Packaging of agricultural products plays a vital role in protecting products from damage and facilitating transportation activities. In Malaysia, regulations for packaging purposes have been outlined under the Grading, Packaging, and Labeling of Agricultural Products (GPL) Regulations enacted under Section 3(2) (c) of Act 141 for the target group, namely manufacturers, wholesalers, exporters, importers, and retailers. However, standard agricultural product packaging practices among these players are not only unable to provide maximum protection in terms of quality, hygiene, and durability, but have negative impacts on agricultural products. There is also a non-compliance issue for bulk packaging weights exceeding 30 kilograms, especially large-sized agricultural products. This research provides a comprehensive, up-to-date review of bulk packaging of fresh agricultural products from the point of view of materials use, cost, and packaging weight. A total of 189 respondents, represented by wholesalers and exporters, were selected. This study found that bulk packaging used by most wholesalers for large-sized fruits in the domestic market must comply with the weight outlined by the GPL regulations. However, all exporters follow the GPL and importing countries' rules. This study also found that Thailand, the Philippines, Vietnam, and Japan mainly used plastic baskets, wooden pallets, and corrugated cardboard boxes and packaging for fresh agricultural produce widely used for export activities. However, the type and packaging materials used varied according to the type of agricultural product.

**KEYWORDS:** Agricultural Products, bulk packaging, fruits, vegetables, flowers.

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**INTRODUCTION**

Packaging of fresh agricultural products plays an essential role in any product sold in the market. The part of packaging has indirectly replaced the promotion of agricultural products itself. In Malaysia, all manufacturers, wholesalers, exporters, importers, and retailers must comply with the Grading, Packaging, and Labeling of Agricultural Products (GPL) Regulations. These regulations are implemented to increase the efficiency and effectiveness of agricultural product marketing to remain

competitive and guarantee the quality of fresh farm products marketed domestically and abroad. GPL regulations are essential to strengthening Malaysia's export market to importing countries. This ensures that exports of agricultural products such as fruits, vegetables, and flowers are not affected. As an agency involved in marketing fresh agricultural products, the Federal Agricultural Marketing Authority (FAMA) is responsible for ensuring compliance with these GPL Regulations.

However, the current agricultural product packaging practices among manufacturers, wholesalers, exporters, importers, and retailers are seen as unable to provide maximum protection in terms of quality, hygiene, and durability, leading to some negative impacts on packaged agricultural products. Observation of the type of packaging used needs to be carefully studied regarding its frequency and the packaging materials. There is also a non-compliance issue for bulk packaging weights exceeding 30 kilograms, especially large-sized agricultural products intended for facilitating distribution. Through the latest logistics and warehousing technologies, a thorough investigation is needed to determine whether 30 kilograms as the maximum packaging weight is still the best weight setting for bulky agricultural products.

## LITERATURE REVIEW

### *Definition of Packaging*

Appiah and Kumah (2009) defined packaging as “the art, science, and technology of enclosing or protecting products for distribution, sale, storage, and use”. Appropriate packaging is an essential element of an agricultural product to ensure quality, reduce damage, and ensure food safety and cleanliness of agricultural products.

### *Importance of Packaging*

Product packaging plays a vital role in determining the quality of agricultural produce. Based on Norsida et al. (2008), 70 percent of retailers or wholesalers receive vegetable and fruit products, with 11 percent to 20 percent of damage caused by using less appropriate packaging. This relatively high risk of postharvest damage results in poor price supply and high disposal of damaged products to farmers. Therefore, the GPL Regulation stipulates that every agricultural development must be packaged appropriately and provide maximum protection against any damage during handling and transportation. This will reduce high post-harvest damage losses and increase farmers' income. Now, the challenges of packaging, labelling, and branding are intensifying, and agents act as advertisement, promotional, and sales agents who need strong appeal and a creative, unique design. They can stimulate consumer emotions and be informative. Packaging will significantly impact sales and increase revenue (Kotler & Armstrong, 2012).

### *Functions of Packaging*

#### *a) Handling and transportation function*

The first function of the package is to act as a handling unit for fresh fruits and vegetables after the harvest. There are many different types of harvest containers ranging from small bags or commercial larger wooden or plastic containers, depending on hand or mechanized harvesting operation. Additionally, packaging should be designed to be easily handled and to allow stowage and space-saving storage. The container to be used for packaging should surround fruits and vegetables in marketable units during handling and distribution (Thompson, 2008).

#### *b) Protective function*

The major function of a package is to protect the product from mechanical damage and undesirable physiological changes and pathological deterioration. The packaging should protect the product from mechanical damage which includes vibration, compression, impact, and puncturing. Reasons for mechanical injuries causing serious loss cause fruits and vegetables, such as vibration injuries, compression injuries, impact injuries and puncture injuries (Ramaswamy, 2014).

### *c) Identification function*

The other function of the packaging is to introduce the product and inform the consumer about the product as the name of the product, its variety, net weight, name of the manufacturing company, shipper, and country of origin are generally printed or written on the package.

## **Type of Packaging**

### *Consumer packaging (Retail packaging)*

Consumer packaging indicates that the containers and packaging used are small in size and easy to carry by consumers. The weight of consumer-sized containers varies from several hundred grams to several kilograms. There are various types of containers with different dimensions (Ramaswamy, 2014). Generally, consumer package types such as bags, trays, folding paper board cartons, and small rectangular or round baskets.

### *Transport packaging (Bulk packaging)*

Transport packaging is one type of packaging used to facilitate the transportation of produce. Single-use wooden and cardboard boxes and re-useable plastic crates are the most often used packages for packaging fruit and vegetables through transport. Shipping containers generally accommodate more products. For example, up to 10 to 20 kg for manual handling and up to 250 kg for bulk handling by using forklifts (Ramaswamy, 2014).

## **Type of Packaging Materials**

Different materials are available on the market to pack fresh fruits and vegetables, and choosing the material depends on factors such as the nature of the freshness, bio-degradability, recyclability, shelf-life, and sales appeal. There are many types of packaging, such as corrugated boxes, baskets, plastic, wooden crates and boxes, and polyfoam (Aysel et al., 2018).

## **Cost of Packaging**

The cost of packaging is dependent on the type of package, size and design of the package, packaging accessories, packaging labour, handling labour, transport, and duties (if applicable). The cost of packaging fresh produce in horticultural supply chains for domestic markets is rather low due to the cost of packaging labour; packaging materials and transport are relatively low. In the case of supply chains for international markets, packaging costs are higher. (Aysel et al., 2018).

## **International Standards and Regulations related to Fresh Produce Packaging**

The expansion of international trade has created a greater need and demand for the international standardization of packaging. Governments and relevant organizations have established standards and regulations for fresh produce packaging, which can be mandatory or voluntary depending on the regulators/regulatory bodies. Global standards and regulations have increasingly been developed for

worldwide use. Major developments as well as existing standards of relevance to the packaging of fresh produce are summarized below.<sup>1</sup>

### *Codex*

Standards and guidelines most relevant to the packaging of fresh produce have been developed by the Codex Alimentarius Commission, established under the joint FAO/WHO Food Standards Programme. Codex Standards for any specific fruits and vegetables generally include packaging. In general, packaging for fresh fruits and vegetables must properly protect the produce. Materials used inside the package must be new, clean, and must not cause damage to the product. Marking or labelling is referred to in CODEX STAN 1-1985, Rev. 1-1991), and packages must be free of all foreign matter.

Packaging of fresh fruits and vegetables shall also comply with the Codex Recommended International Code of Practice for Packaging and Transport of Fresh Fruits and Vegetables (CAC/RCP 44-1995, Amd. 1-2004). This recommendation includes details about proper packaging and transportation in maintaining the quality of fresh produce during transportation and marketing. In summary, the recommendation covers transport equipment (design, condition and loading method) to packaging (forms, materials, packing methods, shipping containers, unit loads and pre-cooling practices).<sup>2</sup>

### *ISO*

One of the most important packaging standards at the international level is established according to the ISO. ISO facilitates standards development through working mechanisms of technical committees (TCs). Among the seven (TCs that fall under the technical sector of “Packaging/Distribution of Goods”, ISO/TC 122 “Packaging” is the most important in the packaging areas. Other TCs most relevant to packaging in a supply chain under the “Packaging/Distribution of Goods” technical sector include TC 51 “Pallets for unit load method of materials handling”, TC 101 “Continuous mechanical handling equipment”, TC 104 “Freight containers” and TC 110 “Industrial trucks”.<sup>3</sup>

### *CEN*

The European Committee for Standardization (Comité Européen de Normalisation, CEN) is an international non-profit organization, which provides a platform for the development of European Standards (ENs) and other products. CEN consists of 31 member countries, which are the national standards organizations of the 27 European Union countries and Croatia and the three countries of the European Free Trade Association (EFTA). CEN national members are responsible for the implementation of European Standards as national standards. CEN cooperates with ISO by various means including the adoption of the same text, as both an ISO Standard and a European Standard for common EN/ISO standards, according to the Vienna Agreement signed in 1991.<sup>4</sup>

## **METHODOLOGY**

This research used both quantitative and qualitative methods. In the quantitative survey, the Krejcie and Morgan table was used to determine the sample size of this research. A total of 189 respondents were represented by wholesalers and exporters who commonly used large-size and bulk packaging for their agricultural products. A questionnaire survey was established and distributed to wholesalers and exporters to collect the necessary data. A face-to-face interview was conducted at wholesale market areas in the state of Selangor and the Federal Territory of Kuala Lumpur. The face-to-face

<sup>1</sup> The Food and Agriculture Organization of the United Nations and the World Trade Organization 2017

<sup>2</sup> [www.codexalimentarius.net/web/index\\_en.jsp](http://www.codexalimentarius.net/web/index_en.jsp)

<sup>3</sup> [www.iso.org/iso/home.html](http://www.iso.org/iso/home.html)

<sup>4</sup> [www.cen.eu/cen/AboutUs/Pages/default.aspx](http://www.cen.eu/cen/AboutUs/Pages/default.aspx)

interview was also conducted in Cameron Highlands with the respondents getting their responses. The structured questionnaire consisted of three sections. Section A consisted of questions on socio-demographic profiles, while Section B consisted of questions on farm or company profiles and Section C was established to include questions about large-size and bulk packaging for agricultural products (including the types, materials, weight, and cost of packaging used). Descriptive analysis was used to analyze data from the responses obtained during interviews. As for the qualitative method, desktop research for benchmark analysis was employed to benchmark Malaysia with other countries in terms of packaging.

## RESULTS AND DISCUSSIONS

### *Sociodemographic Profiles of Respondents*

A total of 189 respondents represented by wholesalers participated in this research. Table 1 shows the sociodemographic profiles of the wholesalers who used bulk packaging on their agricultural products. The results revealed that the majority of the respondents were aged between 31 to 40 years (34.9%) and were male (73.0%). 42.9% of the respondents were represented by Chinese wholesalers and 68.3% of the respondents had only a certificate as their highest education level.

**Table 1: Sociodemographic Profiles of Respondents**

Profiles	Frequency (n)	Percentage (%)
Age:		
Less than 20 years	3	1.6
21-30 years	21	11.1
31-40 years	66	34.9
41-50 years	75	39.7
More than 51 years	24	12.7
Gender:		
Male	138	73.0
Female	51	27.0
Ethnic:		
Malay	63	33.3
Chinese	81	42.9
India	30	15.9
Others	15	7.9
Educational level:		
Secondary school	15	7.9
Certificate	129	68.3
Diploma	18	9.5
Degree	27	14.3
Type of business:		
Retailers	27	12.9
Wholesalers	165	78.5
Exporters	9	4.3
Importers	9	4.3

Source: Researcher

### *Types of Agricultural Products using Bulk Packaging*

The percentage of different agricultural products (fruits, vegetables, and flowers) using bulk packaging is listed in Table 2. The results found that bulk packaging for fruits was commonly used in banana (25.4%) followed by papaya (20.3%). For the vegetables, it was revealed that red chili, tomato, cabbage, and cucumber were the highest percentage for bulk packaging, with 17.6%

respectively. Among flowers, 38.2% indicated bulk packaging was for roses and 80.0% was for coconut.

**Table 2:** Types of Agricultural Products using Bulk Packaging

Agricultural products	Frequency (n)	Percentage (%)
<i>Fruits:</i>		
Banana	45	25.4
Papaya	36	20.3
Watermelon	33	18.6
Honeydew	21	11.9
Jackfruit	21	11.9
Durian	12	5.8
Cempedak	6	3.4
Rock Melon	3	1.7
<i>Vegetables:</i>		
Red Chili	36	17.6
Tomato	36	17.6
Cabbage	33	16.2
Cucumber	33	16.2
Aubergine	12	6.0
Lady's finger	9	4.4
Salad	9	4.4
Capsicum	9	4.4
Onion leaves	6	2.9
Sawi	6	2.9
String bean	6	2.9
Celery leaves	3	1.5
Spinach	3	1.5
Water spinach	3	1.5
<i>Flowers:</i>		
Rose	39	38.2
Orchid	33	32.4
Sunflower	18	17.6
Chrysanthemum	9	8.8
Chrysanthemum	3	3.0
<i>Other commodities:</i>		
Coconut	24	80.0
Sugarcane	3	10.0
Coffee bean	3	10.0

Note: The number of types of bulk packaging for agricultural products is based on the sample of this study only

Source: Researcher

### ***Suitability of Bulk Packaging for Large-Sized Fruits***

Table 3 (a) shows the types of agricultural products, types of packaging materials, and costs of bulk packaging for agricultural products. In general, the type of bulk packaging used and the weight of the packaging are varied according to agricultural products as well as the cost of packaging (RM/unit) for each type of fruit. The use of different types of materials and packaging involved different costs for each type of fruit. The results revealed that, for example, watermelon, the lower packaging cost was a plastic basket which was RM20.00 to RM35.00 per unit of packaging compared to a wooden pallet of RM30.00 to RM48.00 per unit of packaging.



**Table 3 (a):** Types of Agricultural Products using Bulk Packaging (fruits)

No.	Types of Fruits	Types of Packaging	Types of Materials	Packaging Cost (RM/Packaging Unit)	Wholesale Weight (Kg/Packaging Unit)	Export Weight (Kg/Packaging per Box)
1	Durian	Polyfoam	Pulp Container	20.00	20 to 50	10
		Plastic basket	Plastic	20.00 to 35.00	20 to 50	-
2	Jackfruit	Plastic basket	Plastic	20.00 to 35.00	20 to 30	18
3	Papaya	Plastic basket	Plastic	20.00 to 35.00	40 to 50	5
4	Watermelon	Plastic basket	Plastic	30.00 to 48.00	50 to 60	14
		Plastic basket	Plastic	20.00 to 35.00	50 to 60	-
5	Rock Melon	Plastic basket	Plastic	20.00 to 35.00	20 to 50	11
6	Honeydew	Plastic basket	Plastic	20.00 to 35.00	20 to 50	-
		Corrugated box	Paper	2.00 to 12.00	10	11
7	Cempedak	Plastic basket	Plastic	20.00 to 35.00	50	12
8	Banana	Plastic basket	Plastic	20.00 to 35.00	50 to 70	30

Note:

\* Data weight of packaging for wholesale

\*\* Data weight of packing weight for export

Data for the weight of exports packaging use boxes (Source: Federal Agricultural Marketing Authority (FAMA).

Source: Researcher

The widely used bulk packaging for vegetables was corrugated boxes or boxes, and plastic baskets (Table 3 (b)). The type of packaging was selected according to the size and types of vegetable. For green vegetables such as celery, spring onion, spinach, water spinach, and mustard, the type of packaging often used is packaging in plastic and subsequently placed in a box. While for vegetables such as cucumber and aubergine, plastic baskets were commonly used for bulk packaging.

**Table 3 (b):** Types of Agricultural Products using Bulk Packaging (Vegetables)

No.	Types of Vegetables	Types of Packaging	Types of Materials	Packaging Cost (RM/Packaging Unit)	Wholesale Weight (Kg/Packaging Unit)	Export Weight (Kg/Packaging per Box)
1	Red Chilli	Corrugated box	Paper	2.00 to 12.00	10 to 25	20
2	Cabbage	Plastic basket	Plastic	20.00 to 35.00	30 to 35	25
		Box	Paper	5.00 to 10.00	35	
3	Cucumber	Plastic basket	Plastic	20.00 to 35.00	25	20
4	Salad	Corrugated box	Paper	20.00 to 35.00	25	25
5	Tomato	Corrugated box	Paper	2.00 to 12.00	9 to 30	9 to 15
		Plastic basket	Plastic	20.00 to 35.00	5 to 30	
6	Onion leaves	Plastic basket	Plastic	20.00 to 35.00	25	20
7	Celery leaves	Plastic basket	Plastic	20.00 to 35.00	25	20
8	Capsicum	Corrugated box	Paper	2 to 12	25 to 30	25

		Plastic basket	Plastic	20.00 to 35.00	20 to 30	25
9	Spinach	Plastic	Plastic	2.00 to 5.00	25	20
10	Sawi	Plastic	Plastic	2.00 to 5.00	20 to 25	20
11	Water spinach	Plastic	Plastic	2.00 to 5.00	20 to 25	-
12	Lady's finger	Plastic	Plastic	2.00 to 5.00	20 to 30	-
13	Aubergine	Plastic basket	Plastic	20.00 to 35.00	30	25
		Box	Paper	5.00 to 10.00	25	20
14	French beans	Plastic basket	Paper	20.00 to 35.00	25	-

Source: Researcher

Table 3 (c) shows the bulk packaging of flowers. The bulk packaging data finding will look at the type of packaging, type of material, cost of packaging, and packaging weight. The use of packaging/type of materials is different from fruits and vegetables. Bulk packaging types of flowers are corrugated paper, plastic, bubble wrappers, and plastic baskets. Usually, the flowers will be wrapped with paper plastic and placed either in cardboard trays, or plastic baskets. The use of bubbles and paper wrappers on the outer layer is to keep the flowers from damage.

**Table 3 (c):** Types of Agricultural Products using Bulk Packaging (Flowers)

No.	Types of Flowers	Types of Packaging	Types of Materials	Packaging Cost (RM/Packaging Unit)	Wholesale Weight (Kg/Packaging Unit)	Export Weight (Kg/Packaging per Box)
1	Chrysanthemum	Plastic paper	Paper	2.00 to 5.00	5 to 10	10 to 20
		Cardboard tray	Plastic	10.00	5 to 10	10
2	Sunflower	Plastic basket	Plastic	10.00 to 25.00	2 to 5	10 to 20
		Box	Paper	2.00 to 5.00	2 to 5	10 to 20
3	Orchid	Box	Paper	2.00 to 5.00	2 to 5	10 to 20
4	Rose	Corrugated carton box	Paper	14 to 25	2 to 5	10 to 20
		Plastic	Plastic	10.00	2 to 5	10
5	Anthurium	Bubble wrapper	Plastic	10.00 to 15.00	5 to 10	10 to 20
		Paper	Paper	10.00 to 15.00	5 to 10	15

Source: Researcher

Table 3 (d) shows the results of bulk packaging types for the other three commodities, namely coconut: coconut coffee beans. For coffee beans (either for import or export), there were three types of packaging identified for bulk packaging namely jute fibre/fibre, boxes, and sacks. The lowest packaging cost was a sack of RM2.00 to RM3.50. As for sugarcane crops, the type of bulk packaging used is dumping where sugarcane will be tied to 10 sticks/bonds, weighing between 20 to 30 kg/unit.

**Table 3 (d):** Types of Agricultural Products using Bulk Packaging (Other Commodities)

No.	Types of Other Communities	Types of Packaging	Types of Materials	Packaging Cost (RM/Packaging Unit)	Wholesale Weight (Kg/Packaging Unit)	Export Weight (Kg/Packaging per Box)
1	Coconut	Plastic basket	Plastic	20.00 to 35.00	70	30
2	Sugarcane	Strap	Plastic	10.00	20 to 30	30



3	Coffee beans	Jute fibre/fibre	Plant fibre	10.00 to 15.00	60	60
		Box	Paper	10.00 to 15.00	60	
		Sack	Plastic	2.00 to 3.50	60	

Source: Researcher

### ***Percentage of Damage for Not Using Suitable Packaging***

Based on Table 4, it was found that the average damage for fruits that did not comply with the suitable packaging and weight set was around 5.0% to 10.0%. The percentage of damage for watermelon and honeydew was the same at 10.0%, either using box packaging or plastic packaging. For thin-skinned fruits such as papaya and mango, the percentage of damage was higher if the products were wrapped in plastic and box compared to the open plastic baskets that provide adequate ventilation to these fresh agricultural products.

For vegetables, it was found that the percentage of damage ranged from 2.0% to 5.0%. There would be a relatively high damage of around 10.0% if this product used plastic basket packaging. Meanwhile, the percentage of damage to anthurium flowers was relatively small, around 2.0% to 5.0%, compared to other flowers, such as chrysanthemum, rose, and orchid. As for other commodities, the percentage of damage to coffee beans is the least compared to coconut and sugarcane due to the hard and dry nature of coffee beans. However, for these coffee beans, wholesalers often have problems weighing the coffee beans. The loss suffered by the coffee bean wholesaler is around 15.0% if the exporter wants to change the weight of the kilogram of coffee beans to 30 kg.

**Table 4:** Percentage of Damage to Agricultural Products that do Not Use Suitable Packaging for Domestic

Type of Fruits	Percentage of Damage
Coconut	<ul style="list-style-type: none"> <li>10.0% for plastic basket packaging</li> </ul>
Watermelon/Honeydew	<ul style="list-style-type: none"> <li>10.0% for plastic basket packaging, 10.0% for box packaging</li> </ul>
Banana	<ul style="list-style-type: none"> <li>5.0%-10.0% for box packaging, 10.0% for plastic basket packaging</li> </ul>
Papaya	<ul style="list-style-type: none"> <li>5.0% for plastic basket packaging, 10.0% for plastic packaging, 10.0% for box packaging</li> </ul>
Mango	<ul style="list-style-type: none"> <li>5.0% for plastic basket packaging, 10.0% for plastic basket packaging, 10.0% for box packaging</li> </ul>
<i>Cempedak</i>	<ul style="list-style-type: none"> <li>5.0% for plastic basket packaging</li> </ul>
Type of Vegetables	Percentage of Damage
Spinach, water spinach	<ul style="list-style-type: none"> <li>2.0%-5.0% for plastic and box packaging and box</li> </ul>
Aubergine, cucumber	<ul style="list-style-type: none"> <li>2.0%-5.0% for plastic basket packaging and box</li> </ul>
Red Chilli/Capsicum	<ul style="list-style-type: none"> <li>2.0%-5.0% for plastic basket packaging 2.0%-5.0% for plastic basket packaging</li> </ul>

Tomato, carrot, lady's finger, Cabbage	<ul style="list-style-type: none"> <li>10.0% for plastic basket packaging 2.0%-5.0% for plastic basket packaging 2.0%-5.0% for box packaging</li> </ul>
Type of Flowers	Percentage of Damage
Chrysanthemum	<ul style="list-style-type: none"> <li>10.0% for plastic basket packaging and paper plastic</li> </ul>
Sunflower	<ul style="list-style-type: none"> <li>10.0% for paper board packaging</li> </ul>
Orchid	<ul style="list-style-type: none"> <li>10.0% for paper board packaging</li> </ul>
Rose	<ul style="list-style-type: none"> <li>10.0% for paper and plastic board packaging</li> </ul>
Anthurium	<ul style="list-style-type: none"> <li>2.0%-5.0% for paper packaging</li> </ul>
Other Commodities	Percentage of Damage
Coconut	<ul style="list-style-type: none"> <li>10.0% for plastic basket packaging</li> </ul>
Sugarcane	<ul style="list-style-type: none"> <li>Less than 5.0% for rope-bound packaging</li> </ul>
Coffee beans	<ul style="list-style-type: none"> <li>Less than 2.0% for all types of packaging</li> </ul>

Note: The percentage of damage for exports due to packaging is minimal, around 2.0 percent to 5.0 percent only, as the export packaging will use the conditions and standards set by the importing countries. Usually, the damage to agricultural products is caused by the shipping process and logistics in terms of container temperature, the duration, and the delivery duration conditions during the transportation process.

Source: Researcher

### ***Implications of Using Appropriate Types of Materials and Packaging for Bulk Agricultural Products***

Table 5 (a) shows the implications of the use of packaging and material types for agricultural products of fruits, vegetables, and flowers. About 22.0% of respondents stated that using the appropriate type of packaging for a large fruit can save the cost of the materials, for example, plastic baskets, plastic bags, paper, and even nets. Furthermore, 21.9% of the respondents also noted a simpler and faster packaging process that was easily managed manually using manpower (19.0%). For perishable fruits, different materials and good packaging should also be emphasized to preserve the freshness of the fruit (21.1%). To protect fruits such as those that are sharp or soft-skinned (16.0%) was also revealed as one of the benefits.

**Table 5 (a):** Implications of Using Appropriate Types of Materials for Bulk packaging for Fruits

Implications	Rank	Percentage (%)
Cheaper cost	1	22.0
The packaging process is simple and fast	2	21.9
Maintain the freshness of the fruit	3	21.1
Easy to manage manually	4	19.0
To protect Fruits (sharp thorns, soft-skinned)	5	16.0

Source: Researcher

Based on Table 5 (b), the benefits of appropriate packaging types for vegetables were that it provides a more straightforward and faster packaging pr. In comparison, 25.0%), while 23.8% of the respondents agreed that when used, appropriate materials and types of packaging can guarantee the durability of the packaging type from being damaged and also to protect vegetables such as flowering and leafy vegetables (22.7%). 16.9% of respondents also stated that using appropriate makes it easier

for the fruit to be transported manually. The remaining 11.6% of the respondents responded that it is easy to manage using machinery.

**Table 5 (b):** Implications of Using Appropriate Types of Materials for Bulk Packaging for Vegetables

Implications	Rank	Percentage (%)
The packaging process was simple and fast	1	25.0
The durability of a solid type of packaging	2	23.8
To protect vegetables (leave, flowering)	3	22.7
Easy to manage manually	4	16.9
Easy to manage using by using machinery	5	11.6

Source: Researcher

Table 5 (c) shows the benefits of using packaging and materials types for flowers. The care of fresh flowers is highly complicated, and it is necessary to maintain the quality of the flower during pre-sale storage, transportation, and sale at the wholesale or retail stage of fresh flowers. Even the high cost of transportation, in addition to limited cargo space, affects the flower industry. Besides, export by air also affects the quality of flowers, and even flowers cannot be delivered in large quantities and must be sent five hours in advance to the airport for customs inspection. Hence, it is essential to select the appropriate types of materials and packaging that do not affect the quality of the flowers to the volatile ambient temperatures, thus affecting the quality of the blossoms and withers. 24.0% of respondents stated that appropriate packaging could maintain the freshness of the flowers for up to one week after the sale if perfectly packaged. While 23.6% also said it was easy to manage manually as it was wise to choose the proper packaging. In addition, a simpler and faster packaging process (20.0%) was one of the benefits of selecting the type of flower packaging. The durable and sturdy packaging type (17.9%) and the flowers are not easily damaged without compromising the quality of the tread and withers (14.5%).

**Table 5 (c):** Implications of Using Appropriate Types of Materials for Bulk packaging for Flowers

Implications	Rank	Percentage (%)
The freshness of the flower is maintained	1	24.0
Easy to manage manually	2	23.6
The packaging process is simple and fast	3	20.0
The durability of a solid type of packaging	4	17.9
Flowers are not susceptible to rotting, withers	5	14.5

Source: Researcher

### ***Implications of Using Inappropriate Types of Materials and Bulk Packaging for Agricultural Products***

Table 6 (a) shows that 30.0% of respondents stated that using unsuitable packaging for the fruits would damage the packaging itself, thus making it unable to protect the fruit. Inappropriate packaging methods will also prevent the fruits from being easily damaged, especially soft-skinned ones (29.0%). In addition, selecting unsuitable packaging and material types can also lead to high-cost consumption (23.0%) as wholesalers are forced to bear the loss due to the damage to the fruits. 15.0% of respondents also stated that strong-smelling fruits such as *Durian*, *Cempedak*, and Jackfruit must be packed with the suitable types of packaging and materials to prevent the strong-smelling fruits from

impacting the environment in the market. Large-sized fruits are more suitable for solid packaging material to accommodate the fruits' weight while maintaining the freshness (quality) of the product (3.0%).

**Table 6 (a):** Implications of Using Inappropriate Types of Materials and Bulk Packaging for Fruits

Implications	Rank	Percentage (%)
Poor durability packaging (example: easily wet)	1	30.0
Easily damage the fruits (example: soft-skinned)	2	29.0
High cost	3	23.0
Unable to cope with the problem of solid smelling fruits (e.g., durian, <i>cempedak</i> , and jackfruit)	4	15.0
The freshness of the product is easily affected	5	3.0

Source: Researcher

The implications of using improper packaging of vegetables differ from fruits. A suitable packaging method can reduce water loss from vegetables and mechanical damage that can affect the quality of vegetables at the stage of use. Therefore, using inappropriate types of packaging will affect the high-cost value (21.4%). In addition, the quality of vegetable farming products will also be affected, i.e., freshness could be more sustainable, and there will be injuries to vegetables, e.g., vegetables will quickly rot and wither (20.4%). Respondents also indicated that improper packaging made managing the handling process difficult (19.8%). This is because the handling process still uses manpower. The use of improper packaging also made it difficult and delayed the packaging process (19.4%) and indirectly affected the freshness of the product (19.0%).

**Table 6 (b):** Implications of Using Inappropriate Types of Materials and Bulk Packaging for Vegetables

Implications	Rank	Percentage (%)
High cost	1	21.4
Unable to maintain the freshness of vegetables (Vegetables quickly rot and wither)	2	20.4
Difficult to manage manually	3	19.8
The complicated and slow packaging process	4	19.4
The freshness of the product is easily affected	5	19.0

Source: Researcher

The selection of packaging materials did not correspond to the types of flowers. The main implication for using improper packaging for flowers was that they are expensive, and wholesalers are forced to incur losses (29.0%). For example, the flower will quickly wilt when exposed to water and moisture or heat. Then it is impossible to maintain the flower's freshness as the flowers rapidly wither (29.0%).

In addition, 24.0% of respondents stated that the implications of using improper packaging were complicated and that it is a time-consuming process. This shortened the freshness period of the flower. In contrast, the result showed that flowers' durability is easily damaged due to fragile packaging, such as sharp thorny flowers (12.0%). Care for fresh flowers is exceptionally delicate, and it is crucial to maintain the quality of the flower during storage before the sale or export. 6.0% stated

that the freshness of the flowers is negatively affected due to the use of improper packaging causes the flower to be exposed to an uncertain ambient temperature.

**Table 6 (c):** Implications of Using Inappropriate Types of Materials and Bulk Packaging for Flowers

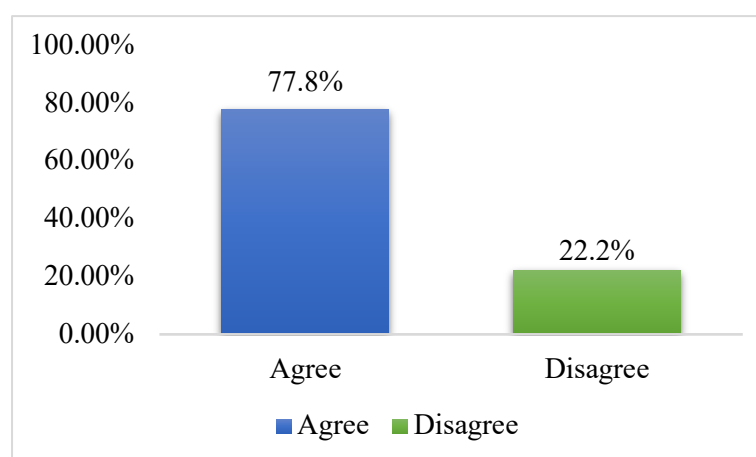
Implications	Rank	Percentage (%)
High cost	1	29.0
Unable to maintain the freshness of the flower (flowers easily wither and rot)	2	29.0
The complicated and slow packaging process	3	24.0
Flowers are easy to damage (sharp thorns)	4	12.0
The freshness of the flower is easily affected	5	6.0

Source: Researcher

### ***The Grading, Packaging, and Labelling (GPL) Regulations for Bulk Packaging***

Figure 1 shows the results related to the GPL regulations of agricultural products under the Federal Agricultural Marketing Authority (FAMA). In general, the results showed that the majority of respondents (77.8%) agreed with the rules set out in the GPL.

22.2 percent of the respondent not agree with GPL regulation due to the commodity types. This indirectly involves additional costs for the repackaging process. For example, the world coffee bulk packaging practice is 60 kg to 69 kg, depending on the manufacturers' country. Wholesalers must incur additional costs of up to 15% for bulk repackaging of coffee beans.



**Figure 1:** Respondents' Views on the Current GPL Regulations

### ***SWOT Analysis***

According to American Marketing Association (AMA), SWOT analysis assesses internal and external factors: strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are inner, while opportunities and threats are external. These factors are contributed by facts to recognize trends and conditions with the prospective to affect the business and the selection of strategies to be implemented. It incorporates the four primary elements to boost strength, benefit from opportunities,

deal with external issues, avoid threats, and minimize weaknesses (DeSilets & Lynore, 2008). The SWOT analysis for these studies are listed in Table 7.

**Table 7: SWOT Analysis**

Strength	Weakness
<ul style="list-style-type: none"> <li>Implementing the GPL Regulation is essential in addressing the challenges faced by producers of agricultural products and can create competitiveness of fresh farm produce. The GPL regulations outline the bulk packaging characteristics of agricultural products in Malaysia, and this provides an advantage for farm products in terms of quality and availability in local and overseas markets.</li> <li>77.8 percent of wholesalers agree with the existing GPL Regulations. The use of packaging in compliance with the GPL Regulation among wholesalers gives the impression that the quality of agricultural products is good and assured of its quality.</li> <li>The durable type of packaging material can protect agricultural products from damage.</li> <li>This is because the premium packaging is ready to be weighed, and the price tag is.</li> </ul>	<ul style="list-style-type: none"> <li>Although the percentage of implementation of the GPL Regulation for the maximum weight of packaging of agricultural products for export purposes is high, the full weight of agricultural packaging in the domestic market still needs to comply with this GPL regulation.</li> <li>Some agricultural products do not require packaging weight based on the GPL Regulation of 30 kg, which is different from the bulk packaging standards of the exporting countries (60 kg to 69 kg).</li> <li>For some agricultural products, the use of types and materials of bulk packaging is not suitable for the durability of an agricultural product. This situation causes fruits and vegetables to be perishable and affects prices and profits.</li> <li>The study shows that manual packaging is still widely implemented compared to technology packaging. This situation resulted in the gradation of agricultural products different from the specified size specifications.</li> </ul>

Opportunities	Threats
<ul style="list-style-type: none"> <li>The existence of clear rules has resulted in the production capacity of agricultural products being increased and easy to penetrate the international market. This situation will allow the country's exports to be raised and thus increase the national income.</li> <li>The 30kg weight as the standard maximum weight facilitates the transportation of agricultural products such as providing box sizes and promoting agricultural products Malaysia competes abroad.</li> </ul>	<ul style="list-style-type: none"> <li>Each country sets the maximum weight for agricultural output. The differences and inconsistency of the regulations relating to packaging across countries cause the packaging to be repackaged if agrarian products are meant to be exported to countries with different rules.</li> <li>For some agricultural products, such as coffee bean commodities, standard bulk packaging is 60 kg. This caused the wholesaler to suffer a loss of 15 percent as repackaging is compulsory, according to GPL Malaysia.</li> <li>The high quality of the packaging for agricultural products used by other countries gives competition to the agricultural products in Malaysia.</li> </ul>

Source: Researcher

## DISCUSSIONS

A SWOT analysis can provide valuable insights into the potential benefits and risks of using this packaging method when investigating bulk packaging for agricultural products. In general, the strengths of bulk packaging for farm products can help reduce packaging costs, as it typically involves



more significant quantities of products being packaged at once. Bulk packaging can also help reduce transportation costs, as larger quantities of products can be transported in a single shipment. Bulk packaging can be more environmentally sustainable, reducing the packaging material required. Adopting bulk packaging for agricultural products can help increase efficiency and reduce costs, improving profitability for farmers and other stakeholders in the agriculture industry. Bulk packaging can also help meet the growing demand for sustainable and environmentally friendly packaging options.

There may be resistance to adopting bulk packaging among some stakeholders in the agriculture industry, especially if they are unfamiliar with this packaging method or have concerns about product quality. However, bulk packaging may only be suitable for some agricultural products, as some products may require specialized packaging to maintain freshness and quality. Bulk packaging can also be more challenging to handle and transport, as it often involves larger and heavier packaging materials. Bulk packaging may also face regulatory challenges, as specific regulations may govern the use of certain packaging materials or methods.

Hence, by considering these strengths, weaknesses, opportunities, and threats associated with bulk packaging for agricultural products, a SWOT analysis can help stakeholders make more informed decisions about whether to adopt this packaging method and how best to implement it.

## IMPLICATIONS

The common practice of packaging by wholesalers is contrary to the GPL Regulations developed by FAMA. The standard weight for bulk packaging of agricultural products should be reviewed according to the type of agricultural output. For example, bulk packaging for coffee beans and coconut commodities should be revisited to align with the world's industrial bulk packaging for wholesale packaging and export. The packaging of fruits, vegetables, and fresh flowers should also comply with the Codex International Code of Practice recommended for the packaging and transporting fresh fruits and vegetables. This paper includes information details for proper packaging and transportation to maintain fresh agricultural products' quality during transportation and marketing.

The relevant parties need to monitor the bulk packaging activities of wholesalers or manufacturers from time to time. Monitoring can be carried out regarding the quality of use of the type of packaging and materials used. This is due to the observation of fieldwork on the use of recycling boxes, such as disposable diaper boxes and mosquito medicine boxes, and newspapers are still in use despite the prohibition from the relevant agencies. Sanitation of packaging, as well as packaging, operation, and storage areas, should also be carried out to maintain the quality level of wholesale and export agricultural products. Therefore, it is recommended to create a penalty if there is non-compliance with the use of recycling boxes which is dangerous from a food safety point of view.

Respondents use less suitable packaging types for each type of agricultural product (fruits, vegetables, flowers, and other commodities). Weight and size should be limited to bulk packaging of agricultural products to minimize damage and increase the protection of farm products as well as worker safety. In addition, the focus should also be on the aspects of the use of durable, easy-to-manage types of packaging and materials. Wholesalers should be given detailed exposure to the GPL regulations that have been set. The wholesaler's awareness of the GPL rules was found to be at a low level. Although they perceived that they were aware of the GPL regulations, the common practice of bulk packaging is different from the required specifications. Communications between FAMA and wholesalers need to be implemented to convey the latest information on various aspects of packaging and distribution

for agricultural products. The communication approach can be through social sites and broadcast media.

The handling of packaging is still conventional and with minimal use of technology. Appropriate packaging technology, such as modified atmosphere and active packaging, should be used on fresh products to maintain better quality and longer shelf life. For example, cold chains are essential for the distribution of fresh produce. Frozen truck facilities or thermal protection equipment should be provided starting from agricultural products' storage and transportation process to maintain freshness and quality. Appropriate handling and transportation can reduce damage and losses. The use of technology in the bulk packaging process not only warranty the quality of the products, but also the use of the workforce can be reduced to manage the bulk packaging of agricultural products.

## CONCLUSION

Based on this research, bulk packaging can be a cost-effective and sustainable option for transporting fresh agricultural products. The type of bulk packaging chosen should depend on the specific needs of the product being transported, including factors such as temperature control, moisture control, and protection from damage. As agriculture industry players, the wholesalers need education and training on the benefits and best practices of using bulk packaging to increase adoption and ensure successful implementation. Besides, regulatory considerations must be considered when choosing bulk packaging materials and methods, as there may be specific regulations governing the transportation of certain agricultural products. Further research is needed to determine the optimal bulk packaging solutions for different types of fresh agricultural products and continue improving the efficiency and sustainability of this packaging method.

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