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Research Article

The Role of Stakeholders in Supporting the Usage of Reusable Crates for Agricultural Products

Asmizal binti Jaafar[a], Mohd Rizaimy Shaharudin[b*], Noor Zahirah Mohd Sidek[c], Fairosnisa Md. Desa[a], Wan Nailah Abdullah[d], Noor Azlina Mohd Salleh[e]

[a]Federal Agricultural Marketing Authority (FAMA), Bangunan FAMA Point, Bandar Baru Selayang, Batu Caves, Selangor, Malaysia, [b]Research Nexus UiTM (ReNeU), Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia, [c]Faculty of Business and Management, Universiti Teknologi MARA, Kedah Branch, Kedah, Malaysia, [d]Faculty of Accountancy, Universiti Teknologi MARA, Kedah Branch, Kedah, Malaysia, [b,e]Smart Manufacturing Research Institute, Universiti Teknologi MARA, Shah Alam, Selangor

*Correspondence: rizaimy@uitm.edu.my

ABSTRACT:
This study aims to determine stakeholder support for the usage of reusable crates, particularly for agricultural products such as vegetables and fruits, in Malaysia. The study utilized a combination of quantitative and qualitative data collection techniques, including surveys and interviews. A total of 597 complete questionnaires were collected, and twelve stakeholders, including government agencies, associations, transportation companies, and supermarkets, participated in focus group discussions. The results indicate that each stakeholder has a distinct role in the usage and management of reusable crates among users. Key stakeholders, including authorities, delivery service providers, and suppliers, effectively fulfil their roles and responsibilities in supporting the use and operation of reusable crates. The study emphasizes the importance of stakeholders such as DBKL, PKPS, and the wholesaler association in recognizing their role in supervising and monitoring the usage, arrangement, and storage of crates. This involvement ensures efficient crate management and promotes the sustainable use of reusable crates among wholesalers, retailers, and end users, thereby fostering sustainable practices in the agriculture sector.

KEYWORDS: Reusable Crates, Stakeholders, Vegetable, Fruits, Packaging

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INTRODUCTION

The use of reusable crates, particularly in the context of supply chain management, has gained significant attention due to their potential environmental benefits and operational efficiencies. Reusable crates are increasingly employed across various fruit and vegetable supply chain stages, including harvesting, handling, packaging, and transportation. Their adoption is often justified by the promise of enhanced sustainability compared to single-use packaging options, such as cardboard boxes. For instance, López-Gálvez et al. (2021) highlight that reusable crates can improve environmental sustainability but also raise concerns regarding hygiene and the risk of microbiological contamination, particularly with fresh produce. This duality of benefits and risks necessitates a comprehensive examination of reusable crates within the broader context of sustainable packaging solutions.

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The operational aspects including reverse logistics, are also critical to the success of the reusable crates system. Park and Waqar (2022) note that returnable packaging requires a robust reverse logistics framework to ensure that reusable items are efficiently returned and reused, which is essential for maximizing their environmental benefits (Shaharudin et al., 2020). Furthermore, Berzi (2024) research on the redesign of reusable packaging highlights the importance of optimizing packaging for specific transport needs, which can enhance both environmental and economic performance. This indicates that the successful implementation of reusable crates is not merely a matter of replacing single-use packaging but involves a comprehensive redesign of logistics and operational processes.

The agricultural supply chain requires efficient handling, packaging, and transportation of perishable goods. Traditional single-use packaging methods, such as cardboard boxes, are widely criticized for their environmental impact and inefficiencies. In response, many companies and organizations are adopting reusable crates, which offer advantages such as waste reduction, cost savings, and improved operational efficiency. These crates are commonly used to transport produce from farms to markets or distribution centers.

In Malaysia, the government has implemented initiatives to promote sustainable packaging and reduce dependence on single-use plastics. The adoption of reusable crates aligns with the goals of the 12th Malaysia Plan (RMKe-12) to support a circular economy and effective waste management. Through the Ministry of Science, Technology, and Innovation (MOSTI), Malaysia aims to eliminate single-use plastics by 2030. This effort is crucial, as Malaysia ranks among the top 10 countries with the highest levels of plastic waste mismanagement globally. Efficient utilization of reusable crates will assist the government's efforts to reduce the amount of plastic packaging waste and achieve more sustainable and environmentally friendly waste management practices.

The Federal Agricultural Marketing Authority (FAMA) extensively uses reusable crates in the supply chain for vegetables and fruits. These crates facilitate transportation from farmers to wholesalers, retailers, and even between operations centers (Pusat Operasi). To maintain the quality and protect the safety of fresh produce supply, it requires integrated efforts from all parties involved in the supply chain, from farmers to consumers. They help maintain the quality and safety of fresh produce while reducing losses. Overall, reusable plastic crates play a vital role in improving packaging, transportation, and sustainability in Malaysia's agricultural sector.

Implementing reusable crate systems can present several challenges. Key issues include developing an efficient reverse logistics system for crate collection and redistribution, maintaining a sufficient number of crates in circulation to meet demand, and ensuring proper cleaning and maintenance between uses. Addressing these logistical challenges requires careful planning and coordination among all stakeholders in the supply chain. Despite these difficulties, reusable crates offer significant potential to support sustainable practices by reducing waste and enhancing resource efficiency. Organizations can maximize the benefits of reusable crate systems by tailoring their implementation to the specific needs and challenges of their industry or sector. This approach helps assess the feasibility and advantages of integrating reusable crates into their packaging strategies effectively.

To date, limited studies have been conducted on the roles and responsibilities of stakeholders regarding the use of reusable crates in Malaysia. Such research is critical to assessing the level of stakeholder support for reusable crates in the agricultural sector, particularly for transporting vegetables and fruits. This can contribute significantly to creating a more sustainable supply chain cycle that benefits farmers, retailers, and sales centers, ultimately improving customer satisfaction. Furthermore, examining stakeholder acceptance of reusable crates is essential for evaluating their environmental impact, cost-effectiveness, supply chain efficiency, customer perception, regulatory

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compliance, and stakeholder engagement. The insights gained from this research can help organizations implement sustainable packaging solutions effectively and align their practices with stakeholder expectations and industry needs.

This study highlights the importance of stakeholder support in adopting reusable crates for agricultural products, particularly fruits and vegetables, in Malaysia. By addressing this objective, the study contributes to practical advancements by promoting sustainable practices within the supply chain, such as reducing plastic waste, improving logistics efficiency, and fostering collaboration among stakeholders, including farmers, retailers, and distributors. From a theoretical perspective, the findings provide valuable insights into stakeholder engagement and the adoption of green technologies in agriculture, bridging gaps in current literature on sustainable packaging systems. The implications extend to policy development, where the study can inform regulatory frameworks and best practices for integrating reusable solutions in agricultural supply chains.

LITERATURE REVIEW

Reusable Crates

Reusable crates, also known as returnable transit packaging (RTP) or reusable plastic crates (RPC), are containers designed to be used multiple times. They offer an alternative to traditional single-use packaging, such as cardboard boxes or wooden crates, which are discarded after a single use (Abejon et al., 2020). The use of reusable crates in Malaysia can bring several benefits, including reduced waste generation, cost savings, and improved logistics efficiency.

The main idea behind reusable crates is to reduce waste and promote sustainability. By using crates that can be repeatedly utilized, the need for disposable packaging materials, such as cardboard boxes or single-use plastic containers, is minimized. This can lead to significant environmental benefits by reducing resource consumption, waste generation, and greenhouse gas emissions associated with the production and disposal of single-use packaging (Coelho et al., 2020).

Reusable crates can offer several advantages over single-use packaging options. They are generally more durable and sturdier, providing better protection for the goods being transported. They can also be designed to optimize space utilization, allowing for efficient packing, and reducing the need for additional packaging materials. Moreover, by reducing waste and the associated costs of disposal or recycling, reusable crates can offer potential cost savings in the long run (Coelho et al., 2020). Concerning this, economic considerations play a vital role in the adoption of reusable crates. Stakeholders must recognize that while the initial investment in RPCs may be higher, the long-term savings from reduced waste disposal costs and the potential for increased efficiency in logistics can outweigh these costs (Betts et al., 2022). For instance, the successful implementation of reusable packaging systems depends on their economic viability and the characteristics of the packaging system (Betts et al., 2022). Moreover, the involvement of policymakers is crucial in creating incentives and regulations that support the transition to reusable packaging, as noted by Blumhardt (2023), who argues for legislative reforms to level the economic playing field between single-use and reusable systems.

The perception of stakeholders on the usage of reusable crates in vegetables and fruits is generally positive. Many stakeholders, such as farmers, distributors, and retailers, have recognized the benefits of using reusable crates for transporting and storing produce. These benefits include cost savings, environmental sustainability, and increased efficiency in the supply chain. Additionally, consumers are increasingly concerned about the environmental impact of single-use packaging, which has led to

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an increased demand for reusable alternatives. Overall, the usage of reusable crates in the produce industry has proven to be an effective and sustainable solution that benefits all stakeholders involved.

Packaging preserves the chemical, physical and nutritional conditions of foods as well as facilitates purchasing, warehousing and transportation activities throughout "the farm to the fork chain" (Verghes and Lewis, 2007). Beneficial changes are occurring; for example, the use of RPCs is gaining traction within the grocery and food retail sector; and researchers such as Levi et al. (2011) and Singh et al. (2006) document such implementations, demonstrating adoptions of RPC systems can provide significant economic and environmental benefits for all stakeholders.

Ecosystem and Operations of Reusable Crates

The stakeholders involved in the ecosystem of reusable crates collaborate to create an efficient, sustainable, and cost-effective supply chain. By integrating reusable crates into their operations, they promote environmental responsibility and contribute to the circular economy by minimizing waste generation and resource consumption.

Figure 1 illustrates the ecosystem of a reusable crates supply chain in Malaysia, which consists of several key parties, namely the appointed reusable crates operator, suppliers, farmers, logistics service providers, and sellers. In general, in terms of operations in Figure 2, the reusable crates are owned by the operator/owner, who provides the crates to farmers to be filled with harvested agricultural produce. The farmers will return the filled crates to the operator/owner for delivery to the wholesaler. The farmers will utilize the services of a logistics company to load the crates containing fruits and vegetables onto a transport truck for delivery to the wholesaler.

The wholesaler, in turn, will utilize the crates to transport the fruits and vegetables to retailers/sellers. Once the retailers/sellers receive the products, they will unload them from the crates and return the crates to the wholesaler. The wholesaler will then entrust the crates to the appointed logistics service provider for transportation back to the farmer/operator/owner of the crates, utilizing the return management services (Shaharudin et al., 2015a). The appointed operator/owner will reuse these crates in future transactions with farmers, wholesalers, and sellers. This cycle of crate usage will persist until the conclusion of the transaction/contract, with the crates being returned to the operator/owner in excellent condition as mutually agreed upon.

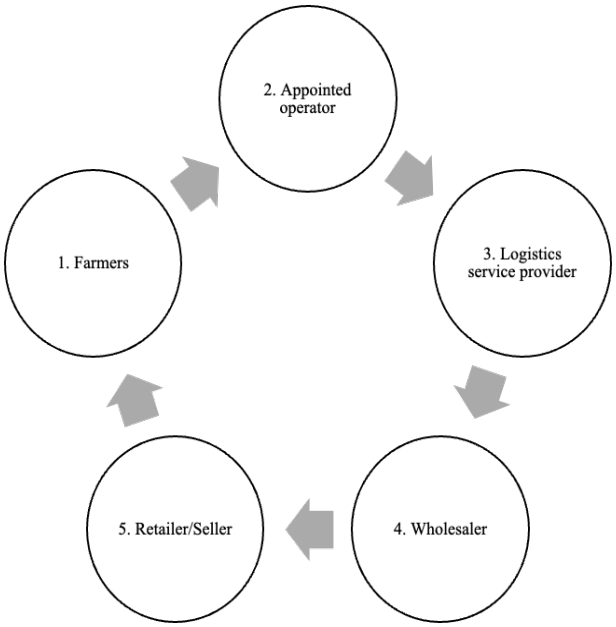

Figure 1. Ecosystem of the Reusable Crates Supply Chain

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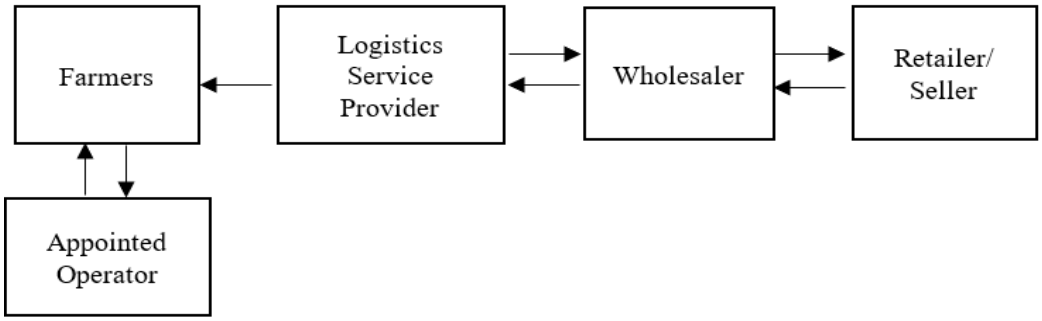

Figure 2. Operations of the Reusable Crates

The previous study highlights the advantages of reusable crates for stakeholders involved in the fruit and vegetable industry. These crates offer environmental sustainability, cost efficiency, improved product quality, enhanced supply chain efficiency, and brand image benefits. By transitioning to reusable crates, stakeholders can contribute to sustainable practices while enjoying long-term economic and operational benefits.

The fruit and vegetable industry heavily relies on efficient packaging solutions to ensure the safe transportation and preservation of fresh produce. Reusable crates have emerged as a sustainable alternative to traditional single-use packaging materials. The literature review advocates the advantages of reusable crates for stakeholders involved in the handling, distribution, and storage of fruits and vegetables, as follows:

Environmental Sustainability

Reusable crates offer significant advantages in terms of environmental sustainability compared to single-use packaging. By replacing disposable packaging materials with durable and reusable crates, stakeholders can reduce waste generation and contribute to the circular economy (Pellatt et al., 2021). A study by Tzilivakis et al. (2019) found that using reusable crates reduced packaging waste by 30-60% compared to single-use packaging. This reduction in waste helps in mitigating environmental pollution and conserving resources.

i. Cost Efficiency

Although reusable crates require an initial investment, they offer long-term cost savings to stakeholders. Research by Aslam et al. (2017) demonstrated that reusable crates provide a lower cost per trip compared to single-use packaging. These crates have a longer lifespan, withstand multiple trips, and require less frequent replacements, thereby reducing packaging costs in the long run.

ii. Improved Product Quality

Reusable crates offer better protection and preservation of fruits and vegetables during transportation and storage. The sturdy construction and design of these crates prevent physical damage, such as bruising and crushing, which can occur with single-use packaging (Pellatt et al., 2021). This results in improved product quality and reduced post-harvest losses.

iii. Enhanced Supply Chain Efficiency

The use of reusable crates can optimize supply chain operations and improve efficiency for stakeholders. Standardized crate sizes and stackability facilitate streamlined handling, storage, and transportation processes (Barreiro-Elorza et al., 2021). The consistent dimensions of reusable crates enable efficient space utilization in storage facilities, trucks, and distribution centers, reducing logistical complexities and improving overall productivity.

iv. Brand Image and Marketing Benefits

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Adopting reusable crates aligns with sustainability initiatives and enhances the brand image of stakeholders. Consumers are increasingly conscious of environmental issues and appreciate businesses that prioritize sustainable practices (Aslam et al., 2017). Using reusable crates provides a marketing advantage by demonstrating a commitment to environmental responsibility and attracting environmentally conscious customers.

The Role of Stakeholders in Supporting the Usage of Reusable Crates

The successful integration of reusable crates into the supply chain relies heavily on the collaboration and commitment of all stakeholders involved. The role of stakeholders—farmers, logistics providers, wholesalers, retailers and consumers—in supporting the usage of reusable crates is multifaceted and essential for the successful implementation of sustainable packaging practices. Each stakeholder plays a critical role in the adoption and efficiency of reusable packaging systems, which are increasingly recognized for their potential to reduce waste and environmental impact. The collective efforts of these stakeholders can lead to significant reductions in waste and environmental impact, contributing to a more sustainable future for the agricultural supply chain.

Farmers are often the first link in the supply chain, and their acceptance of reusable crates is crucial. The transition from traditional packaging methods, such as raffia baskets, to reusable plastic crates can significantly decrease post-harvest losses. Studies indicate that using plastic crates instead of traditional methods can reduce losses in both quantity and quality during transportation (van Wagenberg et al., 2019). Furthermore, the economic incentives for farmers, such as price bonuses for using reusable crates, can enhance their willingness to adopt these systems (van Wagenberg et al., 2019). This highlights the importance of trust and social norms within the agricultural community, as farmers are more likely to adopt reusable systems if they perceive benefits not only for themselves but also for their peers (van Wagenberg et al., 2019).

Logistics providers are responsible for the efficient transportation and return of reusable crates. The implementation of reverse logistics systems is essential for the success of reusable packaging, as these systems facilitate the return of crates to the point of origin after use (Park & Waqar, 2022). Effective inventory management and sharing policies can also enhance the efficiency of reusable packaging systems, ensuring that crates are utilized optimally and minimizing supply-demand discrepancies (Sun, 2024). Moreover, the environmental benefits of reusable packaging, such as reduced carbon footprints compared to single-use options, can be a strong motivator for logistics providers to adopt these systems (Zimmermann & Bliklen, 2020).

Wholesalers and retailers play a pivotal role in the acceptance and promotion of reusable crates. Their willingness to invest in and promote reusable packaging can significantly influence consumer behavior and market trends. Research shows that visible signs of use on reusable packaging can deter consumers, thus emphasizing the need for a cultural shift towards accepting reused items (Collis et al., 2023). Retailers can facilitate this shift by providing education on the environmental benefits of reusable packaging and by creating systems that encourage consumers to return crates (Moss et al., 2022). Additionally, the collaboration between wholesalers and retailers to establish efficient return processes can enhance the overall sustainability of the supply chain (Holweg et al., 2016).

Finally, visual perception of reusable packaging can enhance consumer awareness and acceptance, which is crucial for driving demand for sustainable packaging solutions (Chiu et al., 2023). This is supported by the work of Collis et al. (2023) which identifies that negative perceptions associated with signs of previous use can deter consumers from engaging with reusable systems, indicating the need for effective communication and design strategies to improve consumer acceptance. Therefore, stakeholders must collaborate to create a positive image of reusable crates, emphasizing their environmental benefits and usability.

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METHODS

Research Design

This study employed a combination of quantitative and qualitative data collection techniques using survey methodology and interviews. A survey questionnaire is designed to collect quantitative data. Survey data was collected through face-to-face interviews to obtain appropriate responses from the participants. Well-trained enumerators were assigned to collect the data at several locations of the stakeholders.

Furthermore, for qualitative research, an interview guide is created to structure the interview process. It includes open-ended questions that encourage participants to provide detailed responses, elaborate on their experiences, and express their opinions (Shaharudin et al., 2015b). The guide may also include probing questions to gather more information. Face-to-face interviews (in-depth) were conducted to obtain accurate information from informants. A semi-structured interview method has been employed as it offers greater flexibility, allowing the interviewer to ask new relevant questions spontaneously during the interview process (Patton, 1990). This ensures that the interview results are more comprehensive and thorough investigation has been conducted. All recorded interview findings underwent a coding process. The data was then analyzed to identify themes and research findings.

A tape recorder was used to capture audio during the interview process, ensuring accurate documentation of the conversations. This facilitated precise transcription, detailed analysis, and reliable verification of the data while maintaining its integrity. The recorded interviews served as a dependable reference throughout the research process. The findings were systematically coded, organizing the data into meaningful categories or themes. A thematic analysis approach was applied to identify patterns and extract key findings aligned with the research objectives. This process included transcribing interviews verbatim and analyzing the data through a structured and rigorous methodology (Perkins et al., 2023).

Survey data was analyzed using descriptive statistics and mean score of the perceptual scales. In this case, the Likert scale with response options ranging from 1 (strongly disagree) to 5 (strongly agree) provides a structured and standardized approach to measure and analyze respondents' attitudes, opinions, or perceptions. On the other hand, interview data was analyzed using thematic analysis by which the recordings of interviews are carefully reviewed, coded, and categorized into themes and sub-themes to identify recurring patterns, emerging concepts, and key findings.

Population Sample

A purpose sampling approach was used to select the survey respondents. The respondents were selected due to their usage experience as users of the reusable crates. The population of the study consists of wholesalers and retailers conducting 280 business lots in Pasar Borong Kuala Lumpur (PBKL), 123 stall lots in Pasar Borong Selangor (PBS), 242 business lots in Rural Transformation Center (RTC) Kelantan and 510 stall lots in Medan Niaga Satok (MNS) selling vegetables and fruits. The samples collected were based on 50% of the total population of 1,155 wholesalers and retailers from four selected locations. The sample selection also considered the existence of retailers/wholesalers who occupy more than one business lot in PBKL, PBS, RTC Kelantan, and MNS.

For interviews, a purposive sampling approach is used to select the participants with relevant knowledge and experience related to the reusable crates. This condition allows for an in-depth exploration of specific perspectives. The focus group discussion sessions were conducted with representatives from stakeholders such as local authorities, private and appointed reusable crate

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operators, wet market operators, supermarket management, wholesaler associations, marketers, delivery service providers and suppliers. During the focus group discussions, participants were encouraged to share their experiences, opinions, and perspectives related to the research topic. A facilitator led the session, ensuring that everyone had an opportunity to express their views. The discussions were audio recorded to accurately capture the dialogue.

Data Analysis

Results of Quantitative Research

A total of 597 complete questionnaires were collected from PBKL with 162 respondents, 50 respondents from PBS, 105 respondents from RTC Kelantan and 280 respondents from MNS. Table 1 shows the population and total questionnaires received from the four selected locations.

Table 1. Total Respondents of the Study

Location	Population Vegetables Wholesaler/ Retailer	Questionnaires Received Vegetables Wholesaler/ Retailer	Population Fruits Wholesaler/ Retailer	Questionnaires Received Fruits Wholesaler/ Retailer
PBKL	216	126	64	36
PBS	104	40	19	10
RTC	178	63	64	42
MNS	450	202	60	78
Total	**948**	**431**	**207**	**166**

Based on the analysis of the survey results, Table 2 illustrates the mean score results and interpretation for the four locations of study.

Table 2. Results of Survey Research

Item	Mean Score					Intrepretation
	PBKL	**PBS**	**RTC**	**MNS**	**Average**	
The authorities facilitate the sellers' affairs.	3.94	4.08	4.68	4.49	4.30	Agree
The market operators carry out their duties well	3.84	4.16	4.22	4.40	4.16	Agree
The wholesaler association functions well.	3.81	3.86	4.44	4.27	4.10	Agree
The delivery service providers are efficient.	3.81	4.02	4.17	4.38	4.10	Agree
The suppliers are efficient to ensure that the supply is always sufficient.	3.78	4.00	4.11	4.33	4.06	Agree
The authorities are highly responsible, especially in terms of enforcing regulations on reusable crates.	3.86	3.54	4.03	4.41	3.96	Agree
The market operators resolve issues related to crates that arise	3.78	3.50	4.11	4.45	3.96	Agree

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among the traders.

The wholesaler association takes action if there are any arising issues related to crates.	3.80	3.20	4.11	4.30	3.85	Agree
The delivery service providers are responsible if there are any issues related to crates.	3.78	3.62	3.93	4.40	3.93	Agree
The number of suppliers/renters of crates is sufficient.	3.90	3.84	4.15	4.39	4.07	Agree
Average	3.83	3.78	4.20	4.38	4.05	Agree

As shown in Table 2, on average, the majority of the respondents agreed that the authorities facilitate sellers' affairs, the delivery service providers are efficient, the suppliers are efficient and ensure an adequate supply of crates, and the authorities are responsible, especially in enforcing regulations related to crates, the delivery service providers are responsible for addressing any crate-related issues, and the number of suppliers/renters of crates is sufficient. Overall, respondents agreed that key stakeholders such as the authorities, delivery service providers, and suppliers play their roles and fulfil their responsibilities adequately in supporting the use and operation of reusable crates. However, the detailed analysis revealed that all locations received mostly strongly agreed and agreed for all items except only in PBS, where a majority of respondents indicated less agree that wholesaler associations should take action if there are arising issues related to crates.

The findings highlight the crucial role of collaboration among various stakeholders—authorities, delivery service providers, suppliers, and wholesaler associations—in ensuring the efficient use and management of reusable crates. The consensus among respondents underscores the perceived effectiveness of most stakeholders in fulfilling their roles, with authorities enforcing regulations, suppliers maintaining adequate supply chains, and delivery service providers addressing logistical challenges. This alignment contributes to a streamlined operational ecosystem that promotes sustainability. However, the divergence observed in PBS, where respondents expressed lesser agreement regarding the action of wholesaler associations, points to a potential gap in stakeholder engagement or accountability. This finding suggests the need for deeper investigation into why wholesaler associations are not perceived as proactive. Possible reasons may include inadequate communication with stakeholders, insufficient resources, or lack of clear mandates to address crate-related issues. Addressing these discrepancies in PBS may enhance overall stakeholder collaboration and optimize the management of reusable crates across all locations.

To strengthen the system, the targeted recommendations outlined can be expanded upon as follows:
i. Enhanced Role Clarity
Authorities should clearly define and document the responsibilities of wholesaler associations to ensure all parties understand their obligations. This could involve creating detailed guidelines on their role in addressing crate-related issues, including managing disputes, coordinating between suppliers and delivery services, and advocating for policies that benefit stakeholders. Such formalization can be enforced through updated contracts, agreements, or regulatory frameworks, ensuring accountability.

ii. Collaborative Forums
Establishing regular forums where stakeholders—authorities, delivery providers, suppliers, and wholesaler associations—can engage in open dialogue is critical. These forums can facilitate

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discussion on emerging challenges, share best practices, and collaboratively develop solutions to bottlenecks. A structured approach, such as quarterly meetings or thematic workshops, can encourage proactive participation. Digital platforms could also enhance communication between geographically dispersed stakeholders.

iii. Monitoring and Feedback Mechanisms
Authorities can implement structured monitoring systems to track the performance of stakeholders over time. This could involve using key performance indicators (KPIs) for assessing aspects like delivery efficiency, supply chain reliability, and issue resolution timelines. Feedback mechanisms, such as stakeholder surveys or anonymous reporting channels, could provide valuable insights into systemic weaknesses, allowing for timely corrective actions. Regular public reporting on these assessments can also boost transparency and stakeholder trust.

RESULTS AND DISCUSSION

The focus group discussion session was conducted with several representatives from various stakeholders involved in the use of reusable baskets for vegetables and fruits. This method is highly suitable as it requires in-depth exploration to understand and identify the roles of stakeholders in the use of reusable baskets. Qualitative data obtained through interviews were recorded, encoded, and subsequently analyzed to derive themes and study findings. A total of twelve stakeholders, consisting of government agencies, associations, transportation companies, and supermarkets involved in the use of reusable baskets for vegetables and fruits, were selected for interviews as follows:

i. Dewan Bandaraya Kuala Lumpur
ii. Persatuan Pemborong Sayur-Sayuran dan Buah-Buahan PBKL
iii. Konsortium Pasar Borong Sdn. Bhd. (KPB)
iv. Perbadanan Kemajuan Pertanian Selangor (PKPS)
v. Pertubuhan Peladang Kawasan (PPK) Hulu Langat
vi. Syarikat Pengangkutan A
vii. NSK Supermarket
viii. Super Seven Supermarket
ix. ST Rosyam Mart Supermarket
x. Mercato Supermarket
xi. Jaya Grocer Supermarket
xii. AEON Hypermarket

The following analysis highlights the distinct responsibilities of each stakeholder group in ensuring the effective use of reusable crates across various levels of the supply chain.

Table 3 outlines the roles of key stakeholders involved in the management and operations of reusable crates within the wholesale sector. Dewan Bandaraya Kuala Lumpur (DBKL) supervises the management of public market stalls, focusing on the arrangement and storage of crates. The PBKL Vegetable and Fruit Wholesalers Association represents wholesalers on crate-related issues at Pasar Borong Kuala Lumpur (PBKL), while Konsortium Pasar Borong Sdn. Bhd. (KPB) manages PBKL operations, including crate usage. Perbadanan Kemajuan Pertanian Selangor (PKPS) oversees crate management at Pasar Borong Selangor (PBS). Pertubuhan Peladang Kawasan (PPK) Hulu Langat purchases produce from farmers and delivers it to wholesalers and retailers. Lastly, Transportation Company A provides transport services, using and recording both personal and supplier crates during deliveries and returns.

Table 4 describes the roles of supermarkets and hypermarkets in utilizing crates for agricultural

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products. All stakeholders, including NSK Hypermarket, Super Seven Supermarket, ST Rosyam Mart Supermarket, Mercato Supermarket, Jaya Grocer Supermarket, and AEON Hypermarket, use crates for purchasing, packaging, transportation, and display. They rely on both personal and supplier crates while focusing on preventing loss through effective control measures. Unique measures include Mercato imposing charges for lost crates and AEON enforcing penalties for branch-level losses. Some supermarkets delegate crate maintenance to suppliers by providing them with personal crates.

Table 3. Qualitative Data Analysis Results from Government Agencies, Wholesaler Association and Transport Company

Item/ Stakeholder	Dewan Bandaraya Kuala Lumpur (DBKL)	PBKL Vegetable and Fruit Wholesalers Association	Konsortium Pasar Borong Sdn. Bhd. (KPB)	Perbadanan Kemajuan Pertanian Selangor (PKPS)	Pertubuhan Peladang Kawasan (PPK) Hulu Langat	Transportation Company A
Roles	Supervising the management of Public Market Stalls (PBKL), including the usage, arrangement, and storage of crates by wholesalers/ retailers.	Representing vegetable and fruit wholesalers concerning issues related to reusable crates usage at the Pasar Borong Kuala Lumpur (PBKL).	Managing the operations of Pasar Borong Kuala Lumpur (PBKL), including the crates usage.	Supervising the management of Pasar Borong Selangor (PBS), including the usage, arrangement, and storage of crates by wholesalers/ retailers.	• Buying agricultural produce from farmers and delivering them to wholesalers and retailers. • Using crates for purchasing vegetables from farmers and delivering them to wholesalers /buyers. • Using personal crates.	• Providing transportation services for fruits/vegetables from farmers to wholesalers/retailers. • Controlling and recording the usage of crates during delivery and return of crates. • Using farmers' and wholesalers' crates (according to requirements).

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Table 4. Qualitative Data Analysis Results from Supermarket and Hypermarket

Item/ Stakeholder	NSK Hypermarket	Super Seven Supermarket	ST Rosyam Mart Supermarket	Mercato Supermarket	Jaya Grocer Supermarket	AEON Hypermarket
Roles	· Using crates for the purpose of purchasing agricultural products, packaging, transportation, and display. · Using personal crates and supplier crates. · Controlling personal crates and supplier crates to prevent loss.	· Using crates for the purpose of purchasing agricultural produce, packaging, transportation, and exhibition. · Using personal and supplier crates. · Controlling personal and supplier crates to prevent loss.	· Using crates for the purpose of purchasing agricultural produce, packaging, transportation, and exhibition. · Using personal and supplier crates. · Controlling personal and supplier crates to prevent loss. · Entrusting the responsibility of maintaining the crates to the supplier by providing them with personal crates.	· Using crates for the purpose of purchasing agricultural produce, packaging, transportation, and exhibition. · Using personal and supplier crates. · Controlling personal and supplier crates to prevent loss. · The Distribution Center (DC) will impose a charge if any crates are lost at Mercato.	· Using crates for the purpose of purchasing agricultural produce, packaging, transportation, and exhibition. · Using personal and supplier crates. · Controlling personal and supplier crates to prevent loss.	· Using crates for the purpose of purchasing agricultural produce, packaging, transportation, and exhibition. · Using personal and supplier crates. · Controlling personal and supplier crates to prevent loss. · Imposing a penalty on AEON Branches that cause crate loss.

FINDINGS AND DISCUSSION

The study provides significant findings to the field of research. The results signify that there are stakeholders who are not directly responsible for managing reusable crates but are involved in supervising and monitoring the usage, arrangement, and storage of crates (DBKL and PKPS), representing wholesalers in crate-related issues (wholesalers' association), and managing market operations including crate usage (KPB). For transportation service providers, their role includes controlling and recording the usage of crates during delivery and return to minimize the number of lost crates. The roles played by all supermarkets are evident in the fundamental use of crates for purchasing agricultural produce, packaging, transportation, and exhibition. Furthermore, the role of supermarkets in controlling their own crates and supplier crates is crucial to ensure their availability and prevent loss. There are also supermarkets (ST Rosyam Mart) that entrust the responsibility of crate maintenance to suppliers by providing their own crates to them. Additionally, in controlling the loss rate, charges or penalties are imposed if crates are lost in supermarkets or other branches by the respective supermarkets or distribution centers (DC). For other supermarkets, penalties are imposed by suppliers if there is crate loss during delivery to the respective supermarkets.

Based on the research findings, several practical implications can be derived. Firstly, it is important for stakeholders, such as DBKL, PKPS, and the wholesaler association, to recognize their role in supervising and monitoring the usage, arrangement, and storage of crates. This involvement ensures effective crate management and promotes the sustainable use of reusable crates among wholesalers

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and retailers. Secondly, transportation service providers should prioritize controlling and recording the usage of crates during delivery and return processes. By implementing robust tracking and monitoring systems, they can minimize the number of lost crates, reducing operational costs and environmental impact.

Thirdly, the role of supermarkets as key stakeholders in the crate ecosystem is crucial. Supermarkets should maintain strict control over their crates as well as those provided by suppliers to prevent loss and ensure a continuous supply. This entails implementing effective inventory management systems and fostering collaboration with suppliers to maintain crate availability and reduce waste. Moreover, the case of ST Rosyam Mart exemplifies an alternative approach where supermarkets entrust crate maintenance to suppliers. This practice can be explored by other retailers to optimize crate management processes and ensure proper crate maintenance while establishing collaborative relationships with suppliers.

Lastly, the imposition of charges or penalties for crate loss in supermarkets or distribution centers acts as a deterrent and encourages responsible crate handling and accountability. Such measures can be adopted by other supermarkets and suppliers to minimize crate loss during delivery and reinforce the importance of crate management throughout the supply chain. Overall, the practical implications derived from the research findings highlight the need for active stakeholder involvement, effective tracking systems, proper crate control, and accountability mechanisms to enhance the sustainable use and management of reusable crates in the industry.

CONCLUSION

In summary, the results of the study revealed that each stakeholder has their respective roles in the usage and management of reusable crates among the users. The authorities support wholesalers/retailers in using reusable crates by facilitating merchant transactions. Market operators carry out their tasks effectively, wholesalers' associations function well, delivery service providers are efficient, and suppliers ensure an adequate supply. Stakeholders are involved in supervising and monitoring the usage, arrangement, and storage of crates, representing wholesalers in crate-related issues, and managing market operations including crate usage. Transportation service providers also control and record the usage of crates during delivery and return to reduce the number of lost crates. The fundamental use of crates is for transporting agricultural produce, packaging, transportation, and exhibition purposes. Supermarkets control their own crates as well as supplier crates to ensure they are not lost and are ready for use when needed.

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