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Evaluating the sustainability of restaurant supply chains: A case study of organic restaurants in urban Thailand

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Abstract

This study investigates the sustainability of the organic restaurant supply chain, particularly in the Bangkok Metropolitan Area and Phuket in Thailand. The objectives of this study are to (1) establish sustainability criteria suitable for different contexts in urban Thailand, (2) evaluate the existing degree of sustainability in the organic restaurant supply, and (3) compare the interests and viewpoints of organic farmers, restaurateurs and consumers concerning supply chain sustainability. The scoping review was conducted to establish the sustainability criteria for the organic restaurant supply chain and implement these criteria in the context of urban Thailand. A total of 21 key informants underwent in-depth interviews to investigate their

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current sustainable practices as well as their perspectives regarding sustainability concerns. The sustainability criteria can be classified into four primary dimensions: economic; environmental and welfare; sociocultural; and governance. The findings of the study indicate that the organic restaurant supply chain has made substantial progress toward sustainability in the sociocultural and governance dimensions. However, the economics as well as the environmental and welfare dimensions have received lower levels of recognition by consumers.

Keywords
organic restaurant, restaurant supply chain, organic food supply chain, sustainable food supply chain, sustainability criteria, restaurant sustainability framework, sustainability evaluation, sustainable development goals, urban Thailand

Introduction

Global environmental problems such as deforestation, water scarcity, air pollution, overexploitation, and climate change are the main causes of the global food crisis (Firdaus et al., 2019). Consequently, both producers and consumers must reconsider their practices to overcome the food crisis and ensure sustainable food production and consumption (Beatley, 2007).

In the food supply chain, the restaurant is a mediator between farmers and consumers. Restaurants can play a more sustainable role by reducing food waste (Hu et al., 2010), adopting environmentally friendly practices (Jang & Zheng, 2020), offering sustainable food choices (Reinders et al., 2017), and educating consumers (Higgins-Desbiolles & Wijesinghe, 2018). There are examples of this is in the U.S., such as McDonald's and Burger King reducing their use of fluorocarbons (Dutta et al., 2008). Additionally, a carbon labelled menu is used in Sweden's leading chain of hamburger restaurants (Babakhani et al., 2020) and in some canteens in the Netherlands (Spaargaren et al., 2013). Furthermore, many restaurants worldwide have adopted the trend of serving organic food, which is considered to be a sustainable practice (Hanks & Mattila, 2016).

There is a global effort to standardize restaurant operations using sustainability indicators. The Sustainable Restaurant Association, for instance, has developed the global Food Made Good Sustainability Standard to assess a restaurant's social and environmental impacts (Sustainable Business Magazine, 2023). Similarly, Restaurant Brands International has utilized the United Nations' Sustainable Development Goals (SDGs) to identify how restaurants contribute to these global targets (Restaurant Brands International, 2020). Nevertheless, these standards only focus on the sustainable operations of restaurants.

In Thailand, consumers have a restricted range of options in terms of accessing organic food. Typically, Thai people can only obtain organic produce from specialized stores, selected supermarkets, and organized local markets (Kantamaturapoj & Marshall, 2020). Most organic food is offered through these distribution channels, which sell fresh produce. Kantamaturapoj and Marshall (2020) found that the provision of fresh organic food was incompatible with the lifestyle of the high proportion of Thai people who do not cook. Although eating out is the most predominant consumption practice among Thai consumers, there is currently a scarcity of organic restaurants. This

Author Contributions
NT and KK contributed to conceptualization and design of the study. NT, KK, SP and PT developed framework. NT and KK collected data. NT, KK and PT conducted a formal analysis and wrote the original draft of the manuscript. NT, KK and PL reviewed and edited the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

Conflict of Interest Disclosure
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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scenario presents an opportunity to enhance the promotion of organic food. Dining out is common among Thai consumers (Kantamaturapoj et al., 2022), particularly in urban areas, such as the Bangkok Metropolitan Area (BMA) and tourist areas, such as Phuket. Therefore, restaurants that serve organic meals are a potential means to encourage the consumption of organic food.

A considerable number of scholars conducted research on sustainable restaurants in Thailand, including factors that influence sustainable practices in restaurants (Satchapappichit et al., 2023), willingness to pay at sustainable restaurants (Mahasuweerachai & Suttikun, 2024), and environmental practices of the restaurant (Kattiyapornpong et al., 2023). However, studies on the sustainability of the restaurant supply chain remain limited. The Thai Organic Consumer Association (TOCA), established in 2019 as a nonprofit civil society organization, aims to foster collaboration between organic farmers, consumers, and businesses (TOCA, 2024). This network brings together individuals and organizations dedicated to advancing the consumption of organic foods. TOCA has successfully facilitated connections between farmers, restaurants, and consumers in the BMA and is now expanding its networks to other regions, such as Phuket. TOCA is involved in this study as a local practice partner that supports and promotes these efforts.

This research aims to add to what is already known regarding sustainable food supply chains in Thailand and will help expand our understanding of sustainable food consumption in the country as well. In this study, we argue that these sustainability standards are universal in scope, but they may not be applicable to evaluate the sustainability of restaurants in local contexts. Moreover, the current global standards for sustainable restaurants primarily focus on restaurant operations and often overlook the sustainability of the entire food supply chain, from farm to table. Within the framework of the international Belmont Forum SSCP project "Co-creation of sustainable food supply chains through Cooperative Business Models and Governance (CO-SFSC)," this study aims to establish context-specific sustainability criteria for urban Thailand, assess the current state of sustainability in the organic restaurant supply chain within TOCA's network in the BMA and Phuket, and compare the perspectives of farmers, restaurateurs, and consumers on supply-chain sustainability.

Literature Review

Organic food is characterized by several attributes that distinguish it from conventional food: (1) absence of chemical substances, (2) compliance with organic standards, (3) exclusion of genetic modification, (4) traceability, (5) health benefits, and (6) a natural origin (Kantamaturapoj & Marshall, 2020). Organic food is produced through a regulated process with varying levels of oversight. These regulations may involve third-party certifications, such as those by the International Federation of Organic Agriculture Movements (IFOAM) or the U.S. Department of Agriculture (USDA) (Kahl et al., 2012), as well as participatory guarantee systems (PGS), which rely on the involvement of all stakeholders to ensure the organic integrity of products (Home et al., 2017). In this study, organic food is defined as products that possess these characteristics and are certified through either third-party certification or PGS.

The topic of organic food has gained interest worldwide as one of the ways to achieve sustainability. This development is shown through the promotion of organic food in various aspects, including farmers' conversion to organic farming and promotion of organic food (Woodhouse et al., 2018). As organic food supply chains have become increasingly complex with varying stakeholder interests, it is beneficial to discuss their sustainability practices.

Different Aspects of Sustainability in the Organic Food Supply Chain

The first sustainability dimension is economics, which focuses on enhancing the economic viability of stakeholders. Although there are several economic components to the sustainability dimension, the two most prominent are providers' economic viability (Robling et al., 2023) and consumers' affordability (Galli et al., 2015). The relevant topics for the providers' economic viability include profitability (Hebinck et al., 2021; Thongplew et al., 2023), employment (Azevedo et al., 2018), compet-

itiveness (Galli et al., 2015), and promotion of the local economy (Schmitt et al., 2016). The topics relevant to consumer affordability include the ability to purchase (Schmitt et al., 2016) and the reception of incentives (Azam et al., 2021).

The second sustainability dimension of organic food supply chains is environmental. The primary environmental aspects can be categorized into four aspects: (1) conservation, (2) resource efficiency, (3) minimization of pollution, and (4) welfare and health. Under these four aspects, the environmental and welfare topics being discussed include biodiversity (Schmitt et al., 2016), efficient use of energy and water (Yontar & Ersöz, 2021), waste reduction (Diéguez-Santana et al., 2022), adoption of ecotechnologies (Yontar & Ersöz, 2021), food miles (Malak-Rawlikowska et al., 2019), animal welfare (Hebinck et al., 2021), and food safety (Doernberg et al., 2022).

The third sustainability dimension of organic food supply chains is sociocultural. The sociocultural dimension aims to connect people and enrich local culture to promote quality of life and social integration. Several aspects of the sociocultural dimension have been discussed, such as creating equity (Hebinck et al., 2021) and promoting culture (Doernberg et al., 2022).

Finally, in addition to these three main dimensions, governance plays a crucial role in organizing the organic food supply chain in a more sustainable way. Governance focuses on building trust in an organic food supply chain as an alternative to the traditional food supply chain. Therefore, the topics of communication (Azevedo et al., 2018), engaging partnerships (Ashton, 2022), and certification (Diéguez-Santana et al., 2022) will be discussed.

The evaluation criteria in this study were developed based on these four dimensions of sustainability.

Restaurants as Mediators in the Organic Food Supply Chain

To study and compare different perspectives regarding sustainability in the (organic) restaurant supply chain, we adopted the notion of "consumption junction" (Cowan, 1987) in the analysis framework. The consumption junction refers to specific locations and moments where and when providers and consumers meet to express and negotiate their rationalities (Cowan, 1987). In the case of (organic) restaurant supply chains, organic restaurants are the consumption junction.

At the organic restaurant, the main stakeholders include farmers, restaurant owners, and customers. The "systems of provision" concept refers to socioeconomic infrastructures that offer products and services, reflecting the associations between providers' production processes and consumers' consumption patterns (Fine, 2002). The "citizen-consumer" concept refers to the individuals who assume the dual roles of citizens and consumers; therefore, it is assumed that each individual is an "agent of change" exercising their agency to satisfy needs and to make a good choice (Johnston, 2008). In this regard, organic farmers and organic restaurant owners represent food providers, while restaurant customers represent food consumers.

At the consumption junction, food providers express rationalities of the food production system, whereas customers follow their life-world rationalities (that is, how individuals make sense of the everyday world, guiding their actions and practices) in the mediation processes for sustainability (Oosterveer et al., 2007; Thongplew et al., 2021). Stakeholder negotiations produce distinct patterns of interaction that help improve sustainability throughout the restaurant supply chain.

Focusing on interactions between the provision system and the consumers at the restaurant as a consumption junction, the food provision system and the customer express their concerns related to the different aspects of sustainability. Interactions between stakeholders can be categorized into the same four sustainability dimensions: economic, sociocultural, environmental and welfare, and governance. Previous studies have demonstrated that many sustainability issues are of concern to different stakeholders. These factors include income, environmental problems, local food, and human health (Kantamaturapoj et al., 2022). Due to the dynamics of sustainability between organic farmers, restaurant owners, and consumers, the consumption junction concept is integrated into the analysis framework in order to reveal different views on the sustainability of the restaurant supply chain.

Research Methods

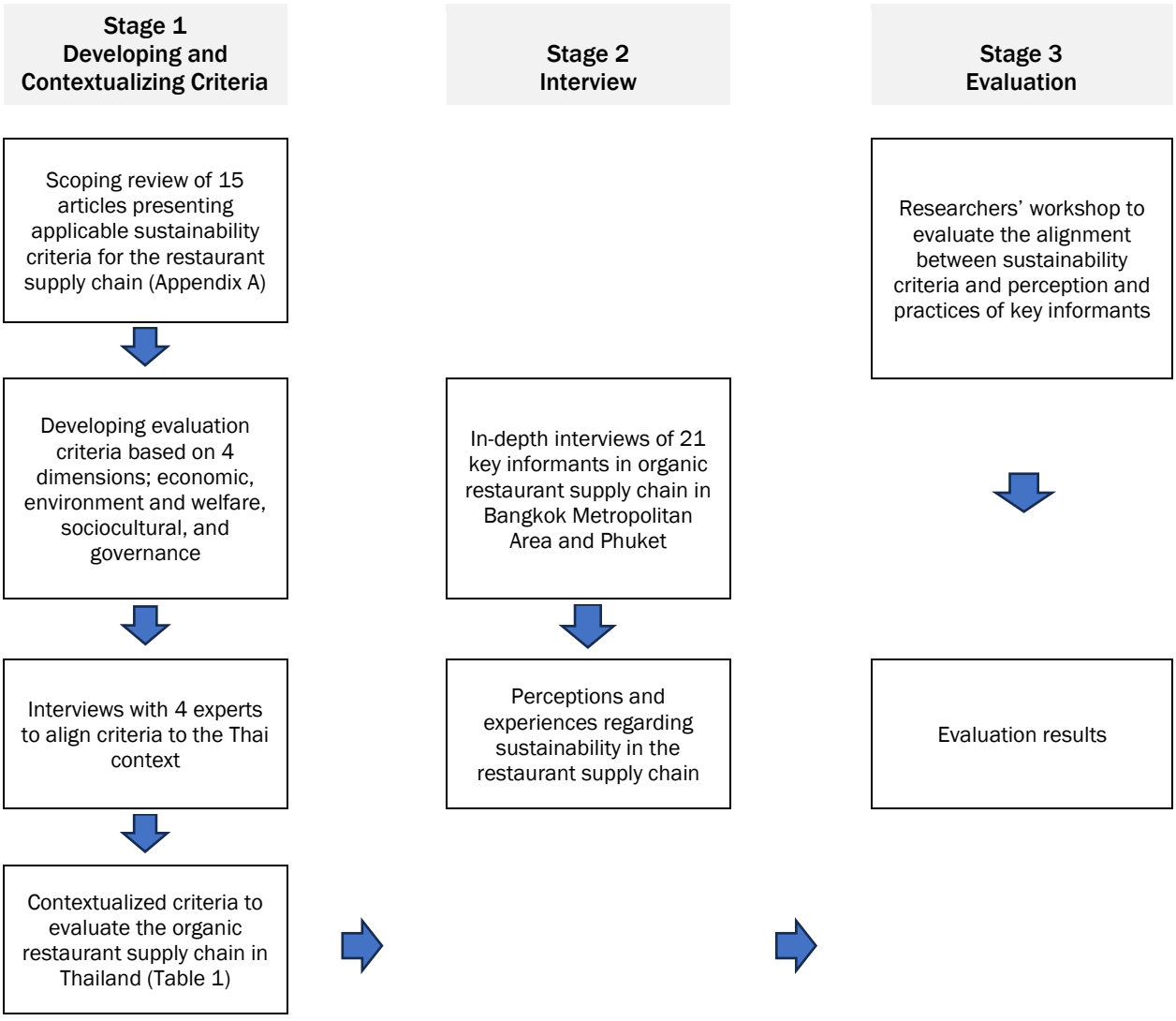
The methodologies used to evaluate the sustainability of the organic restaurant supply chain in urban Thailand are made up of the following stages: (1) developing and validating evaluation criteria; (2) in-depth interviews with key informants; and (3) evaluation (Figure 1).

Stage 1: Developing and Validating the Sustainability Criteria for the Organic Restaurant Supply Chain

We conducted a scoping review to extract sustainability criteria for evaluating restaurant supply chains, focusing on four dimensions: economic, environmental and welfare, sociocultural, and governance. Details of the article-screening process and the final selection of 15 articles are provided in Appendices A and B and Figure A1.

After obtaining the criteria from the scoping review, the criteria were checked by four independent experts in the relevant research fields (Department of Agriculture, Thai Sustainable Consumption and Production Network, Sustainable Food and Social Lab, and TOCA) who have worked on sustainable food in Thailand for more than 10 years to ensure that the criteria were appropriate to the Thai context. To operationalize the sustainability criteria, open-ended

Figure 1. Methodological Approach for Evaluating the Organic Restaurant Supply Chain in Urban Thailand



questions were developed from the sustainability criteria to be used for interviews with key interviewees. The criteria and their operationalization to evaluate the organic restaurant supply chain in this study are presented in Table 1.

Stage 2: Interviewing Key Informants in the Study Area

This study focused on two research sites: BMA and Phuket. These locations represent urban areas in Thailand where shifting lifestyles and growing concerns about food safety have led to increased

Table 1. Criteria and Their Operationalization Used to Evaluate the Restaurant Supply Chain in Urban Thailand

Criteria	Details of criteria from scoping review	Operationalization of criteria
ECONOMIC		
Local employment	• Creation of jobs (Doernberg et al., 2022; Woodhouse et al., 2018) • Contribution to the local economy (Schmitt et al., 2016)	• Farmers and restaurants hire local workers • Consumers acknowledge local employment
Economic viability	• Generation of income along the food supply chain (Doernberg et al., 2022; Galli et al., 2015; Hebinck et al., 2021; Schmitt et al., 2016) • Incentives to producers and suppliers (Azam et al., 2021; Diéguez-Santana et al., 2022), such as financial, technical, and policy supports (Ashton, 2022)	• Farmers work collectively to supply organic products • Farmers and restaurants establish a mutual agreement regarding the pricing, type, and quantity of organic food in advance • Consumers understand that farmers and restaurants collaborate to deliver organic food to customers
Price fairness	• Ability to provide food at acceptable prices (Schmitt et al., 2016) • Provision of incentives to buyers (Azam et al., 2021)	• Farmers and restaurants perceive that they are selling organic food at a price that is fair for them • Customers are satisfied with the price of organic food and willing to pay
ENVIRONMENT AND WELFARE		
Food miles	• Reduction of transportation distance and/or number of journeys (Doernberg et al., 2022) • Reduction of airfreight and cold transports (Woodhouse et al., 2018)	• Farmers and restaurants procure materials from vendors in their local vicinity • Consumers are aware that restaurants serve locally sourced foods
Reduction of energy consumption	• Energy saving (Diéguez-Santana et al., 2022; Woodhouse et al., 2018; Yontar & Ersöz, 2021) and the energy management system (Vipusanapat et al., 2022) • Use of renewable energy (Woodhouse et al., 2018; Yontar & Ersöz, 2021)	• Farmers and restaurants use renewable energy, such as solar panels • Consumers know that farmers and restaurants use renewable energy to produce organic food
Efficient use of water	• Decrease in water footprint (Azam et al., 2021; Samper & Quiñones-Ruiz, 2017) • Use of recycling water (Azevedo et al., 2018)	• Farmers and restaurants use water recycling systems • Restaurants campaign to save water • Consumers are aware that restaurants and farms utilize water by installing recycling systems

continued

continued

Waste minimization	• Reduction of food waste (Doernberg et al., 2022) • Reduction of packaging materials (Doernberg et al., 2022; Woodhouse et al., 2018) • Recycling of waste products (Diéguez-Santana et al., 2022) and use of recyclable materials (Azevedo et al., 2018; Woodhouse et al., 2018)	• Farmers and restaurants reuse, reduce, and recycle waste • Restaurants produce zero food waste • Consumers recognize farmers' and restaurants' efforts to reduce waste
Animal welfare	• Protection of animal welfare (Doernberg et al., 2022; Hebinck et al., 2021; Schmitt et al., 2016)	• Farmers follow agricultural practice for free-range farms • Restaurants use food products from free-range farms • Consumers eat organic food dairy products from free-range farms
SOCIOCULTURAL		
Relationship between actors	• Social relationships in networks (Galli et al., 2015) • Relationships between producers and local institutions (Azevedo et al., 2018) • Knowledge exchange with suppliers and customers (Diéguez-Santana et al., 2022)	• Farmers, restaurants, and consumers organize or attend activities that promote social learning among stakeholders
Equity	• Guaranteed equitable working conditions (Hebinck et al., 2021) • Equitable access to knowledge and technology (Azevedo et al., 2018) • Gender equity (Diéguez-Santana et al., 2022)	• Farmers and restaurants provide good working conditions and welfare to their employees • Customers understand that agricultural and restaurant staff are treated fairly
Local culture	• Diversified cropping systems (Iocola et al., 2020) • Viability of food traditions and cultures (Doernberg et al., 2022)	• Farmers grow a variety of crops, including local crops • Restaurants serve food that is made with local products • Consumers have experiences in ordering local food in restaurants
GOVERNANCE		•
Communication	• Sharing of information (Azevedo et al., 2018) • Communication (Schmitt et al., 2016; Yontar & Ersöz, 2021)	• Farmers and restaurants provide information about organic food to the consumers • Consumers receive information about organic food from farmers and restaurants
Certification	• Food safety (Doernberg et al., 2022; Galli et al., 2015; Vipusanapat et al., 2022; Woodhouse et al., 2018; Yontar & Ersöz, 2021) and traceability (Yontar & Ersöz, 2021) • Compliance with legal limits regarding chemical hazards (Doernberg et al., 2022) and reduction of pesticide use (Samper & Quiñones-Ruiz, 2017)	• Farmers apply for certification, either officially or through PGS • Restaurants use certified organic ingredients and food • Consumers are aware that the restaurants only use certified organic ingredients

consumer demand for sustainable food. These two areas were purposely selected for three main reasons. First, BMA and Phuket have relatively high numbers of organic restaurants. This presents a good probability of successful data collection and analysis. Second, the TOCA, a local practice partner, has ongoing activities and networks in the BMA and Phuket, which allowed the researchers to have access to a comprehensive list of stakeholders in the restaurant supply chain. Lastly, BMA and Phuket present different characteristics, including economic drivers (trade-led economy vs. tourism-led economy) and consumption activities (local consumption vs. foreign tourist consumption). These differences provided an opportunity to examine the differences in the organic restaurant supply chains of the two areas.

The researchers employed a qualitative research method to explore the experiences of individuals engaged in sustainable practices within the restaurant supply chain, as well as their perspectives on sustainability concerns. The in-depth interviews with key informants were conducted from October 2023 to January 2024. The key informants were purposely selected based on their connection with TOCA. All interviews were conducted by the researchers. TOCA solely identified key informants, but did not participate in the interviews. The total number of interviewees was 21 (11 for BMA and 10 for Phuket), comprising 8 farmers, 7 restaurant managers, and 6 consumers. Questions developed from the sustainability criteria were used for each of the key informants. Organic farmers and restaurants were asked about the actual sustainable practices at their farm and restaurants, respectively, whereas organic consumers were asked about their perceptions and experiences regarding sustainability issues in the restaurant supply chain. Each interview lasted an average of one hour.

Stage 3: Evaluation

To evaluate the results, the sustainability criteria of the restaurant supply chain developed in Stage 1 were used as the framework for the evaluation. Interview data were mapped into the framework to determine whether the restaurant supply chain met each criterion. Based on the findings from interviews, the achievement was measured according to three levels and scored as follows: *fulfilled* (the finding supports the indicator), which received 2 points; *partially fulfilled* (the finding partially supports the indicator) received 1 point; or *not fulfilled* (the finding does not support the indicator) received 0 points. These scores were then used in descriptive statistics to analyze and compare various sustainability perspectives of the different stakeholders.

This study has been approved by the committee for research ethics (Social Sciences), Faculty of Social Sciences and Humanities, Mahidol University, Thailand (certificate of approval No. 2023/053.1804). The researchers briefed the participants about the study's objectives, advantages, dangers, and financing prior to their consent or refusal to partake in the interviews. Written informed consent was obtained prior to the interview. The researchers verbally repeated the participant's agreement at the start of each interview. The interview data were transcribed and encoded to preserve the confidentiality of the key informants.

Results

The sustainability of the organic restaurant supply chain in urban Thailand was evaluated using the criteria presented in Table 1. The findings for this part were derived from the insights of the 21 key informants. Overall, the results indicate that the areas with the most substantial progress toward sustainability are Governance (1.69 points) and Sociocultural (1.52 points). These areas show greater progress compared to Economics (1.14 points) and Environmental and Welfare (1.01 points), with statistically significant differences. A summary of the evaluation results is presented in Table 2.

Economics

Economic sustainability refers to the condition in which all stakeholders involved in the restaurant organic supply chain receive sufficient income and profit. The criteria to evaluate sustainability include (1) local employment, (2) economic viability, and (3) price fairness. Overall, it was found that the criterion of Price Fairness is fully met (2 points), followed by Economic Viability (1.10 points) and Local Employment (0.33 points) (Table 2 and Figure 2).

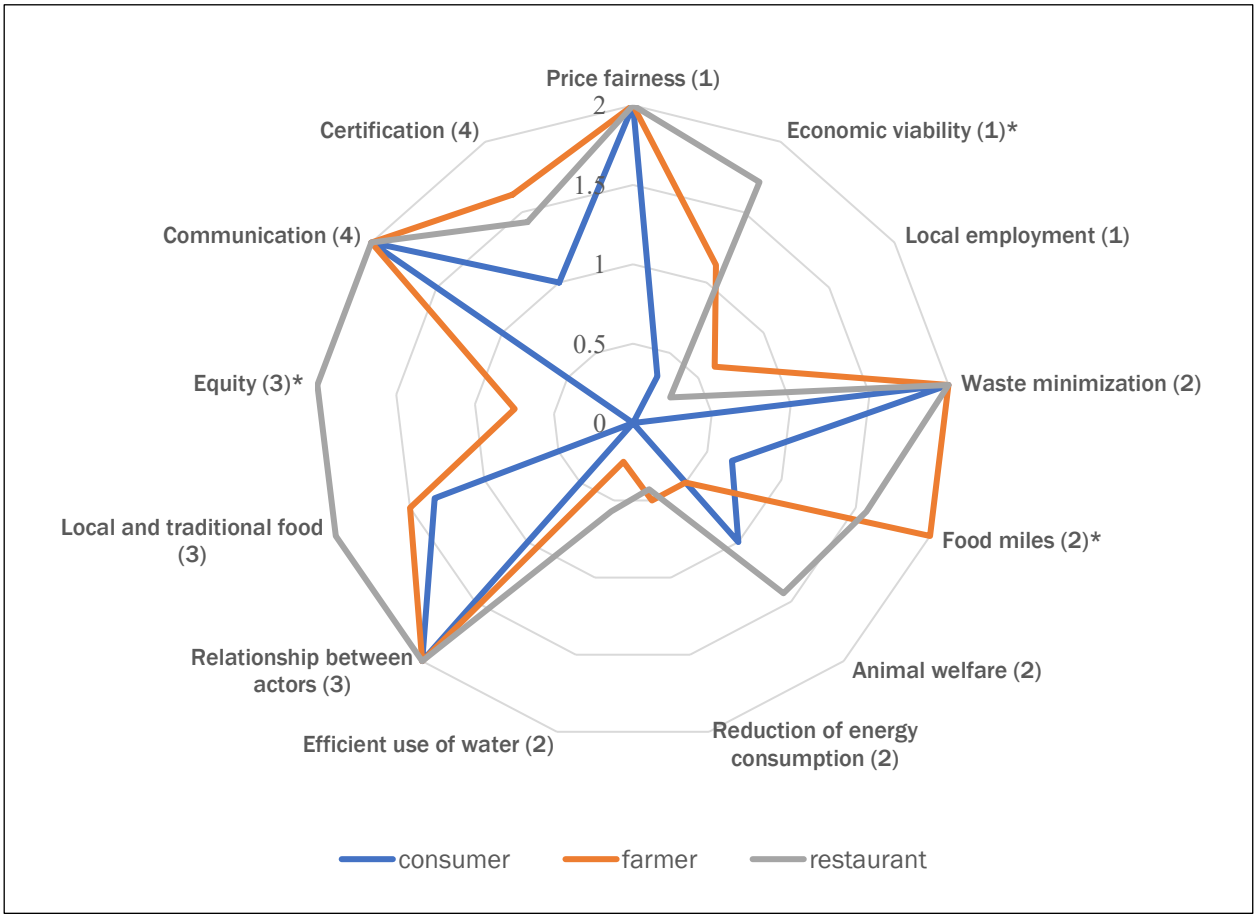
Table 2. Evaluation of the Sustainability of the Restaurant Supply Chain

Criteria	FPH #1	FPH #2	FPH #3	FPH #4	FBMA #1	FBMA #2	FBMA #3	FBMA #4	RPH #1	RPH #2	RPH #3	RBMA #1	RBMA #2	RBMA #3	RMBA #4	CPH #1	CPH #2	CPH #3	CBMA #1	CBMA #2	CBMA #3	Average	Average
Economics	1.33	0.67	1.00	0.67	2.00	1.33	1.67	1.33	1.33	1.00	1.00	1.33	2.00	1.33	1.33	0.67	0.67	0.67	0.67	1.33	0.67	1.14	
Price fairness	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.00	**1.14**
Economic viability	1	0	0	0	2	2	2	2	2	1	1	2	2	2	2	0	0	0	0	2	0	1.10	
Local employment	1	0	1	0	2	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0.33	
Environment and Welfare	1.00	0.80	0.80	1.00	1.80	1.20	0.80	1.00	1.00	1.20	1.20	0.60	1.20	1.80	1.40	0.40	0.80	0.80	0.80	0.80	0.80	1.01	
Waste minimization	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.00	**1.01**
Food miles	2	2	2	2	2	2	2	2	1	1	2	1	2	2	2	0	2	2	0	0	0	1.48	
Animal welfare	0	0	0	0	2	2	0	0	2	2	0	0	2	2	2	0	0	0	2	2	2	0.95	
Reduction of energy consumption	1	0	0	1	1	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0.33	
Efficient use of water	0	0	0	0	2	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0	0	0.29	
Social and Culture	1.33	1.33	1.33	1.33	2.00	2.00	0.67	1.33	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.33	1.33	1.33	0.67	1.33	0.67	1.52	
Relationship between actors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.00	**1.52**
Local and traditional food	2	2	2	2	2	2	0	0	2	2	2	2	2	2	2	2	2	2	0	2	0	1.62	
Equity	0	0	0	0	2	2	0	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.95	
Governance	1.50	2.00	1.50	1.50	2.00	2.00	2.00	2.00	1.50	1.50	1.50	1.50	2.00	2.00	2.00	1.00	1.00	1.00	2.00	2.00	2.00	1.69	
Communi-cation	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.00	**1.69**
Certification	1	2	1	1	2	2	2	2	1	1	1	1	2	2	2	0	0	0	2	2	2	1.38	
Average	1.23	1.08	1.08	1.08	1.92	1.54	1.15	1.31	1.38	1.38	1.38	1.23	1.69	1.77	1.62	0.77	0.92	0.92	0.92	1.23	0.92	1.26	1.26
																						p-value[1]	0.000

Remark: Criterion fulfilled = 2 points; partially fulfilled = 1 point; not fulfilled = 0 points

[1] indicates the *p*-value of Kruskal-Wallis test.

Figure 2. Sustainability Evaluation Result from Stakeholders in the Restaurant Supply Chain



(1) = Economics; (2) = Environment and Welfare; (3) = Social and Culture; (4) = Governance
* Data significantly different at the 0.05 level, as determined by the Kruskal-Wallis test.

In this study, local employment is not fulfilled by most stakeholders. Only one farmer and one restaurant acknowledged the employment of full-time local workers. Most organic farmers were small-scale and relied on their family members for work. Some farmers asserted that they employed local labor on certain days. Three farmers stated that they employed migrant workers due to the lack of Thai laborers willing to work hard on their farm. Interviewees from the restaurant group explained that they prioritized hiring with the required qualifications rather than prioritizing local candidates. No consumers paid attention to whether farms and restaurants employed local labor. Based on the interview findings, we determined that the organic restaurant supply chain in urban Thailand did not fulfill the requirements for employing local workers. However, this was mainly due to the fact that small-scale farmers did not require the assistance of hired labor, which was further exacerbated by the scarcity of local, willing Thai workers.

With regard to economic viability, there were mixed responses from the stakeholders and scores of farmers, restaurants, and consumers that were significantly different. This study found differences in one of the key elements of the economic viability of the organic restaurant supply chain between Phuket and the BMA stakeholders: farm production and planning. Although farmers and restaurants in the BMA have developed a collaborative system to procure organic products and prenegotiate prices, those in Phuket are still in the first stages of discussion and have not yet reached an agreement regarding organic food sales. Farmers in

the BMA collaborated as a network to efficiently coordinate the delivery of organic products to restaurants. All interviewees in the farmer and restaurant groups in Phuket reported that TOCA made efforts to connect with them and provided opportunities for communication. Nevertheless, the farmers in Phuket worked autonomously and were reluctant to guarantee the precise quantity of their organic produce. Restaurants in Phuket expressed their interest in buying organic products from local farmers. However, some farmers reported that they had already sold all of their organic products to intermediaries and received immediate cash payments. The hotel's purchasing system failed to entice them to alter their selling practices. Only one consumer in the BMA was aware of the farmer-restaurant collaboration to prearrange and distribute organic foods.

With regard to price fairness and affordability, all stakeholders agreed that the criterion was fully met. Both farmers and restaurants claimed that they had been able to generate profits by selling organic food. Farmers and restaurants in Phuket have expressed the view that the existing high (nonorganic) food prices in Phuket prevented them from selling organic food at a higher price. Nevertheless, all the farmers in Phuket stated that the expenses associated with the cultivation of organic food were lower than those of conventional farming, which allowed them to still generate profits. The restaurants in Phuket indicated that offering an organic menu does not result in increased profit margins. However, they recognized that the organic menu can be employed as a marketing strategy. All consumers in Phuket also reported that they were able to purchase organic foods due to their comparable pricing. The consumers in the BMA thought that organic food prices were reasonable due to the benefits received. Because of health consciousness, consumers in the BMA were willing to pay a premium for organic food.

> I am very careful about what I eat to keep myself healthy. For the boiled rice with fish dish, I know that the chef used organic rice and fish from local fishermen. It's five times more expensive than a normal meal, but I am willing to pay. (Consumer in BMA#2)

Environment and Welfare

Environmental sustainability together with welfare were evaluated based on five criteria: (1) food miles, (2) reduction of energy consumption, (3) efficient use of water, (4) waste minimization, and (5) animal welfare. Overall, it was found that the criterion of Waste Minimization was fully met (2 points), followed by Food Miles (1.48 points). The remaining criteria received relatively low scores: Animal Welfare (0.95 points), Reduction of Energy Consumption (0.33 points), and Efficient Use of Water (0.29 points), respectively (Table 2 and Figure 2).

The criterion of food miles was fulfilled by most farmers and restaurants, but not by consumers. The scores indicated a significant difference. The majority of farmers and restaurants made deliberate efforts to reduce food miles by procuring materials in their local vicinity. However, the primary rationale for utilizing local suppliers was to minimize transportation expenses rather than being driven by concerns regarding food miles. Phuket is a tourist destination, so agricultural land is limited. As a result, some restaurants reported that they were unable to avoid securing ingredients from other provinces. Interestingly, all consumers interviewed were unconcerned about the distance food had travelled.

Renewable energy utilization was partially fulfilled by some farmers and restaurants. Only four farmers and three restaurants used solar cells in some parts of their operations. As the majority of farmers were small-scale, investing in solar cells was too costly. The restaurants, particularly hotel restaurants, reported that their hotels consume a lot of electricity; therefore, they could not solely rely on solar cells. Even if some farmers and restaurants used renewable energy, all the consumers were not aware of this practice.

Regarding the criterion of efficient water usage, only one farmer and one restaurant implemented a water recycling system. Two restaurants acknowledged that they lacked a water recycling system, but they partially met this criterion by actively raising their customers' awareness to save water. From the interviews, the consumers were unaware of the farmers' and restaurants' water efficiency.

Waste minimization is fulfilled by most stakeholders. Both farmers and restaurants have con-

firmed their waste minimization practices, including recycling materials and producing fertilizers from organic waste. Two farmers reported that they reused materials on their farms. All used reusable packaging, such as opting for glass bottles instead of plastic bottles. The interviewees from the restaurant group reported that they had to strategically arrange their raw material orders to prevent excess or surplus, which was achieved by preselling vouchers allowing for an accurate estimation of the number of customers and the amount of materials to be ordered. Two restaurants claimed to be zero-waste restaurants. All interviewees from the consumer group acknowledged the waste minimization practices implemented in the restaurants.

> Our restaurant serves buffets. It is quite difficult to predict the amount of food when we do not know the number of visiting customers. Therefore, we limit each day's buffet to 50 people and ask guests to make reservations in advance. (Restaurant in Phuket#2)

The animal welfare criterion was fulfilled by some stakeholders. With regard to animal welfare, two farmers in the BMA raised organic poultry in a free-range system. The other six farmers did not raise animals on their farms, so they did not fit this criterion. Four interviewees reported that they provided free-range chicken and eggs in their restaurants. One restaurant used organic milk from free-range cows. Only consumers in the BMA reported consuming free-range poultry from the restaurant, whereas consumers in Phuket stated that they never consumed free-range animal products at the restaurant.

Sociocultural

The social and cultural sustainability of the organic restaurant supply chain was evaluated by considering (1) the relationship between actors, (2) equity, and (3) local traditional food. Overall, it was found that the criterion of Relationship Between Actors was fully met (2 points), followed by Local and Traditional Food (1.62 points) and Equity (0.95 points) (Table 2 and Figure 2).

All key informants agreed that the restaurant supply chain fulfilled the criterion of building relationships. According to the interviews, three main activities were carried out: farm visits, organic market events, and workshops to promote social learning among stakeholders. Four farmers opened their farms for farm visits so that consumers could learn about the origins of the food. All consumers expressed indifference toward formal certification as they visited the farms and witnessed the production process firsthand. All the farmers consistently participated in market events, as they provided the farmers with the chance to directly engage with consumers. One restaurant opened its hotel space once a month for local farmers to sell products. Several consumers expressed that their confidence in the safety of the food increased after interacting with the producers. In addition, the restaurants stated that they held workshops, such as preparing new recipes and farm-to-table events. These workshops encouraged more customers to visit the restaurant.

The criterion on equity was fulfilled by most farmers and all restaurants, which was significantly different from consumers. Equity in the Thai context refers to fair working conditions and welfare. Three farmers in the BMA provided favorable working conditions, including free food and free housing. Two farmers employed migrant laborers and applied for work permits for them so that they could legally work. All restaurants in the BMA and Phuket provided their employees with basic social security benefits, including health insurance and maternity benefits. Furthermore, all interviewees from the restaurant group strictly adhered to labor laws regarding working hours and overtime pay. However, consumers were generally unaware of whether the working conditions that farmers and restaurants offered to their employees were fair.

The local and traditional food criterion was fulfilled by most stakeholders. It was found that all farmers planted a variety of (local) vegetables. Some farmers operated integrated farms comprising poultry farms, rice cultivation, and vegetable plantations. Every farmer in Phuket planted local foods. Two restaurants in Phuket reported that they prepared traditional menus from these local vegetables and listed the food as recommended dishes. Providing local, traditional dishes not only helped preserve the local food, but was also used as

a strategy to attract consumers, as most tourists liked to try different menus. Most consumers also reported that they always ordered local and traditional foods.

Governance

The governance dimension of sustainability in the organic restaurant supply chain was evaluated based on (1) communication and (2) certification. Overall, it was found that the criterion of communication was fully met (2 points), followed by certification (1.38 points) (Table 2 and Figure 2).

The communication aspect was fulfilled by all stakeholders. All the farmers included information on organic farming and organic certification on product packages. The interviewees from the restaurant group disseminated information via information tags and narratives. One restaurant stated that offering a distinct menu for organic cuisine attracted more customers than using a combined menu of organic and conventional food. Because of the widespread use of social media platforms, such as Facebook and Instagram, in Thailand most farmers and restaurants shared information about organic foods, benefits, and activities on these platforms. For example, a storyline and numerous photos were shared by farmers and restaurants to communicate information regarding an organic society. All consumers also stated that they learned about organic food and collaboration between farmers and restaurants from these platforms.

> I see the content from Facebook. Then I learned that the restaurant supports local farmers by sourcing local ingredients like pineapple and goat milk from small farms. Knowing this makes me want to eat at this restaurant because it means I also support local farms. (Consumer in Phuket#3)

The certification criterion was partially fulfilled. For example, one farmer in Phuket claimed to have had their products certified by the Organic Thailand standard, whereas the other three were working with TOCA to apply for the PGS. All farmers in the BMA claimed to have several certifications, including Organic Thailand, Organic EU, USDA, and PGS. According to the interviews, the farmers in the BMA followed international standards as they offered their products to food factories that export organic food to Europe. Restaurants in Phuket sought to use certified organic products, but due to a restricted supply of certified products, they were only able to do so partially. Three BMA restaurants only sourced certified organic products, whereas only one restaurant, a chain restaurant, explained that all 15 shops in the chain had to use the same material standard, so they needed a large amount of organic food and could only use specific certified organic products in their restaurants. The consumers in Phuket exhibited less concern for certification as they habitually visited the farms and obtained information through social media. They placed their trust in farmers and restaurants. The consumers in the BMA were aware that the restaurants used certified organic items. Nevertheless, like the consumers in Phuket, they visited the farms to witness the production with their own eyes. Therefore, they trusted organic foods from restaurants, regardless of their certification status.

Discussion

The development and evaluation of sustainability in the organic restaurant supply chain in the BMA and Phuket offer three practical and theoretical implications for discussions concerning sustainability in the organic (restaurant) supply chain in emerging economies. First, aligning and mediating requirements between food providers and customers is important to realize sustainability. In this case, most sustainability requirements relevant to consumers are being met (e.g., fair price, waste minimization, building relationships, and local food) by organic food providers. However, most customers are still unaware of the good sustainability performances of the organic food providers (e.g., local employment, use of renewable energy, water efficiency, fair working conditions, and welfare). This situation is not conducive to enhancing sustainability since the main aspect of sustainable supply chains, collaboration, is not realized. Collaboration in the supply chain, including information transparency and collaboration to enhance sustainability, is a key element in the sustainable supply chain (Beske & Seuring, 2014). Informing and edu-

cating customers on sustainability performances are crucial to further enhancing sustainability in the organic restaurant supply chains in the BMA and Phuket.

Second, localizing contexts is an essential element to consider in evaluating sustainability using the sustainability criteria. This research shows that certain details of some sustainability criteria are not fully applicable without considering the local contexts, indicating that it is essential to take into account the local context when evaluating sustainability performance. For example, the local employment criterion is not fully applicable to the evaluation of small-scale organic farms. Most organic farmers in the BMA and Phuket are small-scale farmers. Family members are not treated as workers; therefore, social welfare and worker benefits do not apply to family members working at the families' farms. However, in general, social welfare and workers benefit from organic large-scale farms, which are crucial criteria in the social sustainability dimension (Hebinck et al., 2021). The nature of small-scale organic farms and simple supply chains means that organic certification is not regarded by restaurants and customers as an important element. Instead, activities to promote relationships, such as farm visits, play a role in establishing trust among the stakeholders. The results contrast with the importance of certification labels in other countries, where organic supply chains are more complex (Albersmeier et al., 2010).

Third, different organizational characteristics of the organic restaurant supply chains in the BMA and Phuket may affect the development of the organic restaurant supply chains in the long term. This study shows that restaurants and organic farmers in the BMA work closely together to plan the production, sale, and transport of produce. Meanwhile, most organic farmers in Phuket do not cooperate with restaurants for planning and selling produce; instead, middlemen come to the farm to buy the produce. This difference affects how organic restaurants organize their food services, resulting in differences in sustainability performances between the two supply chains. A stable supply of desirable organic produce from farmers allows restaurants in the BMA to reliably prepare organic dishes for customers (also with seasonal dishes). On the contrary, organic restaurants without the cooperation of farmers in Phuket struggle to secure organic produce, resulting in an unstable supply of organic food dishes to serve customers.

This study has limitations that need to be acknowledged. The first limitation of this study is its evaluation framework, which was developed based on a literature review and tailored to the restaurant supply chain in the urban Thai context. As a result, while this framework may be applicable to Thailand or other countries with similar supply chain characteristics, it may not be universally applicable to all contexts. The second limitation results from the selection of key informants for the interviews and the sample size. Since this study was conducted in collaboration with TOCA, all key informants were referred by TOCA and were part of its network. As a result, the findings on sustainability performance may not fully represent Thailand or other emerging economies, as the research was limited to the restaurant supply chain within TOCA's network in urban Thailand. Additionally, due to the qualitative nature of the study and the limited availability of participants actively involved in TOCA's network, significantly expanding the sample size was not feasible within the scope of this research. The third limitation is the methodology used to evaluate sustainability in the organic restaurant supply chain. , Since the evaluation was based on the perspectives and experiences of the key informants, the results of the sustainability performances are unquantifiable.

Conclusion

This study examines the sustainability of the organic restaurant supply chain with a specific focus on the Bangkok Metropolitan Area and Phuket in Thailand. The empirical findings of this research answer the research questions regarding (1) the sustainability criteria of the organic restaurant supply chain in the Thai context, (2) the stage of sustainability for the organic restaurant supply chain, and (3) the similarities and differences of sustainability interests and perspectives between farmers, restaurants, and consumers in the sustainability of the organic restaurant supply chain. To summarize the three main empirical findings of this study, first, this research shows that the sus-

tainability criteria for the Thai organic restaurant supply chain can be established based on the inputs from international literature together with consideration of local contexts on (organic) food consumption and (organic food) eating out practices. Similar to international organic supply chains, four sustainability dimensions of the organic restaurant supply chains can be distinguished: economics, environment and welfare, sociocultural, and governance, which reflect the globalization of organizational structures and operations of organic restaurants in Thailand at the supply-chain level.

Second, the organic restaurant supply chain in urban Thailand has made significant progress in sociocultural and governance sustainability, but lags in the economic, environmental, and welfare dimensions. Key topics for sociocultural and governance include actor relationships, traditional food, communication, and certification. With regard to the economic and environmental aspects, price fairness, waste reduction, and food miles are well-recognized, but issues like local employment, energy efficiency, and water use remain underaddressed.

Third, similarities and differences in sustainability interests and perspectives on sustainability in the organic restaurant supply chain in urban Thailand are shown in the empirical results. The mediation of all stakeholders indicates that all stakeholders shared the same interests and implementation efforts on many topics, including offering price fairness and affordability, minimizing waste, promoting relationships and social learning, and creating communication activities. However, the articulation of organic farmers and restaurants on the sustainability initiatives they have implemented regarding local employment, utilization of renewable energy, water efficiency, and fair working conditions and welfare do not relate closely to consumers' interests.

This research provides insights and implications for future research to enhance sustainability in the organic restaurant supply chain in light of the globalization of Thailand and emerging economies. We recommend that future research should use quantitative methods for the study and evaluation of sustainability in the organic restaurant supply chain, as this research only employs a qualitative method to assess sustainability performances and interests. Conducting quantitative methods to obtain measurable data regarding sustainability criteria (e.g., the water footprint at farms and restaurants and the carbon footprint of food miles) would be beneficial in accurately gauging the current status of the sustainability criteria and setting tangible targets for improvement. The second area of future research is the engagement of customers and consumers in the sustainable food supply chain. This research shows that organic restaurant customers still have a narrow set of sustainability interests. To enhance the level of sustainability in the entire supply chain, it is essential for all stakeholders to share the same set and level of sustainability interests and concerns. In this way, research should be able to find suitable alternative ways of engaging customers in the environmental and social sustainability of the supply chain.

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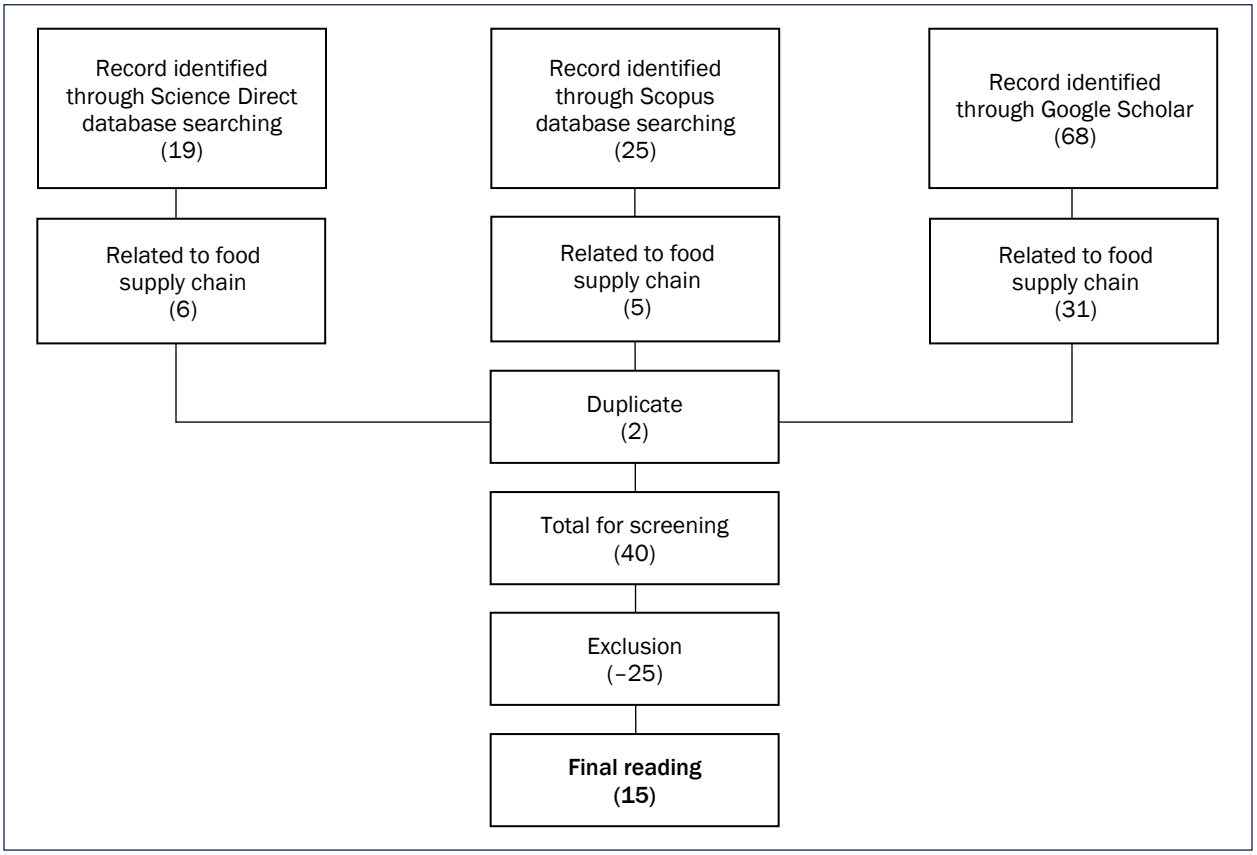
Appendix A. Article Screening Process and List of Articles for Full Reading

In this research, ScienceDirect, Scopus, and Google Scholar were the databases used for article searches. The term search used the keywords "sustainability assessment" AND "evaluation criteria" AND "food supply chain." We restricted the search to articles published between 1 January 2012 and 31 December 2022 (a 10-year period) to ensure contemporary criteria applicable to the current sustainability status. There were three inclusion criteria. The first criterion was the inclusion of studies presenting applicable sustainability criteria for the restaurant supply chain. The second was the identification of at least one dimension (economics, sociocultural, environment and welfare, and governance) that can be used to evaluate the sustainability of the restaurant supply chain. Third, because this research employs qualitative evaluation, only articles including qualitative evaluation criteria were included.

To select literature, two authors (KK and NT) independently reviewed the abstracts of all the retrieved articles. The agreement between the reviewers was evaluated using Cohen's kappa. Disagreements between the two authors were resolved by discussion and consensus with the third author (SP). Potential articles were selected for full-text review and screened for duplication. EndNote X9 was used to store and track the search results in a computerized and retrievable format. The selected articles were read and assessed in full in the roundtable discussions among authors. Key information from the selected articles was extracted and entered into the data extraction form, which was designed following the four pillars of sustainability.

The literature search included a total of 112 articles from ScienceDirect, Scopus, and Google Scholar. Of these articles, 70 were excluded due to their irrelevance and 2 due to duplication, leaving 40 articles for abstract screening. Finally, 15 articles were read and assessed in full. See Figure A1 for an illustration of the entire process.

Figure A1. Article Screening Process



Appendix B. List of 15 Articles for Full Reading

No.	Article
1.	**Ashton**, L. (2022). A framework for promoting natural climate solutions in the agriculture sector. *Land Use Policy*, *122*, Article 106382. https://doi.org/10.1016/j.landusepol.2022.106382
2.	**Azam**, T., Wang, S., Mohsin, M., Nazam, M., Hashim, M., Baig, S. A., & Zia-ur-Rehman, M. (2021). Does stakeholder pressure matters in adopting sustainable supply chain initiatives? Insights from agro-based processing industry. *Sustainability*, *13*(13), Article 7278. https://doi.org/10.3390/su13137278
3.	**Azevedo**, S. G., Silva, M. E., Matias, J. C., & Dias, G. P. (2018). The influence of collaboration initiatives on the sustainability of the cashew supply chain. *Sustainability*, *10*(6), Article 2075. https://doi.org/10.3390/su10062075
4.	**Diéguez-Santana**, K., Sarduy-Pereira, L. B., Sablón-Cossío, N., Bautista-Santos, H., Sánchez-Galván, F., & Ruíz Cedeño, S. d. M. (2022). Evaluation of the circular economy in a Pitahaya agri-food chain. *Sustainability*, *14*(5), Article 2950. https://doi.org/10.3390/su14052950
5	**Doernberg**, A., Piorr, A., Zasada, I., Wascher, D., & Schmutz, U. (2022). Sustainability assessment of short food supply chains (SFSC): Developing and testing a rapid assessment tool in one African and three European city regions. *Agriculture and Human Values*, *39*(3), 885–904. https://doi.org/10.1007/s10460-021-10288-w
6.	**Galli**, F., Bartolini, F., Brunori, G., Colombo, L., Gava, O., Grando, S., & Marescotti, A. (2015). Sustainability assessment of food supply chains: An application to local and global bread in Italy. *Agricultural and Food Economics*, *3*(1), Article 21. https://doi.org/10.1186/s40100-015-0039-0
7.	**Hebinck**, A., Zurek, M., Achterbosch, T., Forkman, B., Kuijsten, A., Kuiper, M., Nørrung, B., van 't Veer, P., & Leip, A. (2021). A Sustainability Compass for policy navigation to sustainable food systems. *Global Food Security*, *29*, Article 100546. https://doi.org/10.1016/j.gfs.2021.100546
8.	**Iocola**, I., Angevin, F., Bockstaller, C., Catarino, R., Curran, M., Messéan, A., Schader, C., Stilmant, D., Van Stappen, F., Vanhove, P., Ahnemann, H., Berthomier, J., Colombo, L., Dara Guccione, G., Mérot, E., Palumbo, M., Virzì, N., & Canali, S. (2020). An actor-oriented multi-criteria assessment framework to support a transition towards sustainable agricultural systems based on crop diversification. *Sustainability*, *12*(13), Article 5434. https://doi.org/10.3390/su12135434
9.	**Malak-Rawlikowska**, A., Majewski, E., Wąs, A., Borgen, S. O., Csillag, P., Donati, M., Freeman, R., Hoàng, V., Lecoeur, J.-L., Mancini, M. C., Nguyen, A., Saïdi, M., Tocco, B., Török, Á., Veneziani, M., Vittersø, G., & Wavresky, P. (2019). Measuring the economic, environmental, and social sustainability of short food supply chains. *Sustainability*, *11*(15), Article 4004. https://doi.org/10.3390/su11154004
10.	**Samper**, L. F., & Quiñones-Ruiz, X. F. (2017). Towards a balanced sustainability vision for the coffee industry. *Resources*, *6*(2), Article 17. https://doi.org/10.3390/resources6020017
11.	**Schmitt**, E., Keech, D., Maye, D., Barjolle, D., & Kirwan, J. (2016). Comparing the sustainability of local and global food chains: A case study of cheese products in Switzerland and the UK. *Sustainability*, *8*(5), Article 419. https://doi.org/10.3390/su8050419
12.	**Segura**, M., Maroto, C., Segura, B., & Casas-Rosal, J. C. (2020). Improving food supply chain management by a sustainable approach to supplier evaluation. *Mathematics*, *8*(11), Article 1952. https://doi.org/10.3390/math8111952
13.	**Vipusanapat**, I., Ratanatamskul, C., & Chandrachai, A. (2022). Development of green supermarket evaluation model based on green process and green output—Case of Bangkok City. *Sustainability*, *14*(17), Article 10745. https://doi.org/10.3390/su141710745
14.	**Woodhouse**, A., Davis, J., Pénicaud, C., & Östergren, K. (2018). Sustainability checklist in support of the design of food processing. *Sustainable Production and Consumption*, *16*, 110–120. https://doi.org/10.1016/j.spc.2018.06.008
15.	**Yontar**, E., & Ersöz, S. (2021). Sustainability assessment with structural equation modeling in fresh food supply chain management. *Environmental Science and Pollution Research*, *28*, 39558–39575. https://doi.org/10.1007/s11356-021-13478-5