

Identifying Key Determinants of Supply Chain Risk Management: A Qualitative Study amongst Smallholder Agropreneurs of Fresh Fruits & Vegetables in Malaysia

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Due to their perishable nature, the supply chain of fresh fruits and vegetables is sensitive and uncertain, which poses several risks to agropreneurs of fresh fruits and vegetables in Malaysia. The country's farming community faces dire challenges in terms of escalating food production costs and the need to push for higher productivity gains. In particular, agri-fresh supply chains need to be managed in ways that help firms and managers effectively handle risks and improve performance. Therefore, to investigate the complex nature of agri-fresh supply chain risk, a qualitative study was conducted amongst 50 smallholder agropreneurs from five different states of Malaysia. Using thematic analysis of respondent interviews, multiple risks were identified that highly impact performance and create uncertainty along the supply chain. Although most agropreneurs work well internally, the major issue faced by them is the failure to implement external supply chain risk management with other trading partners. Moving forward, to minimize supply chain risks and increase performance of agri-fresh supply chains in Malaysia, the development of a formal mechanism of supply chain risk management is necessary.

Key words: *Supply chain, supply chain risk management, fresh fruits and vegetables, independent and contract agropreneurs, Malaysia.*

Introduction

Malaysia faces a deficit of RM18 billion a year in food products, highlighting the necessity for the country to increase its performance in the food sector (New Straits Times, 2018). For this purpose, agropreneurs need to increase their production by transforming the food sector into a dynamic, innovative, and competitive industry. Presently, the perishable agri-fresh sector in Malaysia faces several challenges in meeting the increasing demand for affordable, healthy, and safe food. The rising issues are mostly low productivity, high post-harvest loss, non-optimal land use, disorganized marketing, ineffective institutional support, as well as inadequate and unskilled workers (Economic Planning Unit, 2016). It has also been observed in previous research that the factors affecting growth in the agri-fresh sector are predominantly unsuccessful knowledge transfer, lack of focus on priority research areas, unfavorable financing terms and ineffective broad-based incentives (Shukla & Jharkharia, 2013).

To sustain its position as one of the largest growing economies, Malaysia is working passionately in the agro-food sector, as well as the industrial sector, to maintain food supply and generate income (Economic Planning Unit, 2016). Food security, agropreneurs profit, and sustainability continue to be the targets of agro-meal subsector improvement, in keeping with the National Agrofood Policy (NAP), 2011- 2020. The term 'agropreneur' is a combination of two word parts, 'agro' and 'preneur'. 'Agro' is the short term of agriculture and 'preneur' stands for entrepreneurship. The combined term 'agropreneur' defines entrepreneurship practiced by farmers who desire to succeed in the farm business (Abdul Halim & Hamid, 2011).

The agri-fresh industry is useful in providing employment and increasing earnings for steady economic development. As such, to avoid uncertain situations, more emphasis is needed on enhancing productivity, improving the food supply chain, developing a machinery and services guide, increasing the understanding and skills of agropreneurs, as well as ensuring marketplace compliance. With these efforts, the agri-fresh industry will steadily progress from an association with low profits and unskilled jobs to one of higher income and profession of choice (Economic Planning Unit, 2016).

Analyzing the agri-fresh supply chain requires the examination of underlying supply chain risks that influence smallholder agropreneurs of fresh fruits and vegetables; however, there is little consensus on how to measure this risk. A framework proposed by Waqas, Abd. Rahman & Ismail, (2019), introduced a supply chain risk framework for the agri-fresh sector. Three aspects of supply chain risk management that may aid the identification of risks faced by the agri-fresh sector are risk identification, risk assessment, and risk mitigation strategy. These aspects allow identification of supply chain risks, followed by the assessment of those risks for the formation of mitigation strategies.

This study contributes significantly to the available research in this field as the supply chain risks and their impacts on the performance of the agri-fresh sector have not been widely discussed, especially within the Malaysian context. Therefore, investigating the complex nature of the agri-fresh supply chain will aid agri-fresh firms and managers in effectively controlling risk to improve their supply chain performance. The following three research questions were designed to address the gaps identified in the literature:

- What are the supply chain risks associated with the agri-fresh supply chain in Malaysia?
- How are the major risk sources of the fresh fruit and vegetable agropreneur supply chain in Malaysia assessed?
- What are the supply chain risk management strategies to minimize the supply chain risks of fresh fruit and vegetable agropreneurs in Malaysia?

The paper is organized as follow: Section 2 discusses the literature review; Section 3 describes material and methods, Section 4 presents the study results, Section 5 is the discussion of these results and finally section 6 is the conclusion.

Literature Review

Supply chain risks

Risk is present everywhere and has been studied from many perspectives, including but not limited to business strategies, production, marketing, accounting and finance. However, in almost all fields, there has been no specific consensus on the exact definition of this “risk”. Within the area of supply chain management, risk has been defined as a change in different consequences of the supply chain, their likelihood, and their subjective values (March & Shapira, 1987). From this, it can be surmised that when a breakdown of flow occurs between the various important components of the supply chain, it is called “risk”. This situation does not only interrupt the flow of information and flow of products/materials, but also impedes the use of other resources, including personnel and equipment (Lavastre, Gunasekaran, & Spalanzani, 2012).

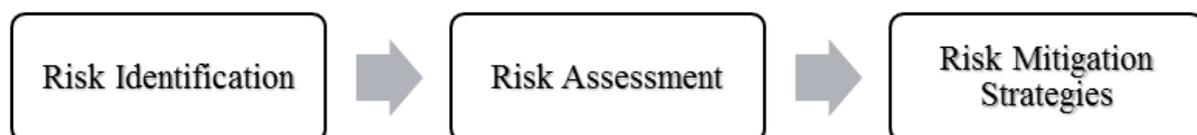
Globally, it has been observed that supply chain managers and local logistics managers have different opinions about the most frequently occurring risks (Lavastre & Gunasekaran, 2014). Commonly, supply chain risks are identified as certain macro- and/or micro-level events or processes that have an impact over a part of or the whole supply chain, causing failure at different levels of the supply chain, such as operational, tactical, or even strategic level failures and temporary disruptions (Ho, Zheng, Yildiz, & Talluri, 2015).

Supply chain risk management

Supply chain risk management is a developing field (Waqas et al. 2019). Due to the newness of the term and concept, researchers are attempting to reach a clear consensus on the exact meaning of supply chain risk management. Previous work in this field has posited multiple components that shape supply chain risk management, including but not limited to, coordination, collaboration, and identification across companies (Tang, 2006), however this definition remains unclear because no distinct consensus has been reached by researchers. Based on the lack of a statutory definition of supply chain risk management, the present study contributes towards a new definition, i.e. “supply chain risk management is a complete systematic method to tackle different types of risks; in this process, risk mitigation strategies are the key to managing risks after assessing major risks identified from diverse fields, in order to maintain performance on a continuous basis.”

There is a dearth of empirical investigation in the field of supply chain risk management, especially within the context of agropreneurs (Sreedevi & Saranga, 2017; Wang, Tiwari, & Chen, 2017). It is also noteworthy that previous researchers have developed supply chain risk frameworks in other sectors, to the exclusion of the agri-fresh sector. Importantly, various aspects of supply chain risk management have been discussed in the literature, i.e. risk identification, risk assessment, risk mitigation, risk monitoring, and contingency planning (Behzadi, O’Sullivan, Olsen, & Zhang, 2017). Thus, supply chain risk management is a critical yet underexplored subject that is important for identifying, assessing, and mitigating risk sources (Fan & Stevenson, 2018) to improve performance (Shenoi, Dath, & Rajendran, 2016). In the present research, three aspects were considered, i.e. risk identification, risk assessment, and risk mitigation strategies, as illustrated in Figure 1 below. These aspects of supply chain risk management are potentially useful to increase performance in the perishable agri-fresh sector (Prakash, Soni, Rathore & Singh, 2017).

Figure 1. Supply chain risk management



Risk Identification

When managing risks, the first and foremost step is to identify the risks (Tummala & Schoenherr, 2011). It can be argued that risk mitigation activities are highly dependent on identification (Kumar Sharma & Bhat, 2014). Before assessing risks, it is important to understand which risks are relevant and need to be assessed (Kern, Moser, Hartmann, &

Moder, 2012). Hence, the risk identification stage is crucial, and necessitates regular, timely screening of potential risks within the supply chain.

For risk identification, there is a need to identify all possible potential threats and their possible impacts on the whole supply chain. This process requires not only focusing on upcoming new threats, but also classifying them accordingly (Breuer, Siestrup, Haasis, & Wildebrand, 2013). In this initial stage, each relevant risk is identified and then evaluated by its causes and effects over the organization and its environment in the next stage (Punniyamoorthy, Thamaraiselvan, & Manikandan, 2013).

There is a scarcity of research on the identification of risks, the severity of said risks, and the ability to manage/control such risks in the agri-fresh supply chain context (Louw & Jordaan, 2016). Risk identification is critical in agri-fresh supply chains because of the short shelf life and high perishability of natural products in the agri sector. The volatile agri-fresh supply chain would be able to effectively manage and mitigate risks if a detailed identification and description of the risk root causes were known (Edmond, Feng, Daniel, & Joseph, 2014).

Risk Assessment

In the proposed supply chain risk management framework, the second step is risk assessment. Risk assessment is known as the occurrence and estimation of risk impact on the overall supply chain (Kern et al., 2012; Vilko & Hallikas, 2012). Risk assessment promotes the effective evaluation of the likelihood and impact of previously identified risks, which are then further mitigated by adopting specific strategies (Zimmer, Fröhling, Breun, & Schultmann, 2017). In order to assess risks, there is a need to understand the diverse factors that lead to risks in the supply chain (Kamalahmadi & Parast, 2017). Specific attention should be given to inter-related risks and the events that trigger those risks (Punniyamoorthy et al., 2013). In this way, risk assessment activities classify the identified risks and prioritize them accordingly. This assessment also maps risks in a way that allows the understanding of when, where, and what risks may occur as well as their impacts on the supply chain (Simba, Niemann, & Agigi, 2017).

Risk assessment helps determine the frequency and impacts of risks across various possible scenarios, which is definitely pertinent for agri-fresh producers who perform independent production. Due to major swings in food and other commodity prices as well as rising concerns regarding climate change, agri-fresh food risks are increasing, leading to growing interest in managing supply chain risks effectively and sustainably (Louw & Jordaan, 2016). In the agri-fresh sector, risk assessment provides an evaluation of factors that improve the competitiveness and sustainability of agricultural supply chains (Jaffee, Siegel, & Andrews, 2010). As such, special attention is required to assess risks before those risks can be managed (Worldbank, 2010).

Risk Mitigation Strategies

Risk mitigation strategies are those strategies that help a firm reduce the negative impacts of certain risks. These strategies are often used to mitigate risks in the commercial context (Lavastre et al., 2012; Tang, 2006). Supply chain delays often arise when firms face difficulties in responding to changes in the market due to a lack of flexibility and knowledge, and when other issues occur like poor process quality or supplier quality and logistics challenges, as well as difficulty to penetrate international markets (Jahre, 2017).

Before initiating risk mitigation strategies, there needs to be an understanding of the identified risks through an in-depth assessment (Li, Fan, Lee, & Cheng, 2015). The present research has highlighted the fact that due to the perishability of products and the massive structural changes in agri-fresh systems globally, both agri-fresh producers and governments face the challenge of designing risk mitigation strategies. In view of this, it is now of profound importance to not only understand the risks in the agri-fresh supply chain, but also to evaluate the impact of these risks on the sector and to develop strategies to manage these risks (Jaffee et al., 2010).

Materials and Methods

The present study utilized a descriptive qualitative research design. Qualitative semi-structured interviews are one of the most dominant and extensively used strategies of information gathering in the social sciences (Kumar et al., 2018). They are valuable because they permit researchers to discover subjective viewpoints and gather in-depth accounts of people's experiences. This systematic research procedure is the superior way to develop new concepts that explain the behavior of respondents (Ashley, Boyd, & Boyd, 2006). The present study began with the selection of questions for the interviews. Along the interview process, the researcher continuously worked on the emerging concepts in the collected data, examined the patterns, and formalized the coding procedures. This approach continued until clear findings emerged.

In the present research, the researcher recruited enumerators from five states in Malaysia. These enumerators were selected from the same community for better understanding and findings. They were also well updated and knowledgeable about their areas. Language was the major communication barrier because the Malay, Chinese, and Tamil languages used were not understood by the researcher. The participants were identified through the convenience and snowball sampling techniques, whereby the initial participants were found by the researcher in a farmer's market. These participants were then asked for their help to find other agropreneurs. The unit of analysis for this study was smallholder agropreneurs of fresh fruits and vegetables from five selected states in Peninsular Malaysia, i.e. Selangor, Pahang, Johor, Perak, and Kelantan. This is because a majority of the agropreneurs of fresh

fruits and vegetables are smallholders and these five states are the major producers of fresh fruits and vegetable (Economic Planning Unit, 2016).

Owners, managers, or assistant managers of agri-fresh farms were amongst the agropreneurs interviewed in the study. Between August 2018 and March 2019, the researcher and the research assistant interviewed 50 agropreneurs from the five selected states, comprising ten interviews from each state as described in Table 1 below. Fresh fruit and vegetable farming is volatile due to the perishable nature of the products, making this sector vulnerable to a large number of supply chain risks (Waqas et al. 2019). To preserve the quality of information, the interviewee selection was important. As such, only participants with diverse knowledge about their own supply chain and who could openly share their risks, strategies, and performances were selected.

Table 1 Selected states in Peninsular Malaysia

Selected states	Agropreneurs
Johor	10
Selangor	10
Pahang	10
Kelantan	10
Perak	10
Total	50

All interviews were conducted in the interviewee office or farm. Formally, each interview started with the introduction of the researcher, the purpose of the study, and the expected output of the research. Before the face-to-face interviews began, participants were asked to answer a brief survey which solicited their background information (type of farming, i.e. fresh fruits or vegetables; experience; education; age; gender). Both audio and video recordings were made to maintain accuracy. Each interview took approximately one hour.

The interview questions were semi-structured, open-ended, and individually guided to avoid missing features of any respondent. Wide-ranging questions were prepared according to the targeted participants. Generally, the agropreneurs were asked about risks at the farm level; awareness about supply chain risks; knowledge of risks; search of short-term risks in their supply chains; identification of risks in the entire supply chain; definition of early warning indicators; possible risk sources for their supply chain; evaluation of risk probability in the supply chain; analysis of possible supply chain risk sources; assessment of the urgency of

risks; and strategies normally used to manage risks. These discussions then led to finding answers for the main research questions.

The present research employed the thematic evaluation method suggested by Evans and Lewis (2017) to analyze the interviews. Thematic evaluation is the procedure of identifying styles and themes within data. This starts at the stage of data collection and continues through each stage of transcribing, studying, reading, re-reading, and interpreting the findings. The researcher alternated between coding and reviewing codes, discussed discrepancies with experts, and ensured the consistency and reliability of findings. This supplied a scientific way to find patterns and trends, and to preserve the validity of the results. A research assistant also re-coded all the interview transcripts separately as a measure of confirming the reliability of the evaluation.

Results

Several themes emerged from the data analysis. First, the results identified the supply chain risks that are faced by fresh fruit and vegetable agropreneurs, i.e. supply, process, demand, and financial risks. Second, the findings discovered a key issue in supply chain risk management, i.e. risk assessment is not being properly used or lacks a formal procedure. Third, the themes revealed two risk mitigation strategies which are used to minimize risks; however, these supply chain risk management procedures are generally not used to improve the supply chain. The following sections divide the main results of the thematic analysis results into three categories as per the proposed framework of this study, i.e. risk identification, risk assessment, and risk mitigation strategies.

Risk Identification

As explained in previous sections, risk identification is the first component of supply chain risk management. The construct of risk identification focuses on regularly scanning for new threats and classifying identified risks. Under risk identification, several key risks were found that directly and indirectly impact the agri-fresh supply chain. These risks are discussed below.

Supply Risk

Agri-fresh supply chains increasingly face supply-related risks, which affect the availability and timing of goods and services, energy, and information (Worldbank, 2010). Supply risks are divided into two types, namely internal risks and external risks. In the present study, 40 (80%) agropreneurs perceived that supply risk affects them severely. Physically moving products from input suppliers to farmers, farmers to traders, traders to buyers, and buyers to

consumers is a critical part of supply, and weaknesses in this movement are a major source of supply risk in the agri-fresh supply chain that impact the availability, timing, and quality of the food (Behzadi et al. 2017; Prakash et al. 2017).

External supply risks are illustrated by the following quotes:

"Quality is the issue of focus in the supply chain. Sometimes suppliers do not meet demand standards due to bad product quality. Supply risk issues, such as low quality of product and supplier delays are a major threat to us," (Respondent 3). He added, "It is difficult to establish payment by quality because the consumer does not pay differentiated prices."

"The majority of seed supplies are from other countries, so quality is not the issue; rather, it is the delay in the supplies. Unfortunately, those who are relying on local suppliers not only face quality issues but also late supply issues that impact their field processing, as crops always need on-time deliveries" (Respondent 1).

"Switching to another supplier is very difficult because delays in cropping cannot be afforded" (Respondent 6).

Further, internal supply risk involves the logistics service from the agropreneurs to the end consumers or distributors and retailers. For example, "Smallholder agropreneurs are mostly dependent on the middle man, who plays a major role in the product supply to the market" (Respondent 7). He further added that, "Sometimes, they don't purchase or even pick up the crop as they previously agreed to. They simply say that they don't have space and cannot buy the total crop. If we insist, then they come in price bargaining, which is not favorable for us". "Because..., we are not in the capacity to buy our own transport and when supply issues come in, most of the time the crop gets wasted because of its perishability" (Respondent 10).

From the results of the interviews, it can be assumed that an increase in the supply risk impacts the performance of the agropreneurs of fresh fruits and vegetables.

Demand Risk

The agri-fresh supply chain faces important demand risks that may affect the production cycle for a single growing season or for longer periods of time. Demand risks have received less attention in studies related to perishable agri-fresh products (Ho et al. 2015). However, in the present study, 45 agropreneurs state that demand-related risks in the agri-fresh chain emerge primarily from unanticipated or volatile customer demand and insufficient/distorted information from customers and distributors. The impact of demand risk is illustrated in the following quotes: "The impact of demand risk causes ambiguity in agropreneurs' forecasting; this situation can be threatening for performance," (Respondent 13). He further added that, "We are facing high impacts of demand risk. Most agropreneurs are independent so... they

are not familiar with market trends and just keep producing according to their understanding; after, they receive very low rates or have excess supplies which they are unable to sell in the market, resulting in huge loses just in one crop. There is no mechanism to control the price, so we simply focus on the demand.”

"Cabbage price is 20 cents/kg at the farm level while retailers sell at RM 4/kg; when we ask about the decreasing price, the distributor says supplies have also arrived from international suppliers, which is why the price is reducing and we cannot pay you more than this rate” (Respondent 12).

The other important aspect identified from these interviews was the problem of quality. Today, people are health conscious and prefer fresh foods. If delivery is late and products are not sold within one or two days, customers are reluctant to buy. It is essential for the agropreneurs to be on time with fresh fruits and vegetables. Unfortunately, most agropreneurs are unable to meet both demand and quality standards at the same time and are thus unable to survive in the markets. Nevertheless, the pricing issue can be resolved through information access throughout supply chain and government intervention to improve inspection and enforce minimum prices when buying from agropreneurs.

Process Risk

In the present study, only 14 agropreneurs were aware of process risks and the consequences related to these risks. The remaining 36 respondents believed that process risk is only post-harvest risk. In actuality, fresh fruit and vegetable management and process-related risks are closely associated with human judgment. A single incorrect managerial or operational decision in the agri-fresh supply chain could spill over to undermine the performance of the entire supply chain. This is the essence of process risk in the current study.

"30% process risk, we face during and after harvesting and a huge chunk of the crop is wasted. We try to minimize it by ourselves but are unable to do this” (Respondent 23). He further added, "There is lack of support from any institute in terms of guiding us to reduce these losses." On the other hand, some agropreneurs are less reliant on institutions because of their own mindset or negligence. Indeed, “one of the weakest points in the supply chain is professionalism in the agri-fresh supply chain” (Respondent 40).

"Sometimes I feel that the basic reasons behind this issue are both labor incompetence and technological issues. Mostly, the labor is not skilled and is unable to use advanced equipment. I think..., a lack of knowledge regarding crop planting and harvesting is another risk which is damaging the crop” (Respondent 29). Interviewees recognized that the only way

to improve labor and technological competency is through new farming techniques and skilled workers.

"Infrastructure and services are the issues we are facing. The lack of good infrastructure causes delays when delivering products" (Respondent 33). Due to this, buyers refuse to purchase. Fresh fruit and vegetable crops are perishable, and customers are health conscious and prefer fresh food". He also said that, "Bad road conditions and outsourcing fruits and vegetable delivery increase the cost. In addition to the large distances, buyers travel to collect low volumes from agropreneurs, these issues increase the opportunist behavior of buyers and reduce the bargaining power of agropreneurs. During the rainy season, access becomes more difficult and expensive."

The rising process risks perceived by agropreneurs are generally low productivity, high post-harvest loss, non-optimal land use, disorganized marketing, ineffective institutional support, as well as inadequate and unskilled workers. As they are unable to deal with these risks, supply chain risks are continuously accumulating. In particular, process risks affect crop outputs and reduce production size and scope. However, the dissemination of technology and infrastructure may directly influence production and quality, and thereby enhance the agri-fresh supply chain.

Financial Risk

Financial products and services in the agriculture sector have been deficient due to the portfolio risk associated with the agri-fresh sector. In the agri-fresh supply chain, financial risk occurs due to a lack of financial support, delays in accessing financial support, changes in financial policies, and price mark-ups. A total of 48 out of 50 agropreneurs in the study stated that middlemen are the major financiers of smallholder fresh fruit and vegetable agropreneurs. Agropreneurs are bound to work with these parties because of the lack of financial support.

One participant commented on this situation in this way: "Financial risk is crucial for us. Most of the time, financial institutions hesitate to finance us because of the issues of high perishability and smallholdings" (Respondent 43).

"Crop timing is very important, so we cannot delay. Risks are associated with the decision to borrow, as the main concern becomes the repayment of loans taken. Financial aid from the government is enjoyed only by contract farmers. That is why our financial risk sometimes affects our production, market access, and purchasing of inputs/seeds" (Respondent 44).

He further added that: "The middleman is the major financier. He takes full advantage of his importance and doesn't bother about our condition. For example, smallholder agropreneurs

are unable to fulfill loan requirements from banks, so they approach the middlemen and ask for seeds, fertilizers, and other financial help. In this way, the middlemen bind agropreneurs to sell products to them.”

Risk Assessment

The assessment of agri-fresh supply chain risks is necessary to achieve performance objectives of farms and the supply chain as a whole. Risk assessment determines the likelihood, frequency, and impact of disruptions within various possible risk scenarios. Its importance is illustrated in the following quote by a participant: "We don't look for the possible sources of our risks. We are familiar with a few risks and we assess them according to our understanding. But then, something different happens and we are unable to cope" (Respondent 31).

Another participant added: "There is no formal mechanism to evaluate the probability of risks...I mostly change the crop but do not evaluate the impact of risks" (Respondent 22). One agropreneur even provided an example: "A sudden disease attacked my banana trees and completely destroyed the fruits. To be on the safe side, I switched from banana to other fruits, because I don't know how to manage the process from the attack to the destruction of the fruit" (Respondent 37).

"agropreneurs sometimes identify their issues, but due to financial problems they cannot control these issues" (Respondent 44).

In summary, 42 of the 50 participants confirmed that there is no formal or established risk assessment mechanism among fresh fruit and vegetable agropreneurs.

Risk Mitigation Strategies

Risk mitigation strategies refer to the efforts aimed at reducing the occurrence and negative outcomes of risk. Supply chain risk management involves how risks occur and delays are mitigated in the commercial context. Supply chain delays arise when firms are unable to respond to market changes due to a lack of flexibility and knowledge, in addition to issues like poor quality from suppliers, difficulty penetrating the international market, and logistics challenges.

In the present research, most of the participants believed that information sharing, and collaboration play a significant role in overcoming risks. For instance, "After I started farming, I developed a platform where I could share my experiences with others and get suggestions from others' experiences to prevent possible risks" (Respondent 19). Nevertheless, information sharing, and collaboration help agropreneurs within their domain

and community only. Many agropreneurs are unaware of the exact strategies used to minimize risks in their supply chain, resorting to traditional ways to resolve issues as they arise. Evidently, there is a lack of a supply chain risk management mechanisms in agri-fresh supply chains. This was reflected in the views of the study respondents as well.

"I have been farming for thirty years. Most of the risks within the farm are easily handled and sometimes, other agropreneurs also consult me about their issues. But some risks are external, from our trading partners; that's why they are unable to be solved" (Respondent 49).

Another respondent added, "The trading partners, during risks and issues, show opportunistic behaviors. That is the main hurdle in managing supply chain risks" (Respondent 31). One respondent suggested the following: "We must monitor our suppliers regularly for possible supply chain risks. In our farm, we are dedicated to reducing supply chain risks" (Respondent 6). He further added that, "Contract farmers are generally secure because 50% of their crop is purchased by the government and they receive abundant training to handle all these risks." However, this respondent had a different opinion on contract farming: "One of the reasons for quitting contract farming is late payment. Initially, the farmer happily accepts their offer but after some time, they avoid the contract's continuity" (Respondent 44).

The risk sharing mechanism pertains to the situation in which a firm provides incentives and assigns responsibilities or duties to supply chain members to mitigate and face supply chain risks. Malaysia is one of a handful of countries that offer contract farming, which has changed the concept of farming. That is why a few agropreneurs had a formal risk sharing mechanism to reduce risks, even with their trading partners. For instance, "Sharing cost/revenue is one of the mechanisms to reduce the opportunistic behaviors of our trading partners" (Respondent 29). Another respondent stated that: "The existence of a formal or informal mechanism to share risk with trading partners is important. Because of this, they are bound to work with us and we feel secure with them. But there is also the problem of perishability and bulk of cropping, which makes it difficult to sign a contract" (Respondent 24). He further added that, "Agropreneurs are also reluctant to join the government's contract farming because of regulations and payment delays."

The use of information sharing, collaboration, and risk sharing can reduce the impact and likelihood of risks faced by fresh fruit and vegetable agropreneurs. Agropreneurs also find that the major problems in implementing contract farming outside government contracts is disloyalty and opportunist behavior. "Very rarely are contracts established for the sake of loyalty and not selfish reasons" (Respondent 21). Firms "understand the importance of establishing contracts, but agropreneurs do not," as in many cases they often seek the highest prices irrespective of who pays due to the lack of future vision and communication.

Discussion

The aim of the present research was to determine the existence and mechanisms of supply chain risk management in the supply chain of fresh fruit and vegetable agropreneurs. The variety of risks discussed in this paper facilitated the differentiation of risk limits of agropreneurs in Malaysia (e.g. probability and severity of risks). It was discovered that no elements of a formal mechanism of supply chain risk management, i.e. risk identification, risk assessment, and risk mitigation strategies were present within the sector of agropreneurs of fresh fruits and vegetables.

From the discussions, feedback, and experiences of 50 agropreneurs, four categories of risks were identified: supply risk, process risk, demand risk, and financial risk. Though previous studies on supply chain risk in the manufacturing sector claim that process risk is the most important [15,24], the present study found that financial risk was considered the most crucial among all the respondents. As the fresh fruit and vegetables agropreneurs are commonly smallholders, their main issue is financing. Once this risk is minimized, they are able to handle other risks effectively. Institutions should take initiatives to help these agropreneurs just as they have helped contract agropreneurs.

The number of fresh fruit and vegetable agropreneurs who are at risk indicates that there are several risk sources in the supply chain that are not managed effectively. The use of a formal risk assessment tool could not be found during the research, while only a few respondents claimed to use informal risk assessment. Previous studies have established that risk assessment is a crucial step in supply chain risk management, as this is the level where identified risks are evaluated, and subsequent actions are planned. The results of the present study further reveal that risk assessment in the fresh fruit and vegetable sector is complicated due to the sector's vulnerability to supply chain risks such as environment, process, demand/market, and improper network channels. This emphasizes the need to develop a risk assessment procedure to measure risk properly in the sector.

Additionally, the present research found that risk mitigation strategies have received less attention from agropreneurs. Existing risk mitigation strategies are limited to information sharing, collaboration, and risk sharing. Notably, though these strategies were identified during discussions with the agropreneurs, there was no formal mechanism and/or platform available for them to utilize the strategies. It is thus recommended that joint ventures along the agri-fresh supply chain use contracts with terms such as buy-back agreement or revenue sharing to coordinate relevant supply chain risk management activities.

Conclusions

The results of the present research show that fresh fruit and vegetable agropreneurs are entangled with multiple risk sources, and that the agri-fresh supply chain still has several areas to improve on in terms of risk management. Due to differences in risk magnitude and supply chain risk management implementation, it is useful for agropreneurs to identify and assess risk impacts frequently. Therefore, agropreneurs are urged to apply immediate measures to promote supply chain risk management, increase efficiency, and contribute to further growth and sustainability in the market. Such changes involve not only technological improvement to equipment, machinery, and seeds/material, but also harvesting procedure improvement to reduce post-harvest loss.

Productivity is crucial to farm growth, and can be achieved through technology, certified seeds, on-time delivery, and increased efficiency. Hence, to boost the performance of agropreneurs, it is necessary to foster professionalism in supply chain. This includes professionalism at the farm level as well as at the processing level, with more skilled workers and managers to achieve higher quality, technological innovation, and direct access to domestic and international markets. Moreover, quality products are the key to sustaining the supply chain from the first to last tier. Such quality requires better managerial practices and higher quality standards that allow the cropping of hygienic products with the potential to survive in the market. As efficiency flows in a top-down manner, it is essential to enhance training and technical assistance to agropreneurs as well, to disseminate available new technologies and techniques. Similarly, proficiency at the processing level is a key step to improving the whole supply chain.

In addition, agropreneurs need to develop a platform where they can easily coordinate and communicate with traders, which allows early notification of potential disturbances. A study by Ellegaard, (2008) found that with the operationalization of knowledge (information) and related knowledge workers within the supply chain, firms can easily identify expected disturbances in the supply chain. Therefore, knowledge management is an important practice that strengthens the proficiency of agri-fresh supply chains.

In Malaysia, supply chain risks can be alleviated by government intervention in infrastructure, inspection, controlled pricing systems and dissemination of available technologies for fresh fruits and vegetables farms. Developing price mechanisms at the farm level can eliminate distributor monopoly. Since financial uncertainty in a supply chain member can easily affect the whole supply chain, financial policy makers are recommended to analyze and understand the operations of smallholder fresh fruit and vegetable agropreneurs in order to develop advanced financial products and interest rates that are favorable to them. In summary, agropreneurs should be aware that supply chain risks are



expected and are diverse in terms of their impacts and likelihood. Also, risk sources, i.e. demand, supply, process, and financial risks, are the main factors that impact the performance of fresh fruit and vegetable agropreneurs. Therefore, mitigating these supply chain risks before they occur can improve performance.

Despite its contributions to the field of agri-fresh supply chain risk management, the present research is not without its limitations. The narrow scope of interviewees is one such limitation. Future studies can consider agropreneurs from diverse background to improve the generalizability of present study in other sectors. This would make it possible to understand the phenomenon of supply chain risk from different perspectives. Further, this study is limited by the regions investigated, as only five of thirteen states in the country were part of the study sample. Moving forward, other regions with fresh fruits and vegetables farms, especially in neighboring countries, should be considered for empirical study.

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