Improving vegetable supply chain collaboration: a case study in Vietnam

Purpose- While various aspects of the vegetable supply chain (SC) have been increasingly studied, most studies tend to investigate the downstream part of the SC in terms of customer demand and product quality. Relatively fewer studies have focused on upstream suppliers/farmers. This study aims to understand upstream farmers' positions in different types of vegetable SCs and identify ways of enhancing sustainable vegetable SC collaboration.

Design- This study is based on an in-depth case study of a cooperative SC in Vietnam from the perspectives of both the cooperative and its farmers.

Findings - The study found that cooperative SCs are the most appropriate for Vietnamese farmers. It also identified the key activities needed to engage farmers with cooperative SCs and the mechanisms that the cooperative needs to develop. Cooperative SCs can be enhanced only when farmers are motivated to engage in SC activities and when the cooperative implements a robust management mechanism.

Originality/Value - This study provides new, insightful results on how to engage with small fragmented farmers for SC collaboration and how to enhance the roles of cooperative SCs in the vegetable industry in Vietnam. It also provides information for policy makers to support sustainable vegetable SC development and maintain its sustainability.

Keywords: vegetable supply chain, cooperative supply chain, transaction costs, farmer empowerment

1. Introduction

With strong global economic growth and an increasing awareness of the positive impact of vegetables on health, consumers have increasingly diversified their diets to incorporate more fresh vegetables into their meals and have increased their daily vegetable intake (Huong *et al.*, 2013). While it is crucial for vegetable SC members to maintain food quality and safety as a top priority throughout the entire process (Pérez-Mesa and Galdeano-Gomez, 2015), they are increasingly under pressure to be both competitive and sustainable. Given consumers' purchasing power in vegetable SCs, numerous studies have been focused on downstream SCs to improve customer services, effectiveness and efficiencies, and product quality.

In recent years, a large share of the grocery market has increasingly been dominated by large-scale retailers, who have exerted their influence over other SC members, e.g. in what to grow and how to process and package products, controlling them to implement strategies for their own benefits and determine SC structures (Hoejmose *et al*., 2013). The negative impact of this growing power asymmetry in vegetable SCs has not gone unnoticed in the literature (e.g., Fischer *et al*., 2008; Gorton *et al*., 2015; Bandara *et al*., 2017; Devin *et al*., 2018), e.g. regarding farmers' disadvantaged positions and unfair treatment within the vegetable SC. In addition to limited power in negotiation of pricing, Brito and Miguel (2017) even noted that less powerful chain

members depend on more powerful members to make their operations decisions, e.g. on inventory level, production volume, and distribution.

However, equal and fair collaboration with farmers is crucial for sustainable vegetable SCs in response to the variability of consumer demands, emerging technologies, and external socio-economic factors. For example, farmers have a key role in improving the implementation of new technologies for food safety and new techniques for large production volumes. Despite the wide recognition of the importance of vegetable SC collaboration, there is a lack of in-depth knowledge on how to actively engage farmers in SC collaboration. In fact, farmers have been struggling to collaborate with other SC members and meet increasing customer demands on product quality and safety, and strict environmental requirements (Gramzow *et al*., 2018). This research therefore considers the importance of empowerment and relationship commitment of small-scale farmers in vegetable SC collaboration, investigates different types of vegetable SCs in Vietnam and identifies the appropriate vegetable SC structure and mechanisms for sustainable collaboration.

More specifically, this study adopts a qualitative research method to examine three different types of vegetable SC in Vietnam and to investigate mechanisms enhancing vegetable SC collaboration. Vegetable SCs are not only crucial for Vietnam in boosting the national economy, but are also essential for the Vietnamese diet (Duyen, 2018). In recent years, the Vietnamese government has developed different policies to expand vegetable markets in order to get larger-scale supply and quality assurance. In contrast with other countries in East and Southeast Asia, which have been decreasing the development of their agricultural industries, Vietnam depends on an agriculture-based economy that has a 15% contribution to its GDP (World Bank, 2019). Vegetable SCs in Vietnam have grown quickly on both supply and demand sides. On the supply side, Vietnam is endowed by nature, with territory coverage of fifteen latitudes, which provides farmers with a diversified agri-ecological environment (Thoa, 2013). A general upward trend for the number of harvested vegetables, from 361,524 ha to 842,638 ha, more than a two-fold increase, was witnessed from 2011 to 2017. On the demand side, vegetables play a very important role in the Vietnamese diet and the daily vegetable consumption is around 290g per capita (Pham *et al.*, 2019), which is amongst the highest levels in Asia.

This study will contribute to the literature on the development of sustainable vegetable SCs. While most researchers have focused on the aspects of product and customer service, this research investigates the mechanism for an appropriate SC model, and identifies key activities to promote SC collaboration with small-scale farmers. Drawing on this study, policy makers could also establish sector-specific guidelines and initiatives to support the development of sustainable vegetable SCs. The remainder of this paper is organised as follows: Section 2 provides a review of the literature on research background, theoretical support and the different types of vegetable SCs in Vietnam (with a focus on relationship commitments for each type of SC). Section 3 explains the research method adopted for this study, while Section 4 presents data collection and data analysis. Subsequently, Section 5 is concerned with research implications and discussion. Section 6 concludes with a summary, limitations of this research and future research directions.

2. **Literature Review**

2.1 Research background

Collaboration with other supply chain members has become increasingly important to a company's business strategy to share risks, access complementary resources, improve capacity for rapid learning and transfer knowledge. It can also be a source of a company's long-term competitive advantage (Jap, 1999). However, the nature and degree of collaboration in SCs can be subject to contextual factors such as product characteristics, industry type and social context (e.g. Matopoulos *et al*., 2007; Singh and Power, 2009;). Turnbull *et al*. (1993) also warned that weaker players are not necessarily better-off in seemingly collaborative arrangements, when compared with adversarial ones. As discussed before, small farms in vegetable SCs suffer from the negative impact of a great power imbalance and resource constraints. In the context of Vietnam, farmers in vegetable SCs are mostly smallholders, solely responsible for their initial production transactions. When farming in Vietnam returned to a family-based farming system in 1990, after a centrally planned economy, farmers experienced top-down, government-led cooperatives, constraining their decisions on collaboration with other businesses. Now, due to the fast increase of an aging population, and a lack of access to technology and little marketing orientation, a large proportion of farmers still work with collectors by negotiating purchase prices and quantities, and payment methods. In some cases, farmers have to sell at a loss due to quality rejection or supply exceeding demand (Huong *et al.*, 2013; Duyen, 2018; Pham, 2018). Farmers often intend to reap short-term profits by planting the previously most profitable vegetables, without considering marketing requirements. Their short-term financial focuses hinder them from long-term investment and sustainable development. As a result, farmers are stuck in a vicious circle of excessive focus on small, short-term benefits, leading to consumers not having enough products that meet development requirements and vegetable SCs that are not sustainable (Johnson *et al.*, 2008).

2.2 Theoretical support

Despite the increasing importance of collaboration across the entire vegetable SC, significant barriers also exist which may limit the level of collaboration for small companies (e.g. Arend and Wisner, 2005; Matopoulos *et al.*, 2007). The theory of structural power (Kanter, 1993) states that empowerment can be adapted and expanded as a factor in facilitating operational performance (Leyer *et al.*, 2019). In fact, empowerment of individuals and teams in an organisational context has been considered to be an effective method in motivating individual employees' activity. In the context of SC, empowerment can be implemented to encourage chain partners' participation and engagement. In vegetable SCs, when farmers perceive the potential value of participating in SC collaboration, empowerment provides a pattern of shared values and beliefs that assert the importance of a farmer's competence and the tasks they perform. Empowered farmers are highly motivated and consider themselves to have considerable autonomy in determining supply practices and developing solutions to operational issues. According to Somech (2005), farmer empowerment manifests itself in four cognitive dimensions: potency, meaningfulness, autonomy and impact, which reflect their orientations towards their roles and performance in vegetable SCs. Somech further stated that each of these four dimensions is necessary but individually insufficient for the emergence of the higher-order concept of empowerment.

As a dominant motivation for collaboration, knowledge sharing has become particularly important, as knowledge and capability have become more dispersed in the network economy and the environment has become more volatile and competitive (Cao and Zhang, 2011). SC collaboration provides access to SC partners' skill and knowledge set, and it can be an effective

means of transferring information, knowledge and new technical skills across SC partners (Malhotra *et al.*, 2005; Vachon and Klassen, 2008). Collaborative arrangements involve a transfer of both explicit and tacit knowledge (Whipple and Russell, 2007, Yang et al., 2020). Explicit knowledge can readily be codified and transferred, e.g. how to use various software programmes to analyse logistics activities. By contrast, tacit knowledge is more difficult to articulate, acquire and transfer (Kogut and Zander, 1992), e.g. how to interpret the output from the software solution in a way that incorporates industry and cultural contexts (which can be only gained through experience and practice). Often, much of the knowledge gained through SC collaboration is tacit knowledge (Nix and Zacharia, 2014). In addition to the development of knowledge-sharing routines, SC members need to internalise relevant explicit and tacit knowledge from SC collaboration, which allows them to develop their own competence in a given technological or management capability (Grant and Baden-Fuller, 1995; Dyer and Singh, 1998). They thus need to actively invest in the development of their absorptive capabilities (Cohen and Levinthal, 1990). However, Touboulic and Walker (2015) show that it may be difficult to develop the absorptive capacity needed, especially in the context of large buyers working with small suppliers. Cao and Zhang (2011) also point out this challenge especially for small firms. Therefore, given the small-scale, farmer-based nature of vegetable SCs in Vietnam, it is important to emphasise the importance of putting in place the right SC collaboration mechanism facilitating information and knowledge sharing to ensure the cooperative SC continually improves.

2.3 Compare and contrast the different types of SCs

Although vegetable SCs in Vietnam have been established for a long time, it was only since recent years that they have become more diversified, with emerging new relationships in the upstream part, and farmers could choose different types of vegetable SCs to participate in. The Transaction Cost Theory (TCT) provides a useful lens for understanding the farmers' choice of different types of SCs. Following the TCT, which was originally introduced by Coase (1937) to examine a make vs. buy decision faced by organisations, farmers in vegetable SCs prioritise transaction costs when choosing their SC partners. There are four types of transaction costs (Williamson, 1996): (1) search costs, which are used for gathering information to identify and evaluate potential partners; (2) contracting costs, which are associated with negotiating and writing an agreement; (3) monitoring costs, which are used to ensure that other SC members fulfil their obligations; and (4) enforcement costs, which are used in line with *ex post* bargaining and sanctioning of a partner that does not perform according to their agreement. Individual farmers need to consider transaction costs with six main key stakeholders in vegetables SCs, including farmers, cooperatives, collectors, wholesalers, supermarkets/shop retailers and end consumers.

As shown in Figure 1, farmers have three options when selecting partnerships with collectors, direct contracts or cooperatives. Each type of SC involves a series of operational activities to produce and distribute vegetables to their chosen destinations in a short time to satisfy their consumers.

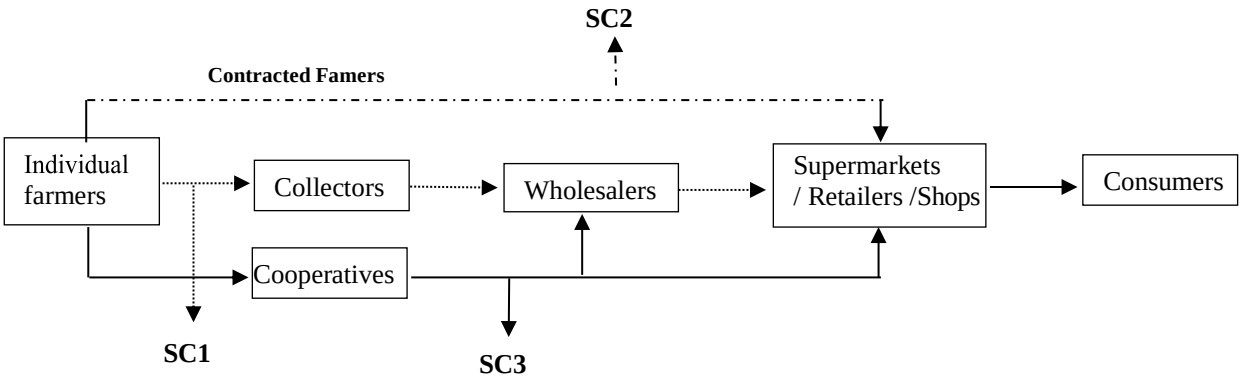

Figure 1. The vegetable supply chain map in Vietnam

2.3.1 SC 1: Farmers- Collectors- Wholesalers- Retailers/restaurants/shops- Consumers

SC 1 represents the traditional approach, which is still well adopted in agricultural industries (Rábade and Alfaro, 2006). Collectors proactively visit farmers to buy their vegetables, and arrange delivery to a wholesaler market by the cash-and-carry method. Farmers often stick to this traditional method because they are familiar with this channel and can deliver vegetables without quality assurance. However, due to no contract between farmers and collectors, farmers have little bargaining power and depend on collectors' offers. In most cases, farmers sell vegetables to a collector without knowing how much they would have been paid by other collectors. Sometimes the prices are favourable, but at other times the prices can be lower than other collectors' offers. Although Decision 80 in 2002 (Decision 80/2002/QD-TTG) was established to encourage contractual sale of commodity farm products to enhance procurement efficiency, the rate of contracts signed is still very low (Wang *et al.*, 2014a).

The reasons for farmers to select this type of SC are mainly the individual farmers' small-scale production, the perishability of their products, low labour costs and high unit transaction costs, which pull down farmers' negotiating power. SC 1 is complicated by the high number of intermediaries operating as collectors, and by the SC being composed of multiple supplier–supplier–customer combinations. This type of SC favours collectors but restrains farmers from getting access to a more profitable market (Negi *et al.*, 2018). The collectors have negotiation power and can exploit farmers' fear of not being able to sell products on time, and offer the lowest possible price to maximise their own profits (Ebata and Hernandez, 2017; Huong *et al.*, 2013). In fact, there is no collaboration between farmers and other SC members. Farmers are the ones suffering the heaviest economic losses in this relationship. The bargaining power imbalance (Ranjan, 2017) further increases the risk of the oversupply of farm products. In the long term, this type of SC can also lead to social issues such as inequality and unfairness, which can negatively affect the stability of SC relationships.

2.3.2 SC 2: Contracted farmers- Retailers (e.g. supermarkets/restaurants/shops)- Consumers

Another type of SC is known as contract farming, which is a pre-plant agreement between retailers and farmers (Gramzow *et al.*, 2018; Pham *et al.*, 2019). The agreement is considered the combination of a marketing contract (in terms of product quantity, price and delivery time) and a production contract (in terms of specifications, quality attributes and chemical use) (Wuepper and Sauer, 2016). SC 2 has resulted from rapid global economic growth and an increasing awareness

of the positive impact of vegetables on health, where consumers have been demanding higher quality, safety and freshness of vegetables. Consumers are even willing to pay extra for these attributes. With rich access to market information, a rising number of retailers have started to sign contracts directly with farmers to ensure product quality and provide product traceability. Retailers also require the use of specific inputs (e.g. seeds and fertilisers), along with investment in capital assets (e.g., packaging) from the farmers to become contracted farmers.

The development of SC 2 has improved the role of (contracted) farmers in the SC and their profits (Wang *et al.*, 2014b). With centralised management by a retailer and smooth flow of transport, individual farmers' production activities and production efficiency have been improved. Various advantages of contract farming have been emphasised in the literature. For example, contract farming improves the coordination between farmers and retailers (Vorley *et al.*, 2009); stabilises farmers' incomes through medium and long-term contracts (Huong *et al.*, 2013); reduces market transaction costs (Wang *et al.*, 2011) and provides farmers with better access to technology and information (Barrett *et al.*, 2012). It can also facilitate more vertical coordination among SC members. However, while there are many benefits that contract farming can bring to contracted farmers as well as the whole SC, the contracts themselves are a source of risk to farmers. This is because a small number of retailers are dominant in SCs. Farmers are still in weak bargaining positions, and retailers may place highly unfair conditions, such as low prices (Cadilhon *et al.*, 2003) and an unpredictable product rejection rate (Ochieng *et al.*, 2017). Delayed payment is another common contract attribute. In addition, not all farmers can join this type of SC because of a strict assessment procedure from retailers, which most small farmers cannot pass. For example, in Vingroup, only 500 out of 2000 farmers are qualified for contract farming (Kinhdoanhnet, 2017), due to their small-scale production volumes, less flexible production portfolios and lower product qualities (Ochieng *et al.*, 2017).

2.3.3 SC 3: Farmers- Cooperatives- Wholesaler/Retailers- Consumers

Cooperative SCs are "autonomous associations of persons united voluntarily to meet their common economic, social and cultural needs as well as aspirations through a jointly-owned and democratically controlled enterprise" (ICA, 2019). A cooperative in SC 3 executes different activities and works together with farmers to achieve their goals while fulfilling customer orders. It is a legal organisation that works "on the basis of self-control, self-responsibility, equality and democracy in management of cooperative" (Article 3, Cooperative Law 2012). A cooperative SC is a symbiosis model of mutual development for both the cooperative and farmers. SC 3 presents a voluntary economic nature, which unifies small-scale farmers who decide to engage in mutual economic activities (Moustier *et al.*, 2010). For Vietnamese farmers, cooperatives are not a new term: when returning to their family-based farming system in 1990, farmers experienced top-down, government-led cooperatives. Most farmers automatically belonged to communal cooperatives tightly controlled by the government. Despite the problems they experienced in the past, in recent years, the new bottom-up approach of cooperative SCs has started to attract farmers' attention again. Cooperative Law 2012 transformed cooperatives into shared capital organisations and offered mutually beneficial activities to members. Nearly all Vietnamese farmers now belong to "old-style" or "new-style" cooperatives. By storing and selling farmers´ produce, cooperative SCs create economies of scale and increase bargaining power in the SC. Cooperative SCs have widely been viewed as an effective means between "farm" and "folk" by reducing farmers' dependence on the "middle-man" (Lyson *et al.*, 2008). They help farmers better

respond to unpredictable consumer preferences and reduce farmers' transaction costs (Michalek *et al.*, 2018).

Based on the above literature and understanding on the three types of vegetable SCs in Vietnamese farming, their distinctive features are summarised in Table 1. Although the table shows that contract farming provides similar functions as cooperative SCs, contract farming aims to improve retailer profits and consumer services, while cooperative SCs place farmers' benefits at the top of their priorities and help a large proportion of small and fragmented farmers (Nagayets, 2005). In addition, cooperative SCs not only improve farmers' short-term performance in terms of income (Liang *et al*., 2015), but also help them adopt new technologies (Abebaw and Haile, 2013), provide training and help them to attract long-term investment (Huong *et al*., 2013). An extensive study led by the University of Wageningen concluded that in all agriculturally advanced countries, cooperatives play a major role in almost all aspects of food production, and have become more and more important for the agriculture industry of developing countries (Giagnocavo *et al*., 2017). However, majority of vegetable cooperatives in Vietnam are not currently operating well. The main reasons are 1) Farmers are still used to the traditional farmer-collector SC. They lack knowledge about cooperative SCs and do not engage with other SC partners; 2) Many cooperatives are formed to meet government targets; 3) Farmers feel that their participation is purely formal. They are very passive and do not engage with the cooperative, still looking for external support; 4) Some cooperatives lack experience and management skills, meaning they cannot provide adequate support for their farmers (Huong *et al*., 2013). Therefore, this study is aimed at understanding how farmers can engage with cooperative SCs and promote cooperative SCs to vegetable farmers in Vietnam.

		Farms-collector SCs	**Contract farming**	**Cooperative SCs**
Functions	Marketing	Yes	Yes	Yes
	Supply input	No	Yes	Yes
	Training	No	Yes	Yes
	Product quality and innovation	No	Yes	Yes
	Internal quality control	No	Yes	Yes
	Information sharing	No	Yes/limited	Yes
	Credit payment	No	No	Yes
	Purchasing price	Low	Medium and stable	High and stable
	Priority	Collector profits	Retailer profits	Farmers' benefits

Table 1. A comparison of vegetable supply chains

3. Research Method

3.1 Research design

A case study was considered the most appropriate research method for this study. It allows a researcher to carry out in-depth investigation on a specific situation through a combination of data collection methods such as document analysis, questionnaires, interviews and observations (Yin, 2014). This approach also allows us to take a variety of perspectives, considering the multiple facets of the phenomenon under study (Yin, 2014).

3.2 Case selection

We have selected C. Son Vegetable Cooperative (CSVC) to conduct our case study with. Founded

in 2006 with the participation of 26 farmers, CSVC's mission is to develop a model of safe vegetable production, and to provide high-quality vegetables to consumers while ensuring farmers have stable incomes and maintain long-term development. In terms of consumer service, CSVC is located in a suitable geographical location for vegetable production, and their farmer members are also very experienced, meaning that many high-quality vegetables can be produced. In terms of farmers' benefits, CSVC is well-known as the cooperative for the neighbourhood, and, as CSVC is close to the capital city of Vietnam, it has the potential to bring its farmer members a large market with diverse customers' demands. Taking advantage of all these benefits, along with judicious policies and management strategies from the management board, CSVC has become a typical successful cooperative in Vietnam.

3.3 Data collection and data analysis

After pilot studies and initial discussions, two different sets of interview questions were developed for both the cooperative and the farmers respectively (See Appendix A). The interview questions consisted of three parts. Part 1 included general questions, followed by questions about the farmers' and cooperative SC's relationship in Part 2, and Part 3 covered questions about the cooperative's operational activities and management mechanisms. Considering that farmers were not used to interviews and research terms, all questions were constructed in a simple and easy-to-understand format. A quick survey on farmers' general information, their business performance and long-term development plan was also conducted during the interviews. All interviewees (i.e. the funder and manager of the cooperative, as well as 5 farmers) were required to fill in a short survey on the cooperative's different roles, and rate their importance. The farmer participants were selected across a broad category of vegetables and different geographical areas. All interviewees were contacted before the interviews with the brief, and the final interviews took between 45 and 60 minutes. They have been audio recorded and transcribed verbatim.

A thematic analysis method (Braun and Clarke, 2006) has been used for the data analysis. To familiarise themselves with the data, the researchers first generated transcripts and developed initial thoughts and pre-codes. Initial codes were then identified through the reflection of patterns from initial thoughts and pre-codes. The next step was classifying codes into different subthemes and themes based on their similarities. Themes were reviewed critically to make sure they fitted into the research's aims. The last step was to identify interrelationships among the themes and subthemes, and to prepare a thematic map establishing their relationships.

To increase construct validity, this study used multiple sources of evidence for data collection. Business documents such as financial reports, administrative documents, production plans and contracts between farmers and the cooperative were analysed to identify the activities that might support or hinder their collaboration. In addition, interviewees were asked to review interview transcripts and the draft of analysis, and to make changes if necessary. The reliability of this study was achieved by conducting several pilot studies, testing the way of questioning and its structure (Yin, 2014). A case study database was also created at the end of the data collection phase to provide a specific way of organising and documenting the data.

Five codes were generated and clustered through the transcripts (see Table 2). Based on two sets of interviewees, summaries of codes were categorised in two correlative sides for convenient comparison.

Types of codes	Extracted from coding	
	The farmers' perspective	**The cooperative's perspective**
Training	Farmers are aware of the benefits of the cooperative's training, although they find it difficult to adapt to new agricultural techniques.	The cooperative clearly defined that its vital function is to provide farmers with advanced farming techniques.
Income	High income is the most important factor for farmers to keep them working actively.	The manager emphasised income and income stability as the first and foremost powerful elements to a farmer's involvement in the cooperative SC.
	Income stability is the second most important factor in remaining in their membership for a long-term period.	
	Farmers want immediate cash payment.	It is nearly impossible to make a deal with farmers in terms of delayed payment. They have agreed to use the cooperative's funds to pay in advance to farmers.
Business Relationship	Farmers are not used to working with others, and find it hard to complete administrative tasks.	It is difficult for farmers to follow rules and policies. However, the cooperative requires farmers' engagement and commitment.
Opportunity for different projects	Farmers are very interested in free input from different projects.	The cooperative considers itself as (only) receiving projects from the government on the behalf of farmers.
Product and innovation	At first, farmers had doubts about the success of a cooperative. When the cooperative started working effectively, they started to fully recognise the key roles of the cooperative to their own performance.	The cooperative clearly states that the success of the cooperative depends on its farmers. They emphasise a cooperative member symbiosis model.

Table 2. the coding types

4. Research findings

4.1 Key activities in encouraging farmers' engagement

The following five subthemes were established as encouraging farmers' engagement.

Financial benefits - it is not surprising that income has been described as a priority by farmers during the interviews: "*When I agree to participate, my biggest aspiration is to earn a better and stable income…" (F1).* From the cooperative's perspective, three factors (i.e. income volume, income stability and payment methods) are equally important: "*We have to say that 99% of farmers care about short-term benefits. So, whatever you do, you must firstly show financial benefits to them*" *(Cooperative).* Therefore, cooperatives need to firstly determine financial benefits for the farmers when establishing management policies. When farmers join a cooperative SC, besides the general contracts regarding the legal confirmation of their participation, short-term purchasing contracts for specific products are also signed, which indicate fixed prices and purchasing quantities if products meet standard requirements: "*Normally, in the village market farmers sell Chinese broccoli at 7,000-8,000 VND per kg, but we offer a higher price of 10,000 VND. We also commit to buying 10-15 kgs per day for 10-20 days per month"* (*Cooperative*). The use of contracts including a set of provisions (e.g. quantity, price, and quality) is a way of utilising contract farming's strengths with the aim of reducing transaction costs (Bontems and Fulton, 2009; Ochieng *et al.*, 2017). In addition, due to farmers' liquidity constraints, which require cash immediately, the cooperative can pay farmers in advance, either in cash or other purchasing credits. Purchasing contracts also create certainty and trust between the cooperative and farmers

(Hakelius and Hansson, 2016).

Information for product improvement and innovation - the cooperative shares information and introduces new technology to its farmer members. For example, the cooperative works with an observation station to provide farmers with accurate forecasts for the temperature, wind speed, precipitation and humidity of the soil. The cooperative has also assisted the farms in seeking information on different agricultural techniques, e.g. planting vegetables when not in season, in order to gain more profits. The cooperative stated that: *"When it is not in season, broccoli yield is only 60-70% compared to its output in the right season, but in return, the price is very high, at 12,000 VND/kg, nearly 1.5 times higher than the price of a product when it is in season."* The cooperative also assists farmers proactively in developing their own plans to adopt emerging techniques and to improve product quality and quantity. The cooperative applies various practices, following VietGAP (Vietnamese Good Agricultural Practices), issued by the Ministry of Agriculture and Rural Development to achieve quality standards, and then differentiate the cooperative's products from non-cooperative members': *"We do not demand very high quality or organic vegetables but provide instructions to all our farmer members for good quality" (Cooperative).* For example, the purchasing contract between the cooperative and farmers clearly states: "*If the amount of pesticide residual in vegetables exceeds the permitted amount, the cooperative has the right to refuse all those products*". For those who have a purely economic interest, this clause forces them to produce qualified products, otherwise they will suffer losses.

Training and supporting activities- the cooperative provides farmers with various training sessions and makes every effort to highlight the benefits of attending the training for farmers. The cooperative has developed a sample field and practical methods for farmers to practise in it. For example, the cooperative has successfully planted a tomato field of 1,000 sqm with an automatic irrigation system and healthy stems from grafting techniques using eggplants' stumps: *"This is a mutually beneficial tomato field contributed to by cooperative members …profits go to the general funds of the cooperative..." (Cooperative).* Farmers also emphasise the benefits they have received from training: *"Thanks to training, product quality is much better … With the help of the cooperative, we have learnt more techniques than ever before" (F4).* Moreover, the cooperative manager also emphasised the importance of continuous learning. *"We must listen to farmers, even though we have new technology. We are willing to learn from farmers…" (Cooperative).* The cooperative also provides different kinds of supporting activities to farmers that positively influence farmers' perception of the cooperative's multi-functional roles. However, farmers also admitted that they had great difficulties in learning new procedures or technology: *"To be honest, the new procedures have so many steps that I find them difficult to follow" (F3).*

Opportunities to engage with government and international projects – these projects are considered part of a support package from the government, as well as from other organisations. The cooperative has received projects in which their members can voluntarily participate. The number of projects is large, and the opportunities are diverse: *"…the number of projects is not small. I remember a four-month period when six projects were available..." (F2).* From the cooperative's perspective, it " *will try to look for projects so that we (they) can gain free supply input for farmers, such as seeds, fertilisers or machines, along with planting techniques" (Cooperative),* but the cooperative "*refuses to use the general fund of the cooperative to make purchases for the input supply"*. The cooperative states: "*We think that if it is free, sometimes it*

is hard to motivate farmers…". From a farmer's perspective, they are excited about these opportunities, especially from international projects. As there is very little input and service provided to individual farmers by independent organisations, the cooperative can provide farmers with access to these opportunities. Research has stated that ambitious donors, NGOs and governments consider the cooperative as one of the main instruments linking small-scale farmers to domestic and even foreign markets (World Bank, 2007).

Long-term relationship - to assure farmers' income stability, the cooperative has contracts with their farmers lasting between six and twelve months, which is considered long-term in the agriculture industry. The cooperative does not only sign contracts with wholesalers, but also directly with retailers and other business customers. Their business customers include hospital kitchens, supermarkets and primary schools. The cooperative can also fulfil specific requests from their customers to gain additional profits for their farmers. For example, for hospital kitchens, vegetables need to have their roots removed, washed and packed so that the vegetables can be cooked immediately. When offering such value-adding activities, the cooperative can normally charge an additional 500,000 to 1,000,000 VND per kg, plus tax and delivery fees, resulting in "*the price of vegetable per kg … [being] two times higher than its normal price" (Cooperative).*

4.2 Cooperative's management mechanism

Farmer members are the most critical asset of a supply chain (Zeuli *et al.*, 2004), and play an essential role in a cooperative SC. All the cooperative's policies should be formulated on the basis of the fact that the cooperative appreciates the roles of their farmer members in the development of cooperative SCs. Due to the specific features of individual farmers, their requirements need to be clearly understood and effectively supported. Before farmers join a cooperative SC, the cooperative needs to make sure that the farmers understand the aims of the cooperative, and their rights and duties: *"If you want to join the cooperative, you are welcome. If not, you can continue to produce on your own" (Cooperative).* As every farmer has their own knowledge and experience, the cooperative lets them register their preferred vegetables to grow and make their own production plans. Table 3 summarises the cooperative's regulations in terms of farmers' rights and duties, to make sure farmers work with discipline,

Rights	Duties
• All members are equal in voting, independent from their capital contribution. • All members have the right to accept or refuse support projects. • All members have the right to express their concerns or improvement ideas.	• Follow the cooperative's production plan and instructions from agricultural engineers. • Financial penalties will be imposed to farmers if they are get caught using an excessive amount of fertiliser. • Cameras will be set up on the fields to record all daily activity.

Table 3. Farmers' rights and duties in the cooperative

Along with strict rules, the cooperative also assigns agricultural engineers to work on the fields every day, monitor farmers' activities and help them be familiar with documents: *"It is hard to work with farmers. If we apply all regulations rigidly, we gain nothing: farmers will just mix everything up… We should be kind when they are performing the best they can…" (Cooperative).* During the early period of their membership, the cooperative has to encourage farmers to a great extent in order to build their trust. As well as that, although the contract indicates the cooperative

has the right to refuse to buy unqualified products, in fact, *"…we still buy those products from farmers, paying them according to material costs but for proper disposal only… we know products are unqualified due to farmers' mistakes, but we still collect them so that farmers can learn from their mistakes, as well as have income to prepare their next crops…" (Cooperative).*

5. Discussion and implications

5.1 Transactions Costs for different types of Supply Chains

The TCT provides an initial explanation of why farmers choose different types of SC and their relationship commitment in SC collaboration. While much of the literature has focused on transport-associated costs, other transaction costs (such as searching for information, negotiation, monitoring, coordination, and enforcement of contracts) in vegetable SCs should receive more attention. In vegetable SCs, farmers have limited time and knowledge to access marketing and technical information, and understand consumers' expectations. In addition to very limited transport facilities, most farmers do not have sufficient communication channels or knowledge of other types of SCs (Trienekens and Willems, 2002, Negi *et al.*, 2018).

Under such conditions, small-scale farmers enjoy advantage over large-scale commercial farmers due to low transaction costs needed to access different collectors. In fact, there are no transaction costs in switching to a different collector in the farmer-collector SCs. In a contract farming SC, farmers have better information access, but not equal access to all information. The type of vegetables and the quantity of their plant depend on their contracts. With increasing purchasing power, supermarkets can further centralise purchasing procedures, and develop their preferred selection systems and quality standards. Therefore, farmers still suffer from information asymmetry. Although the main function of the contracting farming SC (to economise on the sum of transaction and production costs) can be achieved, the farmers still face high transaction costs due to asset specificity, uncertainty and the choice of governance structures (Williamson, 1985). Given the fact that almost all farms in Vietnam are small and the majority of them are not qualified for farming contracts and potential high transaction costs, this type of SC is not popular for most Vietnamese farmers.

Cooperative SCs discern both environmental uncertainty and behavioural uncertainty (Li *et al.*, 2018). With the support of the cooperative, farmers can better manage uncontrollable factors such as weather and pests, and respond to market changes. Behavioural uncertainty emerges because contracting parties may behave opportunistically. This is a key issue in agriculture SCs as agricultural products are now increasingly valued for specific attributes and for the practices used in their production (Bijman *et al.*, 2011). As Williamson (1985) stated, normative relationship commitment leads to stable long-term relationships, in which opportunistic behaviours are reduced. Different from farmer-collector and contract farming, cooperative SCs establish a clear and open mechanism for pricing, quality and quantity with farmers. The various roles of cooperatives in benefiting individual farmers are well documented in the literature. For example, Orsi *et al.* (2017) pointed out the positive and significant relationship between the duration of cooperative memberships and their farmers' net returns, household incomes, productivities and profits. Nordmark *et al.* (2012) studied food SC collaboration for Dutch small food producers to improve the sustainability of local food delivery systems. Wossen *et al. (*2017) identified the influence of cooperative SCs on farmers' long-term investment decisions and technology adoption. Giagnocavo *et al.* (2017) also found that cooperative SCs provide better

marketing and traceability supports to their members.

5.2 The mechanism of cooperative SC

Cooperative SCs develop and enhance normative relationship commitment by communicating and sharing information with farmers. A cooperative SC also encourages mutual commitment over an extended period. In general, the approach adopted by the cooperative to farmers has been threefold, including voluntarism, regulation and incentives. It is recommended for a cooperative to first have a good understanding of farmers' characteristics and objectives, then to generate motivators for farmers by aligning the cooperative's goals with farmers', and finally to create an appropriate mechanism with which to govern farmers. It is also important to consider external factors when the cooperative develops support packages with appropriate orientations (Moustier and Danso, 2006; Negi *et al.*, 2018). Additionally, insights on farmers' ability and willingness, based on their personal characteristics and perception, are required while constructing managing policies (Mills *et al.*, 2017). This study supports Bontems and Fulton's (2009) findings that, until a cooperative clearly shows the alignment between their management mechanism and farmers' objectives, farmers will not engage in cooperative activities. With the development of the agricultural sector, transaction costs for the efficiency and competitiveness of farmers' operations will also become important. Therefore, cooperatives need to provide farmers with access to other information, e.g. financial and technical information. When farmers perceive that their needs will be satisfied, they will be more willing to follow the cooperative's rules. This will lead to the farmers making substantial effort on their own production plans, which ultimately helps the cooperative achieve their business mission. Normative relationship commitment with a cooperative SC also reflects a farmer's willingness to maintain a long-term relationship with the cooperative through affective attachment and the fulfilment of their contracts. This committed, long-term relationship is based on an orientation toward repeated transactions and shared values that ensure future obligation and reduce the intention to terminate the relationship.

From farmers' perspective, five sources of empowerment – financial income, information, support, opportunities and long-term relationships - were effective methods to engage them with cooperative SCs. This study is not only in line with the four aspects of the Structural Empowerment Theory (Kanter, 1993; Leyer *et al.* (2019), but also identifies the importance of long-term relationships in the SC context. Empowerment is considered an essential factor of long-term SC development, and encourages all entities to self-organise and make decisions (Kusnandar *et al*., 2019). SC processes can be redesigned to empower farmers. Several studies have investigated the relationship between empowerment and the long-term sustainability of SCs. For example, McCarthy *et al*. (2018) examined social issues associated with marginalisation and empowerment in food SCs. Kusnandar *et al*. (2019) found that empowerment of farmers can enable social sustainable changes in agricultural SCs. Financial income can be seen as one of the key indicators of social sustainability, which can turn vegetables SC into more socially equitable organisations. In the long run, this will also contribute to the farming community and local society. However, it has become clear from information sharing and engaging with international projects that the cooperative SC needs to overcome barriers to information and knowledge sharing. To continually improve product and service quality, and respond to changing customer preferences and sustainability pressures from various stakeholders, they need to develop channels and mechanisms to actually capture tacit knowledge. The importance of acquiring and applying tacit knowledge to enabling the establishment of sustainable supply chains has also been

increasingly acknowledged in literature (e.g. Vachon and Klassen, 2008; Lee and Wong, 2015; Durst and Edvardsson, 2012; Schoenherr *et al.*, 2014).

6. Conclusion, limitations and future research

This study investigated the different types of vegetable SC in Vietnam and conducted an in-depth case study with a successful cooperative SC to promote and enhance cooperative SCs in Vietnam. This research identified that cooperative SCs have been proven to be the appropriate for Vietnamese farmers due to their multi-functional roles and their long-term suitability for Vietnamese farmers' benefits and characteristics. The ability of a cooperative SC to have direct relationships with retailers and business customers allows the cooperative to help their farmers with long-term development plans, e.g. with technical training on safe vegetable production, international projects, marketing and quality improvement. It is also encouraging to see from this study that farmers are not only interested in short-term financial gain but also in joining cooperative SCs to achieve long-term development. They are also interested in product improvement and innovation, and long-term SC relationships.

While much of the literature has focused on the downstream part of vegetable SCs, this research has examined upstream farmers' positions in different types of vegetable SCs and has identified ways of enhancing sustainable vegetable SC collaboration. This study also contributes to the broader literature on the agri-food supply chain, where most of the upstream chain members are small or medium sized enterprises (SMEs). These SMEs are often characterised by lack of resources and market power, limited education, and geographic dispersion. This study provides insight on practical approaches to integrating small-scale farmers in SC collaboration. Furthermore, the literature on SC collaboration in agri-food SCs has predominately focused on developed countries, whereas this study has focused on a developing country (Vietnam).

This study also has various managerial implications for practitioners. It provides new insight on how cooperatives can engage with small fragmented farmers for SC collaboration. For cooperatives, it is essential to have a good understanding of farmers' needs and characteristics, therefore creating alignment between the cooperative's management mechanisms and their farmers' goals. A three-pronged mechanism has proved an effective way to encourage farmers' positive behaviour. In this mechanism, regulatory and encouraging ways help the cooperative make changes among farmers, and voluntarism will be carried out for long-term sustainability. The inclusion of those farmers (who are minorities and/or are excluded from marketing economy), as well as an open and unbiased governance mechanism, will also contribute to fairness and respect in society. Farmers also need to be aware of the significant benefits of being cooperative members, then involve themselves actively in the cooperative's activities.

In addition, there is also a need for the government to support cooperative SCs in nurturing macro-development of the Vietnamese vegetable industry. For example, policy makers can work closely with non-profit cooperatives, especially in the area of quality assurance, and development of food traceability systems for the next generation. In the long run, policy makers can support cooperatives in implementing their focal coordination role in order to combine vertical and complementary coordination that occurs when a group of cooperatives supply a full package of pre-harvest and post-harvest services to small farmers. This can be a means to promote both vertical and horizontal SC collaboration, reducing oversupply or shortage of certain vegetables at

a more aggregate (macro) level.

This study explored collaboration in vegetable SCs in Vietnam through a qualitative study of a successful cooperative SC with small-scale farmers. This brings with it some limitations, particularly in terms of the generalisability of the results. It would thus be beneficial to extend the research to carry out quantitative statistical analysis using a larger sample size which would be more representative of the target population. Quantitative studies about a cooperative and its membership may investigate the extent to which each factor affects farmers' commitment and the level of the influence of a cooperative's mechanism on farmers' relationship commitment. Also, this research has been conducted in a specific country (Vietnam). The effectiveness of collaboration mechanisms may differ by geographical area (such as the Eastern and Western countries, or developing and developed countries) and the nature of their business tradition. Future research can also take into account other factors such as social capital determined with history, national culture and society, in further analysing the effectiveness of SC collaboration mechanisms. Finally, how to develop an appropriate SC collaboration mechanism facilitating information and knowledge sharing to ensure the cooperative SC continually improves is also an area worthy of further exploration.

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Appendix A

A.1 Interview questions for farmers

Part 1: General information

- When did you start participating in the cooperative? What is your educational background?
- How many cooperatives have you participated in so far?

Part 2: Short survey

- How much cultivated land have you provided to the cooperative out of your own agricultural land?
- What kind of vegetables are you growing for the cooperative?
- What aspects of improvement have you experienced as a member of the cooperative?

○ Financial performance ○ Product quantity ○ Product quality

- Before you joined the cooperative, what range of income did you earn per month? *(Unit: million Vietnam dong)*

○ 1-3 ○ 4-6 ○ 7-9 ○ 10-12 ○ > 12

- Since you joined the cooperative, what range of income do you earn per month? *(Unit: million Vietnam dong)*

○ 1-3 ○ 4-6 ○ 7-9 ○ 10-12 ○ 13-15 ○ 16-18 ○ 19-21 ○ > 21

- What factors influenced your decision of working in the cooperative?

Part 3: In-depth interview questions

- When you agreed to join the cooperative, what were your aspirations?
- After years of participation, do you think your aspirations have been met? And do you have any goals for the short-term future?
- Are there any difficulties for you as a cooperative member?
- Do you reflect these difficulties with the cooperative? And have you received any support from the cooperative?
- Has your income increased since joining the cooperative? More specifically, can you indicate how much of an increase?
- In addition to income, can you describe any other benefits of joining cooperatives (improvement in terms of quality) in detail?
- In addition to income, can you describe any other benefits of joining cooperatives (improvement in terms of agricultural techniques) in detail? Are you satisfied with the way the cooperative operates?
- How do you assess the role of the head of the cooperative in the operation and development of the cooperative?

A.2 Interview questions for the manager

Part I: General information about the cooperative

- When and how was the cooperative established?
- How many household farmers were there in the cooperative at the beginning? And now?
- What distinguishes your "new-style" cooperative from an "old-style" cooperative?
- Who are your cooperative's customers?
- In general, how is your cooperative operated?

Part II: Questions related to farmer-cooperative working relationship

- Are there any difficulties that you are facing when working with farmers? In your opinion, what are the causes?
- What have you done to solve those problems?
- In your opinion, what are the reasons why Vietnamese farmers are not actively participating in cooperatives?
- From a manager's perspective, what can you do to encourage farmers to participate actively in the cooperative?

Part III: Questions related to the cooperative's managing mechanism

- Are there any difficulties that you are facing in terms of operation (for example: administrative management, financial management and production plans)?
- What have you done to solve those problems?
- When establishing the cooperative, did you receive any support from the local province and the government?
- When establishing a cooperative, what long-term (5-10 year) plan did you have?
- In your opinion, how does education affect the cooperative manager's management capacity?