Contract farming arrangements and producer organisations in modern retail vegetable value chains:

evidence from Indonesia

Fanny Widadie

Propositions

1. Innovations in institutional arrangements such as contract farming and producer organisation support smallholders to improve their performance in the value chains.
   (this thesis)

2. Combining vertical and horizontal coordination in the value chain reduces transaction costs more effectively than solely depending on vertical coordination.
   (this thesis)

3. A PhD project is not only pushing the boundaries of science, it is also pushing the student out of his/her comfort zone.

4. To be successful in science, digital literacy is as important as English literacy.

5. Social entrepreneurship has more impact on sustainable rural development than commercial entrepreneurship.

6. Technology has a larger impact on society than policy.

Propositions belonging to the thesis, entitled

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Fanny Widadie

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Contract farming arrangements and producer organisations in modern retail vegetable value chains: evidence from Indonesia

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Fanny Widadie

Thesis

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List of Abbreviations

ASC	Alternative Specific Constant
AVE	Average Variance Extracted
CE	Choice Experiment
CFA	Contract Farming Arrangement
CR	Composite Reliability
FFV	Fresh Fruit Vegetable
FG	Farmer Group
HC	Horizontal Coordination
MM	Modern Market
NGO	Non-Governmental Organisation
RPL	Random Parameter Logit
TCE	Transaction Cost Economics
TM	Traditional Market
USDA	United State Department of Agriculture
SEM-PLS	Structural Equation Model – Partial Least Square
PO	Producer Organisation
VC	Vertical Coordination
VCA	Value Chain Analysis
WTA	Willingness-To-Accept

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CHAPTER 1.

General Introduction

1.1 Introduction

Agri-food value chains in developing countries have transformed rapidly since the 1980s. The transformation has led to more vertical coordination, more high-value markets (e.g., domestic modern retailers) and an increase in the quality requirements from food processors and export markets (Reardon et al., 2009, Reardon and Barrett, 2000, Swinnen and Maertens, 2007). The main drivers of the transformation are increasing per capita income, growing urban populations, changing food consumption and lifestyle and increasing direct foreign investments (Reardon et al., 2016, Reardon et al., 2009, Gómez and Ricketts, 2013, Maertens Miet, 2012).

The growth of modern retailers in developing countries has imposed a procurement process that differs from the ones in traditional channels. The new procurement process includes consolidation of product flows at distribution centres, vertical coordination using contracts between wholesalers and farmers, and continuous supply (Reardon et al., 2004, Ruben et al., 2007a). Coordination appears throughout the value chain from upstream to downstream actors to ensure compliance with the quality requirements of modern retail markets.

The growth of modern retail markets in developing countries creates opportunities for smallholder farmers to increase income and welfare (Schipmann and Qaim, 2011, Olwande et al., 2015). However, when attempting to enter modern retail markets, smallholder farmers face many constraints, such as lack of capital, lack of knowledge, insufficient market information, insufficient organisation of the value chain and lack of quality control (Royer et al., 2016, Key and Runsten, 1999, Hatanaka et al., 2005). Due to these constraints, many smallholders in developing countries are unable to meet the requirements of modern retailers related to quality, quantity, continuous supply and logistics. In addition, modern retailers are more inclined to enter contracts with large farmers who have large assets and are better able to meet their requirements (Royer et al., 2016, Singh and Prowse, 2013, Mugwagwa et al., 2018). Finally, also the weakness of the institutional environment in developing countries implies constraints for smallholders to enter modern retail markets (Trienekens, 2011, Ruben et al., 2007b).

Institutional arrangements are the set of agreements that govern activities to pursue certain goals. According to past studies, innovation in institutional arrangements such as contract farming arrangements (CFAs), producer organisation (PO), and partnerships can help smallholders to transact with modern retail (Royer and Bijman, 2012, Worldbank, 2007). Innovative institutional arrangements may reduce constraints and create opportunities for smallholders to link up with emerging or high value-markets.

In contract farming arrangements (CFAs), for instance, the agribusiness firm provides farmers with inputs, knowledge, technical assistance, credit, quality control and market information (Kirsten and Sartorius, 2002, Bijman, 2008, Otsuka et al., 2016, Ton et al., 2018). Through CFAs, smallholder farmers receive support to improve their processes and meet quality requirements of high-value markets (Maertens and Swinnen, 2009, Dries et al., 2009, Boselie et al., 2003). Previous studies have confirmed that the participation of farmers in contract farming can increase their income, production efficiency and welfare, once farmers receive inputs, technology and access to high-value markets (Simmons et al., 2005, Girma and Gardebroek, 2015, Da Silva and Ranking, 2013). Contract farming also reduces transaction costs by reducing uncertainty and opportunistic behaviour of value chain actors (Yeshitila et al., 2020, Kirsten and Sartorius, 2002, Mugwagwa et al., 2020). CFAs are a form of vertical coordination between farmers and buyers for the production and supply of high quality products (Royer et al., 2016). Buyers in high-value agri-food markets use CFAs when coordinating with farmers, in order to ensure continuity of supply, meet quality standards and reduce transaction costs (Reardon et al., 2004, Ruben et al., 2007a, Sahara and Gyau, 2014).

Producer organisations (POs) also play a role in linking smallholders to modern retail markets (Markelova et al., 2009, Kaganzi et al., 2009, Trebbin, 2014, Moustier et al., 2010). The PO is an example of horizontal coordination, which refers to coordination at the same level of the chain (Lazzarini et al., 2001, Fischer and Qaim, 2012). POs can increase the quality of smallholders' products by providing services such as inputs, credit, marketing and safety certification (Zhou et al., 2019, Naziri et al., 2014, Bizikova et al., 2020). In particular, POs play a role in improving quality and safety to meet the requirements of high-value markets (Moustier et al., 2010, Kirezieva et al., 2016, Tefera et al., 2020). POs are also important in reducing transaction costs by pooling of farm production and negotiation with the buyers (Shiferaw et al., 2011, Bijman, 2007).

We found two knowledge gaps in the literature on CFAs and POs in value chains. First, most studies have either focused on POs or on CFAs. In practice, however, CFAs and POs are often combined in agri-food chains, where contracts are often entered with the PO rather than with individual farmers. The PO acts as intermediary, providing coordination among farmers and between the farmers and the buyer (Fischer and Qaim, 2012, Jia and Huang, 2011, Mugwagwa et al., 2018, Tefera and Bijman, 2021). This thesis addresses this knowledge gap by analysing combinations of contracting and PO in value chains, particularly how these combinations link smallholders with modern retail markets, increase food quality, increase safety performance and build quality relationships. Second, much of the research on CFAs and POs in value chains uses empirical studies focusing on export markets or food processors (Abebe et al., 2013, Blandon et al., 2009, Schipmann and Qaim, 2011, Mugwagwa et al., 2018). Few papers have considered contract farming

and POs in domestic modern retail chains in developing countries, whereas the number of studies on domestic modern retail markets in developing countries has increased (Reardon et al., 2004). This thesis explores empirical cases from Indonesian vegetable value chains focusing on modern retail markets. Indonesia is a developing country where modern retail markets are emerging fast (Reardon et al., 2016, Suryadarma et al., 2010, Sahara and Gyau, 2014). Therefore, there may be opportunities for smallholders to participate in these modern retail chains.

The objective of this thesis is to explore the role of innovative institutional arrangements, notably contracting and POs, to improve smallholders' performance in modern domestic retail value chains. Improving the performance of smallholders in the value chain is part of an inclusive value chain approach, generating social benefits (Ros-Tonen et al., 2019).

The output of this thesis contributes to the literature on value chain coordination and value chain relationships, in particular between POs and modern domestic retailers. This thesis also has managerial implications. Findings are useful for buyers or contractors to design more efficient vertical coordination mechanisms with their partners (farmers), for instance in procuring vegetables. In addition, this thesis provides recommendations for POs to enhance their performance in value chains, more specifically to coordinate horizontal and vertical relationships, and improve their ability to meet the quality and delivery requirements of modern retail markets. Most farmers in Indonesia are smallholders and they have limited access to capital, technology, education, input and output markets. This thesis also provides recommendations for policymakers to upgrade value chains while including smallholder farmers.

This introduction chapter is organised as follows: Section 1.2 describes an overview of Indonesian vegetable value chains and of Indonesian food retail. Section 1.3 highlights the problem statement and research questions. Section 1.4 presents the theoretical framework of this study. Sections 1.5 and 1.6 provide the research methods and thesis outline, respectively.

1.2. Overview of Indonesian vegetable value chains in the modern retail market

1.2.1. The modern retail market in Indonesia

Over the past two decades, the modern retail market in developing countries has been growing rapidly (Reardon et al., 2009, Natawidjaja et al., 2007). In Indonesia, modern retail companies were first established in the 1970s and are located in urban areas (Suryadarma et al., 2010). Modern retail has grown rapidly since 1998, when the

government allowed direct foreign investment to operate supermarkets in Indonesia (Neven and Suleiman, 2007, Suryadarma et al., 2010). Since then, different outlet formats[1] have emerged. In 2019, there were approximately 36,541 modern retailers in Indonesia, comprising 333 hypermarkets (an increase from 266 in 2013), 1,428 supermarkets (from 1,268 in 2013) and 34,780 convenience stores (from 21,942 in 2013) (see Table 1.1).

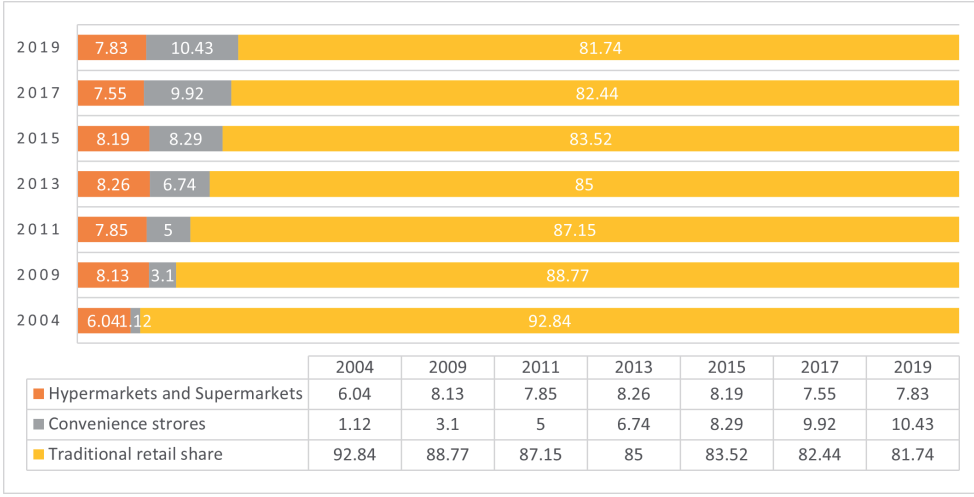
By 2019, the share of modern retail sales in the total retail market increased significantly from 7.16% in 2004 to 18.26% (7.83% from hypermarkets and supermarkets and 10.43% from convenience stores). In turn, the share of traditional retail sales decreased from 93% in 2004 to 82% in 2019 (Figure 1.1). The factors driving the expansion of modern retailers in Indonesia are growth of income, urbanisation, the number of middle-class citizens, liberation of direct foreign investment in the food retail sector and a growing awareness of food safety (Reardon et al., 2015, Minot et al., 2015, Hernández et al., 2015).

Table 1.1. Number of outlets and sales of Indonesia's food retail

Retail sectors	2013		2015		2017		2019	
	Number of outlets	Sales (US$ Billion)	Number of outlets	Sales (US$ Billion)	Number of outlets	Sales (US$ Billion)	Number of outlets	Sales (US$ Billion)
Modern retail:								
Hypermarkets	266	3.3	301	2.9	325	2.8	333	3
Supermarkets	1,268	5.6	1,319	5.1	1,377	5.5	1,428	6
Convenience stores	20,408	7.9	26,674	8.6	32,458	10.9	34,780	12
Total of modern retail	21,942	16.8	28,294	16.6	34,160	19.2	36,541	20
Modern retail share of total sales (%)		15.79		17.31		17.47		17.39
Traditional retail	4,564,555	89.60	4,586,346	79.30	4,574,208	90.60	4,512,891	94
Traditional retail share of total sales (%)		84.21		82.69		82.44		81.74
Total food retail	4,586,497	106.4	4,614,640	95.9	4,608,368	109.9	4,549,432	115

Source: USDA GAIN report (2018, 2020)

1 Modern grocery retail formats are categorised by physical size. Hypermarkets are chain retail outlets larger than 27,000 square feet. Supermarkets are outlets between 4,300 and 27,000 square feet. Convenience stores are smaller outlets of less than 4,300 square feet. The modern grocery retailers sell food, beverages and non-grocery items such as clothing and household goods.



	2004	2009	2011	2013	2015	2017	2019
Hypermarkets and Supermarkets	6.04	8.13	7.85	8.26	8.19	7.55	7.83
Convenience strores	1.12	3.1	5	6.74	8.29	9.92	10.43
Traditional retail share	92.84	88.77	87.15	85	83.52	82.44	81.74

Source: USDA GAIN report (2020)

Figure 1.1. Shares of Indonesia's retail sales (% of total value)

Table 1.2 shows the top sales of outlet brands in Indonesia's modern retail in 2019. The hypermarket outlet with the highest sale was Carrefour-Transmart (a French retail chain at first, then locally owned and operated by the local company Trans Retail in 2012) with a total of US$ 1,135 million. The supermarket outlet with the highest sales was Hero and Giant with sales of US$ 748 million, and the convenience stores with the highest sales were Indomaret and Alfamart with sales of US$ 5,948 and US$ 5,179 respectively.

Table 1.2. Top sales of outlet brands in Indonesia's modern retail in 2019

Hypermarket			**Supermarket**			**Convenience stores**		
Outlet Brand (Company)	Sales (US$ million)	Number of Outlets	Outlet Brand (Company)	Sales (US$ million)	Number of Outlets	Outlet Brand (Company)	Sales (US$ million)	Number of Outlets
Carrefour – Transmart (PT Trans Retail Indonesia)	1,135.3	74	Hero and Giant (PT Hero Supermarket Tbk)	748.1	139	Indomaret (PT Indoritel Makmur Internasional Tbk)	5,947.9	17,505
Hypermart (PT Matahari Putra Prima Tbk)	621.8	102	Super Indo (PT Lion Superindo -Gelael)	446.5	182	Alfamart (PT Sumber Alfaria Trijaya Tbk)	5,178.7	13,779
Lotte Mart Wholesale (PT Lotte Mart Indonesia)	174.2	29	Farmer's Market (PT Supra Boga Lestari Tbk)	117	29	Alfa Midi (PT Midi Utama Indonesia Tbk)	892.6	1,484

Source: USDA gain report (2020)

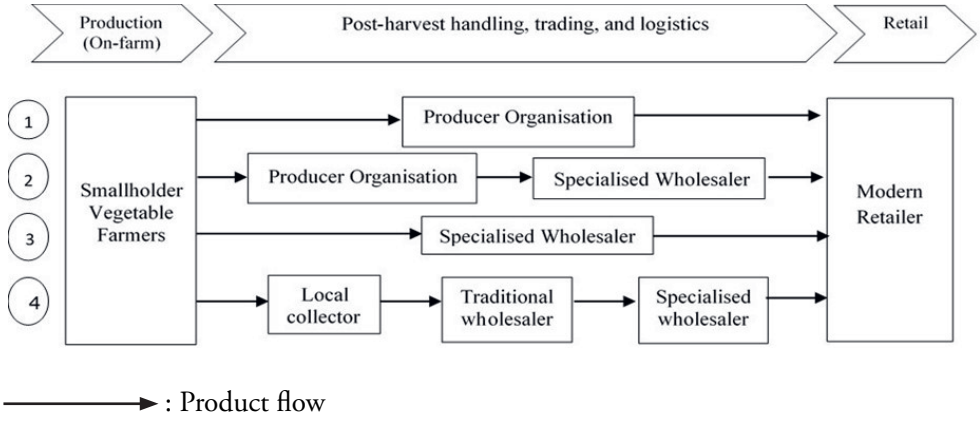
The shift of consumer preferences from grain staples to fresh products encourages modern retailers to sell fresh fruit, vegetables, meat, seafood and poultry (Umberger et al., 2015). Urban consumers in Indonesia spent around 15% of their food budget on fresh fruit and vegetables in 2010 (Reardon et al., 2015). Toiba (2015) conducted surveys in three cities (i.e., Surabaya, Bogor and Surakarta) and found that 25% of the total food expenditure was spent at modern food retailers. Most of the food sold were fresh milk and dairy, fresh fruits and grain. Only around 1% of the total expenditure in modern retail markets was on vegetables. Although the market share of food is still dominated by traditional retailers (traditional wet markets, small stores and peddlers), the share of fresh fruit and vegetable sales in modern retail markets is expected to increase steadily due to economic growth and consumers' demand for food quality, safety, availability, convenience and traceability (Natawidjaja et al., 2007, Slamet et al., 2017). A survey on Indonesian urban consumers reported that modern retail markets are the 'best' for quality, safety and trustworthy information (Toiba et al., 2013). Still, modern retailers in Indonesia are concerned about food quality and safety standards (Minot et al., 2015, David and Ardiansyah, 2017, Slamet et al., 2017).

1.2.2. Vegetable value chains in Indonesia

A value chain is defined as 'the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), to delivery to final consumers, and final disposal after use' (Kaplinsky and Morris, 2001). The vegetable value chains in Central Java, Indonesia, involve several actors and institutional arrangements to move products from producers (farmers) to modern retailers. Farmers produce vegetables following the requirements of the modern retail markets. Intermediary actors such as POs and specialised wholesalers in the chain have the function of adding value to the vegetables through packaging, trading, distribution and marketing.

In our survey in the Central Java and Yogyakarta provinces in Indonesia we found four types of vegetable value chains for modern retail markets (Figure 1.2). In Chain 1 and 2, the farmers connect with the modern retail markets via a PO. In Chain 1, the PO has a direct formal contract with the retailer. The contract to supply the vegetables is negotiated directly between the PO and the retailer. In Chain 2, the PO supplies the vegetables to a specialised wholesaler who distributes these to the retailer. In this chain, the specialised wholesaler has a formal contract with the retailer and a verbal contract with the PO to coordinate the procurement of vegetables. In Chain 3, the specialised wholesaler coordinates with individual farmers through a verbal contract and has a formal contract with the retailer. In Chain 4, the farmers sell the vegetables to local collectors through spot market transactions. Spot market transactions are characterised by having a weak vertical coordination. In a spot market, transactions between farmers and local

collectors are mostly performed at farm-gate, without consideration of quality standards. The local collectors act as middlemen, then sell and distribute the vegetables to the traditional wholesalers.

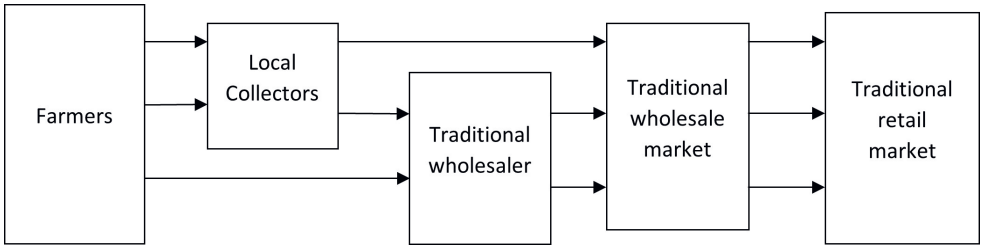


Source: authors' survey (2017)

Figure 1.2. Vegetable supply chains to modern retailers in Central Java and Yogyakarta Provinces, Indonesia.

Overall, at the downstream part of the chain, the modern retailers coordinate with their suppliers (specialised wholesaler and PO) through a formal (written) contract. In the contract arrangements, the retailers establish quality requirements and standards, quantity to be delivered, prices, payment methods, contract length and logistics such as delivery time and distribution. The retailers use the contract for coordinating with the suppliers to maintain a consistent supply of products and to meet specific quality standards. Most contracts in modern retail chains are for one year; at the end of the year the retailer will evaluate the performance of the supplier. At the upstream part of the chain, the specialised wholesalers, POs (Chain 2) and individual farmers (Chain 3) coordinate through a verbal contract. The contract arrangements include quality standards, quantity, prices, payments and logistics. The contract arrangements are made for compliance with the requirements of the modern retail market. At the upstream part of Chain 4 there is no contract, there is a spot market transaction between farmer and local collector.

The product flow in chain 4 is not only toward modern retailers but also to traditional retailers (Figure 1.3). Traditional and modern retail chains interact in Indonesia, which is common in developing countries (Mccullough et al., 2008). According Slamet et al. (2017) and Natawidjaja et al. (2007), Indonesian vegetable chains focusing on traditional markets are long and involve many actors. Most of the transactions among actors in the chain are of a spot market type, with minimal coordination, making these chains different from the more coordinated modern retail chains.



Source: (Slamet et al., 2017, Natawidjaja et al., 2007)

Figure 1.3. Indonesian vegetable value chain in traditional retail markets

1.2.3. Producer organisations in Indonesia

In Indonesia, the Farmer Group (FG) is a type of PO formed by a community of vegetable smallholder farmers in a village, with the purpose of providing services to the members. According to the Indonesian Agriculture Ministry Regulation Number 82/2013, an FG is defined as a group of farmers formed based on mutual interest, common environmental conditions (social, economic and resources) and solidarity with the aim to improve and develop the members' business. FGs provide services to their members, such as production inputs, technical assistance and training, post-harvest handling, storage and marketing[2].

FGs were initially formed by the central government in 1979 to facilitate the distribution of government aid and input subsidies to individual farmers (Hermanto and Swastika, 2011, Ibnu et al., 2018). Later, many programmes have been implemented to strengthen the bargaining position of FGs, improve production, and provide credits and input subsidies. However, when these programmes ended, a number of groups collapsed (Nuryanti and Swastika, 2011, Hermanto and Swastika, 2011, Bourgeois et al., 2003). Only those based on initiatives of farmers themselves, to service, help and improve their farms, continued to exist.

According to the Indonesian Agriculture Ministry Regulation Number 273/Kpts/Ot.160/2007 on the Guidelines of FG development, FGs should be developed based on six principles: openness, freedom, participation, self-reliance, equality and partnership. FGs have three main functions: (1) to help farmers improve their knowledge and skills; (2) to build cooperation among farmers and FGs, and other parties such as buyers, governments and NGOs, and (3) to help farmers develop their farms.

According to data from the Agricultural Extension Center, published in the Indonesian Agriculture Ministry's database[3], the number of FGs increased every year and reached

2 The rest of the thesis use the term Producer Organisation (PO) instead of Farmer Group (FG)
3 https://app2.pertanian.go.id/simluh2014/index.php

643,710 in 2020. FGs have on average 30 members. The management board of the groups commonly consists of a group leader, a secretary and a treasurer. The board consists of FG members selected in meetings with all FG members. The leader of the FG is the coordinator and energiser of the group – the one who takes actions, makes decisions and motivates the group to carry out the activities determined during group meetings (Raya, 2014). The FG management board governs the organisation to ensure that it runs well, according to the guidelines agreed in the group meetings.

1.3. Problem statement and research questions

The development of modern retail markets in Indonesia has resulted in new procurement systems requiring coordination among actors in the value chain (Sahara and Gyau, 2014, Reardon et al., 2016, Natawidjaja et al., 2007). The institutional arrangements that govern the transaction among actors in the chains are aimed at more efficient and effective coordination. Contract farming arrangements (CFAs) and producer organisations (POs) are examples of institutional arrangements that appear in the vegetable value chains in Indonesia. CFA is a vertical value chain coordination mechanism between farmers and buyers at different chain levels. Meanwhile, a PO is a form of horizontal coordination among farmers.

Past studies have analysed CFA and PO separately, whereas, in practice, both institutional arrangements are often combined. The World Development Report 2008 (World Bank, 2007) advocated to conjoining contract farming and PO to strengthen the bargaining position of smallholders in value chains and mitigate the risks of contract farming.

The emergence of modern retail markets in developing countries, including Indonesia, is an opportunity for smallholders to participate in these markets. POs can act as intermediaries to connect farmers and buyers in modern retail value chains. Upgrading a value chain by establishing a PO can mitigate the constraints faced by smallholders when trying to connect with modern retail. Upgrading may apply to network structure, added value, and governance (Trienekens, 2011). Investigating upgrading opportunities on these key components of Value Chain Analysis can provide insights for actors in modern retail chains and policy makers to successfully connect smallholders with the modern retail market. Therefore, Chapter 2 addresses the following research question:

RQ1: How can value chain upgrading through POs link smallholder farmers with modern retail?

Contract farming is frequently used in agri-food chains, particularly in high-value markets. Literature shows beneficial impacts for farmers that participate in contract

farming, such as increased income and welfare (Bellemare, 2012, Narayanan, 2014, Barrett et al., 2012), productivity and efficiency (Mishra et al., 2018, Bidzakin et al., 2020, Ajao and Oyedele, 2013). Although participating in CFAs brings benefits for farmers, many empirical studies found that farmers drop out from the contract scheme (Andersson et al., 2015, Romero Granja and Wollni, 2018). CFAs have trade-offs between incentives and risks (Bogetoft and Olesen, 2002). On the one hand, the farmers receive incentives such as premiums and price stability, inputs, knowledge and even credits. On the other hand, the farmers must obey the CFA rules such as meeting quality and quantity requirements, and on time delivery. Farmers have different views on each attribute that is part of the contract. Clarifying the trade-offs by analysing the preferences of smallholders towards the attributes in the CFA, therefore, is required to better understand how the CFA is perceived by smallholders. By understanding contract preferences of smallholders, the buyer can design more sustainable contracts and reduce drop-outs from the contract scheme. Chapter 3 analyses the preferences of smallholders regarding the attributes of a CFA in modern retail markets using a choice experiment to answer the following research question:

RQ2: Do smallholder farmers prefer contractual arrangements in modern retail value chains? Which contract attributes do smallholders prefer?

Modern retail has greater coordination requirements than traditional retail. Moreover, with the growing demand for food safety and quality in developing countries, more integrated value chain coordination is required to meet the stricter safety and quality requirements (Reardon et al., 2017, Alita et al., 2020). Value chain coordination to meet the food quality and safety requirements of modern retail markets not only takes place in the vertical relationships between farmers and buyers but also in horizontal relationships among farmers. Combined analysis and improvement of vertical coordination and horizontal coordination in the vegetable value chain may be an efficient approach to meet food quality and safety standards. Chapter 4 explores and examines the alignment between vertical coordination and horizontal coordination in the vegetable value chains with the aim to comply with the retailer's food quality and safety requirements.

RQ3: How are contracts and POs aligned in the vegetable chain to meet food quality and safety standards?

The success of contract farming is determined by the quality of the relationship between farmer and buyer (Eaton and Shepherd, 2001). Empirical studies show that relationship quality in contract farming is still low, as indicated by the many farmers that quit the contract, engage in side selling or otherwise do not honour the contract (Ruml and Qaim, 2020, Andersson et al., 2015, Minot and Sawyer, 2016). Chapter 5 analyses how

relationships quality is affected by vertical coordination and intra-organisational ties in modern retail vegetable value chains. Vertical coordination is operationalised in open communication and information exchange between contracted farmers and buyers; intra-organisational ties refer to the farmer's relationship with the PO. Further, how relationship quality affects continuity of relationships between farmer and buyer is also investigated in this chapter. Therefore, this chapter addresses the following research question:

RQ4: What is the impact of communication openness, information exchange and intra-organisational ties on the quality and continuity of relationship between contracted farmers and buyers?

1.4. Theoretical Framework

To understand the role of contract farming arrangements (CFAs) and producer organisations (POs) in modern retail chains, we have combined transaction cost economic (TCE) theory and value chain and network approach into the theoretical framework of this study. TCE was used to describe the role of contracts and POs as the institutions that govern transactions, while the chain and network approach was used to analyse coordination and collaboration between different actors in the value chains.

TCE explains the appropriate governance structure for a given set of situational contingencies (Barney and Hesterly, 2006). Transaction costs can be reduced by choosing an appropriate governance structure from a set of options ranging from spot markets to hierarchy (Williamson, 1998). Many studies have explored the different types of governance structures used in agri-food chains, including spot markets, contracts, cooperatives, and hierarchy (Raynaud et al., 2005, Gellynck and Molnár, 2009, Martins et al., 2017, Schulze et al., 2007). Transactions in spot markets are less coordinated and largely determined by the price mechanism, while those in the hierarchy governance structure have a high level of coordination within a single legal entity managing all stages of production and distribution (Peterson, 2001). In between spot market and hierarchy exist the hybrid forms of governance, where transacting parties are mutually dependent yet autonomous (Peterson, 2001, Ménard and Klein, 2004).

CFAs and POs are examples of hybrid governance structures (Ménard, 2005). CFAs involve an agreement between farmers and buyers for the production and transaction of agricultural commodities (Bellemare and Lim, 2018). CFAs are commonly used to maintain continuity of supply, meet quality standards, and reduce the concomitant risks (Bijman, 2008, Ménard and Klein, 2004, Rehber, 2007). A CFA governs the transaction

between farmers and buyers, with the purpose of improving coordination and reducing transaction costs.

CFAs may include price incentives, provision of inputs, credit and technical support, risk-sharing, distribution, and penalty. The arrangements entail trade-offs between incentives and risks (Bogetoft and Olesen, 2002, Ochieng et al., 2017). To increase the willingness of smallholder farmers to participate in contracting with modern retailers, in this thesis (Chapter 3) we analysed the preferences of smallholders towards specific contract attributes that are offered to them. By understanding these preferences, buyers can design contracts that increase participation of smallholder farmers and hence sustain the collaboration.

According to value chain and network analysis, coordination among members in a value chain can be viewed from the vertical and horizontal dimension (Lazzarini et al., 2001, Barratt, 2004). The vertical dimension reflects the collaboration between actors at different levels of the chain, such as between farmers and traders, whereas the horizontal dimension reflects the collaboration between actors at the same level of the chain, such as collaboration among farmers in a PO. Vertical coordination refers to the process of aligning and controlling quality, quantity, and other terms of exchange across segments of production or marketing system (Peterson, 2001). Vertical coordination can be achieved by contracting.

A PO is an example of a hybrid governance structure (Ménard, 2004). The governance in the PO blends market mechanisms (e.g., prices) and hierarchy mechanisms (e.g., authority and administrative control) (Chaddad, 2012). POs created by smallholders to support the members' business provide a range of services such as access to market, input, credit, and technical assistance (Bizikova et al., 2020). In developing countries, different POs exist with various activities. Bernard et al. (2008) classified POs into two types on the basis of such activities: marketing and community services. Marketing POs organise various marketing activities for their members, such as pooling, improving added value, and delivering the agricultural commodities to the buyers. Community POs, in contrast, do not involve any marketing activities and rather perform activities for sharing knowledge, technical assistance, and organising social events. For connecting smallholders with high-value markets, authors have claimed that POs need to transform from community to marketing organisations (Bijman and Wijers, 2019).

Several studies have revealed that POs in developing countries help smallholders connect with high-value markets (Kaganzi et al., 2009, Trebbin, 2014, Fischer and Qaim, 2012, Tefera and Bijman, 2019). POs can reduce transaction costs, enhance bargaining power and benefit from economies of scale. In addition, POs play a pivotal role in improving

quality and meeting the quality requirements of buyers through their functions, providing services to their members and coordinating vertically with buyers (Moustier et al., 2010, Kirezieva et al., 2016, Naziri et al., 2014, Mwambi et al., 2020).

In the context of value chain and network research, authors have conceptualized POs as horizontal coordination mechanisms in agri-food chains (Martins et al., 2019, Fischer and Qaim, 2012, Groot-Kormelinck et al., 2019, Imami et al., 2021). This thesis follows this line of thinking, by describing POs as a horizontal coordination mechanism that governs the collaboration among farmers. The governance of horizontal coordination is operationalized, in this thesis, by the services a PO provides to its members, the meetings among members and the way decisions are taken.

This thesis not only explores the governance structures in the value chains but also studies the relationships quality. The success of contracting is determined by the quality of the relationship between a farmer and a buyer (Eaton and Shepherd, 2001). A strong relationship among actors in the value chain is important to reduce or eliminate communication barriers and improve efficiency (Power, 2005). A high quality relationship between the contracted farmers and the contractor (buyer) may reduce the risk of side-selling (Bijman, 2008), improve learning exchanges to meet quality demands (Damme, 2012), reduce transaction costs (Coronado et al., 2010), and increase the overall performance of the chain (Peng et al., 2012). In this thesis we use the concept of upgrading (Kaplinsky and Morris, 2001, Trienekens, 2011) to discuss improvement options in the vegetable value chain in Indonesia. By upgrading the value chain, smallholders in developing countries can mitigate their constraints in linking to high value markets (Trienekens, 2011).

The conceptual framework of this thesis is shown in Figure 1.4. This thesis uses the value chain and network approach to explore contract farming arrangements between buyers and POs. Value chain analysis is an analytical approach to understand the nature of ties between the actors in value chains (De Boer et al., 2019, Ellis et al., 2019). Trienekens (2011) proposed three key elements to study the value chain in developing countries: network structure, added value, and governance of the value chain. This thesis identifies and explores these three elements for the modern retail vegetable value chain in Indonesia. Upgrading of the network structure in this study refers to development and improvement of horizontal and vertical relationships in this value chain. Upgrading added value refers to adding economic value to a product, for instance by using the organic production process, post-harvest handling (e.g. packaging, and sorting), and distribution (Trienekens, 2011). Upgrading governance of these value chains refers to improving vertical arrangements (i.e., CFAs) between PO and buyers (Wever et al., 2012), and horizontal arrangements among members in the PO (Bijman et al., 2014). Chapter 2 discusses how value chain upgrading

can link smallholders with modern retail markets. Chapter 3 examines the preferences of smallholders towards CFAs in modern retail markets. Chapter 4 explores the alignment between vertical coordination (through CFAs) and horizontal coordination (through POs) in the vegetable value chain, with the aim to meet food quality and safety standards. Chapter 5 examines the impact of vertical coordination (e.g., open communication and information exchange) and horizontal coordination (intra-organisational ties) in the PO on the quality and continuity of relationship between contracted farmers and buyers.

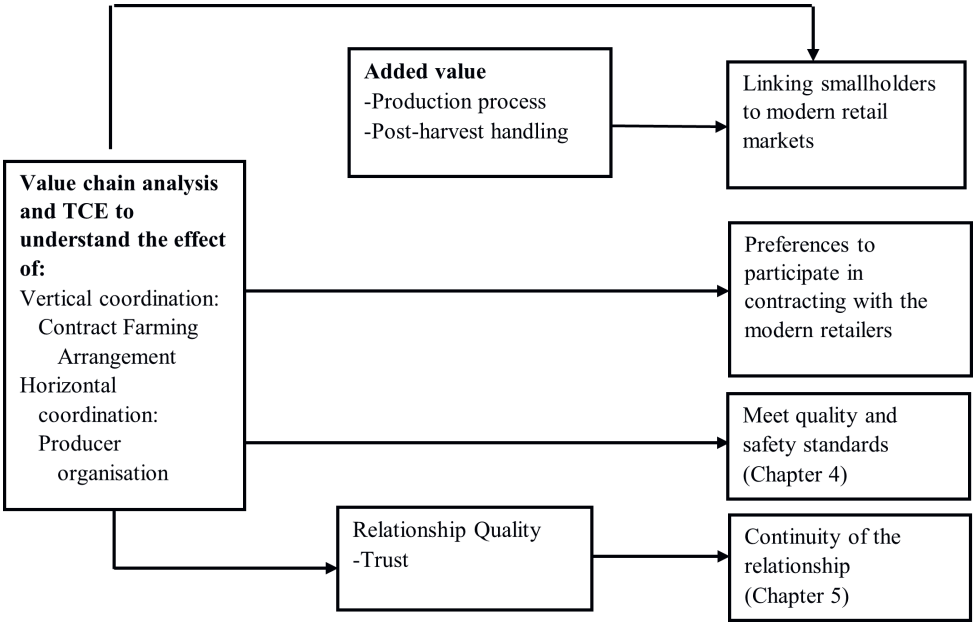


Figure 1.4. Conceptual framework

1.5. Context and research methods

The study is based on data collected by a survey among vegetables value chain actors located in the provinces of Central Java and Yogyakarta, more precisely on the slopes of Mount Merbabu and Merapi, which are administratively spread over four regencies: Magelang (subdistricts: Pakis and Ngablak), Semarang (Subdistrict: Getasan), Boyolali (Subdistricts: Cepogo and Selo) and Sleman (Subdistrict: Cangkringan) (Figure 1.5). These areas are the centre of vegetable production in the provinces of Central Java and Yogyakarta. Furthermore, the vegetables produced in the areas supply the modern retailers in the main cities in the Central Java region, namely, Semarang, Yogyakarta, Surakarta and Salatiga. Because in Central Java and Yogyakarta modern retailers have become increasingly important, we have selected this area for our study.

The survey was conducted with respondents involved in the vegetable value chain and the institutional environment of these chains (questionnaire in appendix). To select the respondents of this study, we used a multistage strategy supported by the snowball sampling method. In the first stage, we interviewed modern retailers to obtain information on who supplies the vegetables they sell. In this step, we deliberately selected three modern retailers that were willing to be interviewed. In the second stage, based on the information from the retailers, we selected suppliers that consisted of specialised wholesalers and POs through a convenience sampling method, as several suppliers were not interested in collaborating with this study. In the third stage, we selected farmers that supply vegetables to modern retail markets based on information provided by the specialised wholesalers and POs. The farmers selling to the traditional markets were selected through convenience sampling by choosing farmers around a sample of vegetable farmers who supply modern markets. More details on the actors in the vegetable value chains who were interviewed in this study is presented in Table 1.3.

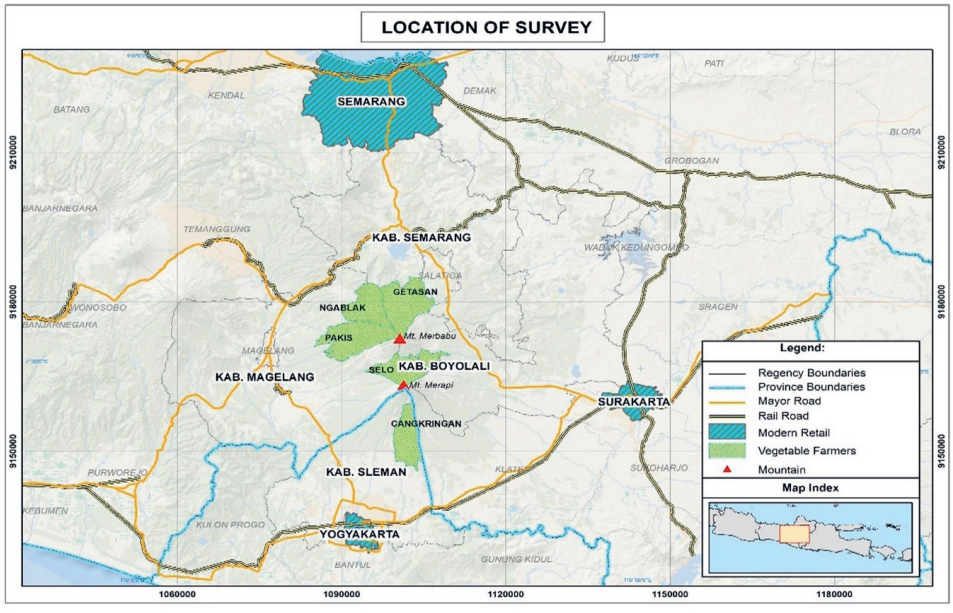


Figure 1.5. Study area: Central Java and Yogyakarta Provinces, Indonesia

To answer the research questions, we used both qualitative and quantitative data analysis. In Chapter 2, where we explore how upgrading the value chains by POs can link smallholder farmers to modern retail markets, we used a qualitative methodology, describing multiple cases of POs that have upgraded their chains and successfully linked smallholders with modern retail markets. The value chain analysis used for describing the process of upgrading includes analysis of the network structure, the added value in the chain and the governance of the chain. The data were obtained through semi-

structured interviews with actors involved in the value chains such as the POs, specialised wholesalers, and modern retailers.

Table 1.3. Interview respondents

Actors	*Interviewee function (Number of interviewees)*	*Location (Regency and Districts)*
Modern retailers	Purchasing staff (3)	Yogyakarta, and Surakarta
Specialised wholesalers	Owner (5)	Cangkringan-Sleman, Depok-Sleman, Teras-Boyolali, Ngablak-Magelang
Producer organisations	Leader (6), Secretary of PO (2)	Getasan-Semarang, Pakis-Magelang, Selo-Boyolali, Ngablak-Magelang
Smallholder farmers	Farmers who sell to the modern retail markets (128), to the traditional retail (173)	Ngablak-Magelang, Pakis-Magelang, Getasan-Semarang, Cangkringan-Sleman, Selo-Boyolali
Institutional environments	OKKPD[4] (local government), and Persada (an institute for organic certification)	Semarang and Yogyakarta

Chapter 3 analyses the preferences of smallholder farmers regarding contract farming arrangements in modern retail markets. We used a choice experiment (CE) to analyse the preferences of smallholders in choosing among alternative contract options. Furthermore, by using the CE, we also obtained the preferences of smallholders regarding each specific attribute of the farming contract. Data were collected through structured interviews with smallholder farmers. The sample of farmers in this study was divided into two subsamples: farmers that sell to the modern retail channel and farmers that sell to the traditional market channel. The interview contained questions on the socioeconomic and demographic characteristics of farmers, their market channels, and contract choices.

Chapter 4 uses a multiple case study to analyse the effect of aligning vertical and horizontal coordination on the compliance with food quality and safety requirements of the modern retail markets. A qualitative approach was used to explore the diversity of chain coordination mechanisms aiming at achieving high food quality and safety performance. Data were gathered through semi-structured interviews with actors in the chains such as farmers, POs, specialised wholesalers, modern retailers and actors from the institutional environment. The interviews with specialised wholesalers and modern retailers focused on vertical coordination in terms of quality agreements, monitoring, inspection, resource allocation, technical assistance, knowledge sharing and organic certification. For the horizontal coordination, the interviews with the POs focused on the services provided by the PO to meet quality and safety standards in modern retail markets.

4 Otoritas Kompeten Keamanan Pangan Daerah (OKKPD) translates as the Regional Food Safety Competent Authority. It is an institution within the Department of Agriculture and Food Security Agency in Central Java and is tasked with ensuring food safety and the quality of fresh food of plant origin.

Chapter 5 follows a quantitative approach to analyse the impact of vertical coordination (communication openness and information exchange) and horizontal coordination (ties between PO members) on the relationship quality between contracted farmers and buyers. A Structural Equation Model using Partial Least Squares (SEM-PLS) was used to test relationships between multiple independent (information exchange, open communication, and horizontal relationships) and dependent variables (relationship quality and relationship continuity) simultaneously. The data were gathered through structured interviews with the contracted farmers. The summary of the research design and data sources in each research question are presented in Table 1.4.

Table 1.4. Research design and data gathering in each research question

Research Questions	*Research Design*	*Data Collection*	*Data sources*
RQ1	Qualitative study (multi-case study)	Semi-structured interviews	POs, specialised wholesalers and modern retailers
RQ2	Quantitative study (Choice experiment)	Cross-sectional survey	Smallholder farmers
RQ3	Qualitative study (multi-case study)	Semi-structured interviews	Smallholder farmers, POs, specialised wholesalers, modern retailers and actors from the institutional environment
RQ4	Quantitative study (Structural equation model)	Cross-sectional survey	Smallholder farmers

1.6. Thesis outline

The thesis is outlined in Figure 1.6. Chapter 2 explains the upgrading of value chains through POs in order to connect smallholder farmers with modern retail markets. Upgrading opportunities involve network structure, added value produced and value chain governances. Upgrading of the value chain may mitigate the difficulties that smallholders face when attempting to enter modern retail markets. This study provides lessons how policymakers, POs, and buyers can assist and connect smallholder farmers with modern retail.

Chapter 3 analyses the preferences of smallholders for contract and contract attributes with modern retail. To analyse the preferences, we used a choice experiment (CE) model. Through the model, we assessed the preferences of smallholders regarding different contract farming attributes in modern retail markets. Attributes of CFAs include price, payment, quality, selling place and quantity. For the CE model, the farmers chose a contract option with different attributes in the contract. Understanding the preferences of smallholder farmers towards specific contract designs can help buyers to design CFAs

that are more liked by farmers. For policy makers, this study helps to develop policies for increasing smallholder participation in modern retail markets.

Chapter 4 explores the alignment between contracts and POs in meeting the food quality and safety requirements of modern retail markets. The alignment between vertical coordination and horizontal coordination was studied within and across the five cases analysed to understand how chain coordination structures influence food quality and safety in the modern retail markets. This study provides managerial implications for actors in modern retail to design more efficient coordination with the farmers to achieve quality and safety of vegetables.

Chapter 5 examines the relationship between vertical coordination through open communication and information exchange, and horizontal coordination (intra-organisational ties) in the POs to relationship quality and relationship continuity between contracted farmers and buyers. Structured interviews were carried out with contracted farmers to gather quantitative data on the farmers' perception of their relationship with buyers. This study tests hypotheses regarding the direct and indirect effects of the independent variables (information exchange, open communication, and intra-organisational ties) on relationship quality and relationship continuity. This study provides managerial implications for buyers to build quality and continuity of relationships with their supplying farmers.

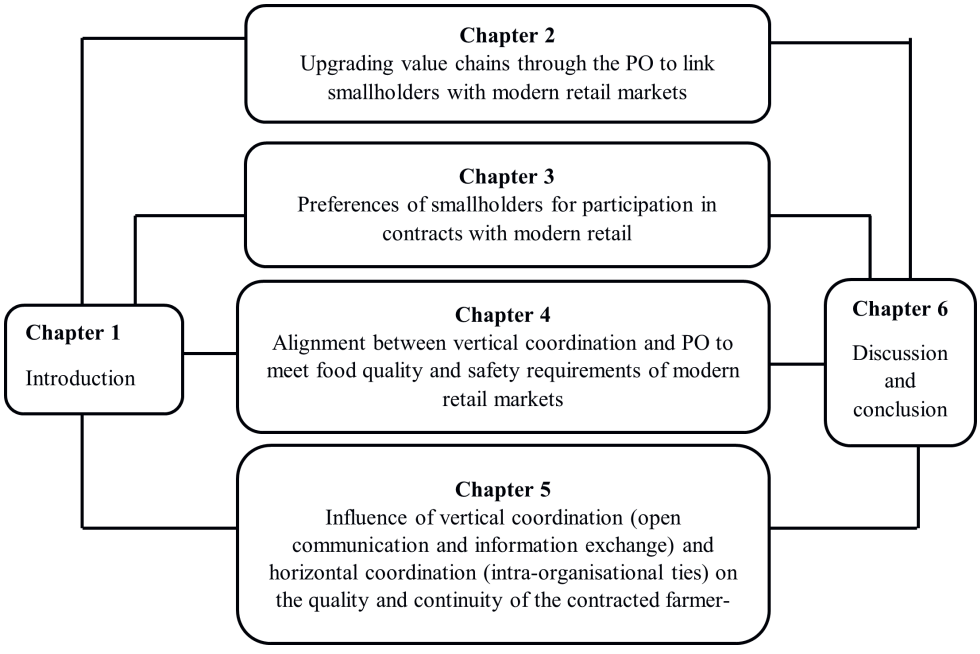


Figure 1.6. Thesis outline

2

CHAPTER 2.

Value chain upgrading through producer organisations: linking smallholder vegetable farmers with modern retail markets in Indonesia[5]

[5] This chapter is based on:
Widadie, F., Bijman, J. and Trienekens, J., 2021. Value Chain Upgrading through Producer Organisations: Linking Smallholder Vegetable Farmers with Modern Retail Markets in Indonesia. *International Journal on Food System Dynamics, 12*(1), pp.68-82. DOI: https://doi.org/10.18461/ijfsd.v12i1.76

Abstract

The study uses three elements of value chain analysis (VCA) – network structure, added value, and governance – to explore upgrading possibilities of value chains of producer organisations (PO)s in Indonesia in order to help and link smallholders to the modern retail market. Qualitative data are obtained through semi-structured interviews with PO members and other value chain actors. POs upgrade their value chains through linking smallholders with the modern retail market. Upgrading network structures is achieved by building collaboration between PO members and buyers. Upgrading added value is obtained by increasing the capability of farmers to meet quality requirements. Upgrading of governance structures in the chains is reached through contracts as vertical governance mechanisms and enhanced member services as horizontal arrangements.

Keywords

Modern retail; Indonesia; producer organisation; value chain; upgrading.

2.1. Introduction

Upgrading value chains is important for firms in developing countries as a strategy to respond to the challenges of globalisation and increased competition (Ponte and Ewert, 2009). Upgrading can enable firms and industries to move towards making better products and advance efficiently into more skilled activities with greater rewards in high-value markets (Giuliani et al., 2005, Kilelu et al., 2017). In value chain analysis, upgrading concepts have been widely applied to identify the possibilities for producers to 'move up the value chain,' either by shifting to more rewarding functional positions or by offering products with more added-value (Bolwig et al., 2013, Gereffi, 1999). In many cases, upgrading value chains is achieved through multi-business efforts, such as combined upgrading of products and processes or collaborative upgrading under contractual arrangements (Trienekens, 2011, Humphrey and Schmitz, 2000).

Many studies describe upgrading value chains at the firm or industry level (Tanrattanaphong et al., 2020, Giuliani et al., 2005, Tessmann, 2018, Lee and Gereffi, 2015). Other studies on upgrading agri-food value chains focus on export markets (Ponte and Ewert, 2009, Roy and Thorat, 2008, Maertens Miet, 2012, Trienekens et al., 2017). In addition, some studies examine upgrading of domestic agri-food value chains at individual producer level through contract farming (Bellemare, 2012, Maertens and Velde, 2017, Ragasa et al., 2018). Only rarely has a study looked at upgrading the value chain at the level of the producer organisation (PO), that sells members' products to domestic modern retailers.

Similar to export markets, the retail markets in developing countries have transformed to become more integrated in vertical coordination and with higher concerns for food quality and safety (Reardon, 2011, Reardon et al., 2012). The emergence of modern retail has opened the opportunity for smallholders to participate in high-value food chains. However, many farmers face constraints when trying to sell in high-value markets due to a lack of organisation, finance, and knowledge about certification and quality control (Royer et al., 2016). An institutional innovation aiming to solve such constraints and facilitate linking with modern retailers is the producer organisation (Markelova et al., 2009, Royer et al., 2016). Although POs have been around in developed and developing countries for a long time, the innovation lies in the more business orientation of modern and new POs (where the old ones were more focussed on lobbying and/or distributing state support). Prior studies have found that (modern) POs help smallholders connect with high-value markets in developing countries (Trebbin, 2014, Moustier et al., 2010, Kaganzi et al., 2009, Fischer and Qaim, 2012). To the best of our knowledge, no studies have been conducted on the role of POs in Indonesia in the context of modern retail markets.

In Indonesia, most smallholder vegetable farmers engage with a Farmer Group (FG), a type of PO initiated by the government in 1979 to distribute financial support and technical assistance (Ibnu et al., 2018, Hermanto and Swastika, 2011). Several POs have evolved from social-community organisations into economic organisations whose aim is to integrate their members into high-value food chains. There is, however, scant information on how POs engage in upgrading value chains. By using a multiple case study approach, our study explores how POs in Indonesia have upgraded their value chains by supporting the link between smallholder farmers and modern retail markets. This study contributes to the existing literature on value chain development and the role of POs in linking farmers to modern retail markets. The findings may also serve as lessons for POs and policy makers to upgrade the capabilities of POs from a value chain perspective.

This paper is organised into seven sections. In Section 2.2, the theoretical framework is presented. Section 2.3 describes the background of modern Indonesian retail, the transformation of POs and vegetable value chains. Section 2.4 presents the methodology used, while Section 2.5 outlines the empirical results, and Section 2.6 discusses the role of the POs in value chain upgrading. Section 2.7 concludes and discusses managerial and policy implications.

2.2. Theoretical framework

Smallholder farmers face constraints when selling farm products in modern retail markets, such as poor access to finance, extension services, market information and quality control, and the lack of organisation (Royer et al. (2016). Producer organisations have been claimed to be capable of solving these constraints by successfully linking farmers to modern retail (Trebbin, 2014, Markelova et al., 2009).

Value chain analysis (VCA) can be used to describe and explain the role of different actors in a (food) value chain. "Value chain" refers to the progression of activities and actors through each phase of production, handling, and distribution when delivering a product to the end consumer (Kaplinsky, 2000). These activities include the flow of products, exchange of information, financing of investments, distribution of value-added, coordination among actors, and governing the chain (Kaplinsky and Morris, 2001, Trienekens, 2011). VCA is an analytical approach used to understand the nature of ties between the actors in the value chain (De Boer et al., 2019, Ellis et al., 2019).

VCA can be conducted at different levels: global, macro, meso or micro (Gereffi and Kaplinsky, 2001). This study was carried out at the meso level focusing on smallholders' activities in the domestic modern retail market in Indonesia. Trienekens (2011) proposed

a framework of VCA in developing countries. He used three key elements of VCA in developing countries: network structure, added value and governance. This paper uses these three elements of VCA to explore the role of POs in mitigating smallholders' constraints and in linking them to modern retail markets.

The first element — network structure — includes both vertical and horizontal dimensions. Lazzarini et al. (2001) developed the concept of a 'netchain' to present the interrelationship between horizontal and vertical dimensions in the value chain. The horizontal dimension reflects the collaboration between actors at the same level of the chain (e.g., collaboration among the farmers in a PO), while the vertical dimension reflects the collaboration between actors at different levels of the chain, such as between farmers and traders (Lazzarini et al., 2001, Barratt, 2004). According to Omta et al. (2001), networks are looked upon as the total of actors within industries and/or between industries which can work together to add value to products. According to Ellis (2010) and Lenney and Easton (2009), joint activities in networks include exchange, planning, and organising. The network structure in this study includes the vertical and horizontal relationships between PO members and other value chain actors, that jointly produce added value.

The second element is the added value created at different levels and by different actors along the chain (Trienekens, 2011). Added value refers to adding economic value to a product by adding characteristics preferred by customers (Coltrain et al., 2000). Added value can be achieved, for example, by upgrading packaging, processing, and distribution functions (Trienekens, 2011). For the operationalisation of upgrading in this study, we focused on value-added activities conducted by the PO to comply with buyers' quality specifications and logistic requirements. The main PO activities included the provision of technical assistance regarding organic production, the post-harvest handling, and the distribution of vegetables to buyers.

The third element of VCA is the governance of the value chain, that is, the organisational arrangements among value chain actors. According to Hendrikse (2003), governance consists of a collection of rules between actors for carrying out their bilateral transactions. In this study, the governance of value chains was identified not only in the governance of vertical arrangements between PO and buyers (Wever et al., 2012) but also in horizontal arrangements among the members of the PO. These horizontal arrangements relate to the internal governance of the PO, such as to how information exchange is organised, how decision are being made, and how leaders are selected and elected (Bijman et al., 2014, Bijman et al., 2007).

Upgrading all three elements of VCA may help smallholder farmers link with modern retail markets. Upgrading is defined as the actions a firm takes to improve its abilities to make better products or to produce them more efficiently (Giuliani et al., 2005, Gereffi, 1999, Kaplinsky, 2000). Upgrading in agrifood value chains may involve modifying production processes to improve productivity or introducing production methods that adhere to quality standards and food safety measures (Bolwig et al., 2013, Mccullough et al., 2008). In most cases, upgrading of value chains is achieved by using multi-business approaches, such as a combination of upgrading of products and processes, often in collaborative arrangements (Trienekens, 2011). This study used upgrading options for three elements in VCA, as mentioned above—network structure, value-added, and governance. This upgrading, then, will illustrate the role of POs in linking smallholder farmers to modern retail markets.

Upgrading network structures in this research refers to improving the networks of POs with buyers on the one hand and the members of the PO on the other hand. Network structures depend on market channels (Wilkinson, 2001). By improving the network, the PO can help farmers to access (new) market channels, for instance shifting from traditional retail markets to higher-value markets. Upgrading added value relates to upgrading product quality, packaging, and distribution (Trienekens, 2011). The PO can help smallholders increase the value of their vegetables by making sure they meet the quality specifications of modern retailers. Upgrading governance refers to improving the vertical relationships with the buyers and the horizontal relationships among the farmers, so as to reduce transaction costs and strengthen the bargaining position of the farmers. According to North (1990), transaction costs consist of information, contract, and monitoring costs. Information cost refers to efforts to obtain knowledge about suppliers, buyers, and quality of the product. Contract cost relates to the cost of negotiating prices and designing contracts. Monitoring cost refers to determining whether actors are complying with their agreements and preventing opportunistic behaviour. To reduce transaction costs, actors to a transaction choose a certain governance structure depending on the levels of asset specificity, uncertainty, and measurement difficulties (Ghosh and John, 1999, Rindfleisch and Heide, 1997). Those governance structures range from spot market, via contracts to vertical integration (Williamson, 1999, Ménard, 2005). Meanwhile, upgrading governance in horizontal relationships is related to improving the internal governance of the PO in organising meetings and joint decision-making among the members (Bijman et al., 2014) and providing member services (Bijman et al., 2007). Figure 2.1 illustrates the conceptual framework of this study: value chain analysis helps to explore options for value chain upgrading, which leads to mitigating smallholder constraints in selling in modern retail markets. Table 2.1 shows the operationalisation of VCA concepts used in this study.

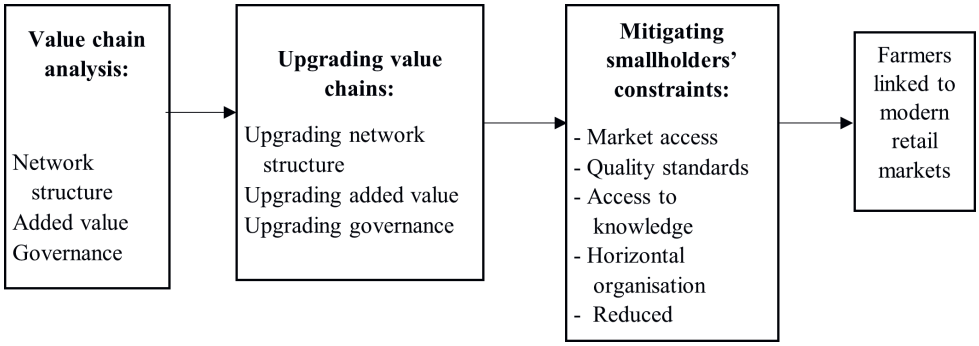


Figure 2.1. Conceptual framework.

2.3. Background

2.3.1. Modern Indonesian retail market

Modern retail in Indonesia expanded rapidly after 1998 when the government allowed direct foreign investment (FDI) in the operation of food retail (Suryadarma et al., 2010, Neven and Suleiman, 2007). In 2014, the total number of retailers was 24,449, comprising 269 hypermarkets, 1,362 supermarkets, and 22,818 convenience stores. The market share of modern retail increased constantly each year, from 5% in 1999 to 16% in 2014. In comparison, the share of traditional retail decreased from around 93% in 1999 to 83% in 2014 (Usda, 2015). Factors driving the emergence of modern retail in Indonesia are income growth, liberalisation of FDI in the retail sector, urbanisation, and consumer awareness of food quality and safety (Minot et al., 2015, Reardon et al., 2016).

Table 2.1 Operationalisation of the value chain analysis.

Value chain element	Dimension	Indicators	Literature
Network structure	Actors involved in increasing added value	All vertical and horizontal actors involved, from producers to end market/consumers, in increasing added value.	(Omta et al., 2001, Lazzarini et al., 2001)
Added value	Production process	Organic cultivation.	(Trienekens, 2011, Kaplinsky, 2000)
	Post-harvest handling	Sorting, cleaning, packaging, labelling of brand and organic logos.	
	Distribution	Delivery or transportation to the buyers.	
Governance	Vertical arrangements	Contract arrangements between PO and buyers: type of agreement, price, quantity, quality, place of delivery, and payment mechanism	(Wever, 2012)
	Horizontal arrangements	Internal governance of PO in organising meetings, decision making, and providing services.	(Bijman et al., 2014; Bijman et al., 2007)

In the beginning, the modern retail market focussed on staple and processed foods, for which supply chains are easy to organise. As the market developed, fresh fruits and vegetables were added to the assortment. The retail share of fresh fruits and vegetables (FFV) in Indonesia increased from 15% in 1998 to 21% in 2014. When purchasing FFV, Indonesian consumers still rely heavily on the traditional market (Minot et al., 2015). However, the share of FFV in retail sales is expected to continue to increase along with the rapid growth of consumer demand for food quality, safety, availability, ease, brand, and traceability (Slamet et al., 2017, Natawidjaja et al., 2007). In fact, increasing consumer awareness about food quality and safety has encouraged retailers to allocate more space to organic products. To supply organic vegetables, organic certification from a third party is needed as well as placing an organic logo on the packaging. According to the Alliance of Organic Indonesia (AOI), domestic consumption of organic food is dominated by fruits and vegetables (21%), rice (20%), and honey (10%). The total area of land of certified organic crops increased from 62 thousand ha in 2012 to almost 80 thousand ha in 2015 (David and Ardiansyah, 2017) .

2.3.2. Producer organisations in Indonesia

One type of PO is the Farmer Group (FG). According to the Indonesian Agriculture Ministry Regulation no 82/2013, an FG is defined as a group of farmers formed on the basis of mutual interest, common environmental conditions (social, economic, and resources) and solidarity to improve and develop the members' businesses. Commonly, the FGs are formed around the crop(s) cultivated by their member farmers. An FG largely contains farmers from the area in and around a specific village. An average FG in Indonesia consists of 30 members. These groups organise collaboration among farmers, facilitate knowledge sharing and learning processes, and help distribute farming inputs and credit from the government (Ibnu et al., 2018, Hermanto and Swastika, 2011). Usually, the members of the FG pay a membership fee for covering operational cost and for investments in equipment for post-harvest handling.

The management board of the groups commonly consist of a group leader, secretary, and treasurer. The board consists of members of the FG who are selected in meetings of all the FG members. The leader of the FG is the coordinator and energiser of the group – taking actions, making decisions and motivating the group to carry out activities that have been determined during the group meetings (Raya, 2014). The FG management board governs the PO to ensure that it runs well according to the guidelines outlined in the group meetings. FGs are independent of the government in taking any decision.

The formation of FGs was initiated by the central government in 1979 to facilitate the distribution of governmental aid and input subsidies to individual farmers (Ibnu et al., 2018, Hermanto and Swastika, 2011). Many programs have since been established to

strengthen the bargaining position of FGs, to improve production, and to provide credit. In many cases government efforts were unsuccessful in sustaining of the FGs and many groups collapsed after the project or program was finished (Hermanto and Swastika, 2011, Nuryanti and Swastika, 2011). However, those that were based on farmers' initiative to help, serve, and improve their members' farms remained in existence.

According to the Indonesian Agriculture Ministry Regulation no 273/2007, FGs should be developed based on six principles: openness, freedom, participation, self-reliance, equality, and partnership. FGs also have three main functions: (1) helping farmers to improve their knowledge and skills; (2) building cooperation among farmers as well as between FGs and with other parties such as buyers, governments and NGOs; and (3) helping farmers develop their farms.

According to data from the Agricultural Extension Center, published in the Indonesian Agriculture Ministry's database[5], the number of FGs reached 643,710 in 2020. These FGs have been registered in each regional agricultural ministry and they are guided by agricultural extension services to improve farmer knowledge. FGs operate with diverse internal governance mechanisms and provide services to their members such as inputs for production, technical assistance and training, post-harvest handling, storage, and marketing[6].

2.3.3. Indonesian vegetable value chains in modern retail markets

The vegetable value chains that supply the modern retail involve several actors at different levels (Figure 2.2). Based on the survey and interviews with key informants, we found four vegetable value chains to modern retail markets: smallholder farmers can link with retail markets via a PO (chains 1 and 2), a specialised wholesaler (chain 3), and a local collector (chain 4). Various vertical coordination mechanisms exist in the relationship between farmers and buyers. There are four general types of vegetable value chain arrangements. The first is a contract negotiated directly between a PO and a retailer (chain 1). The second is a tripartite contract between PO, specialised wholesaler and retailer. The specialised wholesaler serves as a service provider for the transactions between PO and retail. The third arrangement is a contract between the farmer and a specialised wholesaler. Unlike the contract of POs, contract arrangements of farmers individually with buyers (in this case, specialised wholesalers) are driven by buyers (Gramzow et al., 2018). Finally, the fourth arrangement is a spot market arrangement. Transactions in the spot market are characterized by low vertical coordination. In spot market arrangements, farmers and local collectors engage in transactions mostly at the farm-gate, without any quality standards

5 https://app2.pertanian.go.id/simluh2014/index.php

6 In the rest of the paper, we will use the term Producer Organisation (PO) instead of Farmer Group (FG).

and with variable quantities. The local collectors act as middlemen, subsequently selling and delivering these vegetables to traditional wholesalers.

The modern retailers in Indonesia mostly use written contracts with specialised wholesalers to procure vegetables. The specialised wholesalers, in turn, have their own contracts with various actors, such as POs, farmers, and traditional wholesalers as their strategies to procure the vegetables. The specialised wholesalers are commonly small medium enterprises (SMEs), a family business, with few employees, and usually owning a truck to transport the fresh produce. They act as collection centers, where vegetables are sorted and packaged. They are also gateways through which farmers can enter modern retail markets.

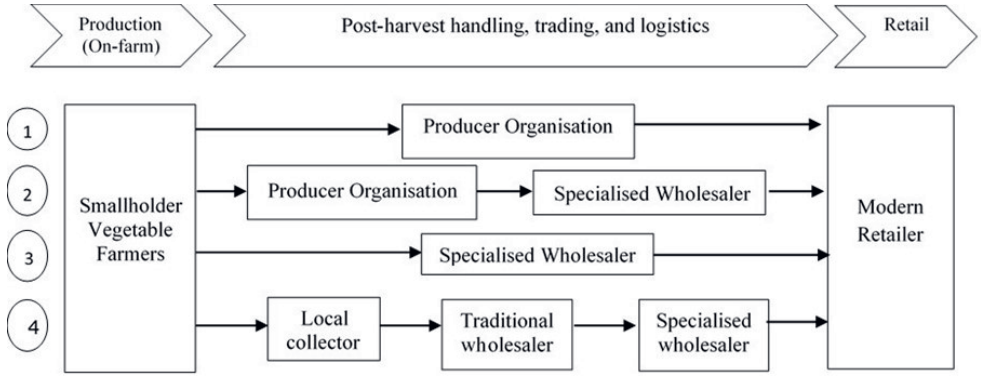


Figure 2.2. Vegetable supply chains to modern retailers in Central Java and Yogyakarta Provinces, Indonesia (own survey, 2017)

2.4. Research methods

The study was conducted on the slopes of Mount Merbabu which is administratively divided into three regencies: Magelang (subdistricts: Pakis and Ngablak), Boyolali (subdistrict: Cepogo), and Semarang (subdistrict: Getasan). These regencies are the centre of vegetables production in Central Java, Indonesia. The area of the districts is approximately 18,524 ha. Vegetables produced in this area are supplied to modern retailers in the cities of Semarang, Yogyakarta, and Surakarta.

To select the POs for our study, we used snowball sampling based on information from three modern retailers. We chose three modern retailers[7] out of eight which have operated in Central Java and Yogyakarta provinces, based on convenient sampling. These three retailers were willing to share information and to be interviewed. In addition, the three retailers have a high-market share compared to other modern retailers in Indonesia

7 The three modern retailers are Transmart Carrefour, Giant Supermarket, and Superindo

(Slamet et al., 2017), and they are spread across the cities in the research area (Semarang, Yogyakarta, and Surakarta).

By tracing the suppliers of the retailers, we found that five POs were involved in modern retail chains. Out of these five, we purposively selected three POs because they had different relationships and arrangements with their members and buyers. PO1 — Tranggulasi — is located in the village of Batur, a sub-district of Getasan, in the regency of Semarang. PO2 — Redo Tani — is located in the village of Kragilan, a sub-district of Pakis, in the regency of Magelang. PO3 — Kredo Tani — is located in the village of Tarubatang, a sub-district of Selo, in the regency of Boyolali. The selected three POs supplied vegetables to two modern retailers via direct contract (chain 1) and specialised wholesalers (chain 2). Figure 2.3 shows the research location of the POs and the modern retailers.

The unit of analysis in this paper is the PO. This paper uses data collected through semi-structured interviews with the actors involved in the chains of the three sampled POs: seven smallholder farmers (members of the PO), four specialised wholesalers, and two modern retailers (Table 2.2). A qualitative research methodology with multiple cases was used to obtain in-depth information on the functions of POs. According to Yin (2003), case studies are used to provide in-depth information regarding a specific phenomenon in the field. The interviews were conducted from November 2016 through March 2017. The operationalisation of the VCA concept in the interviews is shown in Table 1. All interviews were recorded and transcribed. The average length of the interviews was about 90 minutes.

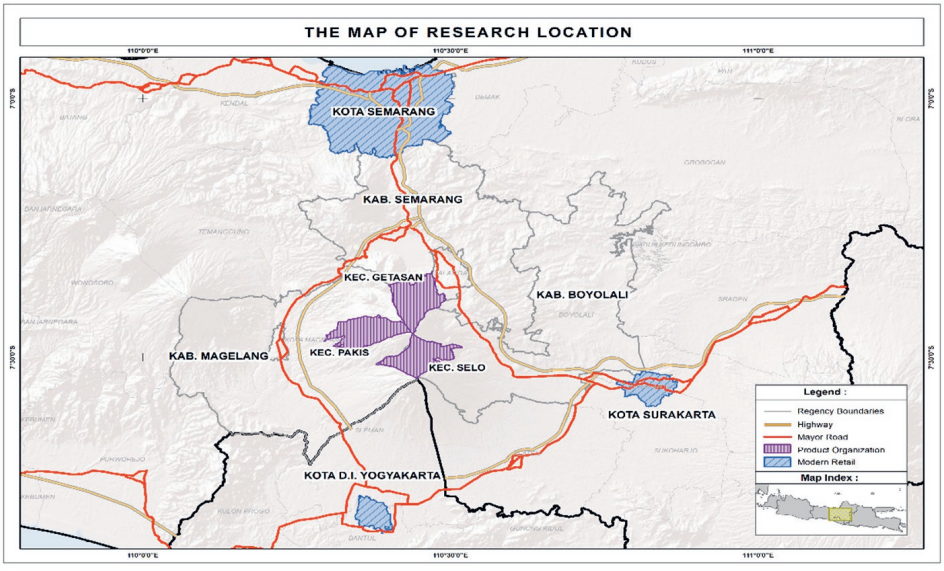


Figure 2.3. Research locations

Table 2.2. Respondent interviews.

Actors (number interviewed)	Interviewee's role	Location
Smallholder farmers (7)	Members of the PO	Getasan-Semarang, Pakis-Magelang, and Selo-Boyolali
Producer organisations (3)	Leader and secretary of the PO	Getasan-Semarang, Pakis-Magelang, and Selo-Boyolali
Specialised wholesalers (4)	Owner	Cangkringan-Sleman, Depok-Sleman, Teras-Boyolali, and Ngablak-Magelang
Modern retailers (2)	Purchasing staff	Yogyakarta and Surakarta

2.5. Descriptive results

2.5.1. Network structures

The three POs in this study were founded in the 2000s as the initiative of the farmers themselves. As communities of farmers, the POs main functions are helping farmers to learn; building cooperation among farmers; and helping farmers develop their farms. According to the interviews, the POs in our study have transformed from being community POs, with no marketing activities, to being marketing POs. The transformation of POs is pushed by the farmers themselves and also comes from increasing demand of high-value markets (e.g., processors, export markets, and modern domestic retail). Importantly, the growth of high-value markets in Indonesia has changed the procurement process from weaker to stronger coordination between farmers and buyers through POs and contracting mechanisms (Reardon et al., 2016, Sahara and Gyau, 2014).

Specialised wholesalers and modern retailers are more likely to work with a group of farmers (thus POs) rather than with individual farmers, in their procurement of vegetables. They look for POs that can meet their quality, quantity, price, and delivery requirements. The three POs in our study are able to comply with the quality, quantity, price, and delivery requirements and therefore buyers have offered them contracts to supply vegetables. PO1 has been supplying vegetables to modern retailers since 2010, and PO2 and PO3 have been doing so since 2013.

The POs that produce for these retail markets indicated to have strong horizontal collaboration among its members and strong vertical collaboration with the buyers, in order to meet the market demands. The network of PO1 includes 32 smallholder farmers supplying organic vegetables to the retailer. In the vertical relationship, PO1 has a direct contract with a modern retailer and three specialised wholesalers. Figure 2.2 shows that, in chain 2, the specialised wholesaler has an important role as intermediary actor connecting farmers and modern retailers. PO1 delivers the fresh vegetables to the

specialised wholesalers, then the specialised wholesaler sorts, packages, labels, and delivers vegetables to the modern retailers.

PO2 connects 50 smallholder farmers supplying organic vegetables to two retailers via two specialised wholesalers. The 50 farmer-members are located in one village. PO3 connects 30 smallholder farmers who supply non-organic vegetables to retailers through a specialised wholesaler.

Table 2.3 shows the number of horizontal actors (farmers) and vertical actors collaborating in the PO value chains. Only PO1 deals directly with the retailer; the others work through specialised wholesalers.

Table 2.3. The number of horizontal and vertical actors collaborating in the PO chain.

PO	Horizontal actors (farmers)	Vertical actors
PO1	32	1 modern retailer, 3 specialised wholesalers
PO2	50	2 specialised wholesalers
PO3	30	1 specialised wholesaler

2.5.2. Added value

PO1 increases the added value of vegetables by providing technical assistance and facilitating organic production, such as sorting, cleaning, packaging, labelling of brand and organic certification, and distributing vegetables to the modern retailer directly. The regional government, as part of its aid initiative, gave PO1 a vehicle for delivering vegetables. The vehicle's operational costs are covered by PO1. For this, PO1 has defined regulations about how membership fees are used for such operations and also for investments such as tools for improving production and post-harvest handling. PO1 provides technical assistance regarding the production of organic vegetables and provides members with organic fertilizer and environmentally-friendly phyto-pesticides. The technical assistance is provided by the PO members themselves and by an agricultural extension agent. During PO meetings, the members share information about what technical assistance they may need for improving production and implementing new technology. PO1 also has an internal control system (ICS) to monitor organic production and quality. The ICS team ensures that the vegetables are produced in accordance with organic farming guidelines, and it provides training in producing organic fertilizer and phyto-pesticides. Establishing an ICS in the PO is one of the requirements for achieving organic certification.

To increase the added value of vegetables, PO2 provides technical assistance for its members in cultivating organic farming and it monitors production. The technical

assistance comes from PO member-farmers who share knowledge and experience, and also from the agricultural extension service. PO2 has built an ICS team to monitor and ensure that the vegetables are produced in accordance with organic farming guidelines. The PO also provides training to its members in producing organic fertilizer and phyto-pesticides. Post-harvest, PO2 sorts and cleans the members' vegetables which are then transported to a specialised wholesaler who provides packaging with the brand and organic labelling and transports the products to the retailers. According to the agreement between the PO and the specialised wholesaler, half the cost of organic (re-)certification is covered by the wholesaler.

PO3 increases the added value of vegetables post-harvest only by sorting according to appearance and cleaning of the vegetables. There are no value-added activities in the PO related to improving quality or post-harvest handling. Specialised wholesalers pick up the vegetables at the PO and perform the rest of post-harvest handling activities required up to distribution to the retailers. Table 2.4 shows the differences in value-added activities across the three POs. PO1 performs more added value activities than the other POs.

Table 2.4. Value-added activities in three PO cases.

PO	Production process	Post-harvest handling	Distribution
PO1	Technical assistance for organic farming	Sorting quality, cleaning, packaging, and labelling with brand and organic logos	Delivery to buyers
PO2	Technical assistance for organic farming	Sorting quality and cleaning	Delivery to buyers
PO3	-	Sorting quality and cleaning	-

2.5.3. Governance

2.5.3.1. Vertical arrangements

Regarding the vertical arrangements between POs and buyers, PO1 has written contracts with modern retailers directly and verbal agreements with the specialised wholesalers. The contracts include price agreements between the PO and the buyers. On average, the agreed price is slightly higher than the market price and tends to remain constant. The buyers set a base price based on the market price. If the market price rises, the PO can renegotiate the price agreement with the buyers. Quantity agreements in the contract are specified based on supply agreements. The retailer sets a fixed quantity of a specific vegetable to be ordered in one year during the contract. Every three days, the retailer orders vegetables from the PO in a certain volume, while specialised wholesalers order every weekday in a certain volume. Quality agreements in the contract with a modern retailer are determined by the prevailing quality standards. The standard establishes the appearance, size, packaging, branding, and organic certification as quality assurance of the

products. Quality agreements in the contract with specialised wholesalers are specified for appearance, size, and organic certification. The place of delivery is the buyer's location.

PO2 has verbal agreements with specialised wholesalers. The agreements include price arrangements. Specialised wholesalers set the base price based on the retail price. Quantity arrangements are based on supply agreements. In the purchasing order, the specialised wholesalers determine the volume of the order, including the kinds of vegetables. Quality specifications in the arrangements are based on appearance, size, and providing organic certification for quality assurance. The PO delivers the vegetables to the buyer's location. The cost of transportation is partly covered by the buyers.

PO3 has a verbal agreement with a specialised wholesaler. The agreement includes an arrangement on the price. The specialised wholesaler sets the base price of the contract based on the price established by the retailers. The specialised wholesaler orders the vegetables from the PO every weekday in a specific volume. The quality specifications in the contract are related to appearance and size. According to the place of delivery agreement, the specialised wholesaler picks up the vegetables from the PO's location. Table 2.5 outlines the contract arrangements of the three POs. It demonstrates that the contract arrangements in PO1 are more compatible with modern retail than the others because PO1 has a direct contract with the modern retailer.

Table 2.5. Contract arrangements between POs and buyers.

PO	Type of agreement	Price	Quantity	Quality	Delivery location
PO1	Written and verbal contract	Price agreement	Fixed	Appearance, size, packaging, and organic certification	Buyer's location
PO2	Verbal contract	Price agreement	Fixed	Appearance, size, and organic certification	Buyer's location (half the cost of transportation paid by buyer)
PO3	Verbal contract	Price agreement	Fixed	Appearance and size	PO's location

2.5.3.2. Horizontal arrangements

The horizontal arrangements refer to the relationships among the farmers in the PO. PO1 holds regular meetings, at least once a month. In the meeting, the board of the PO and members share information, such as market and financial information. In addition, the PO organizes knowledge transfer among members and/or by agricultural extension officers. In the meeting, the decisions are made on strategies and operations for production, such as planting and harvesting schedules, distribution, determining what vegetables should be planted, and payment mechanisms. A part of revenues is retained by the PO to cover operational costs, re-certifying organics, and investing in new tools.

PO1 provides member services such as a marketplace, technical assistance for improving quantity and quality of organic products, and inputs.

PO2 organises meetings at least once a month. In the meeting, information is shared with the members, including market conditions and the PO's general financial status. PO2 also organizes knowledge transfer internally and/or with the agricultural extension service. PO2 makes decisions jointly with members concerning the procurement of vegetables, such as arranging the schedule for planting, harvesting, and distributing, and determining what kinds of vegetables should be planted, and the payment mechanism. As an organisation driven by member-farmers, this PO provides member services, such as market access and technical assistance to improve the quantity and quality of organic products.

PO3 organises regular meetings at least once a month. In the meeting, the PO and members share market and financial information and occasionally organize knowledge transfer within the PO internally and/or with the agricultural extension service. All decisions are discussed internally with the members on matters relating to the supply of vegetables to the modern retail market, including harvesting and distribution schedules, the kinds of vegetables to be planted, and payment mechanisms. PO3 offers services, such as providing a marketplace for its members, knowledge sharing, and training related to crop production.

It is clear that all three POs hold regular meetings and involve their members in making decisions. The difference is in member services; PO1 provides more services consisting of marketplace, technical assistance for improving quantity and quality of organic products, and technical input for farming.

2.6. Discussion

The aim of the study was to explore how POs in Indonesia have upgraded their value chains, thereby helping smallholder farmers to link with modern retail markets. In line with the three principal elements of value chain analysis – network structure, added value, and governance - the POs have upgraded their value chains to resolve smallholders' constraints and link farmers to the modern retail market. For upgrading the network structure, the POs entered vertical networks with specialised wholesalers, and PO1 has a direct relationship with modern retail. The capabilities of POs to improve their networks, particularly with vertical actors such as specialised wholesalers and directly with modern retailers, can enhance their ability of accessing new market channels. These findings are in line with other studies that have shown that building networks may lead to increased

market share and value-added market channels (Gereffi, 1999, Fitter and Kaplinksy, 2001).

With regard to upgrading added value, POs increase the value of the vegetables supplied by smallholders by providing technical assistance on organic farming in PO1 and PO2, post-harvest handling activities, such as sorting and cleaning in all three POs, packaging and labelling in PO1, and distribution of the vegetables in PO1 and PO2. Such added value complies with the quality requirements of the buyers. Upgrading the value-added activities in the PO can resolve smallholder constraints related to low quality compliance. The role of POs in increasing the added value of smallholders' production has been presented in previous studies (Moustier et al., 2010, Roy and Thorat, 2008).

Upgrading the governance of value chains includes both vertical and horizontal governance arrangements. The governance structure in the vertical relationship between POs and buyers is the contract. The three POs had a variety of contract arrangements with buyers (Table 5). By switching the form of governance from spot market to the contract, transaction costs between the farmers or POs and the buyers are reduced (Williamson, 1999, Ménard, 2005). The contract may lead to a reduction of transaction costs by reducing the cost of monitoring, coordination, and information at the buyer level (Kirsten and Sartorius, 2002, Bijman, 2008). The quality arrangement in the contract can reduce buyers' monitoring cost because the vegetables supplied already went through quality inspections. Coordination to meet contract arrangements is conducted by POs rather than by individual farmers. Hence, the coordination cost in the transaction can be minimised. Information costs can also be reduced by contracts because the contract specifies the characteristics required—price, quantity, quality, and delivery. Only farmers who can meet these requirements will become suppliers. Therefore, the cost of monitoring suppliers can be minimised. A contract reduces uncertainty for farmers because it provides a guarantee of sales. Through a contract, the buyer absorbs the vegetable production of the farmers. Contracting also lowers the risk of high asset specificity because the farmers' investments in the production of high-value vegetables is rewarded at ex ante agreed prices.

The governance structure in the horizontal arrangement among farmers in a PO reflects the internal governance of the PO in arranging meetings, decision making, and providing member services (Bijman et al., 2014, Bijman et al., 2007). The empirical results show that the three POs hold regular meetings and that decision making is shared among the members. As an organisation formed by smallholder farmers, the POs provide a variety of member services, including a marketplace, technical assistance for improving quantity of production and quality of organic products, and inputs. Upgrading the internal governance of POs by organising meetings, shared decision-making, and providing

member services may reduce asymmetric information and opportunistic behaviour (Bijman and Wollni, 2008). In addition, upgrading the governance structure through contracts and enhancing the internal governance of the PO may strengthen the bargaining position of the farmers in the value chains. This is clearly observed in the capabilities of these three POs to negotiate contract arrangements with buyers.

2.7. Conclusions and implications

Many studies have explored the upgrading of value chains of firms in the export market, and several studies have explored value chain upgrading in domestic market. However, the role of POs in upgrading of agrifood value chains in domestic markets in developing countries has rarely been analysed. This study explores how POs in Indonesia upgraded their value chains to link smallholders to modern domestic retail markets. We used Value Chain Analysis (VCA) to explore upgrading in three elements — network structure, added value, and governance.

The empirical results show that POs upgraded their value chains, thereby helping smallholders link with modern retail markets. In the upgrading of network structure, the POs built a network with vertical actors, such as specialised wholesalers and modern retailers. In addition, the POs strengthened their network horizontally with the farmer members coordinating in the sales of vegetables. The capabilities of POs to build their networks, particularly with vertical actors, can help smallholders' access modern retail. In the added-value upgrading, the PO helps farmers increase the value of their vegetables by providing technical assistance for organic farming, post-harvest handling, and distribution to the buyers. The value-added activities in the POs consist of their efforts to help the smallholders comply with the quality standards and specifications established in the contract. In upgrading the governance of the value chain, the POs bolster the vertical arrangements through contracts and the horizontal arrangements through their internal governance. Upgrading governance both vertically and horizontally can reduce transaction costs and strengthen the bargaining position of POs in value chains. The combination of the three items of value chain upgrading mitigates smallholders' constraints and enables linking them to modern retailers.

Based on these results, we can point to some managerial implications for POs to improve their capabilities. First, POs should upgrade their value chains by improving their networks, particularly with vertical actors, to obtain market access. Second, POs can improve added value by increasing the smallholders' capabilities to comply with quality standards and specifications of modern retailers. Third, governance can be improved by negotiating contracts with buyers in the vertical chain, which may strengthen members'

bargaining position. In the horizontal dimension, improving the internal governance enhances the collaboration within the PO to meet market expectations. The empirical evidence shows that POs in Indonesia can help smallholders link with modern retail. It provides the lesson that POs have an important role in increasing smallholder participation in modern retail markets. Therefore, policy makers should support POs in the process of upgrading their value chains. For example, they should support POs to collaborate in value chains, provide assistance to POs to increase the added value of vegetables, and finally, support POs in the mechanisms of contract negotiations.

There are several limitations associated with our research. The first is that the study examines only three POs. Future research could include more and different types of POs, to gain a more complete assessment. Second, upgrading value chains in this study focused on three elements. For future studies, the research could look into other elements involved in upgrading value chains, such as reinforcing partnerships with non-chain actors like governments and NGOs. Third, upgrading in this study focused on the economic perspective, i.e. linking farmers to modern retail markets. Future studies on value chain upgrading could also include environmental and social objectives. Integrating these different perspectives in research on POs in value chains could contribute to more sustainable upgrading of developing country value chains. Fourth, this research used only qualitative methods to collect data for describing the role of POs in linking smallholder farmers with the retail market. Future studies could include a quantitative approach to gain a more comprehensive understanding of the impact of PO coordination in improving smallholders' access to modern retail markets.

3

CHAPTER 3.

Farmer preferences in contracting with modern retail in Indonesia: A choice experiment[9]

[9] This chapters is based on:
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Abstract

Understanding the preferences of smallholder farmers for contracting can help in making contracts more sustainable. This paper presents the results of a choice experiment (CE) among smallholder farmers in Indonesia to assess their preferences for accepting contracts with modern retail. The CE was based on attributes of actual sales transactions in modern retail and traditional retail channels. A total of 301 vegetable smallholder farmers participated, consisting of 173 farmers participating in traditional markets and 128 in modern retail markets. A random parameter logit model estimates that, in general, smallholders do not prefer contracting with modern retail over spot market selling in traditional retail channels. Most contract attributes are perceived as negative by smallholders. A willingness-to- accept analysis shows that farmers are critical of most contract attributes, particularly those related to quality requirements. Producer organizations (POs) reduce trans- action costs and increase smallholders' preference toward contracts. Contract designs that reduce transaction cost, mitigate risks for farmers, provide fair prices, and involve POs are more likely to attract smallholders to modern retail channels.

Keywords: choice experiment, contract preferences, modern retail, producer organization, smallholder

3.1. Introduction

Contract farming arrangements (CFAs) are increasingly used in agrifood chains in developing and emerging economies. Academic literature has discussed the impact of contracts on income and welfare (Bellemare, 2012, Narayanan, 2014), productivity, and efficiency (Mishra et al., 2018), reducing transaction costs (Key and Runsten, 1999) and strengthening coordination in modern supply chains (Schipmann and Qaim, 2010, Maertens and Swinnen, 2009). Although participating in a CFA may seem beneficial for the farmers' welfare, empirical studies have found that farmers drop out from contract schemes after initial engagement (Andersson et al., 2015, Romero Granja and Wollni, 2018). The unsustainability of the CFA in developing countries results from behavioural opportunism, combined with a contract design that fails to meet the preferences of both parties (Barrett et al., 2012, Oya, 2012).

Participating in a CFA entails trade-offs between incentives and risks (Bogetoft and Olesen, 2002). For instance, a contract may provide price premiums, but farmers must comply with quality requirements and other transaction specifications. If the contract design does not include price incentives, risk-sharing, provision of inputs and credit, farmers may be discouraged from participating in the CFA. Entering a CFA implies complying with difficult-to-meet quality requirements and reduced flexibility to switch buyers. However, farmers differ in their views on and experiences with the advantages and disadvantages of CFAs. This study aims to clarify trade-offs and to understand farmer preferences for contract attributes. By understanding contract preferences of smallholders, better contracts can be designed leading to more sustainable supply chain relationships between farmers and buyers.

To analyse smallholders' preferences for specific contract attributes, we used a choice experiment (CE). CE is a method for discovering the value of nonmarket goods (in this study, contracts) by using individual stated preferences in hypothetical settings (Alpizar et al., 2001, Bateman et al., 2002). Different from other stated-preference methods such as Contingent Valuation, CE assesses the individual attributes of a good (Horne, 2008). CE is relatively easy for respondents to make realistic choices (Holmes et al., 2017). CE allows for a calculation of the marginal value of the willingness-to-accept (WTA) a good (Alpizar et al., 2001, Hensher et al., 2005). Moreover, CE is consistent with consumer theory (Alpizar et al., 2001) and it is less costly than a field experiment (Ochieng et al., 2017).

Several studies have examined farmer preferences for contract designs (Abebe et al., 2013, Blandon et al., 2009, Broeck et al., 2017, Ochieng et al., 2017, Schipmann and Qaim, 2011). Most of these studies examine contracts for export markets and/or for processors;

few studies deal with contracting in fresh produce supply chains for domestic modern retail[8]. We are aware of only two studies that have used CE in exploring contract attributes in the case of food chains for domestic modern retail: one in Honduras (Blandon et al., 2009) and one in Kenya (Ochieng et al., 2017).

Previous studies on contract farming have mainly focussed on production contracts (i.e., contracts with the contractor providing key farming inputs) in export and processing chains (Abebe et al., 2013, Broeck et al., 2017, Schipmann and Qaim, 2011). Our study explores so-called marketing contracts because this type of CFA is mostly used in selling to modern retail (Otsuka et al., 2016). Moreover, our focus group discussions with farmers made clear that the marketing attributes were perceived as highly important. In a marketing CFA (here after just called "contract"), buyers are only concerned about the quantity and quality of the product delivered, while all production decisions are left to the farmers (Macdonald et al., 2004).

This study also investigates the role of producer organizations (POs) in affecting the probability of farmers to accept the contract. While a few studies have investigated the role of POs in contracting, research so far has not made a distinction between different types of POs. We distinguish between marketing PO and community PO.

The first aim of this study is to investigate smallholder preferences for particular contract attributes. We designed a CE that combines contract attributes currently used in modern retail channels with attributes of traditional channels as a base alternative. The second aim is to determine whether farmer characteristics, such as socio-demographics, risk orientation, producing organic vegetables, and being member of a PO, affect the probability of accepting the contract. The third aim is to estimate how much compensation farmers demand to accept the contract through an analysis of the marginal WTA. Finally, we measure choice probabilities in several scenarios of contract designs with the purpose of helping buyers design contracts that could increase participation of smallholder farmers.

Our paper seeks to fill a knowledge gap on what are effective and sustainable CFAs. By exploring the preferences of smallholders, we contribute to the literature on contract design. In addition, we contribute to the literature by exploring farmer preferences for contracts in fresh produce supply chains for local supermarkets (while most of the literature on contract farming focusses on contracts for export or for the processing industry).

8 Modern retail includes hypermarkets, supermarkets, and convenience stores. A key difference between traditional retail and modern retail is that the latter applies stricter quality requirements. These requirements have important implications for coordination in the agrifood supply chain.

This study was conducted in Central Java, Indonesia, where modern retail markets have grown in recent years (Reardon et al., 2016). However, modern retail companies face supply chain challenges, particularly related to sustainably involving smallholder farmers (Sahara and Gyau, 2014). Most smallholders sell vegetables in the traditional spot market and only a minority participates in modern retail channels. We explore under what conditions smallholders are more willing to engage in modern retails channels. The result of our study may be useful for buyers to understand farmer preferences toward specific contract designs, thereby making contracting more durable. For policy-makers, this study may help to develop policies for strengthening smallholder participation in modern retail supply chains.

3.2. Research Background

3.2.1. Modern food retail

Modern food retail companies in Indonesia, first established in the 1970s, are concentrated in urban areas (Suryadarma et al., 2010). Modern food retail grew rapidly after 1998, when the government allowed foreign companies to operate supermarkets in Indonesia (Neven and Suleiman, 2007). Since then, the number of modern supermarkets has increased every year, and different formats have been established (Dyck et al., 2012). As of 2014, the total number of modern food retail outlets reached 24,500, consisting of 300 hypermarkets, 1,400 supermarkets and 22,800 convenience stores (Usda, 2015). The market share of modern food retail increased from 5% in 1999 to 17% in 2014 (Usda, 2015). Increased income, foreign direct investment, middle-class growth, urbanization, and consumer consciousness about food quality and safety have all driven the rapid growth of modern retail (Minot et al., 2015, Reardon et al., 2016).

In the first stage of its development, modern retail focuses on selling processed food. Then, with the development of new format outlets and changing consumer patterns, companies start selling fresh products, such as fruit, vegetables, meat, seafood, and poultry. Fresh foods are associated with high quality, safety, freshness, and convenience (Umberger et al., 2015).

In their procurement, modern retail companies often use contracts with their suppliers to maintain a consistent supply of products meeting specific quality standards. These suppliers are specialized supermarket wholesalers and POs.

The usual period of a contract in the modern retail channel is 1 year. At the end of this year, the supermarket will evaluate the performance of the supplier. Contract prices are higher and more stable than prices in the traditional market. Also, quality requirements

are stricter than in traditional markets. Contracts usually cover only specific quantities of vegetables, whereas traditional markets absorb any quantity the farmer produces. Payment in modern retail markets is delayed for 1–3 weeks after the vegetables have been delivered, while in traditional markets buyers pay directly. Regarding the place of sales, farmers need to bring their vegetables to the wholesaler when they supply modern retail. In the traditional market, the transaction takes place at the farm gate.

3.2.2. Research area

This study was carried out in the Central Java and Yogyakarta provinces, Indonesia, in the five subdistricts Getasan, Ngablak, Pakis, Cangkringan, and Selo. These districts are located on the slopes of Merbabu and Merapi volcanoes, and they form the main production center of vegetables in Central Java. Smallholder farmers produce many kinds of (leafy) vegetables in intercropping farming systems. Most farmers sell their vegetables in traditional markets, which implies selling directly to a trader or selling in the local wholesale market. Some farmers have a contract with a PO or with a specialized wholesaler that is supplying the modern retail in the main cities of Central Java, such as Semarang, Yogyakarta, Surakarta, and Salatiga.

3.2.3 Producer Organisations (POs)

Many smallholder farmers in Indonesia are members of informal organizations called farmer groups (Bourgeois et al., 2003, Simmons et al., 2005). Basically, these community-type of POs cover a limited geographical area and aim to improve community living standards. Within these POs, members share knowledge, information, and technical assistance from agricultural extension. In addition, they receive government subsidies and organize social events.

Vegetable supply chains for modern retail involve a different type of farmer group, the marketing PO. The marketing PO organizes economic activities for its members, such as collecting, sorting, packaging, labelling, and delivering vegetables. By contrast, the community PO has no marketing activities. Some POs have transformed from community PO to marketing PO, now organizing collective marketing and supplying vegetables to the modern retail.

3.3. Methods

3.3.1. Survey and experimental design

Before employing the CE, we selected contract attributes and attribute levels based on the contracts currently used in modern and traditional markets. First, we interviewed key informants (leaders of POs, purchasing managers of supermarkets, and traders in

the village) to identify the actual contract attributes and attribute levels in modern and traditional markets. Second, we conducted focus group discussions with POs to find the attributes that are most important to farmers (Table 3.1). We tested whether each attribute level influences farmer preferences.

The first attribute is the price received by farmers when selling the vegetable (broccoli), per kilogram in Indonesian rupiah (Rp). We used six attribute levels, ranging from Rp6,000/kg, the average price[9] in the traditional market during the survey (base scenario), to Rp16,000/kg, which represents the highest price when contracting to modern retail. We expected the price to be positively related to the farmer's preference for contracting. The second attribute is the payment method, with four attribute levels ranging from immediate payment to 3 weeks delayed payment. Delayed payment relates to higher uncertainty; thus, we expected a negative preference for delayed payment. The third attribute relates to product quality, with four attribute levels on postharvest handling by farmers. The handling includes sorting, washing, packaging, and organic labelling. As postharvest handling is costly for farmers, we expected that these attribute levels lead to lower preferences of farmers for contracting. The fourth attribute is the selling place. Selling place relates to transportation costs. Hence, we expected that the farmers prefer to sell at the farm gate rather than at the buyer's place. The fifth attribute is the quantity arrangement, with two levels: flexible and fixed quantity. The fixed quantity demanded by supermarkets requires the farmers to carefully plan the production, harvesting, and delivery process. We expected that the farmers prefer selling with flexible quantity rather than fixed quantity.

The full factorial design to generate choice sets is very large, with 576 (6 × 42 × 3 × 2) possible combinations. To minimize this large number, we employed D-efficiency design, which accounts for possible correlation among the attributes and statistical efficiency, while still capable of estimating significant parameters (Scarpa and Rose, 2008). SAS software was used to create the D-efficiency design, which resulted in 24 choice sets in four blocks (D-error 0.0692). Thus, every respondent was randomly offered six choice cards. Each choice card consisted of three alternative contract options (A, B, and C). Contract C was the no-contract option, representing the sales arrangement in the traditional market and acting as a base reference in the model. In the survey, we used pictures in the choice cards to make it easy for respondents to understand the different alternatives (Figure 3.1).

9 We use average price as the base option. We think that farmers are more likely to compare the contract price with the average market price than with the lowest market price (as the latter can be determined by many nonstructural variables, including moment of sales, the appearance and freshness of the product, the seller–buyer relationship, and the type of packaging).

Table 3.1. Attributes and attribute levels used in the choice experiment

Contract attributes	Definition	Attribute levels	Coding	Expected signed
Price	Selling price of broccoli (Rp/Kg)	6.000[a], 8.000, 10.000, 12.000, 14.000, 16.000/kg (Rp)	Actual value	+
Payment	Length of delayed paymentafter delivery (weeks)	0 (immediate payment after delivery)[a], 1, 2, 3 weeks delayed payment	Actual value	-
Quality	Vegetables post-harvest handling by farmers	Handling1 (no further handling)[a]	Base reference	Base reference
		Handling2 (sorting)	Dummy variable	-
		Handling3 (sorting, washing, and packaging)	Dummy variable	-
		Handling4 (sorting, washing, packaging, and organic labelling)	Dummy variable	-
Selling place	Place of selling between farmer and buyer	Place1 (at the farm gate)[a]	Base reference	Base reference
		Place2 (in the near market)	Dummy variable	-
		Place3 (in the buyer's place)	Dummy variable	-
Quantity	Quantity delivered to the buyer	Quantity1 (flexible quantity/in_ any quantity)[a]	Base reference	Base reference
		Quantity2 (fixed quantity/ certain quantity)	Dummy variable	-

Note: [a] situation in the traditional market (base references)

3.3.2. CE and econometric approach

The CE method is based on consumer theory (Lancaster, 1966) and random utility maximization (RUM) theory (Mcfadden, 1974). Consumer theory postulates that consumer utility is derived from the bundle of attributes of a good rather than the good itself. Consumers choose a good based on the utility of the individual attributes instead of the good as a whole. By applying this theory in our study, we assume that farmer utility of the contract depends on the utility derived from a set of contract attributes. To measure this utility, CE is linked to RUM theory that provides an explanation for the choice behaviour (Louviere et al., 2010). In RUM theory, utility is constructed on the basis of latent variables comprising of deterministic (observable) factors and stochastic (unobservable) factors, which is specified as follows (Train, 2009):

$$U_{nsj} = V_{nsj} + \varepsilon_{nsj} = \left(X_j + Z_n\right) + \varepsilon_{nsj} \quad (1)$$

where U_{nsj} is the utility of an individual farmer n from selecting an alternative contract j from the choice set s ($s \in S$); S is a set of choice sets. V_{nsj} are the observed factors of utility, whereas ε_{nsj} is the distributed error term that reflects the unobservable factors. In

our study, the observable factors can be further decomposed into a vector of contract attributes (X) and a vector of farmer characteristics (Z) in each individual farmer n that determine preferences. Because the unobserved factor (ε_{nsj}) is a random component that varies across individual farmers and across alternatives, the farmer's utility cannot be observed with certainty. Thus, the outcome is predicted in the probability of choice (Bateman et al., 2002). Assuming that the farmer acts rationally, she maximizes utility, by choosing an alternative contract j over k, if $U_{nsj} > U_{nsk}$, so the probability of farmer n choosing the alternative contract j can be written as (Louviere et al., 2010)

$$P_n(j) = P(V_{nsj} + \varepsilon_{nsj} > V_{nsk} + \varepsilon_{nsk}); \forall \text{ j, k} \in \text{S; j} \neq \text{k} \quad (2)$$

The probability can be translated into a various random utility model which depends on the assumptions of the underlying distribution of the stochastic term ε and on the specification of the utility function. In this study, we use a random parameter logit (RPL) model, which accounts for a random variation by taking unobservable preference heterogeneity among farmers and allowing correlations among unobservable utility (Train, 2009). Unlike other random utility models, such as multinomial and conditional logit with assumptions of independence of irrelevant alternatives (IIA), the RPL model relaxes the IIA assumption (Train, 2009). The RPL probability of choosing alternative contract j in a choice set s (Pnsj) is expressed as follows (Train, 2009):

$$P_{nsj} = \int \left(\frac{\exp(\beta' V_{nsj})}{\sum_{j=1}^{J} \exp(\beta' V_{nsj})} \right) f(\beta) d\beta, \quad (3)$$

where $f(\beta)$ is a density function for the random parameter β.

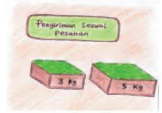
"Imagine a buyer offers different contract options to supply vegetables. Which one of the following contract options do you prefer the most?			
Contract attribute	Options A	Options B	Options C
Price of broccoli	 Rp12,000/kg	 Rp10,000/kg	 Rp6,000/kg
Payment	Payment delayed for one week 	Payment delayed for two weeks 	Payment immediately 
Quality (Post-harvest handling)	Sorting, washing, packaging and organic labelling 	Sorting and putting in common crates 	Fresh from field (no handling) 
Selling place	Farm gate 	Buyer's place 	Farm gate 
Quantity delivered	Fixed quantity 	Flexible quantity 	Flexible quantity 
Your choice	☐	☐	☐

Figure 3.1 An example of a choice card

We apply utility functions that include the alternative specific constant (ASC) and the contract attribute levels as explanatory variables. The utility function can be expressed as generalized regression function as follows:

$$Y_{nsj} = \alpha_n ASC + \beta_n' X_{nsj} + \varepsilon_{nsj}, \quad (4)$$

where Y is a binary decision, with code 1 if farmer n selects the alternative contract j from the choice set s. X is the configuration of contract attributes including price, delayed payment, postharvest handling, selling place, and quantity. β is the coefficient vector of preferred contract attributes. If β has a positive value, it indicates that the farmer prefers a higher level than the base reference level. The model includes the ASC to measure the

utility of the base alternative of no-contract in the choice set. ASC reflects the general preference toward a contract and measures the difference in utility for each alternative contract to the base alternative of no-contract (Hensher et al., 2005). The ASC is a dummy variable coding 1 if the no-contract alternative was chosen, and 0 otherwise. A positive coefficient of α indicates a positive utility toward the no-contract in general. All parameters of contract attributes X and ASC except the price attribute are specified as random and normally distributed. We assume preference heterogeneity across the respondents, while for price, the attribute is specified as a fixed coefficient, assuming that all farmers prefer higher prices.

In a further model specification, we add the interaction term between ASC and farmer characteristics (Zn) to investigate the factors that influence whether farmers accept the contract. The estimation of the model is shown in the following equation:

$$Y_{nsj} = \alpha_n ASC + \beta'_n X_{nsj} + \gamma'_n (ASC \; x \; Z_n) + \varepsilon_{nsj}, \quad (5)$$

where Z is a vector of farmer characteristics including age, education, risk orientation, organic certification, and relationship characteristics between farmer and PO. A negative value of coefficient γ indicates a higher probability of the farmer to choose one of the contract options A or B. In addition, we also tested interaction terms between attribute levels and farmer characteristics to examine farmers' preference toward specific contract attributes. The specification of the model is as follows:

$$Y_{nsj} = \alpha_n ASC + \beta'_n X_{nsj} + \gamma'_n (X_{nsj} x \; Z_n) + \varepsilon_{nsj}, \quad (6)$$

We also calculate the marginal value of the WTA the contract, which is measured by dividing the non-monetary attributes coefficient (β_{nm}) by the coefficient of monetary contract attributes (βm) (Equation 7). The latter is the price premium offered in the modern retail market. The WTA indicates the compensation a farmer wants to receive for accepting a change in the level of a contract attribute. The value of the WTA is expressed in the number of rupiah for a unit increase in the attribute level. A higher marginal value of the WTA means a higher compensation demanded by farmers to accept the contract. The estimation of the WTA assumes utility maximization:

$$\text{WTA} = - \beta_{nm} / \beta_m \quad (7)$$

3.3.3. Sample selection and data collection

We used a multistage sampling strategy to select the respondents for our study. In the first stage, we interviewed modern retail companies to obtain the names of their suppliers. For the second stage, our plan was to select a sample of suppliers randomly from the list of all

suppliers. However, several suppliers did not want to collaborate. Therefore, we switched to a convenience sampling method, choosing four wholesalers and two POs that were willing to provide the necessary information (such as a list of the supplying farmers). In the third stage, we used the information provided by the suppliers on the names and locations of the farmers that supply vegetables to them. We included in our sample all the farmers that sell in the modern retail channel (MM farmers). This subsample consisted of 128 farmers. For selecting the farmers selling in the traditional market (TM farmers), we used convenience and proportional sampling. Because there is no list of farmers with their products and market channels, we had to rely on asking around in the villages. In each of the seven villages in which we carried out our research, we selected 30 TM farmers that were comparable (in farm size and type of products) with the MM farmers in that same village.

Table 3.2. Comparison descriptive statistic between our sample and previous studies

Variables	Definition of variable	Our Sample	Previous studies	BPS
Socioeconomic characteristics:				
Age (years)	Age of household head	43.00	45.21	n/a
Education (years)	Household head spent on formal education	7.48	6.00	n/a
Family size (people)	Number of family members in a household	4.05	4.12	3.72
Farming experiences (years)	Household head's experience in in farming	27.96	27.0	n/a
Off-farm occupation (dummy)	Household head has off-farm occupation as side-job	0.22	0.35	n/a
On-farm income (million Rp)	Vegetables gross income per year	118.52	99.50	96.20
Off-farm income (million Rp)	Off-farm income per month	0.65	n/a	n/a
Risk orientation (average)	Likert scale 1-5	3.01	n/a	n/a
Farm characteristics:				
Farm size (ha)	Area cultivated with vegetables	0.30	0.35	0.32
Organic (dummy)	Farm has an organic certification	0.33	n/a	n/a
Greenhouse (dummy)	Farm has a bamboo greenhouse (dummy)	0.14	n/a	n/a
Irrigation (dummy)	Farm has access to irrigation	0.58	n/a	n/a
Access to credit (dummy)	Farm has access to credit	0.27	0.32	n/a
Relationship between farmer and PO:				
Membership relationship in a PO (dummy)	Membership relationship without any marketing transaction in the PO (community PO)	0.37	0.64	
Marketing relationship in a PO (dummy)	Farmers has marketing transaction in the PO (Marketing PO)	0.32		

Note: n/a, not available.
Abbreviations: PO, producer organization; Rp, Indonesian rupiah.

Although our sampling strategy has its limitations, the procedure is not uncommon in CE studies (Dellaert et al., 1999, Permadi et al., 2017). We have compared the characteristics of our sample with data from previous studies on vegetable farmers in Central Java (Fachrista et al., 2019, Hastuti, 2008) as well as with agricultural census data from the Central Bureau of Statistics of the Province of Central Java (Bps, 2018). The comparison (see Table 3.2) gives us sufficient confidence to conclude that our sample is representative.

Data were collected from March to May 2018 through face-to-face interviews using national and local languages. We trained four enumerators to interview the respondents. The questionnaire not only asked farmers' preferences as to contract choice, but also generated data on their socioeconomic characteristics, on CFAs, market channels, and their risk orientation. We asked the respondents to rate statements on risk orientation using a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). The questions on risk orientation are listed in Appendix A Cronbach's - test was performed on those questions. The result, 0.6, indicated that the questions were reliable.

3.4. Results and Discussion

3.4.1. Descriptive statistics

Table 3.3 shows descriptive statistics of the surveyed farmers and compares modern and traditional marketing channels. It shows that most farmers are smallholder farmers with an average area of vegetables of 0.3 ha. The main occupation of the household head is farming, while 22% also has off-farm occupation. Most farmers sell the vegetables in traditional channels to middlemen, wholesalers, and traditional retailers. Several farmers also sell in modern market channels to POs or specialised supermarket wholesalers. Modern market (MM) farmers sell on average 47% of their vegetable production in the modern channel. Issues of food safety and sustainable agriculture, as well as the rising demand for organic products, are drivers for farmers to adopt organic farming. About 33% of all farmers and 65% of MM farmers have an organic certificate. Regarding the relationship between farmer and PO, 37% of all farmers is a member of a PO that is not involved in any marketing transaction. Most of these farmers are traditional market (TM) farmers. Thirty-two percent of the farmers have a marketing relation with their PO, and most of these are MM farmers. Regarding risk orientation, respondents are on average risk-neutral. However, statistically, the MM farmers have a higher risk acceptance level than TM farmers. By using a t-test for continuous variables and a -2 test for dummy variables, the main statistically significant differences between MM farmers and TM farmers are in education level, on-farm income, risk orientation, having an organic certification, having a bamboo greenhouse, and being a member of a PO.

Table 3.3. Descriptive statistics of farm-households in the sample

Variable	Definition of variable	Full sample	Traditional Market (TM)	Modern Market (MM)	Difference
Socioeconomic characteristics:					
Age (years)	Age of household head	43.00 (12.04)	42.37 (12.79)	43.47 (11.47)	1.1
Education (years)	Household head spent on formal education	7.48 (3.20)	6.69 (3.16)	8.54 (2.95)	1.85***
Family size (people)	Number of family members in a household	4.05 (1.26)	4.01 (1.20)	4.08 (1.31)	0.07
Farming experiences (years)	Household head's experience in farming	27.96 (12.65)	26.95 (12.79)	28.72 (12.53)	1.77
Off-farm occupation (dummy)	Household head has off-farm occupation as side-job	0.22 (0.42)	0.25 (0.43)	0.22 (0.41)	-0.03
On-farm income (million Rp)	Vegetables gross income per year	118.52 (81.19)	111.42 (69.25)	128.12 (94.42)	16.7**
Off-farm income (million Rp)	Off-farm income per month	0.65 (1.76)	0.57 (1.4)	0.70 (1.9)	0.13
Risk orientation (average)	Likert scale 1-5	3.01 (0.78)	2.82 (0.73)	3.26 (0.78)	0.44**
Farm characteristics:					
Farm size (ha)	Area cultivated with vegetables	0.3 (0.29)	0.29 (0.29)	0.32 (0.28)	-0.03
Organic (dummy)	Farm has an organic certification	0.33 (0.47)	0.10 (0.29)	0.64 (0.48)	-0.54***
Greenhouse (dummy)	Farm has a bamboo greenhouse (dummy)	0.14 (0.35)	0.09 (0.29)	0.20 (0.40)	-0.11*
Irrigation (dummy)	Farm has access to irrigation	0.58 (0.49)	0.61 (0.48)	0.54 (0.49)	0.07
Access to credit (dummy)	Farm has access to credit	0.27 (0.44)	0.24 (0.43)	0.30 (0.45)	-0.06
Relationship between farmer and PO:					
Membership relationship in a PO (dummy)	Membership relationship without any marketing transaction in the PO (community PO)	0.37 (0.50)	0.50 (0.50)	0.16 (0.45)	0.34***
Marketing relationship in a PO (dummy)	Farmers has marketing transaction in the PO (Marketing PO)	0.32 (0.31)	0.00 (0.00)	0.75 (0.43)	-0.75***
Observations		301	173	128	

Note: Standard deviations in parentheses.

***, **, * Denote that mean value of traditional market farmers are significantly different from modern market farmers at p<0.01, p<0.05, and p<0.10, respectively.

Table 3.4. Hausman test for independence of irrelevant alternatives (IIA) property

Alternative dropped	Full sample		TM		MM	
	Chi-squared ($\chi 2$)	Significance level	Chi-squared ($\chi 2$)	Significance level	Chi-squared ($\chi 2$)	Significance level
Alternatives A	56.49	$p < .01$	48.22	$p < .01$	18.04	$p < .05$
Alternatives B	30.14	$p < .01$	18.67	$p < .05$	14.34	$p > .1$
Alternatives C (non-contract)	28.75	$p < .01$	18.06	$p < .05$	14.00	$p > .1$

3.4.2 Model fitness and farmers' preferences toward the contract in general

We tested the validity of the model specification, using the Hausman test for the assumption of IIA error term by dropping one alternative consecutively (Table 3.4). The test shows that the IIA assumption is rejected with statistical significance ($p < .01$), indicating that there is significant dependence across alternatives and that a conditional logit estimation would be inappropriate. We used a RPL model because it relaxes the IIA assumption (Train, 2009).

The results of the RPL model estimation with and without interaction is shown in Table 3.5. Overall, the model fit is good as shown by the statistically significant -2 test in all model specifications, implying that the model significantly better predicts farmers' utility on contract attributes than the null model. McFadden's pseudo-R2 falls within the range of 0.2–0.4, indicating the goodness-of-fit of the RPL model (Hensher et al., 2005). The significance of standard deviation estimates in several contract attributes confirms that heterogeneity of farmers' preferences exists in our sample. A likelihood ratio test shows that the parameters are statistically significant between the TM and MM models.

Table 3.5. Estimation of random parameter logit (RPL) models – base specification and factors influencing choice of contract

Variables	Full Sample		TM		MM	
	(1)	(2)	(3)	(4)	(5)	(6)
Mean attributes						
ASC (no-contract)[a]	1.23(0.32)***	2.76(0.79)***	2.06(0.48)***	2.12(0.97)**	-0.73(0.50)	1.48(1.77)
Price (in Rp 000)	0.15(0.02)***	0.15(0.02)***	0.14(0.03)***	0.14(0.03)***	0.18(0.03)***	0.18(0.03)***
Delayed payment	-0.16(0.06)***	-0.15(0.06)**	-0.28(0.11)**	-0.28(0.11)**	-0.14(0.09)	-0.15(0.09)*
Sorting and putting in crates (Handling2)[b]	-0.62(0.20)***	-0.62(0.20)***	-0.69(0.32)**	-0.71(0.33)**	-0.62(0.29)**	-0.59(0.29)**
Sorting and packaging (Handling3)[b]	-0.83(0.21)***	-0.84(0.20)***	-0.98(0.33)***	-0.99(0.33)***	-0.82(0.31)***	-0.82(0.29)***
Sorting, packaging, and organic labelling (Handling4)[b]	-1.17(0.22)***	-1.28(0.24)***	-1.68(0.45)***	-1.62(0.44)***	-1.15(0.30)***	-1.13(0.28)***
Near market (Place2)[c]	-0.10(0.16)	-0.09(0.16)	-0.32(0.26)	-0.46(0.30)	-0.15(0.24)	-0.08(0.23)
Buyer's place (Place3)[c]	-0.33(0.15)**	-0.31(0.16)**	-0.58(0.28)**	-0.63(0.28)**	-0.28(0.22)	-0.27(0.22)
Fixed quantity (Quantity2)[d]	-0.29(0.11)***	-0.29(0.11)***	-0.02(0.17)	-0.04(0.17)	-0.60(0.22)***	-0.59(0.19)***
Heterogeneity around mean (ASC interaction)						
ASC x age		0.02(0.01)		0.01(0.01)		0.02(0.02)
ASC x education		-0.14(0.05)***		-0.09(0.05)*		-0.16(0.09)*
ASC x organic		-2.27(0.44)***		-1.22(0.70)*		-2.68(0.58)***
ASC x risk orientation		-1.27(0.34)***		-1.09(0.49)**		-1.17(0.55)**
ASC x community PO		-0.09(0.34)		0.50(0.36)		0.60(1.08)
ASC x marketing PO		-1.15(0.50)**				-0.24(0.97)
Standard deviation						
ASC	3.46(0.26)***	2.74(0.23)***	2.52(0.27)***	2.39(0.27)***	3.44(0.40)***	3.06(0.39)***
Delayed payment	0.07(0.18)	0.06(0.13)	0.54(0.11)**	0.48(0.15)***	0.05(0.16)**	0.07(0.12)
Handling2	0.51(0.22)**	0.51(0.27)*	0.55(0.36)	0.60(0.42)	0.28(0.41)	0.45(0.35)
Handling3	0.51(0.18)*	0.23(0.38)	0.17(0.34)	0.23(0.36)	0.49(0.35)	0.64(0.42)

Handling4	0.53(0.32)*	0.72(0.37)**	1.13(0.47)**	1.05(0.50)**	0.38(0.45)	0.27(0.48)
Place3	0.17(0.25)	0.18(0.28)	0.44(0.30)	0.61(0.32)*	0.46(0.31)	0.38(0.37)
Quantity2	0.58(0.22)***	0.74(0.19)	0.41(0.29)	0.42(0.32)	0.92(0.34)***	0.88(0.26)***
Summary statistics						
Observations	1806	1806	1038	1038	768	768
Respondents	301	301	173	173	128	128
Log-likelihood (LL)	-1,430.401	-1,355.29	-693.56	-687.93	-674.60	-653.84
Chi-squared (χ^2)	1,107.35***	1,257.59***	893.58***	904.84***	338.25***	379.76***
Pseudo-R^2 (ρ^2)	0.279	0.316	0.391	0.397	0.200	0.225
Info.criterion AIC	2,894.8	2,756.6	1,421.1	1,419.9	1,383.2	1,353.7

Note: Standard error in parentheses.

Abbreviations: AIC, Akaike information criterion; MM, modern market; PO, producer organisation; TM, traditional market.

[a] base alternative is the non-contract options.

[b] base alternative is no further handling (handling 1).

[c] base alternative is in farm gate (place 1).

[d] base alternative is flexible or any quantity (quantity 1).

*p < .10.

**p < .05.

***p< .01.

Table 3.6. Overview of respondents' choices

Alternatives	Full Sample		TM		MM	
	Number of choices	%	Number of choices	%	Number of choices	%
Alternatives A	329	18	114	11	215	28
Alternatives B	358	20	182	18	271	35
Alternatives C (non-contract)	1,119	62	742	71	282	37
Total observations	1,806	100	1,038	100	768	100

Abbreviations: MM, modern market; TM, traditional market.

The RPL model shows that the ASC (non-contract) has a positive and significant sign in the full sample and in the subsample of TM farmers. It indicates that in general, the farmers have a positive preference toward non-contract rather than to contracting with modern retail; in other words, farmers prefer selling in traditional markets than selling under contract in modern retail markets. Not surprisingly, fewer than 50% of the respondents choose contract options A or B (Table 3.6). This result is line with a study on sweet pepper contracts in Thailand (Schipmann and Qaim, 2011) and vegetables contracts in Kenya (Ochieng et al., 2017), whereas it is in contrast to a study for rice contract in Benin (Broeck et al., 2017). The low preference for contracting may be explained by the strict requirements related to payment methods, quality specification, quantity delivered, and selling place. For the MM farmers, who are already participating in modern channels, the ASC coefficient is not statistically significant, and a much higher proportion (63%) chooses a contract option relative to TM farmers.

Among the contract attributes, price is the only attribute with a positive and significant effect in all sub-samples, implying that the likelihood of farmers entering a contract scheme is higher when the price stated in the contract is higher. Previous studies also revealed that price positively affects farmers' preferences (Blandon et al., 2009, Broeck et al., 2017, Ochieng et al., 2017).

As to payment, farmers do not like delays. Delayed payment increases uncertainty, particularly for farmers who do not trust buyers. In this study, farmers preferred immediate payment over delayed payment because they need the money for purchasing inputs for the next production cycle. These findings are in line with other studies on the impact of the payment method. For instance, delays increased the probability of contract breach in China (Cai and Ma, 2015) and negatively affected coordination of vegetables contracts in India (Singh, 2002). Interestingly, for MM farmers, delayed payment is not statistically significant, implying that they are indifferent about delayed or immediate payment.

Regarding the post-harvest handling attributes, all the attribute levels had a negative sign, implying that the farmers dislike postharvest handling activities. The farmers prefer selling the vegetables without any further handling because handling requires effort, time, and investment in equipment. The negative and statistically significant sign is particularly present in the group of TM farmers, while for MM farmers it is statistically significant only for Handling4.

As for the selling place, we found a negative and statistically significant effect for Place3 (the buyer's place). Delivering vegetables to the place of the buyer requires transportation, which is perceived by farmers (particularly TM farmers) as costly. Most farmers prefer the transaction to take place at their farm. Previous studies also revealed a preference for selling at the farm gate compared to selling at the buyer's place (Blandon et al., 2009, Ochieng et al., 2017). The statistically non-significant coefficient for MM farmers indicates that MM farmers do not mind whether the selling place is at the buyer or at the farm.

Contrary to our expectations, the fixed quantity is not statistically significant for the TM sub-sample. This implies that quantity is not an important consideration in their preference for a particular contract. However, for MM farmers the fixed quantity is negative, meaning that the MM farmers prefer flexible quantity. From the focus group discussion with the MM farmers we learned that the quantity ordered by the modern retail was small while it required considerable extra effort in managing the cultivation and harvest activities; MM farmers would like to supply larger quantities to the modern retail.

3.4.3. Factors determining smallholders accepting the contract

Columns 2 ,4, and 6 of Table 3.5 show the interaction of explanatory variables and accepting the contract (Equation 5). Compared to the RPL model without interact, the RPL model with interaction between ASC and farmers' characteristics has a better fit, which is shown in McFadden's pseudo R^2 being somewhat higher and the AIC being lower in all three models. A positive (negative) coefficient of the interaction between ASC and farmers characteristics increases (decreases) the probability to choose the no-contract option. In addition, we also tested the interaction between contract attribute levels and farmer characteristics (Equation 6). The result of the interaction is shown in Table 3.7. A positive interaction indicates a positive preference toward particular contract attribute levels.

Interaction between the ASC and age is not statistically significant in any of the models, implying that age does not influence the preference for accepting the contract. This finding is different from previous studies (Ochieng et al., 2017, Permadi et al., 2017) which found that older farmers are more positive towards contracts than young farmers.

Neither is interaction between age and various contract attribute levels statistically significant, implying that age does not influence the preferences for contract attribute levels.

Table 3.7. Estimation of random parameter logit (RPL) models – interaction between contract attributes and farmer characteristics

	Farmer characteristic variables interacted with contract attribute level					
	Age (1)	**Education (2)**	**Organic (3)**	**Risk (4)**	**Community PO (5)**	**Marketing PO (6)**
Full sample						
Interacted with						
…x delayed payment	-0.00(0.00)	0.04(0.02)**	0.49(0.10)***	0.29(0.11)***	-0.24(0.11)**	0.36(0.10)***
…x handling2	-0.01(0.01)	0.13(0.05)**	1.27(0.35)***	0.83(0.36)**	-0.15(0.34)	0.96(0.36)***
…x handling3	-0.01(0.01)	0.14(0.04)***	0.51(0.15)***	0.84(0.34)**	-0.44(0.31)	0.77(0.31)**
…x handling4	-0.01(0.01)	0.15(0.04)***	0.74(0.11)***	1.25(0.35)***	-1.06(0.32)***	1.91(0.31)***
…x place2	-0.01(0.01)	0.08(0.03)**	1.40(0.27)***	0.20(0.28)	-0.39(0.26)	1.39(0.27)***
TM sample						
Interacted with						
…x delayed payment	-0.00(0.00)	0.00(0.02)	0.55(0.27)***	-0.01(0.12)	-0.15(0.16)	-
…x handling2	-0.022(0.02)	0.05(0.08)	0.85(0.84)	1.47(0.42)***	0.45(0.59)	-
…x handling3	0.00(0.01)	0.09(0.07)	0.33(0.37)	0.98(0.30)***	-0.66(0.45)	-
…x handling4	-0.00(0.02)	0.09(0.06)	0.33(0.25)	1.06(0.30)***	-0.38(0.46)	-
…x place2	-0.01(0.01)	0.03(0.06)	-0.41(0.62)	0.36(0.28)	0.65(0.47)	-
MM sample						
Interacted with						
…x delayed payment	-0.00(0.00)	0.02(0.02)	0.31(0.15)**	0.43(0.10)**	-0.06(0.15)	0.14(0.16)
…x handling2	-0.02(0.01)	0.12(0.07)	0.78(0.48)	0.47(0.33)	0.18(0.50)	0.13(0.51)
…x handling3	-0.02(0.01)	0.10(0.07)	0.10(0.22)	0.53(0.32)	0.61(0.46)	-0.33(0.47)
…x handling4	-0.02(0.01)	0.09(0.07)	0.60(0.16)***	0.65(0.30)**	-0.63(0.49)	1.26(0.53)**
…x place2	-0.00(0.01)	0.06(0.05)	1.21(0.39)**	0.53(0.25)**	-0.31(0.38)	0.50(0.40)

Note: standard errors in parentheses.
Abbreviation: PO, producer organisation
*p < .10.
**p < .05.
***p < .01.

Interaction between ASC and education is negative and statistically significant in all three samples, meaning that education leads to a higher probability of accepting a contract. The interaction between education and contract attribute levels (Table 3.7, column 2) also revealed that more education has a positive association with delayed payment, post-harvest handling, and selling place. More education may lead to better understanding the requirements of modern retail contracts.

Having an organic certification is negative and statistically significant in the three samples, meaning that organic farmers are more likely to choose contract options than non-organic farmers. This could be explained by the specific investments needed for organic production; the contract is then the governance mechanism that provides a safeguard for these investments. Moreover, a contract functions as a coordination tool as it specifies the requirements of the buyer (Goodhue, 2011). Interaction between organic and contract attribute levels in Table 3.7 also confirms that organic farmers have a positive preference toward postharvest vegetable handling, particularly Handling4, that is related to organic certification requirements.

Risk orientation is also negative and statistically significant in all samples, implying that farmers who are willing to accept risk have a higher probability to choose a contract than farmers who are risk-averse. A possible explanation is that only risk-tolerant farmers are likely to accept the challenges related to complying with the quality requirements. This finding is consistent with earlier studies that found that risk tolerance is positively associated with preference for a contract (Fischer and Wollni, 2018, Permadi et al., 2017). Interaction between risk and contract attribute levels in Table 3.7 (column 4) implies that the farmers who are risk-tolerant have a positive preference towards delayed payment and post-harvest handling.

Farmers selling through a PO are more likely to accept a contract. Table 3.5 (column 2, 4 and 6) shows that interaction between ASC and marketing PO is negative and statistically significant in the full sample, meaning that farmers selling through a marketing PO are more likely to choose a contract than farmers who have no relationship with a marketing PO. A marketing PO functions as an intermediary between its members and the modern retail. The PO takes care of packaging the vegetables, acquiring the organic certification, and transporting the vegetables to the buyers. Interaction between marketing PO and contract attribute levels (Table 7, column 6) also confirms that farmers transacting with the PO have a positive preference toward delayed payment and postharvest handling.

In contrast, interaction between ASC and community PO is not significant, implying that membership of a community PO is not associated with contract choice. Moreover, interaction between community PO and contract attribute levels (Table 3.7, column 5) for the full sample reveals negative preference toward delayed payment and Handling4. Being a member without any sales transaction with the PO is not related to smallholders accepting a contract.

3.4.4. Willingness-to-accept the contract

The CE model can also be used to estimate the WTA for different contract attributes. The marginal WTA is calculated as the ratio of the non-monetary attribute coefficient and the price attribute coefficient (Equation 7) and can be expressed as the marginal rate of

substitution between contract attributes and price. A negative value of the WTA coefficient reflects a price premium that is needed to induce farmers to accept a contract attribute. The coefficients are based on the RPL base specification model without interaction between ASC and farmer characteristics (see Equation 4, and columns 1,3, and 5 of Table 3.5). Table 3.8 shows the values of the marginal WTA, expressed as the price premium required for accepting the contract attribute, in Rp per kg. The price of vegetables (broccoli) in the traditional market used in this study was Rp6,000 per kg (in May 2018).

Table 3.8 shows that the highest marginal WTA value is in the contract attribute related to quality requirements (Handling4), meaning that this attribute is the most critical for farmers. In the full sample, the farmers require a price premium of about Rp7,642 to accept Handling4 (i.e., sorting, washing, packaging, and organic labelling). The second most critical contract attribute is Handling3, which the farmers will accept only when the price premium is Rp4,375 for MM farmers and Rp6,946 for TM farmers. The third most critical attributes level is Handling2. According to our analysis, the farmers need a price premium of around 67% (Handling2) to 127% (Handling4) to accept the postharvest handling of vegetables. The high marginal WTA could be explained by the need to invest in equipment for sorting, washing and packaging and for obtaining an organic certificate.

Table 3.8. Marginal WTA estimates for contract attributes (Rp per kg of broccoli)

Attributes	Marginal WTA (95% confidence interval)		
	Full Sample	TM	MM
Delayed payment	-1,077** [-1,069 to -1,084]	-1,988** [-1,833 to -2,144]	-788 [-779 to -797]
Sorting and putting in crates (Handling2)	-4,006*** [-3,923 to -4,088}	-4,733* [-4,609 to -4,857]	-3,469* [-3,419 to -3,520]
Sorting and packaging (Handling3)	-5,448*** [-5,376 to -5,519]	-6,946** [-6,913 to -6,978]	-4,375** [-4,277 to -4,473]
Sorting, packaging, and organic labelling (Handling4)	-7,642*** [-7,567 to -7,717]	-11,933*** [-11,634 to -12,233]	-6,249*** [-6,181 to -6,317]
Near market (Place2)	-613 [-566 to -661]	-2,216 [-2,082 to -2,350]	-839 [-0,595 to -1,084]
Buyer's place (Place3)	-2,164** [-2,138 to -2,189]	-3,930* [-3,825 to -4,036]	-1,598 [-1,488 to -1,709]
Fixed quantity (Quantity2)	-1,964*** [-1,867 to -2,061]	-288 [-205 to -372]	-2,833*** [-2,536 to -3,131]

Notes: Confidence interval (95%) are shown in the brackets; WTA estimates were calculated from random parameter logit model estimates (base specification) using the Delta method.
Abbreviation: MM, modern market; TM, traditional market; Rp, Indonesian rupiah; WTA, willingness-to-accept.
*p < .10.
**p < .05.
***p < .01.

Regarding delivering vegetables to the place of the buyer (Place3), the required price premium is Rp2,164 for the full sample and Rp3,930 for TM farmers. For MM farmers, the coefficient was not statistically significant. The marginal WTA for delayed payment is Rp1,077 for the full sample, which represents the price premium a farmer would like to receive for an additional week delay in payment. The last attribute level is the fixed quantity, where the full sample farmers require Rp1,964 and the MM farmers require Rp2,833 in price premium before accepting this contract attribute.

3.4.5. Contract design scenario and choice probabilities

Contract attributes influence the utility of smallholders. If the contract is accurately designed, the chances of smallholders accepting the contract will increase. Table 3.9 provides the probability of smallholders in choosing contract options for various scenarios of contract designs. We propose contract designs Contract1 to Contract5 based on various combinations of attributes levels and price increase. According to our model, the probability of choosing the contract over non-contract in the design of Contract1 (Immediate payment, Handling2, Place1, and Quantity1) is 51% for full sample, 41% for TM farmers, and 72% for MM farmers. Among all contract designs, Contract1 is the minimum in terms of requirements and farmers effort to comply. When changing the attribute levels to an additional week of delayed payment and to Quantity2 (Contract2), the probability of farmers choosing this contract decreases to 47% for the full sample. In Contract3 (3 weeks of delayed payment, Handling4, Place3, and Quantity2), reflecting high-quality and large farmer efforts, the probability of choosing the contract decreases to 41%, 29%, and 69%, respectively. In the designs of Contract4 and Contract5 we increased the price by 20%. Although in both designs, attribute levels consist of various combinations of high requirements and farmer effort, when compared to Contract1, 2, and 3, higher prices increase the probability of choosing these contracts.

The contract design scenario leads to the following summarizing observations. First, the probability of farmers choosing a contract option is relatively higher (above 50%) for MM farmers than for TM farmers, for all contract designs. Second, a contract design with low transportation costs, low payment risk, selling at farm place, and flexible quantity increases the probability of farmers choosing the contract. Third, providing incentives is the best strategy for buyers to induce farmers to accept contracts.

Table 3.9. Probability of smallholders choosing the contract options in different contract designs over no-contract

Scenarios of contract design	Probability to choose the contract[a] (%)		
	Full sample	TM	MM
Contract1[b] (Payment immediately, handling2, place1, and quantity1)	51	41	72
Contract2[b] (Delayed payment one week, handling2, place1, and quantity2)	47	37	65
Contract3[b] (Delayed payment three weeks, handling4, place3, and quantity2)	41	29	60
Contract4 (Delayed payment one week, handling3, place2, quantity1, and increase price 20%)	53	40	74
Contract5 (Delayed payment three weeks, handling2, place3, quantity2, and increase price 20%)	48	36	67

Abbreviations: MM, modern market; TM, traditional market.
[a]The probability is measured based on the base specification RPL model.
[b]The price attribute is constant.

3.5. Conclusion and Implications

Different contract attributes imply trade-offs for farmers. Our study assesses how different contract designs may influence smallholders' preferences for accepting a contract with modern retail in Central Java, Indonesia. We assess utility of smallholder farmers by means of a discrete choice model. According to the estimations of the RPL model, heterogeneity of preferences for contract attributes is present. In general, farmers are more likely to choose the non-contract option, which is selling in traditional markets, than a contract. Most farmers had a negative preference for most contract attributes except for a higher price. This finding is consistent with previous studies by Ochieng et al. (2017) and Schipmann and Qaim (2011), but it is in contrast with the findings by Broeck et al. (2017). Our study focussed on domestic fresh produce supply chains, while most research on contracting deals with export supply chains or the supply of commodities to the processing industry. Contracting for export or for the processing industry has a longer tradition than contracting for domestic retail markets. Given the importance of contracting in export and processing markets, buyers are more likely to provide sufficient price incentives and risk mitigation to farmers. In our study on contracts for the supply of vegetables to domestic supermarkets, price incentives seem too low to induce most smallholder farmers as requiring additional investments and effort to comply with quality, high transportation cost, and greater risk than transactions in the traditional market. Analysing the marginal WTA the contract also confirmed that farmers require substantial price premiums to accept the contract. The highest WTA value was found for post-harvest handling, implying that farmers are very critical about complying with quality requirements.

Farmers characteristics like level of education, risk orientation, engaging in organic farming, and the type of relationship with a PO, all associate with the probability of choosing a contract. Regarding risk attitude, this study adds to the literature that risk tolerance is positively associated with the preferences of smallholders to choose a contract. Farmers who invest in organic farming are more likely to opt for contracts with modern retail than non-organic farmers, as the contract can be a safeguard for the investments in organic farming. Regarding membership of a particular type of PO, our study confirms that farmers maintaining transactions with a marketing PO have a higher probability for accepting the contract, as the marketing PO reduces the costs of transacting in modern retail channels.

Several managerial implications can be derived from our results. First, to attract and increase smallholder participation in CFAs, farmer preferences need to be considered when designing the contract. Specialised wholesalers and modern retail companies need to offer a price that solves the participation constraint for farmers. The analysis of the contract design scenarios (Table 3.9) showed that a contract offering a high price premium in combination with quality requirements can increase the probability of accepting a contract. Many farmers in the sample had negative perceptions of the contract attributes due to a lack of risk-sharing in the contracts currently used in modern retail channels. Therefore, reduction of transaction costs should be considered in contract design. In addition, buyers can build trust, maintain a good reputation, and offer transparent contracts, particularly with TM farmers who have no experience with contracts.

Behavioural preferences for choosing a contract can be predicted by farmers' characteristics such as level of education, risk orientation, having an organic certification, and PO membership. Using this information, buyers can create segmentation of their suppliers. Farmers with high education, risk tolerance, having an organic certification, and being members of a marketing PO are more likely to accept a contract. Furthermore, policy interventions aimed at increasing farmers' education, promoting organic farming, and strengthening POs may have a positive impact on linking smallholder farmers to modern retail. Since we found that farmers selling through a marketing POs are more likely to prefer contracting, building partnerships with POs to procure vegetables could be a good strategy for retailers, as these partnerships will reduce transaction costs. The marketing POs can provide both technical assistance and marketing information to its members; all this can reduce uncertainty and risk for farmers. Mugwagwa et al. (2018), taking a buyer perspective, found that buyers do partner with various types of POs, depending on the type of contract they want to offer to farmers.

The limitation of our study lie in the limitations of the CE method, which allows only a small number of contract attributes to be assessed. In future research, additional contract attributes could be explored, such as provisions of inputs, technical assistance, and credit. As Abebe et al. (2013) have shown, not only the type of services matters but also which actor (buyer, NGO, or state) is providing those services. Another option for future research would be to study contracts for exports and for domestic supermarkets together. Do these different contracts affect each other and if so, what is the interaction? Finally, while our study was concerned with the smallholder perspective, further research could include the buyer perspective, to increase understanding of the preferences of buyers on contract design.

APPENDIX TO CHAPTER 3

Statement to measure risk orientation:

1. If there is a chance of high profit I am willing to take a high risk
2. I feel secure selling my vegetables to the middlemen, even against a low market price
3. I take more risk in farming compared to other farmers
4. In farming, I would prefer planting kinds of vegetables with high profit which could be easily lost to stable return but with lower profit
5. To achieve something in life one has to take risk

(based on (Permadi et al., 2017, Zaleskiewicz, 2001)

4

CHAPTER 4.

Alignment between vertical and horizontal coordination for food quality and safety in Indonesian vegetable chains[12]

[12] This chapter is based on:
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Abstract

This study explores the alignment between vertical coordination (VC) and horizontal coordination (HC) in Indonesian vegetable value chains. This alignment helps buyers to design efficient coordination mechanisms with regard to the production of safe and high-quality vegetables. We use a qualitative approach and describe five vegetable value chains featuring VC and HC. Within-case and cross-case analyses have been performed to develop propositions. The empirical study finds that there is a diverse combination of VC and HC mechanisms in Indonesian vegetable value chains. Strong VC correlates with high food quality and safety standards that farmers have to meet. The presence of HC through a producer organisation (PO) reduces the need for strict VC mechanisms. When VC is combined with HC through a PO, efficiency of quality and safety control increases and coordination costs decrease, ensuring better compliance with food quality and safety requirements.

Keywords: Value chain, Producer organisation, Vertical coordination, Horizontal coordination, Food quality and safety

4.1. Introduction

The rise of modern retail markets[10] in developing countries has changed the nature of coordination between actors in agri-food chains (Reardon et al., 2009). Vegetable procurement in modern retail markets requires high levels of coordination to deliver vegetables while complying with the requisite quantity and quality standards (Ruben et al., 2007a, Reardon et al., 2012). Moreover, the growing demand for food safety in developing countries implies that food chains are increasingly concerned about food safety requirements (Reardon et al., 2017, Alita et al., 2020). In their vegetable procurement processes, modern retailers often coordinate vertically with suppliers, which include smallholder farmers, often using contracts (Sahara and Gyau, 2014, Michelson et al., 2012, Hueth et al., 1999).

When attempting to enter the modern retail market, smallholders in developing countries are often constrained by quality requirements (Royer et al., 2016, Jaffee and Henson, 2005). However, contract farming arrangements including the provision of financial services, farming inputs, quality control measures, inspections and market information, can improve the quality and safety of farmers' produce (Boselie et al., 2003, Key and Runsten, 1999, Dries et al., 2009, Tefera and Bijman, 2021). Alongside vertical coordination (VC) via contracts, other institutional arrangements, such as horizontal coordination (HC) through a producer organisation (PO), can help alleviate the concerns faced by smallholders who attempt to link up with modern food chains. The literature has shown evidence of POs being involved in quality control and providing services aimed at meeting product quality requirements (Kaganzi et al., 2009, Dorward et al., 2004, Moustier et al., 2010, Kirezieva et al., 2016).

Although there is ample literature that explains the role of vertical contracts or the role of POs in the improvement of food quality and safety in modern food chains (Adabe et al., 2019, Saenger et al., 2013, Moustier et al., 2010, Mwambi et al., 2020, Kirezieva et al., 2016), most of these studies analyse these VC and HC roles separately. In practice, however, VC and HC mechanisms are often combined, as POs may act as intermediary actors, providing coordination functions between buyers and the members of the PO (Mugwagwa et al., 2018, Fischer and Qaim, 2012, Jia and Huang, 2011, Widadie et al., 2021). Literature has shown that involving a PO in contract farming strengthens the efficiency and equity of the contracting arrangement (Jia and Huang, 2011, Key and Runsten, 1999). POs and contract farming may complement each other to overcome constraints relating to product quality. However, empirical studies that examine how VC (through contract farming) and HC (through a PO) combine to address quality and safety constraints faced by smallholders in value chains are lacking. Understanding how VC

10 Modern retail markets include hypermarkets, supermarkets, and convenience stores.

and HC mechanisms in value chains align may be extremely useful for planning effective coordination among actors and for lowering costs associated with such coordination. To fill this knowledge gap, this study explores how VC (in the form of contracting) and HC (in POs) interact in enhancing food quality and safety performance.

This study may help actors in modern retail chains design more efficient coordination processes concerning quality management. For policy makers, this study may help interventions that aim to improve the quality and safety of vegetables produced by smallholders. This study contributes to the academic literature on value chain coordination and food quality management, particularly how a combination of VC and HC structures can be used to improve food quality and safety performance at the farmer level. The study uses case studies from the Indonesian vegetable sector and modern retail markets. In addition, this study uses a cross-case analysis to compare value chains and develop propositions.

The paper is organised into five distinct sections. Section 4.2 provides background information on vegetable value chains and food quality and safety requirements in Indonesia's modern retail value chains. Section 4.3 presents the theoretical framework and a literature review focussing on VC and HC in value chains and food quality and safety management. Section 4.4 describes the methodology of the empirical study. The results and discussions are presented in Section 4.5, which includes propositions. Section 6 contains conclusion, which includes policy and managerial recommendations, as well as suggestions for future research.

4.2. Background

4.2.1. Indonesian vegetable value chains in the modern retail market

Different types of institutional arrangements, including contracts and POs, exist in modern retail chains in Indonesia. According to our survey, modern retailers in Indonesia have formal vegetable procurement contracts with suppliers, including POs and specialised wholesalers. In these contracts, retailers establish the requirements for quantity, quality and delivery times that suppliers must comply with. These suppliers may then coordinate with other actors in the upstream part of the chain (Figure 4.1).

We distinguish four different value chains. In Chain 1, the modern retailer has a formal contract with a PO that coordinates with its members. In Chain 2, the specialised wholesaler has a formal contract with a modern retailer and a verbal contract with a PO, which then coordinates with its members to meet the contractual requirements. In Chain 3, the specialised wholesaler has verbal contracts with individual farmers and has

a formal contract with a modern retailer. In Chain 4, the modern retailer coordinates with a specialised wholesaler through a formal contract; in the upstream part of this chain, farmers sell their vegetables to a local collector, who sells to a traditional wholesaler who sells to the specialised wholesaler. Overall coordination between farmers and local collectors in chain 4 is weak, with spot market type of transactions. In all four value chains retailers have contracts with their direct suppliers, who coordinate with actors upstream in the value chain.

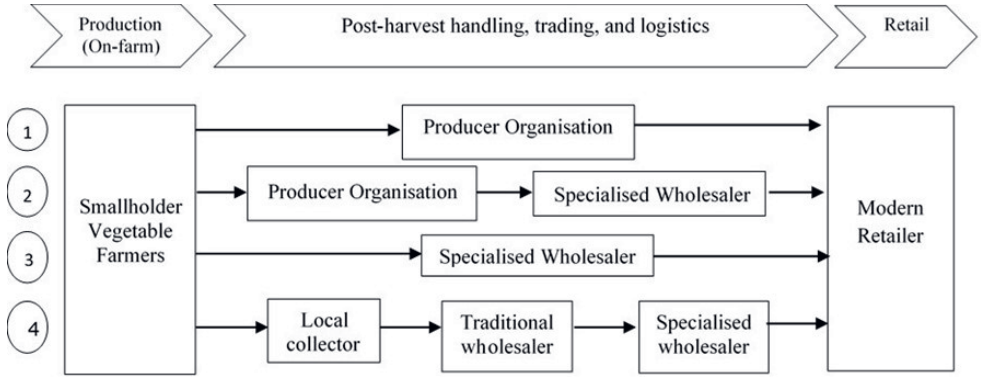


Figure 4.1. Vegetable value chains in Central Java and Yogyakarta Provinces, Indonesia

4.2.2. Food quality and safety (organic) standards

The modern retail market in Indonesia is concerned about food quality and safety (Minot et al., 2015, Slamet et al., 2017, David and Ardiansyah, 2017). To supply vegetables, suppliers have to meet quality and safety requirements determined by retailers. In general, modern retailers use quality standards based on intrinsic and extrinsic quality cues. Intrinsic quality cues relate to the physical properties of a product, such as its appearance, colour, shape and size; extrinsic quality cues relate to the production process (Ophuis and Van Trijp, 1995, Luning and Marcelis, 2007). Through our interviews, we learned that intrinsic vegetable quality is gauged in terms of appearance, colour, shape, and size, while extrinsic vegetables quality is judged in terms of organic production practices. The extrinsic quality is related to the safety of the product, for example, organic vegetables are free from pesticides and synthetic fertiliser residues. The retailers use organic certification as a cue for extrinsic quality (Table 4.1). To guarantee that vegetables have been produced according to organic standards, producers must obtain organic certification from an independent certification institution.

Table 4.1. Intrinsic and extrinsic vegetable quality attributes

Intrinsic	Extrinsic
Appearance Colour Shape Size	Organic production practices (certified)

According to the Indonesian Agriculture Ministry's Regulation No. 64 established in 2013, organic agricultural products sold in Indonesia must meet the standards of the organic certification institutions. Indonesia has nine independent organic certification institutions that have the authority to assess agricultural production on organic practices. The standards for agricultural products in Indonesia are established in Indonesian National Standard (SNI) No. 6729: 2016, which acts as a guide for producers and for the organic certification institutions. According to SNI No. 6729: 2016, organic certification institutions inspect and assess the activities of producers and distributors, including farm inputs, cultivation, harvesting, storage, post-harvest handling and distribution. Producers are assessed through on-site inspections, interviews, the review of documentation and residue analysis. SNI No. 6729: 2016 is based on the minimal use of external input materials and the non-use of synthetic fertilisers and pesticides. Producers that meet organic standards are allowed to use an organic logo when labelling their products. In Indonesia, demand for food safety increases yearly due to the growing awareness of consumers of the importance of safe production and handling of food (David and Ardiansyah, 2017, Minot et al., 2015). Organic certification guarantees that an agricultural product is free from pesticides and synthetic fertiliser residues.

4.3. Conceptual framework and literature review

Coordination is defined as managing interdependencies between activities performed to achieve a goal (Malone and Crowston, 1994). Within a food supply chain, coordination has two key dimensions. The first is vertical coordination (VC), which includes collaboration between the different actors in the chain from the primary producer up to the customers. The second is horizontal coordination (HC), which includes collaboration between actors in the same level of the chain, e.g. farmers collaborating with other farmers (Lazzarini et al., 2001, Lyne and Martin, 2008). Contract farming is a type of VC that consists of a combination of coordination mechanisms between farmers and their buyers (Grandori, 1997, Rehber, 2007).

Previous studies have examined coordination mechanisms to better understand how governance structures work and to elaborate on the forms of governance that feature on the market-hierarchy continuum (Grandori, 1997, Wever, 2012, Martins et al., 2017).

Using the concept of coordination through governance structure, this study examines the VC mechanisms that are present in the relationship between farmers and buyers. The governance structure continuum stretches from spot market to hierarchical relationship. If the governance structure closely resembles a hierarchy, then a high degree of VC is implied.

The presence of POs in contract farming can be beneficial and can help to create more efficient VC mechanisms to comply with food quality and safety requirements (Moustier et al., 2010, Tefera and Bijman, 2021, Mwambi et al., 2020). As POs are organisations that are formed by farmers, their key function is to provide goods and services to their members (Bijman, 2016). Next to providing technical assistance and delivery of farm inputs, other services add value to vegetables through packaging and organic certification. In the context of chain coordination, providing all members of the PO with the same services and inputs is a form of HC.

This study explores the alignment between VC and HC, and how this affects food quality and safety performance. Based on the above-presented literature, we identify the following key concepts: *vertical coordination* mechanisms such as quality arrangements, quality monitoring and resource allocation; *horizontal coordination* via the services provided by POs to improve compliance with quality requirements; and *food quality and safety performance* measured by the intrinsic and extrinsic quality attributes achieved by coordination in the chain. Figure 4.2 illustrates our conceptual framework.

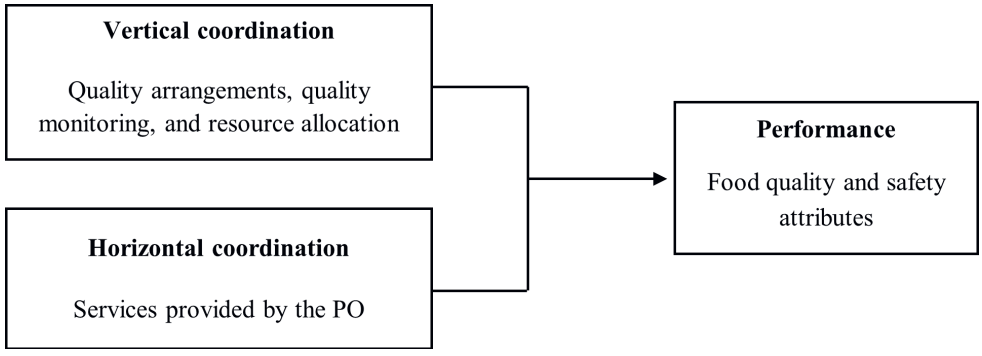


Figure 4.2. Conceptual framework

4.3.1. Governance structures and vertical coordination mechanisms

Transaction cost theory is often used as a fundamental theory to explain firms' and farmers' participation in contract farming. Transaction costs consist of information costs, negotiation costs, and monitoring or enforcement costs (Coase, 1937). By selecting

a suitable governance structure for a particular transaction, transaction costs can be minimised.

Governance structures can be placed on a continuum, ranging from spot market to hierarchy (Williamson, 1991). Between the spot market and hierarchy extremes on the continuum lie various hybrid governance structures. In the spot market, transactions have a low level of coordination and are mainly determined by the price mechanism. In a hierarchical structure, there is a high level of coordination, with a single firm controlling all stages of production and distribution (Peterson, 2001). A hybrid form of governance is an intermediary form of control, where parties are mutually dependent but remain autonomous (Williamson, 1991, Ménard and Klein, 2004). Examples of hybrid forms of governance are contracts, networks, cooperatives, alliances and franchising.

Governance structures combine several coordination mechanisms (Grandori, 1997). Williamson (1991) discussed different governance structures on the market to hierarchy continuum, however without detailing the nature of coordination within these governance structures (Raynaud et al., 2005, Gellynck and Molnár, 2009, Martins et al., 2017, Wever, 2012). Even within one governance structure, different coordination mechanisms, such as agreements on price, quality and quantity may be located at different points on the continuum (Wever, 2012, Martins et al., 2017).

Based on our survey, VC mechanisms designed to address food quality and safety requirements in Indonesian vegetable value chains are depicted along the governance structure continuum (Table 4.2). Coordination mechanisms relating to food quality include quality arrangements, quality monitoring, and the allocation of resources provided by specific buyers.

With regard to spot market governance, there are no specific quality arrangements; buyers do not monitor quality, buyers do not provide support or technical assistance and there is no support regarding farming inputs. With regard to coordination on quality, farmers are free to use their resources independently and to produce vegetables with no specific quality requirements. Transactions between farmers and buyers are generally based on the price mechanism. When we move on to hybrid governance arrangements, which lie between the spot market and the hierarchy, VC becomes stronger. In terms of quality arrangements, buyers establish intrinsic and extrinsic (e.g., organic) requirements that contracted farmers must comply with. The buyer and a third party (an independent organic certification institution) evaluate farmers' quality and safety achievements. In such transactions, the role of the third party is to evaluate whether producers have met the organic standards. Regarding resource allocation, the vertical coordination mechanism consists of buyer support, such as the provision of technical assistance, production

knowledge and farming inputs (seed, fertiliser and pesticide), as well as support for the organic certification process. The highest degree of coordination occurs in the hierarchy governance structure. Here, coordination comes through ownership and farmers become employees in a vertically integrated firm (Gereffi et al., 2005, Peterson, 2001). In a pure form of hierarchy governance, firms control all decisions regarding quality and resource allocation.

Table 4.2. Vertical coordination mechanisms regarding quality and resource allocation on the governance structure continuum

Vertical coordination mechanism	*Variables*	Spot Market	<----------> Hybrid		Hierarchy
Quality	*Quality arrangements*	No specific quality arrangements	Intrinsic quality arrangements	Intrinsic and extrinsic (organic safety) quality arrangements	Internal quality
	Quality monitoring	No monitoring of production	Monitoring by the transaction party (buyer)	Monitoring by the transaction party and a third party	Internal monitoring
Resource allocation	*Buyer support: technical assistance*	No buyer support regarding technical assistance and production knowledge	Buyer provides technical assistance and production knowledge in line with supplier requests	Buyer provides technical assistance and production knowledge	Internal technical assistance and production knowledge
	Buyer support: farming inputs	No farming inputs provided or approved	Farmers use farming inputs approved by the buyer	Farming inputs are allocated by the buyer	Farming inputs are used internally
	Buyer support: organic certification	No support	Buyer supports the process of organic certification and pays all expenses	Buyer supports the process of organic certification by paying expenses and applying to a third party	Internal support for organic certification

Source: Elaborated from Martins et al. (2017){Martins, 2017 #1533@@author-year;Martins, 2017 #1533@@author-year}

4.3.2. Producer organisations and food quality

The key function of a PO is to provide services and goods to its members (Bijman, 2016). A PO supports quality and safety improvements and compliance with quality requirements. For instance, the services provided can support on-farm activities, e.g., by providing farming inputs or technical assistance, or can support vegetable sales by sorting, packaging, marketing, storage, delivery and organic certification. Farmers coordinate horizontally with other farmers to examine and meet food quality and safety requirements. The literature shows that the activities of POs and the services that they offer to members influence food quality and safety. For example, POs monitor their members' compliance with food safety requirements (Hueth et al., 1999) and they provide training and technical assistance to enhance food safety (Naziri et al., 2014, Lindahl et al., 2018). Value chain coordination, monitoring and technical advice provided by the PO supports members to adopt food safety measures (Mwambi et al., 2020).

4.4. Research methodology

We conducted this research on the slopes of Mount Merbabu and Mount Merapi in Central Java and Yogyakarta Provinces because these areas are large centres of vegetable production and they supply vegetables to modern retailers. To achieve our aims, a qualitative case study was conducted, as this was an appropriate way to obtain detailed information about the processes and actors (Yin, 2003). Semi-structured interviews were conducted with chain actors and actors from the institutional environment (see Table 4.3). Interviewees were selected through a multistage sampling strategy. In the first stage, we interviewed the modern retailers to obtain the information about the suppliers of vegetables and mechanisms to supply the vegetables. In the second stage, based on the information received from the retailers, we selected the suppliers of vegetables (the specialised wholesalers). In the third stage, using the information provided by the specialised wholesalers, we selected the farmers who supplied the vegetables to the modern retailers. Snowball and convenience sampling method were conducted until the saturation point, that is, until we did not find any other VC and HC mechanisms. Five value chains were selected based on the VC mechanisms, the role of POs in the value chains and the food quality and safety performance in the value chain.

The interviews focused on quality arrangements, monitoring, resource allocation, and organic certification. For POs, the interviews focused on the services provided by the PO, including meeting food quality and safety requirements and making improvements. In this study, food quality and safety performance were measured by the intrinsic and extrinsic attributes of vegetables produced by farmers. To analyse the interviews, we performed a within-case analysis (to describe each value chain) and a cross-case analysis (to explore differences in VC mechanisms, POs, and food quality and safety performance).

Table 4.3. Overview of interviewees

Type of organisation	n	Interviewees' function	States
Farm	13	Individual farmers selling to rural collectors (4), farmers contracted to specialised wholesalers (5), farmers contracted through a PO (4)	Magelang, Yogyakarta and Semarang
Producer organisation (PO1 and PO2)	4	Leaders (2), secretaries (2)	Boyolali, Semarang and Magelang
Specialised wholesaler (Wholesaler 1, 2, 3, 4)	4	Owners (4)	Yogyakarta and Magelang
Modern retailer (Retailer1 and Retailer2)	2	Purchasing staff members (2)	Yogyakarta and Surakarta
Institutional environment	2	OKKPD (local government) and Persada (an organic certification institution)	Semarang and Yogyakarta

Otoritas Kompeten Keamanan Pangan Daerah (OKKPD) translates as the Regional Food Safety Competent Authority. It is an institution within the Agriculture Department and Food Security Agency in Central Java, and is tasked with ensuring food safety and the quality of fresh food of plant origin.

4.5. Results and Discussions

The results and discussions of this study are presented in the within-case and cross-case analyses. In the within-case analysis (section 5.1.), five value chain cases are identified and described. In the cross-case analysis (section 5.2.), the results highlight the different levels of VC and HC (involving POs) in the five cases and their different quality and safety achievements.

4.5.1. Within-case analysis

4.5.1.1. Case A

Spot market transactions are present when farmers sell vegetables to rural collectors (see Box 1). In the spot market, the level of coordination between farmers and rural collectors is low, and coordination is primarily based on the price mechanism. Rural collectors do not have specific requirements regarding either intrinsic or extrinsic quality. *The farmer stated: 'I, along with most of the farmers nearby, sell the vegetable to the rural collectors who come to our house and field at harvest time to buy vegetables. These rural collectors are willing to buy and accept all the vegetables produced without any specific grading and quality'.* Due to the absence of quality standards in this chain, rural collectors do not carry out quality monitoring activities and do not provide any resources to the farmers. Therefore, vegetables traded in this transactional context do not meet any quality or safety standards.

Box 1. Case A

Vertical coordination

Farmers sell vegetables to rural collectors based near their homes and fields. There are no quality specification agreements. The farmers sell unsorted vegetables of heterogenous quality to the rural collectors. The rural collectors do not monitor quality or sort vegetables based on a specific quality standard. Rural collectors accept vegetables of any quality and then sell them to traditional (wet) markets. In addition, rural collectors do not allocate resources, such as farming inputs or technical assistance, that could help farmers address quality concerns.

Horizontal coordination

No PO is involved in this chain.

Quality performance

The vegetables produced are heterogenous and do not meet any specific quality requirements, either intrinsic or extrinsic (organic).

4.5.1.2. Case B

In Case B, the buyer (specialised wholesaler 1) has contracts with individual farmers to supply vegetables to modern retail markets (see Box 2). The specialised wholesaler sets specific requirements regarding the intrinsic quality of vegetables that the contracted farmers must comply with. Wholesaler 1 stated: *'Farmers have understood the quality of products that should be sold to us and to the traditional markets. For us, they select and deliver the vegetables having good quality. We accept the vegetables with the good quality*

and share the quality requirements with our farmers'. Wholesaler 1 monitors quality by sorting the vegetables that have been delivered by the contracted farmers. Wholesaler 1 stated: *'Before we pack and deliver vegetables to the supermarkets, we sort them by selecting the ones that fulfil our standards in term of appearance, size, shape, and colour; like the supermarkets' quality requirements".* Wholesaler 1 does not provide any farming inputs, technical assistance, knowledge or organic certification assistance. In this chain, the producer meets the intrinsic quality requirements set by the wholesaler.

4.5.1.3. Case C

In Case C, the specialised wholesaler 2 defines intrinsic quality requirements in the contract, which PO1 must comply with (see Box 3). PO1 coordinates the activities of its members for meeting the quality requirements. PO1 stated: *'For enhancing quality, we share pertinent information and provide technical assistance to our members. We share knowledge among our members that can also be received from an agricultural extension. We share the quality requirements from wholesaler 2 and arrange the logistics and procurement process to deliver the vegetables to wholesaler 2'.* Before delivering vegetables to the wholesaler 2, PO1 sorts the vegetables and selects produce that meets the intrinsic quality requirements. The wholesaler also carries out sorting activities, and monitors quality to ensure that the vegetables meet the intrinsic quality requirements before delivering them to modern retailers. Wholesaler 2 stated: *"We inform PO1 about the quality specification that we want as per the requirements of supermarkets. We want good quality with grade A. We sort and monitor these vegetables and check whether they fulfil our specifications or not. Generally, we seek good appearance, fresh colour, specific size, and shape. We then pack these vegetables in our warehouse'.*

Box 2. Case B

Vertical coordination

Specialised wholesaler 1 has contractual arrangements with local individual farmers regarding the supply of vegetables to modern retailers. In terms of contractual arrangements, wholesaler 1 sets out intrinsic quality product specifications. Farmers should meet the intrinsic quality requirements regarding size, appearance, colour and shape. Quality monitoring is carried out by wholesaler 1, as it sorts vegetables before delivering them to the modern retailers. Wholesaler 1 offers no technical assistance or farming inputs to contracted farmers to help them achieve quality standards.

Horizontal coordination

No PO is involved in this chain.

Quality performance

Vegetables delivered to wholesaler 1 by the farmers meet intrinsic quality requirements.

Box 3. Case C

Vertical coordination
Specialised wholesaler 2 has a contract with a PO1 regarding the supply of vegetables to modern retail markets. Wholesaler 2 sets the intrinsic quality requirements that PO1 must comply with. To achieve the quality standards, wholesaler 2 uses sorting to monitor vegetables on the basis of intrinsic requirements, such as appearance, size, colour and shape. Wholesaler 2 provides no support to PO1 in terms of farming inputs, knowledge or technical assistance.

Horizontal coordination
The PO1 provides services to its members by sharing knowledge and providing technical assistance regarding production. In addition, PO1 holds regular meetings with its members to share information about quality requirements and to arrange logistics and procurement processes that will help contractual requirements to be met.

Quality performance
Vegetables produced by smallholders meet intrinsic quality requirements.

4.5.1.4. Case D

In Case D, the buyer (a specialised wholesaler 3) has a contract with a PO2, rather than with individual farmers, regarding the supply of vegetables (see Box 4). Wholesaler 3 stated: *'We have a partnership with PO2 to deliver the organic vegetables to the supermarkets in Semarang. Our partner, PO2, has the capability to meet our quality specification and produce organic vegetables. We share information about the quality of vegetables that we need with the PO2'.* Wholesaler 3 establishes the intrinsic and extrinsic (organic) quality requirements that the PO2 must comply with. To monitor intrinsic quality, wholesaler 3 sorts vegetables before accepting them from PO2. *Wholesaler 3 stated: 'We sort vegetables according to the quality. We select only those vegetables that meet supermarkets standards. For organic vegetables, the PO2 has an organic certification from INOFICE, an organic certification institution, which assesses the organic standard from the farmers' production'.*

Box 4. Case D

Vertical coordination
Specialised wholesaler 3 has a contract with PO2 to supply organic vegetables to modern retailers. Wholesaler 3 establishes the intrinsic and extrinsic (organic) requirements that PO2 must comply with. Wholesaler 3 monitors the intrinsic quality of vegetables, via sorting, and examines the produce in terms of size, appearance, colour and shape. The intrinsic quality standards stem from the requirements of modern retailers. Regarding the extrinsic (organic) standards, a third party (an organic certification institution) assesses the standard of farmers' production processes.

Horizontal coordination
PO2 coordinates with its farmer members to comply with the quality requirements set out by wholesaler 3 regarding intrinsic and extrinsic quality. PO2 provides services to its members to comply with quality requirements by providing organic farming inputs (organic fertiliser and phyto-pesticide), technical assistance and organic farming knowledge. In addition, PO2 holds regular meetings to share information with its members, including information on buyers' quality requirements. To achieve extrinsic quality (an organic standard), a third-party monitor and assesses vegetable production for PO2 members. The members cover the costs of PO2, including paying for the expenses associated with the organic certification process.

Quality performance
Vegetables produced at the farm level meet intrinsic and extrinsic (organic) safety standards.

PO2 coordinates member activities in order to comply with the quality requirements. PO2 facilitates quality achievement by providing farming inputs involving the use of pesticides and organic fertiliser and by providing knowledge and technical assistance for organic production. PO2 stated*: 'Our group opts for organic vegetables because we find the soil structure to be more sustainable. Our group provides organic farming knowledge and technical assistance to our members to produce organic vegetables. The government and sometimes the experts as well come to share the knowledge with us. For supporting our members producing organic vegetables, we produce organic fertiliser and phyto-pesticide for the members'.* With regard to achieve the extrinsic quality, the farmers are assessed by the third party, an organic certification institution. As the statement of PO2: *'We use an organic certification institution, INOFICE, to ensure that our vegetables have meet with the Indonesian organic standard. We pay all the expenses for the certification and re-certification every three years. The label "organic" and the number of the organic standard are specified in the packaging'.*

4.5.1.5. Case E

In Case E, the buyer (specialised wholesaler 4) establishes intrinsic and extrinsic quality requirements that farmers must comply with (see Box 5). The intrinsic quality requirements involve the appearance, colour, shape and size of the vegetables. In terms of extrinsic quality, the produce must meet organic standards. Wholesaler 4 stated: '*We have created a group of farmers around here who supply the organic vegetables to us. We regularly meet the farmers to share anything, such as knowledge of organic farming without any chemical input, arrange the schedule of delivery, logistics, and information about the quality, quantity and kind of vegetables.*

Quality monitoring is conducted by the wholesaler 4, which sorts vegetables delivered by contracted farmers based on intrinsic quality standards. Wholesaler 4 stated: *'Our staff in the warehouse sorts the vegetables that meet our quality standard. The vegetables are then cleaned, packaged and labelled. If these vegetables do not meet our quality, we reject them and return them to the farmers'.* In terms of the extrinsic requirements (organic production process), a third party (an independent organic certification institution) inspects the vegetables to assess whether organic standards have been met. Wholesaler 4 stated: *'To guarantee that our vegetables have been produced with the organic standard, we use PERSADA, an organic certification institution that inspects the vegetables to ascertain whether the organic standards have been met. Sometimes, we also inspect the farmers in the field, and if we find the farmers using chemical inputs, then we reject these products like our partners'.* In this chain, the transaction between the specialised wholesaler and farmers is based on a contractual arrangement.

Box 5. Case E

Vertical coordination

Specialised wholesaler 4 has contracts with individual farmers for the supply of vegetables to modern retail markets. Wholesaler 4 has contractual arrangements with local farmers. In the contracts, wholesaler 4 establishes a strict rule that vegetables must meet intrinsic and extrinsic (organic) quality requirements. To achieve the quality required, wholesaler 4 shares information and knowledge and provides technical assistance regarding organic production to the contracted farmers. Wholesaler 4 also pays expenses associated with organic certification applications to a third party. Quality monitoring is carried out by wholesaler 4, which sorts vegetables and selects those that meet the intrinsic quality requirements before delivering them to modern retailers. For the extrinsic (organic) standard, a third party (an independent organic certification institution) inspects vegetable production to assess whether organic standards have been met by the contracted farmers. The third-party issues organic certifications for vegetables that have reached organic standards.

Horizontal coordination

No PO is involved in the chain.

Quality performance

The vegetables produced at farm level meet intrinsic quality and extrinsic (organic) safety standards.

Table 4.4 shows that the coordination mechanisms to address food quality and safety requirements, both vertically with the buyers and horizontally within POs, are diverse. The diversity of the vertical coordination is presented in the continuum of the governance structures, from less coordinated in Case A to more integrated in Case E, as well as within the models, which describe the various VC mechanisms on quality agreements, monitoring, and resource allocation. These findings confirm previous studies that a diversity of governance structures and related coordination mechanisms exists in agri-food chains (Martins et al., 2017, Gellynck and Molnár, 2009, Raynaud et al., 2005). At the same time, the HC in this study shows a diversity of services provided by the POs to meet quality and safety requirements. This finding confirms previous studies that different types of POs are involved in value chains, which differently influence food safety and quality performance (Mwambi et al., 2020, Groot-Kormelinck et al., 2019). It is the combination of VC mechanisms and HC mechanisms that determine the ability to meet food quality and safety standards.

Table 4.4. Overview of VC mechanisms and POs in the five value chain cases

Items	*Variables*	Case A	Case B	Case C	Case D	Case E
		Spot market			**Hybrid**	
Vertical coordination mecha-nisms	*Quality arrangements*	No specific quality arrangements	Intrinsic quality arrange-ments	Intrinsic quality arrange-ments	Intrinsic and extrinsic quality arrange-ments	Intrinsic and extrinsic quality arrange-ments
	Quality monitoring	No monitoring	Monitoring by buyer	Monitoring by buyer	Monitoring by buyer and third party	Monitoring by buyer and third party
	Resource allocations	No resource allocation	No resource allocation	No resource allocation	No resource allocation	Buyer provides technical assistance, knowledge and support for organic certification
PO	*Services*	No PO involved in the contract	No PO involved in the contract	PO shares knowledge and provides training	PO provides inputs, knowledge, training, and support for organic certification	No PO involved in the contract
Quality and safety perfor-mance	*Quality*	No quality standards	Food quality	Food quality	Food quality and safety	Food quality and safety

4.5.2. Cross-case analysis

In this section, we present the cross-case analysis to illustrate the differences between VC mechanisms, PO services, and quality and safety standards in the five value chains. Based on the cross-case analysis, several propositions have been developed.

4.5.2.1. Vertical coordination mechanisms and food quality and safety requirements

The first difference between the five cases is the strength of VC. In case A, no quality standards were used; in cases B and C, vegetables were produced according to quality standards; while in cases D and E, quality and safety according to (organic) standards were produced. The level of vertical coordination was stronger in cases D and E than in cases A, B and C. The correlation between VC and quality performance shows that a strong vertical coordination goes together with strict requirements for production according to standards. To meet food quality and safety standards, actors in the upstream part of the value chain (farmers and buyers) must use strong VC mechanisms. Robust coordination is apparent in the efforts made by buyers to monitor intrinsic quality, involve third parties in the assessment of the organic standards, detail quality requirements in contracts and provide support such as technical assistance, knowledge sharing and the payment of organic certification expenses. Based on the findings about the relationship between vertical coordination and quality and safety standards, we have formulated the following proposition:

Proposition 1. *Strong vertical coordination correlates with strict requirements regarding the quality and safety of the vegetables produced.*

This finding is in line with previous studies that found that governance, in terms of VC in agri-food chains, correlates with food quality (Raynaud et al., 2005, Wever et al., 2010, Kataike et al., 2019). This result is also consistent with previous studies that showed that VC, through contracts, positively affects quality improvement by farmers (Boselie et al., 2003, Dries et al., 2009, Hueth et al., 1999). The proposition adds to the existing literature that strong VC not only correlates with food quality requirements but also with food safety requirements (such as organic).

4.5.2.2. The relationships between vertical and horizontal coordination

The second difference between cases is seen in the relationship between VC and HC (e.g., services of a PO) to comply with the food quality and safety requirements. These relationships are both substitutable and complementary. The substitution dimension of the relationship can be seen in the role of POs in the value chains that may reduce the strength of VC and contribute to less hierarchical governance structures. In cases C and D, contracts between buyers and farmers are applied via the PO. The presence of a PO

in the chain leads to weaker VC in comparison to chains without a PO (cases B and E). The POs in cases C and D provide services to members by sharing knowledge and providing training, farming inputs and even organic certification support (in case D) to help farmers improve quality and safety and meet requirements. In comparison, the buyer in cases B and E coordinates directly with individual farmers, with no mediation by a PO, to produce vegetables that meet food quality and safety standards. In addition, in case E, the VC strength is evident in the effort of buyers to provide technical assistance, share knowledge about organic farming and certification, and monitor the vegetables being produced by farmers. The involvement of a PO in cases C and D partly substitutes VC mechanisms to meet the quality and safety standards. The POs in the chains play a role in providing services and replace some part of the buyer's function regarding monitoring compliance with the quality and safety requirements. This finding has led us to formulate the following proposition:

Proposition 2. *The presence of horizontal coordination (a PO) in a chain reduces the need for strict vertical coordination to comply with food quality and safety requirements*

Considering VC and HC as substitute governance mechanisms is in line with Vroegindewey et al. (2018). These authors found that either a PO or a buyer takes control of specific coordination activities, depending on the relative costs of the competing structures. The substitution view is common among studies that categorise POs as a hybrid form of governance structure (Ménard, 2007, Peterson, 2001). In the extant literature, not much attention has been paid to the interaction between VC and HC in value chains. Proposition 2 contributes to the literature on transaction cost and governance structure; it posits that the presence of HC influences the level of VC and even influences the form of governance structure.

The relationships between VC and HC can also be seen as complementary. HC cannot completely replace VC in the chain because VC structures concern coordinating with the buyers downstream, while HC mainly concerns coordination among farmers in the PO. In cases C and D, HC is combined with VC to comply with quality and safety standards in modern retail chains. HC through POs providing services to its members complements VC structures in coordinating with buyers. In cases C and D, the POs provide inputs on farming, knowledge and training, and even on organic certification, as well as implement the marketing contracts in the VC structures. The pairing of HC structures (marketing POs) and VC structures (marketing contracts) in cases C and D is more effective than solely depending on VC (e.g., cases B and E). In cases B and E, the buyer assumes all the coordination responsibilities to comply with quality and safety requirements through resource-providing contracts (in a so-called buyer-led value chain (Gereffi et al., 2005)). The coordination costs in cases B and E are higher than the

coordination costs in cases C and D. The coordination costs are associated with the costs of exchanging information and activities among partners to the joint accomplishment (Grover and Malhotra, 2003). In cases B and E, the coordination costs are high because of the efforts of the specialised wholesalers coordinating with the individual farmers to meet the quality requirements and arranging the logistics mechanism. With regard to meeting the quality requirements, the specialised wholesalers share information with individual farmers about the quality requirements, they monitor compliance and they provide resources to the farmers. Different from cases C and D, which involve a PO in the chains, the specialised wholesalers just share with the POs the quality requirements without interacting with the individual farmers. On the basis of this finding, we formulate that:

Proposition 3: *The combination of vertical and horizontal coordination in a value chain will increase efficiency when compliance with food quality and safety standards is needed.*

The literature has viewed HC and VC structures as a complementary relationship, in which each structure has specific advantages to help overcome coordination problems (Sartorius and Kirsten, 2007, Bijman and Wollni, 2008, Royer et al., 2016). With regard to meeting quality and safety standards, POs are often seen as more efficient at pooling agricultural products, delivering inputs such as training, extension, and technology transfer, coordinating the logistics and communication among members, monitoring quality standards and enforcement of rules in the contract arrangements (Sartorius and Kirsten, 2007, Bijman, 2008, Ton et al., 2018). VC, through contract farming, is often seen as more efficient at reducing uncertainties through market guarantees, providing market information, and providing protection from buyer hold-up (Kirsten and Sartorius, 2002, Minot, 2007). The combination of HC and VC in a value chain results in higher efficient in reducing transaction costs by minimising the coordination costs of complying with quality and safety standards. This finding confirms previous studies that VC and HC structures are often simultaneously present in agri-food chains, and that they have a complementary and substitution relationship that is effective at reducing transaction costs (Vroegindewey et al., 2018). Proposition 3 adds to the existing literature on efficiency in chain coordination. The proposition can be tested by quantitative research that examines the efficiency in different forms of chain coordination.

4.6. Conclusion and implications

This paper explores the alignment and interaction of VC mechanisms, PO activity and production according to quality and safety standards. Qualitative case studies were conducted in five modern retail vegetable value chains in Indonesia. Within-case and

cross-case analyses were performed to understand how the chain coordination structures, both vertically and horizontally, influence compliance with the quality and safety requirements of modern retail. Within-case analysis shows that different combinations of VC and HC can be used to comply with food quality and safety standards. Several propositions are derived from the cross-case analysis. First, the strength of VC is correlated with the quality and safety requirements of the vegetables produced. The strength of VC can be seen in the efforts of buyers to monitor intrinsic quality, involve third parties in the assessment of extrinsic (organic) quality, and provide resources. Second, in meeting quality and safety requirements, VC and HC can be substitutes or complements. In the substitution view, HC reduces the needed for strict VC, while in the complementary view, VC and HC together coordinate the compliance with food quality and safety requirements.

4.6.1. Policy and managerial implications

This study offers policy and managerial implications for government and buyers to improve efficiency in value chain coordination in order to meet the food quality and safety standards required by modern retail. This study found that VC mechanisms, combined with POs, improve compliance with food quality and safety and reduce transaction costs. To meet quality and safety requirements, buyers enter contracts with POs rather than with individual farmers. Specifically, partnerships of wholesalers and POs have the capability of complying with quality and safety (organic) requirements. Contracts that involve POs do not need strict VC, as POs can themselves coordinate farmer compliance with quality and safety standards.

The increase in consumer awareness of and demand for food safety assurances in Indonesia provides an opportunity for POs and smallholders to become more concerned about food safety (organic) standards. Therefore, policymakers should support the development of POs and encourage them to be increasingly concerned about food safety (organic) standards. For instance, local governments could impart knowledge and provide facilities to POs to help implement organic farming and help POs build internal control systems that assist in the monitoring of compliance with organic certification requirements.

4.6.2. Limitations and future research

Our study has several limitations. First, we focused on the upstream part of the value chain, which involved farmers and buyers. We suggest that future studies explore the entire value chain, from the upstream to the downstream level. By doing so, the whole process of chain coordination and the impact of coordination on quality and safety could be better understood. Second, in this study, HC was measured in terms of POs providing goods and services to its members. Future studies could also include other aspects of horizontal coordination, such as POs' internal governance and decision-

making, member commitment and internal control systems that help to improve quality management. Third, this study used qualitative analysis to develop propositions. For testing the propositions, future studies should collect and analyse quantitative data; qualitative findings are often followed by a quantitative assessment (Harrison and Reilly, 2011). Lastly, this study discusses the evidence of VC in a single form of governance structure in each case; however, in the field, the buyers (specialised wholesalers) use plural governance structures to coordinate with farmers. Future studies could also include such plural governance structures in line with research by Mugwagwa et al. (2018).

5

CHAPTER 5.

Influence of communication openness, information exchange, and intra-organisational ties on farmer–buyer relationship continuity: Evidence from Indonesian vegetables supply chains[14]

[14] This chapter based on:
Widadie, F., Bijman, J. and Trienekens, J., 2022. Influence of communication openness, information exchange, and intra-organisational ties on farmer-buyer relationship continuity: evidence from Indonesian vegetable supply chains. In: G.W.J Hendrikse, G Cliquet, I. Hajdini, A Raha and J. Windsperger (eds), *Networks in International Business; Managing Cooperatives, Franchises and Alliances.* Cham: Springer. Forthcoming.

Abstract

This chapter investigates the direct and indirect effect of open communication, information exchange, and intra-organisational ties on the quality (trust, satisfaction) and continuity (commitment, dependence) of the vertical relationship between farmers and their buyers. Data were collected through interviews with two groups of vegetables producers – members of a producer organisation (PO) and independent producers – in Central Java and Yogyakarta provinces of Indonesia. The results demonstrate that open communication and information exchange improve relationship quality, while intra-organisational ties (only relevant for PO members) improve both relationship quality and relationship continuity. Moreover, open communication, information exchange, and intra-organisational ties indirectly influence relationship continuity through relationship quality. The paper adds to the literature by distinguishing between relationship quality and relationship continuity in the value chain and by investigating the impact of intra-organisational ties in a PO on the vertical buyer-farmer relationship.

Keywords: producer organisations, farmer-buyer relationship, communication openness, intra-organisational ties

5.1. Introduction

Supply chain management literature has shown that supply chains can become more efficient and effective if sellers and buyers maintain close relationships (Fawcett et al., 2012, Dania et al., 2018). High quality relationships among partners reduce communication barriers (Power, 2005), provide frameworks for mutual learning (Krause et al., 2007), and lower transaction costs (Coronado et al., 2010). High quality relationships also imply lower uncertainty and higher commitment of the partners to the relationship, allowing improvement of business exchange routines and stimulating consistent supply (Krause et al., 2007, Somogyi et al., 2010, Damme, 2012). However, research also shows that relationships between farmers and buyers are often not sustainable, as parties abandon contract schemes and violate contract agreements (Andersson et al., 2015, Romero Granja and Wollni, 2018, Ruml and Qaim, 2020, Minot and Sawyer, 2016).

Vertical coordination is the alignment between the decisions and activities of sellers and buyers, more generally of the parties in a value chain (Peterson, 2001). Such alignment may relate to prices, quality and quantity of produce, logistics, packaging and innovation activities. Vertical coordination in food chains refers to alignment between farmers and their buyers (such as traders and processors), between traders and retailers, or between all parties of the value chain. Effective vertical coordination requires communication and information exchange between actors in the chain (Saida et al., 2016, Gaudreault et al., 2009). Communication and information exchange has been found to be key to successful partnerships (Tuten and Urban, 2001) Our research examines how two mechanisms of vertical coordination, notably open communication and information exchange, between contracted farmers and buyers influence the quality and continuity of their relationship.

Next to vertical coordination mechanisms in the value chain also the horizontal coordination among farmers impacts the buyer-farmer relationship (Lazzarini et al., 2001). Jointly selling products, for instance through a producer organisation (PO), requires coordination among all members to produce the same products or follow the same production methods (Cechin et al., 2013). Producer organisation (PO) is the generic term for an economic organisation that is owned and democratically-controlled by farmers (Bijman, 2016). A PO supports the economic well-being of its member-farmers through joint purchasing of inputs, providing services such as market information and technical training, and jointly selling farm products (Penrose-Buckley, 2007). In many countries, a PO has the legal form of a cooperative, while in other countries a PO is an association or a limited liability company.

We assume that the intra-organisational ties among the members of a PO affect the scope of horizontal coordination which in turn influences the effectiveness of the vertical alignment in the value chain (Bijman et al., 2011). For instance, a contract arrangement between

a farmer and a buyer is often implemented through a PO that acts as an intermediary connecting the buyer with multiple farmers (Fischer and Qaim, 2012, Mugwagwa et al., 2018, Widadie et al., 2021). Our research examines whether the intra-organisational ties in a PO influence the business relationship between contracted farmers and their buyer.

For contract arrangements to be effective, parties need to refrain from opportunistic behaviour. In addition, there is an economic incentive to make contracts repetitive. Because setting up contracts involves high initial costs, making contracts durable will reduce the fixed contracting cost per unit of product. In addition, strengthening the continuity of the business relationship will lead to a more reliable supply, higher potential for product adaptations and innovation, consistent product quality, and reduced uncertainties (Batt and Wilson, 2000).

In the literature there is little attention for the combined influence of vertical and horizontal coordination on value chain performance (Martins et al. 2019 being the exception). Our study aims to examine the effect of vertical coordination (operationalised with open communication and information exchange) and intra-organisational ties (in the PO) on the business relationships between contracted farmers and buyers in Indonesian vegetable value chains. Buyers implement contracts through POs or with individual farmers. This study examines the relationships between contracted farmers and buyers in two samples: farmers contracted through POs and farmers contracted individually.

This study contributes to the literature on the determinants of a sustainable farmer-buyer relationship and provides new insights into supply chain management networks and business relationships. The outcomes offer managerial recommendations for buyers to better understand their suppliers' perception of the bilateral relationship and to use that understanding to build high quality supplier relationships.

The paper is organised as follows. Section 5.2 discusses the background of the Indonesian vegetable supply chain in current retail markets. Section 5.3 presents the literature review and hypotheses. Subsequently, section 5.4 contains methodology, followed by the results and discussion in section 5. Finally, section 5.6 presents the conclusion, limitations, managerial recommendations, and suggestions for future research.

5.2. Overview of the Indonesian vegetable value chain in modern retail markets

The market share of modern retail rapidly increased after 1998, when the Indonesian government allowed foreign companies to operate supermarkets in Indonesia (Neven

and Suleiman, 2007, Suryadarma et al., 2010). In 2019 there were approximately 36,500 modern retailers in Indonesia with different outlet formats[11] consisting of 333 hypermarkets (an increase from 266 in 2013), 1,428 supermarkets (from 1268 in 2013), and 34,780 convenience stores (from 21,942 in 2013) (Usda, 2020). Between 2004 and 2019, the share of modern retail in grocery sales increased from 7 to 18% (Usda, 2020). The expansion of modern retailers in Indonesia is driven by the growth of income, urbanisation, the number of middle-class citizens, the entrance of foreign investment, and a growing awareness of food safety (Reardon et al., 2016, Minot et al., 2015). Modern retailers in Indonesia are concerned about food quality and safety standards (Minot et al., 2015, David and Ardiansyah, 2017). Fresh foods in modern retail are associated with high quality, safety, freshness, and convenience (Umberger et al., 2015).

In the procurement of vegetables, modern retailers often use contracts with specialised wholesalers and producer organisations (POs). Because traditional wholesalers are not able to deliver a consistent supply of uniform and high quality products, specialised wholesalers have seized this opportunity by setting quality standards, controlling suppliers and supplies and organizing customised packaging, to be able to supply modern retail with high quality vegetables.

In an exploration of modern retail markets in the Central Java and Yogyakarta Provinces, (Widadie et al., 2021) have identified four vegetables value chains (Figure 5.1). In chain 1 and 2, the smallholder farmers link with modern retail markets through a PO. In chain 3, the specialised wholesaler links the smallholders to the modern retailers. In chains 1, 2, and 3, the modern retailers and specialised wholesalers use contract schemes for procuring vegetables. Contracted farmers in these chains closely coordinate with the buyers to meet contract agreements on the quality of products, the quantity ordered, and the delivery process. In chain 4 the transactions between farmers and buyers are performed in spot markets which are characterized by low vertical coordination. Farmers and local collectors engage in farm-gate transactions, without any agreement on quality or quantity. The local collectors sell the produce to traditional wholesalers.

The farmers in chains 1 and 2 do not have a contract directly with the final buyer (modern retailer or specialised wholesaler) but they receive information about the contract arrangement through the PO. The PO communicates with its members about the agreed price, quantity ordered, quality standard, and other delivery requirements that the farmers must comply with. In chains 1 and 2, the PO plays a vital role by acting as an intermediary between the buyer and individual farmers. While most information

11 Modern grocery retail formats are categorized by physical size. Hypermarkets are chain retail outlets larger than 27,000 square feet. Supermarkets are outlets between 4,300 and 27,000 square feet. Convenience stores are smaller outlets of less than 4,300 square feet. The modern grocery retailers sell food, beverages, and non-grocery items such as clothing and household goods.

exchange is organised through the PO, sometimes the buyer meets and communicates with farmers directly. The horizontal coordination within the PO includes coordinating production, providing services to improve the quality of the vegetables, and arranging logistics. In contrast, the farmers in chain 3 have a direct contract with a specialised wholesaler, who communicates directly with the farmers.

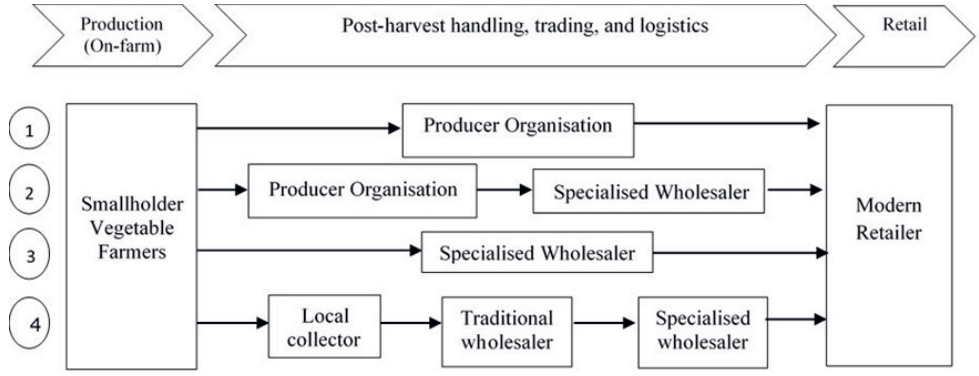


Figure 5.1. Indonesian vegetable value chains in modern retail markets (Reproduced from Widadie et al. 2021)

The majority of vegetables farmers who supply to the modern retailers are smallholders with less than 0.5 hectares of land (Kementan`, 2012). These farmers have several kinds of vegetables, grown in an intercropping system. Many of these farmers are member of a producer organisation (PO), organized on a village level, with the task to support the members' farming business. The PO provides services to its members, including market information and technical training, and sometimes organic certification. According to the Agricultural Extension Centre of the Indonesian Ministry of Agriculture[12], the number of POs was 643,710 in 2020. POs on average have a membership of 30 farmers and they carry out three main functions: (1) to help farmers improve their knowledge and skills; (2) to build cooperation between farmers other parties such as buyers, governments, and NGOs; and (3) to help farmers develop their farms.

5.3. Literature review and development of hypotheses

5.3.1. Conceptual model

Transaction cost economics (TCE) has been widely used to explain the governance of transactions in value chains. The basic unit of analysis in TCE is the transaction between two companies (Williamson, 1999). Companies in the chain select the appropriate governance structure that will economize on the transaction costs that are related to

12 https://app2.pertanian.go.id/simluh2014/index.php

the bounded rationality and potential opportunistic behaviour of transaction partners (Rindfleisch and Heide, 1997). Governance structures are ordered on the continuum from spot market to hybrid to hierarchy (Williamson, 1998). Contracting is a hybrid governance structure that has been often used in food chains to govern the transactions between farmers and buyers (Mugwagwa et al., 2020, Ton et al., 2018). Contracts act both to safeguard against the risk of opportunism and to minimise the coordination cost in food chains (Almazan et al., 2011, Bijman and Wollni, 2008). Information exchange and communication between value chain actors support the effectiveness of contracting arrangements in keeping transaction cost low and allowing strong coordination among the actors.

Previous studies found a positive relationship between information exchange and relationship quality (Nyaga et al., 2010, Prajogo and Olhager, 2012). Other studies found communication to be a key determinant of successful partnerships (Tuten and Urban, 2001). Open communication builds trust between parties (Batt et al., 2010, Smith, 1998) and reduces conflict (Ayoko, 2007). Previous investigations also revealed that intra-organisational ties among members of a PO or a farmer network improved the quality of the relationship with buyers (Lu et al., 2012). A recent study by Martins et al. (2019) investigated the vertical and intra-organisational ties using a single model to examine their impact on supply chain performance in the Brazilian pork chain.

Ng (2008) explained that business relationships go through several stages, including pre-relationship, early and development, before they become sustainable. In this paper we focus on relationship continuity as our main outcome variable (Figure 5.2). Relationship continuity is operationalized by commitment and dependence in farmer-buyer relationships (Somogyi et al., 2010, Damme, 2012). Literature suggests that relationship continuity is affected by the quality of the relationship (Somogyi et al., 2010), which can be operationalised by the variables trust and satisfaction (Nyaga and Whipple, 2011).

We assume that open communication, intra-organisational ties (in the PO) and information exchange all function as coordination mechanisms that influence both relationship quality and relationship continuity. While these coordination mechanisms may affect relationship continuity directly, we also conjecture that they have an indirect effect, with relationship quality as the mediating variable. Below we will discuss each of the hypotheses individually.

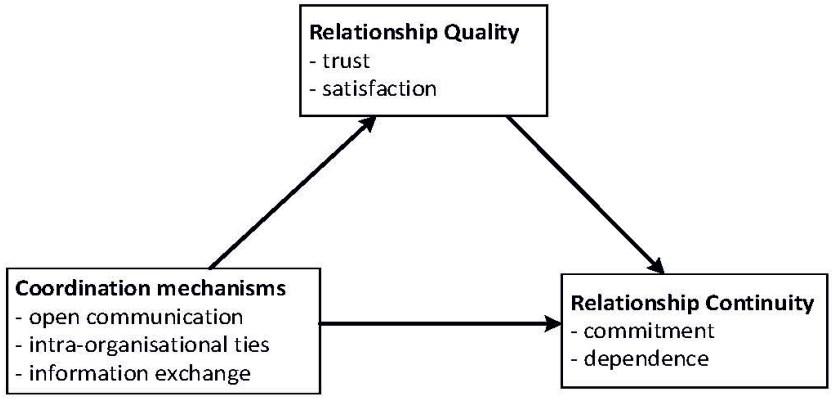


Figure 5.2 Conceptual model

5.3.2. Communication openness

Open communication is a critical strategy for enhancing supply chain performance (Su et al., 2013). Studies on buyer-seller relationships found that open communication had a positive impact on relationship quality. For example, Smith (1998) found open communication to be the most crucial predictor of trust and satisfaction. Mohr et al. (1996) defined communication as the glue that holds a relationship together. They revealed that collaborative communication had a positive impact on relationships, as measured by satisfaction, commitment, and coordination. Miscommunication leads to conflict and confusion among supply chain partners, resulting in partnership failure (Tuten and Urban, 2001). Our study suggests that open communication increases relationship quality and increases relationship continuity between farmers and buyers:

- H1a: Open communication positively influences relationship quality;
- H1b: Open communication positively influenced relationship continuity.

5.3.3. Information exchange

Information asymmetry can be reduced by information exchange such as sharing data on production, inventory, sales, and planning and forecasting (Patnayakuni et al., 2006). Martins et al. (2019) discovered that information exchange between pig farmers and buyers on technical assistance and production practices positively influenced relationship quality. Ghosh and Fedorowicz (2008), by exploring multiple case studies, found that information exchange influenced the building of trust between retailers and suppliers. Previous studies also found that greater information sharing reduced uncertainty and improved trust in relationships (Kwon and Suh, 2005, Doney and Cannon, 1997). Concerning the relationship between information exchange and commitment, Nyaga et al. (2010) revealed that collaborative activities, such as information sharing and mutual

investments between supply chain partners, led to long-term commitment. The following hypotheses are therefore proposed:

- H2a: Information exchange positively influenced relationship quality;
- H2b: Information exchange positively influences relationship continuity.

5.3.4. Intra-organisational ties

Supply chain network research has postulated that relationships are not only vertical but also horizontal, between actors at the same stage of the chain (Lazzarini et al., 2001). Intra-organisational ties refer to the collaboration and networking among actors of the same stage of the chain, such as farmers collaborating in a PO. Scholars have identified various forms of intra-organisational ties in terms of collective action (Fischer and Qaim, 2012, Markelova et al., 2009). Intra-organisational ties between farmers may influence relationship quality. Lu et al. (2012) revealed that the strength of guanxi networks in China influenced farmers' satisfaction with their relationship with buyers. Moreover, Martins et al. (2019) found that intra-organisational ties among pig farmers in a farmers' association in Brazil influenced the quality of the relationship these farmers had with buyers. A strong network among members enables joint learning, frequent communication with partners, stable and long-term business relationships, and easy handling of conflicts and uncertainty (Uzzi, 1997, Lu et al., 2012, Tefera and Bijman, 2019). Based on this literature, we expect that intra-organisational ties lead to higher relationship quality and relationship continuity, prompting the following hypotheses:

- H3a: Intra-organisational ties positively influence relationship quality;
- H3b: Intra-organisational ties positively influence relationship continuity.

5.3.5. Relationship quality

Relationship quality is a term that has been commonly used to describe the health of an inter-firm partnership (Osobajo and Moore, 2017). Improving relationship quality between transaction partners is important to enhance efficiency and reduce transaction cost (Coronado et al., 2010). Relationship quality refers to the trust in the relationship, more specifically to the trust of one partner in the behaviour of the other partner. The trust of one partner is his/her perception that the other partner will fulfil the expectations, desires, and goals of the partnership (Gyau and Spiller, 2007). Several studies have confirmed that trust has a pivotal role in the success of a relationship (Corsten and Kumar, 2005, Chen et al., 2011, Whipple and Frankel, 2000). Trust in partners reduces opportunistic behaviour and uncertainty and encourages openness and goal sharing (Nyaga and Whipple, 2011). Several studies have shown that trust has a positive influence on commitment in a business relationship (Morgan and Hunt, 1994, Kwon and Suh, 2004, Kwon and Suh, 2005, Wu et al., 2004).

Another element of relationship quality often mentioned in the literature is satisfaction (Eggert and Helm, 2003). Satisfaction with the relationship reduces uncertainty and increases the likelihood of future transactions (Ulaga and Eggert, 2006). Thus, satisfaction is also expected to support relationship continuity.

5.3.6. Relationship continuity

To achieve a stable buyer-supplier relationship and to allow a contract farming arrangement to pay-off, the relationship between the partners should be sustainable, which means that it should not prematurely terminate (Somogyi et al., 2010, Wilson and Nielson, 2001). Relationship continuity is based on partners' commitment, which is their attitude to make the relationship a success, their willingness to make short-term sacrifice for maintaining the relationship, and their belief in a sustainable relationship (Morgan and Hunt, 1994). Continuity reflects the likelihood of continuing collaboration between parties (Kumar et al., 1995).

Previous studies have advocated that relationship quality also has a mediating effect on the impact of communication mechanisms and relationship continuity (Kwon and Suh, 2005, Ulaga and Eggert, 2006). On the interaction between coordination mechanisms, relationship quality and relationship continuity, the following hypotheses were formulated:

- H4a: Relationship quality positively influences relationship continuity;
- H4b: The impact of open communication, intra-organisational ties, and information exchange on relationship continuity is mediated by relationship quality.

5.4. Methods

5.4.1. Data gathering

To gather the data, face-to-face interviews with smallholder vegetable farmers were conducted across five sub-districts in the Central Java and Yogyakarta provinces in Indonesia. To supply vegetables to modern retail markets, buyers enter into contractual agreements with farmers individually (in chain 3) or with farmers collectively (in chains 1 and 2). Because of the different chains and relationships, this study distinguishes between two samples: farmers supplying through POs (sample A) and farmers selling directly to specialised wholesalers (sample B). Samples A (n = 97) and B (n = 41) were selected through snowball sampling based on information lists provided by the POs and the specialised wholesalers. The selection of the POs and specialised wholesalers was based on information provided by modern retailers, using convenience sampling. This

study focused on the farmers' perceptions regarding their relationships with buyers in supplying vegetables to modern retail markets.

5.4.2. Measurement

To enhance the validity of the constructs in this study, variables were chosen based on the literature and cross-checked through interviews with POs and specialised wholesalers. Before distributing the questionnaire among the farmers, we piloted 30 farmers. We dropped some variables that did not meet validity. All the items used a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The constructs and sources of the items are presented in Table A1 in the Appendix. We now discuss each of the variables and constructs of our conceptual model.

5.4.2.1. Open communication

Open communication refers to the extent to which buyers and sellers communicate openly, sincerely, and substantively, either formally or informally (Smith, 1998, Anderson and Weitz, 1989). Open communication involves easy conversation between the parties (Ayoko, 2007). The construct of open communication includes openness and honesty, the way buyers communicate with their suppliers (farmers), and transparency and frequency of communication. All measurement items were taken from Smith (1998).

5.4.2.2. Information exchange

Information exchange refers to sharing strategic and tactical information with partners in the supply chain (Mentzer et al., 2001, Kembro and Näslund, 2014). The instrument comprises information exchange about quality requirements, production planning, technical assistance, and buyers' feedback regarding product quality. The items concerning information exchange about quality requirements, production planning, and buyers' feedback were adapted from Martins et al. (2019) and Arana Coronado et al. (2010). The item on technical assistance was adapted from Schulze et al. (2006) to assess communication and services provided to suppliers and from Martins et al. (2019) regarding buyers providing production manuals to farmers.

5.4.2.3. Intra-organisational ties

In this study intra-organisational ties refers to the collaboration and networking between farmers in a PO. Based on (Martins et al., 2019, Wardhana et al., 2020) we developed a four-item instrument to assess intra-organisational ties: the involvement of the farmer in PO meetings; the extent of communication with other farmers in the PO; the willingness to share knowledge with other farmers in the PO; and the trust in other farmers in the PO.

5.4.2.4. Relationship quality

Many studies have measured relationship quality as a high-order dimension (Nyaga and Whipple, 2011, Autry et al., 2008, Bennett and Barkensjo, 2005), including both trust in the relationship and satisfaction with the relationship. We follow this custom, by measuring relationship quality with the variables trust and satisfaction. The construct for trust was developed from Nyaga et al. (2010), Smith (1998) and Kwon and Suh (2005). The construct for satisfaction is based on Eggert and Helm (2003), Smith (1998) and Ulaga and Eggert (2006).

5.4.2.5. Relationship continuity

To measure relationship continuity, our study used the constructs of commitment and dependence. Both of these constructs have been used by Damme (2012) and Somogyi et al. (2010) to measure the durability of the relationships between farmers and buyers. Commitment refers to the desire to continue a relationship (Morgan and Hunt, 1994). This study used items for commitment based on Kwon and Suh (2004) and Nyaga et al. (2010). The dependency in a supply chain relationship refers to the producer's need to maintain the relationship to achieve its goals. The items used to measure dependency were developed by Damme (2012), who took into account farmers' perceptions of the importance of partnership continuity and the availability of other (trustworthy) buyers.

5.4.3. Data analysis

Structural equation modelling with partial least squares (SEM-PLS) was employed to examine the hypotheses. This method allows researchers to deal with multiple independent and dependent variables simultaneously. PLS is a component-based modelling method that concurrently examines an outer (or measurement) model and an inner (or structural) model. The measurement model specifies the relationship between indicators or items and a latent or construct variable, while the structural model specifies the relationship between latent or construct variables (Sholihin et al., 2011).

PLS can handle small sample sizes and make less stringent assumptions for normal distribution and multicollinearity between independent variables than other types of SEM (Chin, 1998, Chin and Newsted, 1999, Henseler et al., 2009). The study employed SEM-PLS software (SmartPLS version 3.2, SmartPLS GmbH) to analyse the data.

5.5. Results and discussion

5.5.1. Measurement model analysis

The measurement model assesses the reliability and validity of indicators or items in explaining a particular construct (Sholihin and Pike, 2009). The reliability of a reflective

construct[13] is determined by loadings of construct items and composite reliability (CR); the loading and CR coefficients should be at least 0.6 (Chin, 1998, Hair et al., 2011). The analysis revealed that all loadings of items exceeded 0.6, except item OC2 in sample B (Table 5.1); therefore, this item was excluded from the analysis. Additionally, because the PO is not involved in the chains in sample B, the latent variable of intra-organisational ties was not included in the analysis of this sample. The construct validity of a reflective construct is governed by the average variance extracted (AVE), which specifies the total variance explained by the construct and the discriminant validity. The construct should have an AVE of at least 0.5 (Chin, 2010). Table 5.1 presents that the AVEs for all constructs of samples A and B exceeding 0.5, indicating adequate validity. Discriminant validity is treated as achieved when the square root of a construct's AVE (the italic number in Table 5.2) is higher than the correlations between constructs (Chin, 2010). The results in Table 5.2 show that the square root of the AVE exceeded the correlations between constructs, representing adequate discriminant validity. Overall, the analysis revealed that the model used in this study was reliable and valid. In addition, a t-test comparing the mean scores showed that the sample means are significantly different for some items, while they are similar for other items.

This study uses second-order constructs to measure latent variables of relationship quality and relationship continuity. Based on the CR values, both constructs scored higher than 0.5 and all path coefficients from the second to the first order (reflective constructs) were significant (Table 5.3). Therefore, the second-order construct of relationship quality – constructed from satisfaction and trust – and the second-order construct of relationship continuity – constructed from commitment and dependence – could be applied in the analytical model.

13 This study uses the model of reflective constructs which represent the indicators depicting the constructs (Wetzels et al., 2009).

Table 5.1. Reliability, convergent validity, and mean comparisons

Latent variable	Sample A					Sample B					t-test
	CR	AVE	Mean	SD	Loading	CR	AVE	Mean	SD	Loading	
Open communication	0.86	0.61				0.76	0.52				
OC1			4.34	0.74	0.81			4.02	0.71	0.87	2.31
OC2			3.49	1.34	0.63			n/a	n/a	n/a	n/a
OC3			4.29	0.66	0.83			3.73	0.82	0.60	2.25*
OC4			4.05	0.79	0.83			3.70	0.80	0.67	1.98*
Information exchange	0.85	0.60				0.91	0.73				
IE1			4.35	0.57	0.83			3.95	0.85	0.82	1.44
IE2			4.34	0.67	0.78			3.75	0.87	0.80	1.84
IE3			4.27	0.70	0.83			3.87	0.91	0.90	1.97
IE4			3.99	0.78	0.64			4.12	0.73	0.88	2.73**
Intra-organisational ties	0.80	0.50				n/a	n/a				
HR1			4.47	0.55	0.73			n/a	n/a	n/a	n/a
HR2			4.41	0.55	0.83			n/a	n/a	n/a	n/a
HR3			4.42	0.57	0.63			n/a	n/a	n/a	n/a
HR4			4.51	0.52	0.61			n/a	n/a	n/a	n/a
Trust	0.85	0.59				0.88	0.66				
TR1			4.49	0.52	0.73			4.24	0.61	0.85	2.26
TR2			4.30	0.58	0.71			4.14	0.68	0.73	1.32
TR3			4.53	0.53	0.79			4.19	0.63	0.83	2.98
TR4			4.45	0.55	0.81			4.12	0.70	0.83	2.65
Satisfaction	0.84	0.65				0.84	0.64				
S1			4.44	0.62	0.81			4.04	0.62	0.85	3.36**
S2			4.36	0.50	0.81			4.09	0.65	0.76	2.27
S3			4.43	0.65	0.79			4.14	0.52	0.78	2.70***
Commitment	0.79	0.56				0.78	0.55				
C1			4.53	0.49	0.75			4.22	0.60	0.62	2.92
C2			4.42	0.53	0.84			4.09	0.65	0.78	2.77
C3			4.21	0.69	0.63			3.97	0.74	0.80	1.74

Dependence	0.75	0.50				0.86	0.68			
D1			4.45	0.51	0.70			4.17	0.53	0.77	2.83**
D2			4.06	0.85	0.73			3.92	0.77	0.83	0.51
D3			4.15	0.67	0.67			3.70	0.89	0.87	2.42*

CR composite reliability AVE average variance extracted SD standard deviation

n/a = the item of OC2 and the construct of intra-organisational ties in sample B were excluded from the model because the loading was less than the rule of thumb of 0.50 for the OC2 items, and the chain in sample B is not involved in horizontal coordination in supplying vegetables;

*** significant at p ≤ 1%; ** significant at p ≤ 5%; *Significant at p ≤ 10%.

Table 5.2. Discriminant validity

	Sample A							Sample B						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
1. Commitment	*0.74*							*0.74*						
2. Dependence	0.54	*0.70*						0.60	*0.83*					
3. Intra-organisational ties	0.60	0.52	*0.71*					n/a	n/a	*n/a*				
4. Information exchange	0.38	0.29	0.47	*0.77*				0.52	0.42	0.69	*0.85*			
5. Open communication	0.23	0.24	0.39	0.13	*0.78*			0.22	0.41	0.30	0.27	*0.72*		
6. Satisfaction	0.57	0.49	0.51	0.30	0.25	*0.80*		0.66	0.61	0.33	0.38	0.41	*0.80*	
7. Trust	0.62	0.51	0.62	0.44	0.45	0.60	*0.76*	0.60	0.71	0.42	0.59	0.52	0.69	*0.81*

Italic numbers represent the square root of the average variance extracted; numbers below the italic numbers show the construct correlations.

Table 5.3. Second-order construct of relationship quality and relationship continuity

Second-order construct	First-order construct	Sample A			Sample B		
		Path Coefficient	P	CR	Path Coefficient	P	CR
Relationship quality	Satisfaction	0.86	0.00^{***}	0.87	0.88	0.00^{***}	0.89
	Trust	0.92	0.00^{***}		0.94	0.00^{***}	
Relationship continuity	Commitment	0.90	0.00^{***}	0.70	0.86	0.00^{***}	0.85
	Dependence	0.85	0.00^{***}		0.92	0.00^{***}	

CR composite reliability *** significant at p ≤ 1%.

5.5.2. Structural model analysis

The structural model was employed to test the hypotheses (direct and indirect effects) on relationships among the construct variables. Bootstrapping of 500 resamples was used to derive the path coefficient, standard error, and t-statistics of the PLS estimation (Chin, 1998). The path coefficient (β) is the degree to which exogenous variables explain the endogenous variables. The validity of the structural model can be seen in the variance explained if $R^2 > 0.10$ (Falk and Miller, 1992). The outcomes show that the three endogenous variables reached R^2 values higher than 0.1 in both samples, ranging from 0.44 to 0.63 (see the Appendix, Figures A1 and A2). The goodness-of-fit (GoF) index was 0.56 in sample A and 0.57 in sample B, which exceeded the cut-off value of 0.36 and confirmed the model fit (Wetzels et al., 2009). The structural model estimation is presented in Table 5.4 for the direct effects and in Table 5.5 for the indirect effects.

5.5.2.1. Openness of communication

The results for the direct effect of communication openness on relationship quality (Table 5.4) show a positive impact in both samples A (β = 0.17, p ≤ 0.01) and B (β = 0.39,

$p \leq 0.01$). This finding is consistent with Kwon and Suh (2005) and Smith (1998), who revealed that open communication positively influences trust and satisfaction. Communication transparency can improve the relationship quality between contracted farmers and buyers; however, the influence of open communication on relationship continuity was statistically insignificant for both samples. These findings imply that communication openness between farmers and buyers has a positive impact on the farmers' perception of relationship quality; however, it does not affect the level of perceived relationship continuity.

5.5.2.2. Information exchange

Information exchange influences relationship quality significantly and positively in sample A ($\beta = 0.13$, $p \leq 0.1$) as well as in sample B ($\beta = 0.44$, $p \leq 0.01$). The results support hypothesis H2a. This finding is in line with Kwon and Suh (2005) and Martins et al. (2019), who found that information exchange between buyers and sellers (farmers) improves relationship quality. However, the direct impact of information exchange on relationship continuity was statistically insignificant. Maybe information exchange is perceived by the farmers as a short term activity that is mainly relevant for current transactions.

5.5.2.3. Intra-organisational ties

Intra-organisational ties between vegetable farmers in the PO positively influence the quality of the relationship between farmers and buyers ($\beta = 0.56$, $p \leq 0.01$). Additionally, it has a positive effect on relationship continuity ($\beta = 0.30$, $p \leq 0.01$). These results are in line with Martins et al. (2019), who found that intra-organisational ties among pig farmers improved the farmer-buyer relationship. Lu et al. (2012) also found that guanxi networks (social capital) among Chinese farmers positively impact farmer–buyer relationship satisfaction. A strong guanxi network fosters stable and tighter business relationships, maintains frequent communication with partners, and sustains close contact among partners for an extended period (Lu et al., 2012, Standifird and Marshall, 2000). Stronger intra-organisational ties among farmers in POs result in better information exchange about potential buyers and lead to stable relationship with buyers over time. This finding implies that the strong ties among the farmers in the PO are important in achieving the quality and continuity of the relationship with the buyers. The PO has an important role in the value chain as an intermediary between buyers and farmers. The buyers communicate with the farmers through the PO; the PO coordinates with its members for the supply of specific quality and quantity of vegetables. The strong intra-organisational ties in the PO reduce behavioural opportunism and asymmetric information among farmers, which allows for better coordination in production and logistics (Kormelinck et al., 2019).

5.5.2.4. Impact of relationship quality

Relationship quality positively influences the relationship continuity in sample A (β = 0.51, p ≤0.01) and sample B (β = 0.74, p ≤ 0.01). These findings corroborate previous studies' findings that relationship quality has a positive association with commitment (Kwon and Suh, 2005, Chen et al., 2011). Our results also confirm Ganesan (1994) assertion that satisfaction with past outcomes is significantly related to a long-term orientation. Our results, therefore, support hypothesis H4a. The trust and the satisfaction in the relationship between buyers and farmers encourage farmers to continue the relationship.

Table 5.4. Hypothesis testing for direct effects

Hypothesis	Structural path	Sample A		Sample B	
		Path Coefficient (SE)	P	Path Coefficient (SE)	P
H1a	Open communicationàrelationship quality	0.17 (0.06)	0.00***	0.39 (0.12)	0.00***
H1b	Open communicationàrelationship continuity	-0.05 (0.09)	0.51	-0.04 (0.13)	0.73
H2a	Information exchangeàrelationship quality	0.13 (0.07)	0.07*	0.44 (0.14)	0.00***
H2b	Information exchangeàrelationship continuity	0.04 (0.07)	0.55	0.12 (0.13)	0.36
H3a	Intra-organisational tiesàrelationship quality	0.56 (0.09)	0.00***	n/a	n/a
H3b	Intra-organisational ties àrelationship continuity	0.30 (0.10)	0.04**	n/a	n/a
H4a	Relationship qualityàrelationship continuity	0.51 (0.11)	0.00***	0.74 (0.14)	0.00***

SE standard error, *** significant at p ≤ 1%; ** significant at p ≤ 5%; *Significant at p ≤ 10%

5.5.2.5. Indirect effects

A Sobel test was employed to determine whether the indirect effects of open communication, information exchange, and intra-organisational ties on relationship continuity via relationship quality were significant. The statistics for the Sobel tests of the structural paths in both samples were significant (Table 5.5), indicating that the mediator effect was significant. In other words, relationship quality mediates the relationships between the variables open communication, information exchange, and intra-organisational ties and relationship continuity. Although there was no significant direct effect of open communication and information exchange on relationship continuity (Table 5.4), a significant indirect effect via relationship quality was observed in both samples (Table 5.5). This implies that relationship quality fully mediates the relationship between open communication and relationship continuity (β = 0.08, p≤0.01 (sample A), β = 0.29, p≤0.01 (sample B)) as well as the relationship between information

exchange and relationship continuity (β = 0.06, p≤0.1 (sample A), β = 0.33, p≤0.01 (sample B)). The connection of intra-organisational ties to relationship continuity via relationship quality also shows statistical significance (β = 0.29, p≤0.01). Both the direct and indirect effect analyses are statistically significant, although the path coefficient in the indirect effect analysis is slightly lower than the path coefficient in the direct effect analysis, suggesting that relationship quality partly mediates the connection between intra-organisational ties and relationship continuity. Hypothesis H4b, that relationship quality is a mediator variable in the model, was thus supported. These findings imply that a durable relationship between farmers and buyers can be achieved through the quality of the relationship (i.e., trust and satisfaction). The openness of communication and the information exchange between farmers and buyers have an indirect effect on the continuity of their relationship through relationship quality.

Table 5.5. Hypothesis testing for the indirect effect

Hypothesis	Structural path	Sample A		Sample B	
		Indirect effect (SE)	Sobel test statistic	Indirect effect (SE)	Sobel test statistic
H4b	Open communicationàrelationship qualityàrelationship continuity	0.08 (0.04)	2.41***	0.29 (0.12)	2.76***
	Information exchangeàrelationship qualityàrelationship continuity	0.06 (0.04)	1.72*	0.33 (0.10)	2.70***
	Intra-organisational ties àrelationship quality àrelationship continuity	0.29 (0.07)	3.71***	n/a	n/a

SE standard error *** significant at p ≤ 1%; ** significant at p ≤ 5%; *Significant at p ≤ 10%

The results, consistent with previous studies, show that open communication increases relationship quality (Kwon and Suh, 2005, Smith, 1998). Regarding the structural path of information exchange to relationship quality, this study is also in line with the findings of and Martins et al. (2019) suggesting that information exchange increases the quality of relationships between farmers and buyers. Concerning the path of intra-organisational ties to relationship quality, this study confirms the reports of (Lu et al., 2012) and Martins et al. (2019) that intra-organisational ties positively impact relationship quality. In addition, the intra-organisational ties in the PO also positively influence relationship continuity. Our results confirm what Uzzi (1997) and Lu et al. (2012) had hypothesized, namely that strong network ties enable long-term collaboration. This study also confirms previous findings that relationship quality positively influences relationship continuity (Kwon and Suh, 2005, Ganesan, 1994).

The indirect effect analysis showed statistical significance for the mediation of relationship quality between coordination mechanisms and relationship continuity. These findings

corroborate the findings of Ng (2008) that relationship continuity can be achieved through a variety of approaches. Moreover, our results indicate that relationship continuity could be attained by reinforcing relationship quality.

Figure 3 summarizes the statistically significant pathways for sample A (Figure A2 in the Appendix shows the pathways for sample B). The dotted lines indicate pathways that turned out to be not significant.

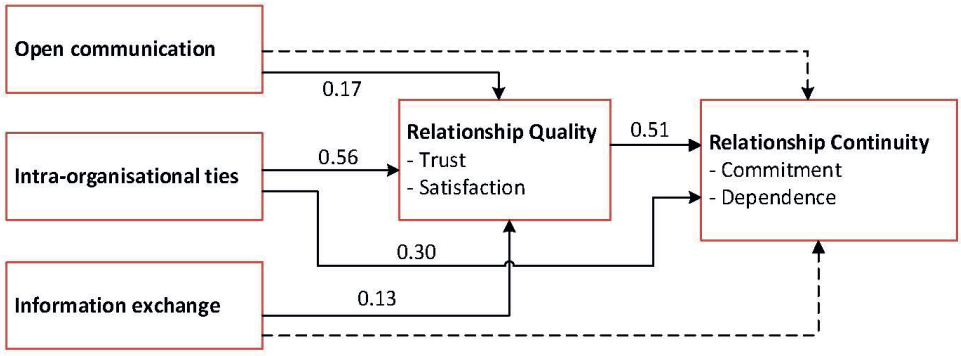


Figure 5.3. Statistically significant pathways

5.6. Conclusion and recommendations

This study examined the nature of the relationship between contracted farmers and buyers by analysing the impact of open communication, information exchange, and intra-organisational ties on the quality and continuity of the business relationship.

The study provides managerial recommendations, particularly for buyers, to build strong relationships with their suppliers. First, open communication with partners increases (the perception of) the quality of the relationship; therefore, buyers should engage in transparent communication with their suppliers. Second, information exchange positively influences relationship quality. For farmers, information exchange is critical to meet the buyer's quality and quantity requirements. Similarly, buyers should improve information exchange with their suppliers about quality specifications and market information. Thirdly, strong intra-organisational ties among farmers in a PO can enhance the quality and the continuity of the relationship with the buyer. Therefore, the effort a PO in organising meetings, sharing information, and building trust among members should be bolstered. For buyers, exchanging information with a PO does not only relate to meeting quality and quantity of supplies, but also supports intra-organisational ties among farmers in the PO. For instance, the buyers may attend farmers' meetings and

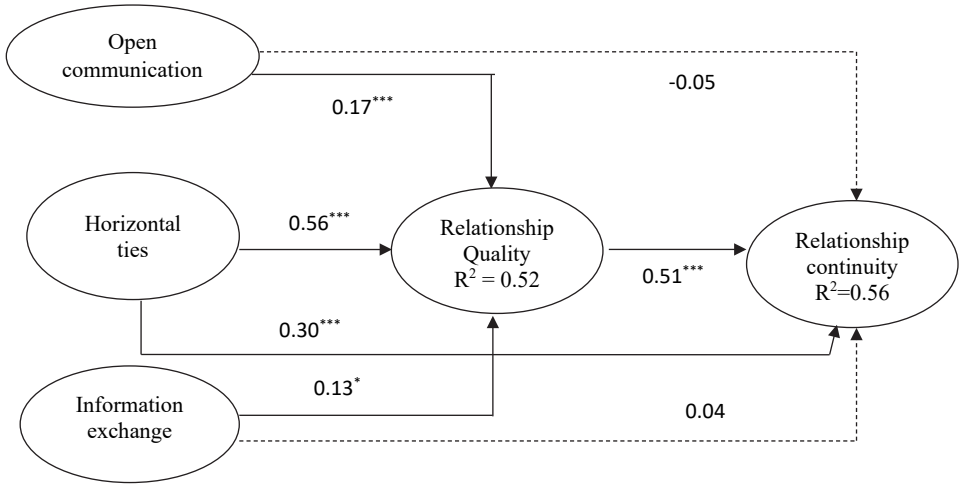
guide PO management. Lastly, to strengthen relationship quality, buyers should promote farmers' trust and satisfaction.

This study has several limitations. First, the analysis was based on data collected at one side of the seller-buyer relationship as only farmers' perceptions of the relationship were measured. In future studies, the buyers' perspective on the relationship with farmers could be addressed. Second, the study analysed the perceptions of farmers who were contracted by buyers either directly or through a PO. We did not consider spot market farmers (chain 4) in the Indonesian vegetable industry. Future studies should involve spot market farmers in order to gain an understanding of the quality of the relationship between farmers and rural traders in spot markets. Thirdly, the intra-organisational ties in this study focussed on the relationship among farmers involved in a PO. In Indonesia, the majority of farmers participate in a PO that is more like a community organisation instead of a business organisation. Future research could look into how intra-organisational ties in community-type of PO and business-type of PO may differently affect the business relationship with buyers.

Appendix to Chapter 5

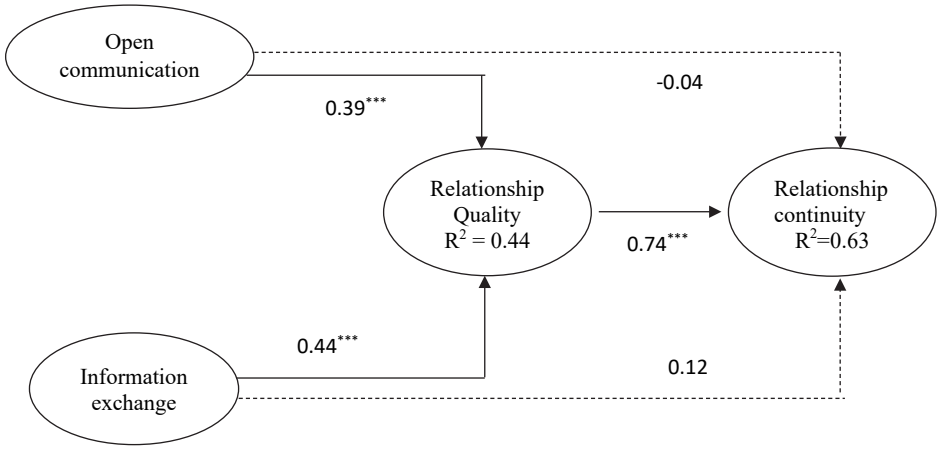
Table A1 list of measurement items

Dimension	Constructs	Items	Questions	Adopted from
-	Open communication	OC1	Our communication with the buyer is open and honest	(Smith, 1998)
		OC2	Sometimes the buyer does not tell me everything I need to know (-)	
		OC3	We exchange relevant information with the buyer on a regular basis	
		OC4	We talk candidly with each other	
-	Information exchange	IE1	We are frequently informed about quality requirements	(Martins et al., 2019, Coronado et al., 2010, Schulze et al., 2006)
		IE2	The buyer helps us to plan our production according to the buyer's needs	
		IE3	The buyer gives us feedback to improve the quality of the vegetables we deliver to him/her	
		IE4	The buyer provides knowledge and technical assistance	
-	Horizontal ties	HR1	I regularly participate in meetings with other farmers in the PO	(Martins et al., 2019, Wardhana et al., 2020, Lu et al., 2008)
		HR2	I regularly communicate with the other farmers in the PO	
		HR3	I am willing to share my knowledge with other farmers in the PO	
		HR4	I trust the other farmers in the PO	
Relationship quality	Trust	TR1	The buyer pays on time	(Nyaga et al., 2010, Smith, 1998, Kwon and Suh, 2005)
		TR2	The buyer and I trust each other	
		TR3	I am confident that the buyer is telling the truth	
		TR4	The buyer works in our joint interests	
	Satisfaction	S1	We are very satisfied with the buyer	(Eggert and Helm, 2003, Smith, 1998, Ulaga and Eggert, 2006)
		S2	It is a pleasure to have a good sales relationship with the buyer	
		S3	This is the best sales relationship that I have experienced	
Relationship continuity	Commitment	C1	We want this relationship with the buyer to continue for a long time	(Kwon and Suh, 2005, Nyaga et al., 2010)
		C2	Our positive feelings towards the buyer are a major reason for continuing to work with him/her	
		C3	I will not switch to another buyer, even if the other buyer offers a better price	
	Dependence	D1	This buyer is important for our future sales	(Damme, 2012)
		D2	It is difficult to find another buyer	
		D3	It is difficult to trust another buyer	



Note: *P<10%, **P<5%, ***P<1%
GoF index:0.56
Significant path
Non-significant path

Fig. A1 Result of SEM-PLS in sample A



Note: *P<10%, **P<5%, ***P<1%ssssa
GoF index: 0.57
Significant path
Non-significant path

Fig. A2 Result of SEM-PLS in sample

6

CHAPTER 6.

Discussion and Conclusion

6.1. Introduction

For almost two decades, the number and market share of modern retailers in Indonesia has been growing (Slamet et al., 2017, Minot et al., 2015). Globalisation and foreign direct investment have brought foreign companies to the Indonesian retail industry (Suryadarma et al., 2010). At the same time, the customer base of modern retailers has increased due to urbanisation, rising income, and changes in diet and lifestyle (Reardon et al., 2016). Outlets of the various modern retailers have proliferated in the main cities as well as in the suburban areas. The growth of fresh food sales in modern retail has pressured these companies to strengthen coordination in the food chain (Reardon et al., 2004).

This growth of modern retail is an opportunity for Indonesian farmers. It can lead to higher income and thus greater well-being. Most Indonesian farmers, however, are smallholders, with an average farm size of approximately 0.5 hectares (Kementan, 2019), and they face many constraints, such as a lack of capital, low quality and small quantities of produce, and a dearth of organisations that can help them enter the modern retail market.

Contract farming arrangements (CFAs) and producer organisations (POs) are two prominent examples of institutional innovation that could help smallholders in ameliorating these constraints (Worldbank, 2007). The literature has shown that through CFAs, farmers receive inputs for farming, technical assistance, credit, quality control, and market information (Otsuka et al., 2016, Ton et al., 2018). As a result, farmers can improve their production processes and meet the quality standards required by modern retail markets. CFAs can reduce transaction costs through reducing uncertainty and preventing opportunistic behaviour of companies in the value chain (Mugwagwa et al., 2020). Buyers use CFAs when coordinating with farmers to ensure the continuity of supply and compliance with quality standards (Ruben et al., 2007a). CFAs are thus a form of vertical coordination between farmers and buyers for coordinating the production, transport and processing of high-quality products (Royer et al., 2016).

Producer organisations (POs) can play an important role in the improvement of production processes and thereby in complying with food quality and safety standards, through providing services such as technical assistance, quality control and safety certification (Zhou et al., 2019, Kirezieva et al., 2016). POs reduce transaction costs for both farmer and buyer, by pooling farm products and collectively negotiating with buyers (Shiferaw et al., 2011). POs are a form of horizontal coordination among farmers (Fischer and Qaim, 2012).

Two knowledge gaps have been identified in the literature on what role CFAs and POs play in the value chain. First, most studies focus either on CFAs or on POs. In practice, however, CFAs and POs are often both present in agri-food chains, and they interact with each other. When implementing a contract, the buyer often deals with a PO rather than with individual farmers; the PO acts as an intermediary between farmers and buyers (Mugwagwa et al., 2018, Tefera and Bijman, 2021). Second, most studies on the role of CFAs and POs in value chains use data from chains targeted at export markets or food processors. Few empirical studies focus on domestic modern retail chains in developing countries.

To fill these knowledge gaps, this thesis explored the combined role of CFAs and POs in value chains. Specifically, this thesis explored how innovative institutional arrangements like CFAs and POs can link smallholders with modern retail markets, encourage farmers to participate in a CFA, guarantee that farmers meet food quality and safety standards, and support the building and maintenance of the seller–buyer relationship. To analyse the (combined) functioning of CFAs and POs in modern retail chains, this thesis used data on domestic modern retail chains in the provinces of Central Java and Yogyakarta in Indonesia.

This thesis contributes to the literature on value chains, governance structure, and relationship quality between farmers and buyers in the modern food chain. In addition, it provides managerial implications for buyers and POs when designing more efficient coordination mechanisms to better support the supply of the demanded quantity and quality of vegetables and build relationship quality and continuity in the chains. It also provides recommendations for policymakers that seek to improve the socio-economic position of smallholder farmers in the food chains.

The main results presented in the previous chapters are synthesised and discussed in this chapter. Additionally, the results are reflected upon using the existing theoretical and empirical literature. The answers to the research questions are presented in Section 6.2. The theoretical and methodological contributions of this thesis are provided in Section 6.3. The implications for policy and management are shown in Section 6.4. Limitations and suggestions for future research are provided in Section 6.5.

6.2. Answers to the research questions

The main objectives of this thesis were to explore the role of CFAs and POs in supporting the performance of smallholders in modern retail value chains. Specifically, this thesis aimed to enhance our understanding of how CFAs and POs can link smallholders with

the modern retail companies, improve the willingness of smallholders to participate in CFAs, facilitate compliance with quality and safety standards, and strengthen the relationships between farmers and buyers.

Transaction cost economics (TCE) and value chain and network approaches were used as the main theoretical framework of this study. TCE was used to explore how the CFA and the PO, as innovative institutions, govern transactions at the upstream segment of the chain. TCE helps to explain why the actors choose a specific governance structure – that is, to minimise transaction costs (Williamson, 2002). CFAs and POs are examples of hybrid governance structures that stand between the spot market and a hierarchical form of governance (Ménard, 2005).

The networks approach looks at all the actors within and/or between related industries that potentially work together to add value to customers (Omta et al., 2001), while the value chain approach addresses the sequence of activities and associated actors through each phase of production, handling and distribution from producer to end consumer (Kaplinsky, 2000). These activities include the flow of products, information exchange, financing of investments, distribution of added value, coordination among actors, and governing of the chain (Kaplinsky and Morris, 2001). Lazzarini et al. (2001) introduced the concept of netchain, which integrates supply (value) chain and network analysis, interpreting inter-organisational collaboration with emphasis on the sources of value creation and coordination mechanisms.

This thesis used value chain and network theory to analyse coordination and collaboration between different actors (Lazzarini et al., 2001). Value chain and network theory were used to position the CFA and the PO as, respectively, the vertical and horizontal structures of coordination and collaboration in the value chain. In the context of value chain and network analysis, the CFA reflects the vertical collaboration between farmers and buyers at different levels of the chain, while POs reflect the horizontal collaboration among farmers at the same level of the chain.

The data of this study were obtained through interviews with actors involved in the vegetable value chains, such as modern retailers, specialised wholesalers, POs, and smallholder farmers, and also actors in the institutional environment who support the chains, such as the local government and an institute for organic certification. In the interviews, we collected data about the activities of the POs in terms of their networks, added value, and governance of the chains; the coordination mechanisms among the actors in the value chains to meet specific quality requirements; the preferences of farmers when selecting specific CFAs; and the perceptions of contracted farmers concerning their relationship quality and continuity with the buyers.

Both qualitative and quantitative methods were used to answer the research questions. More specifically, the qualitative methods focused on identifying the diverse value chain coordination mechanisms between farmers and buyers and among farmers within the PO. In addition, the qualitative methods explored the implementation of quality management practices by the farmers and POs. Quantitative methods were used to assess the preferences of smallholders regarding the different contracts offered to them, and to measure the relationship between vertical coordination (operationalized as communication openness and information exchange) and horizontal coordination (measured by ties within the PO) as it impacts relationship quality and continuity. The answers to each research question are presented and discussed in Sections 6.2.1–6.2.4.

6.2.1. Linking smallholders in POs with modern retail

Value chain upgrading with the support of POs was the focus of Chapter 2. Value chain analysis (VCA) has been widely applied to identify the possibilities for producers to 'move up the value chain', either by shifting to a more rewarding functional position or by offering products with more added value (Bolwig et al., 2013). In many cases, value chain upgrading is achieved through multi-business efforts, such as combined upgrading of products and processes or collaborative upgrading under contractual arrangement (Humphrey and Schmitz, 2000). Value chain upgrading at the firm level has been described in many studies, but rarely have these studies considered the role of the PO, particularly when members of the PO sell to modern domestic retailers. Therefore, the following research question was formulated:

RQ1: How can value chain upgrading through POs link smallholder farmers with modern retail?

Value chain analysis was used to answer this first research question by exploring three critical elements: the chain's network structure, added value, and governance (Trienekens, 2011). Upgrading the network structure refers to improving the vertical network of the PO with its buyers and the horizontal network of the PO with its members. Upgrading the chain's added value refers to upgrading product quality, packaging and distribution. Upgrading governance of the chain relates to the vertical arrangements between the PO and the buyers through CFAs. Upgrading governance also relates to horizontal arrangements among the members of the PO for selling the products and providing member services. Qualitative data were collected through semi-structured interviews with three POs that supply vegetables to modern retail and with farmers, specialised wholesalers and modern retailers. A multiple-case study was performed to obtain in-depth information on the coordination of POs with their buyers and among the members.

This thesis shows that POs have upgraded their value chains by linking smallholders with modern retailers. In upgrading the network structure, the POs have built a vertical network with specialised wholesalers and modern retailers. Then, the horizontal network among the members was strengthened by coordinating the sales of vegetables to modern retailers. Regarding the upgrading of added value, the value of the vegetables has been increased by POs supporting farmers in producing organic vegetables, post-harvest handling (e.g., sorting quality, cleaning, packaging and labelling) and distribution. The upgrading of the governance of the value chain applies to vertical arrangements: POs have entered into contracts with buyers, making agreements on price, quantity, quality and location of delivery. It also applies to horizontal arrangements: the internal coordination of POs has been upgraded by organising regular meetings with all the members, instituting shared decision-making and providing proper services to the members. Combining the three elements of value chain upgrading mitigates the constraints of the smallholder when entering the modern retail market, such as the difficulty of adhering to quality standards, lack of knowledge, and high transaction costs.

6.2.2. The preferences of the smallholders concerning CFAs

In Chapter 3, the preferences of smallholders for specific CFA attributes offered by the buyers were analysed. Participating in the contract entails trade-offs between risks and incentives (Bogetoft and Olesen, 2002). Farmers have different attitudes towards contracting, with some attributes perceived as positive and others as negative. Literature has indicated that many farmers drop out from the contract scheme, even though the contract may at first glance look beneficial for farmers (Andersson et al., 2015). The study aimed to clarify the trade-offs and to understand the preferences of farmers for certain contract attributes. Understanding the preferences of smallholders is critical for buyers in designing contract attributes that will be accepted by the farmers, thereby avoiding their premature abandonment of the contract scheme. The second research question was formulated as follows:

RQ2: Do smallholder farmers prefer contractual arrangements in modern retail value chains? Which contract attributes do smallholders prefer?

The choice experiment (CE) method was used in this study to examine the preferences of smallholders. In this method, utility-based consumer theory and random utility maximisation theory (Louviere et al., 2010) were used. Interviews with the key informants (POs, modern retailers, and traders in the village) were conducted to identify the attributes of actual contracts in the modern and traditional retail value chain. Then, a focus group discussion with representatives of the POs was carried out to select the attributes used in the choice set. The choice set was generated from D-efficiency design, and consisted of three alternative contract options. One option was the non-contract

option. Preferences were measured through farmer utility in selecting an alternative contract derived from the bundle of contract attributes from the choice set. Data from the CE were gathered through face-to-face interviews with smallholders selling vegetables in modern and traditional retail value chains. The smallholders were asked to select a specific bundle of contract attributes, with each bundle varying on price, payment conditions, quality, selling place, and quantity. The data were analysed using a random-parameter logit (RPL) model.

The results showed that, in general, smallholders do not prefer a contract over the non-contract option. In other words, smallholders preferred selling their products to traditional retailers rather than through contracts in the modern chains. Most contract attributes in the model (such as payment method, quality, sale location, and quantity) elicited negative preferences from smallholders, except for a higher price. It may be that smallholders perceived contracting in modern retail chains as unfavourable due to the additional investment required, including the high cost of complying with quality and transportation, and the higher risk entailed than when selling in traditional chains. The characteristics of farmers that positively associate with the probability of being in favour of a contract were their level of education, risk orientation, current engagement in CFAs and type of relationship with the PO.

6.2.3. Vertical and horizontal chain coordination for food quality and safety standards

Chapter 4 discussed the relationship between chain coordination and food quality and safety performance. We studied the interaction between vertical coordination (VC) and horizontal coordination (HC) in vegetable value chains that need to comply with food quality and safety requirements of modern retail. Literature has explained the role of VC through contracts and HC through POs in improving food quality and safety (Kirezieva et al., 2016, Moustier et al., 2010, Mwambi et al., 2020), but all of these studies look only at VC or only at HC. However, in practice, VC and HC mechanisms are often combined (Mugwagwa et al., 2018, Jia and Huang, 2011); contracts and POs often complement each other to address the constraints of smallholders in meeting food quality and safety standards in modern retail markets. This study may help actors in vegetable value chains to design more efficient coordination processes when implementing quality management. The following research question was addressed in this study:

RQ3: How are contracts and POs aligned in the vegetable chain to meet food quality and safety standards?

In a qualitative study, five cases of vegetable value chains were described and explored. Data were gathered through semi-structured interviews with the actors involved in the

chains, such as farmers, POs, specialised wholesalers and modern retailers. Institutional environments were also considered in the interviews. The VC mechanisms between farmers and buyers were identified in this study in terms of quality agreements, quality monitoring and resource allocation. HC mechanisms were operationalized as the services that POs provide to their members to enable them to comply with the quality requirements of modern retailers. The food quality and safety standards in this study were measured by the intrinsic and extrinsic quality attributes. This study applied within-case analysis to five cases of value chains and cross-case analysis to compare the value chains.

The diversity of combinations of HC and VC in complying with the quality and safety requirements of modern retailers was shown by the within-case analysis. Propositions were developed based on the cross-case analysis. First, the strength of VC is correlated with food quality and safety requirements. Buyers need a high level of coordination with farmers to meet the quality and safety standards of modern retailers. The strength of VC is expressed by the activities of buyers in monitoring and controlling intrinsic quality and in providing resources to the farmers, as well as by the involvement of third parties to assess the extrinsic (organic) quality. Second, the relationship between VC and HC can be seen as substitutional or complementary in nature. From the point of view of substitution, VC was less strict because of the presence of HC, allowing a less hierarchical governance structure. The presence of HC (i.e., a PO) in the chain substitutes part of VC regarding the provision of services and monitoring the compliance with quality and safety standards. At the same time, HC and VC can also be seen as complementary in that each contributes those tasks of supporting compliance with food quality and safety standards that the other is less equipped to do. As HC mainly concerns coordination among farmers in the PO, it cannot completely replace VC in the chain. PO activities like monitoring quality and providing services to its members complement VC between farmers and buyers. Third, in marketing products the combination of HC and VC is more efficient than only relying on contracts (i.e., VC), due to reduced transaction costs in monitoring and controlling farmer compliance with quality and safety standards.

6.2.4. Chain coordination and relationship quality

Relationship quality has been described as "the depth and climate of interfirm relationships" (Johnson, 1999) as well as being an indicator of the health and well-being of a relationship (Crosby et al., 1990). Relationship quality is measured not only by the quality of the collaboration in the relationship, but also by the duration of the relationship (Johnson, 1999). A strong relationship among members of the value chain is favourable to reducing communication barriers, eliminating redundancy, improving efficiency (Power, 2005) and lowering transaction costs (Coronado et al., 2010).

In the context of agri-food chains, the success of CFAs is determined by the quality of the relationship between farmers and buyers (Eaton and Shepherd, 2001). Side-selling to other buyers can be avoided when the quality of the relationship between contracted farmers and the contractor (buyer) is strong (Bijman, 2008), improving knowledge exchange to meet quality (Damme, 2012) and reducing transaction costs (Coronado et al., 2010). The impact of VC (i.e., communication openness and information exchange) and intra-organisational ties on relationship quality and continuity were studied in Chapter 5. We formulated the research question as follows:

RQ4: What is the impact of communication openness, information exchange and intra-organisational ties on the quality and continuity of relationships between contracted farmers and buyers?

The method of structural equation modelling - partial least squares (SEM-PLS) was used in this study to examine the relationship between the independent variables (open communication, information exchange and horizontal relationship) and dependent variables (relationship quality and relationship continuity). Data were gathered through face-to-face interviews with contracted vegetable farmers. Survey results showed that some farmers had direct supply contracts with buyers, while others supplied through a PO. Therefore, the respondents were categorized based on their sales channel. We asked farmers about their perceptions about their relationship with buyers in supplying vegetables to modern retail.

The relationship quality between farmers and buyers in both samples was positively influenced by open communication and information exchange, thereby confirming previous studies on factors influencing relationship quality in food chains (Kwon and Suh, 2005, Martins et al., 2019). Relationship quality and continuity were also positively influenced by strong horizontal (intra-organisational) ties within the PO. The strong intra-organisational ties in the PO result in collaborative learning, deeper collaboration among farmers and decreased information asymmetry, uncertainty and opportunistic behaviour. Also, the willingness of farmers to collaborate with buyers and to sustain the contract was facilitated. In the indirect effect analysis, the connection between independent variables (i.e., open communication, information exchange and intra-organisational ties) and relationship continuity was mediated by relationship quality. This implies that relationship continuity between farmers and buyers can be attained by reinforcing relationship quality.

Overall, this thesis found that CFAs and POs play an essential role in increasing the performance of smallholders in value chains. It was found that upgrading in value chains through upgrading PO networks, added value in production, and improved governance

of farmer–buyer relationships can mitigate the constraints on the smallholders and successfully link them with modern retailers (Chapter 2). Smallholder farmers who were members of a PO were more inclined to accept the CFAs of modern retailers than those who were not (Chapter 3). The pairing of VC and HC (in a PO) in the value chain will increase efficiency through a reduction in transaction (i.e., coordination) costs in complying with quality and safety standards. In addition, the presence of HC (a PO) in the value chain allows less strict VC and thus a less hierarchical (and therefore costly) governance structure (Chapter 4). The quality of the relationship between contracted farmers and buyers was influenced by vertical coordination (i.e., communication openness and information exchange) and by horizontal coordination in a PO (Chapter 5). Both a CFA and a PO can reduce the transaction costs through minimising the coordination costs in transactions between farmers and buyers. CFAs combined with a PO play an important role in supporting the inclusion of smallholders in modern retail value chains.

6.3. Theoretical and methodological contributions

This thesis contributes to the broader literature on upgrading value chains, preferences of smallholders regarding CFAs, food quality and safety management, governance structures in value chains, and seller-buyer relationship quality.

6.3.1. Value chain upgrading at POs

The examination of value chain upgrading has attracted much attention from scholars, many of them focusing on upgrading the value chain at the firm or industry level (Giuliani et al., 2005, Tanrattanaphong et al., 2020), often focussing on export market (Maertens et al., 2012, Ponte, 2009, Trienekens et al., 2017). However, there is a scarcity of literature exploring value chain upgrading at the PO level. Value chain upgrading at three POs in Indonesia was investigated using a case study approach. The three POs were shown to upgrade their value chains by upgrading their network structure, their added value and their governance in linking their members with modern retailers. A contribution was made to the literature by demonstrating that the analysis of value chain upgrading can also be carried out at the level of the PO. As organisations formed by smallholder farmers, providing various services and coordinating with buyers, POs play an important role in the inclusion of smallholders in value chain upgrading.

6.3.2. Preferences of farmers for contracting with modern retailers

The preferences of smallholders for contracting in modern retail markets were analysed in Chapter 3. The preferences were examined using a choice experiment (CE) model, where farmers had to choose between alternative contracts offered to them. The preferences of farmers for contract farming attributes have been examined in previous

studies (Abebe et al., 2013, Ochieng et al., 2017, Broeck et al., 2017). In most of these studies, contracts for the export market or for processors were examined. In this thesis, the focus was on contracts with modern domestic retail. The contract design used was based on actual contract attributes in modern retail as well as traditional retail value chains. The results were consistent with previous studies showing that, in general, farmers prefer to sell vegetables to traditional retailers in the spot market rather than to buyers under a contract scheme (Ochieng et al., 2017, Schipmann and Qaim, 2011). However, this finding contrasts with the study by Broeck et al. (2017). Differences in attitude towards contract attributes resulted from the trade-off between incentives and risks for farmers participating in the CFA. This thesis contributes to the literature on behavioural preferences of smallholder farmers regarding CFA and informs the debate on the trade-offs between contract attributes.

6.3.3. Food quality and safety management

In Chapter 4, the impact of chain coordination (both VC and HC) on food quality and safety was analysed. The impact of VC on the improvement of food quality and safety in the production of farmers has been analysed in previous studies (Dries et al., 2009, Tefera and Bijman, 2021, Kumar et al., 2016). Other studies have analysed the role of POs in improving the quality and safety of agri-food products to meet buyer requirements (Kirezieva et al., 2016, Moustier et al., 2010, Mwambi et al., 2020). To the best of our knowledge, there is a gap in the literature on the combined impact of VC and HC on food quality and safety management at the level of farmers. In this thesis, the alignment and interaction between VC mechanisms and PO activities for compliance with food quality and safety requirements of modern retailers were analysed. Consistent with past studies, it was shown that VC and POs play a critical role in addressing the food quality and safety constraints that smallholders face. Moreover, combining VC and HC (in a PO) in the chain will increase efficiency due to reduction of transaction costs. Therefore, a contribution is made to the literature on food quality and safety management by adding a value chain coordination perspective.

6.3.4. Governance structures in value chains

Transaction cost theory was the main theoretical framework of this thesis, describing the coordination mechanisms and coordination costs between actors in the value chain. Transaction cost theory seeks to identify the governance structure that best reduces transaction costs (Williamson, 1991). In Chapter 4, the interaction between VC and HC mechanisms to meet food quality and safety requirements of modern retail was analysed, using empirical cases. This study has shown that the relationship between VC and HC structures in the chain can be seen as substitutional and complementary. The presence of HC (in a PO) in the chain can play an important role in quality and safety control, thereby substituting vertical coordination structures. When POs provide services to their

members that improve quality, it complements the VC structures in coordinating with buyers. Hence, in complementing VC through providing (horizontal) services to their members for quality improvement, POs can reduce the strength of VC between buyers and farmers, and thereby reduce hierarchy in the governance structure. In addition, the combination of VC and HC in a value chain leads to higher efficiency due to reduced coordination costs. This finding implies that the HC construct should be included in value chain analysis that seeks to find appropriate governance structures.

6.3.5. Relationship quality

Relationship quality has been found to be influenced by VC (Prajogo and Olhager, 2012, Huo et al., 2014) and by HC (Hansen, 2015, Martins et al., 2019). However, in most studies, vertical and horizontal relationships were examined in separate models. The influence of VC and HC on the quality of relationships in a single structural model was investigated in Chapter 5. More specifically, this thesis examined the influence of VC through open communication and information exchange and the influence of intra-organisational ties among farmers in the PO on relationship quality and continuity between contracted farmers and buyers. This thesis contributes to an understanding of the path along which relationship continuity in the value chain can be achieved. Continuity of the farmer–buyer relationship is achieved through relationship quality; and the antecedents of relationship quality are open communication, information exchange, and intra-organisational ties among farmers in the PO.

6.3.6. Methodology contribution

This thesis combined qualitative and quantitative methods to answer the main research questions. In the qualitative approach, we obtained in-depth information about value chain coordination, governance structures, CFAs and food quality and safety management. The qualitative approach was used for describing and exploring the multiple case study of value chain upgrading through POs (Chapter 2) and to investigate the interactions of vertical and horizontal coordination for the improvement of food quality and safety (Chapter 4). The qualitative data were analysed using within-case and cross-case analysis. The cross-case analysis was used to develop propositions.

The quantitative studies in this thesis were based on a survey among smallholder vegetable farmers. Data obtained through questionnaires were analysed with the discrete choice model (Chapter 3) and structural equation modelling - partial least squares (SEM-PLS) (Chapter 5). In Chapter 3, the choice experiment (CE) method was used to analyse the preferences of farmers for the variety of contract attributes. Based on the theory of consumer behaviour and random utility maximisation theory (Lancaster, 1966, Mcfadden, 1974), the CE method has been used widely and has become a standard analytical tool for investigating the preferences of respondents in consumer behaviour research (Hensher et

al., 2005, Louviere et al., 2010). The CE method was employed in this thesis to measure the preferences of farmers in choosing a specific bundle of contract attributes. Further, the interaction terms between contract attributes and farmer characteristics were used in the model specification to investigate which characteristics of farmers influence the probability of their choosing a certain contract option. Additionally, the marginal value of the willingness to accept (WTA), which was expressed as the compensation demanded by the farmers to accept the contract, was calculated.

SEM-PLS was used to examine the influence of open communication, information exchange and horizontal ties on the quality and continuity of relationships, in Chapter 5. SEM-PLS examines the relationships between independent and dependent variables simultaneously. Direct analysis was used to examine the direct effect of information exchange, open communication, and intra-organisational ties on relationship quality, and of relationship quality on the continuity of relationships. Indirect analysis was used to examine whether the connection between the independent variables (i.e., information exchange, open communication, and intra-organisational ties) and continuity of relationships was mediated by relationship quality. The indirect effect analysis helped to delineate the attainment of the relationship continuity between the partners in the value chain.

6.4. Policy and managerial implications

This thesis has managerial implications, particularly for actors involved in modern retail chains, such as modern retailers, specialised wholesalers, POs and smallholders, when collaborating and coordinating efficiently with their partners. This thesis is also beneficial for policymakers in formulating a strategy for increasing the participation of smallholders in modern retail markets, in supporting long-term relationships between farmers and buyers, and in fostering the inclusion of smallholders in the value chain.

6.4.1. Managerial implications

In Chapter 2, lessons were provided regarding value chain upgrading through upgrading the network structure, added value and chain governance that could mitigate the constraints on smallholders, enabling them to link with modern retail. To upgrade the network both vertically and horizontally, the directors and managers of the PO could encourage close collaboration with specialised wholesalers and modern retailers, and also facilitate close collaboration in its own horizontal network of farmers. Regarding adding value, the PO can increase the capabilities of the farmers by providing support for the production of organic products, and by supporting quality control, post-harvest handling (e.g., packaging and labelling of products) and distribution to the buyers. Upgrading the

governance of the value chain could be achieved by negotiating contracts with buyers and enhancing collaboration within the PO.

In Chapter 3, lessons for buyers (i.e., specialised wholesalers and modern retailers) were provided about how to design contracts that are preferred by the farmers and what farmer characteristics to take into account. It was shown that many farmers had a negative perception of the contracts proposed by the modern retailer, except for the price. The lack of risk sharing in the design of contracts caused farmers to avoid these. Therefore, the design of a contract with a fair price and a premium as compensation for the efforts of the farmers in meeting specific quality requirements could increase their probability of accepting the contract. Moreover, contracts in which the payments for farmers, post-harvest handling, distribution of products and quantity flexibility are facilitated may increase the probability of farmers accepting the contract. A further consideration is that the preferences of farmers for a given contract and the chance of them accepting such a contract could be predicted according to their characteristics. Buyers could aim at partnerships with highly educated farmers, who are risk-tolerant, have organic certifications and are members of a marketing PO, as these farmers are more likely to accept a contract.

Lessons for buyers to coordinate more efficiently to meet the food quality and safety standards of modern retail were provided in Chapter 4. Buyers could build contracts with POs that already adhere to quality and safety (organic) requirements; contracts with POs entail lower coordination costs than contracts with individual farmers. Moreover, buyers do not need strict VC, since the POs handle the tasks of coordinating among the farmers to follow the quality requirements. The presence of a PO in the value chain can replace part of the function of the buyer in coordinating the quality and safety practices of farmers in order to adhere to the standards of modern retail.

In Chapter 5, managerial implications for buyers in building a sustainable relationship with contracted farmers were provided. Relationship quality between contracted farmers and buyers was influenced by open communication, information exchange and strong horizontal ties. This implies that transparent communication from the buyers to the contracted farmers and good information exchange in terms of quality specification and market information can improve the quality of the relationship quality with the farmers. Additionally, relationship quality was influenced by buyer support for the horizontal relationship among farmers in the PO. Such support could be shown by attendance at farmers' meetings, along with guidance and recommendations to PO management. Further, lessons for buyers on building relationship continuity by maintaining trusted and satisfactory transactions with their contracted farmers were provided.

6.4.2. Policy implications

The thesis has provided recommendations for policymakers to support the performance of smallholder farmers and their inclusion in vegetable value chains. POs play an essential role in value chains. It was shown that the PO can mitigate the constraints on smallholder farmers occasioned by a lack of horizontal organisation, the challenges in complying with quality and safety standards, and high transaction costs (Chapter 2). Additionally, policymakers can support the reduction of transaction costs and the increase in added value in value chains through promoting POs (Chapter 4), encourage farmers to become members of a marketing PO (Chapter 3), and supporting horizontal networks with the POs (Chapter 5). Due to the importance of POs in value chains, policymakers could include POs as part of a strategy for encouraging smallholders in sell in modern retail vegetable value chains. POs in Indonesia still lack the capabilities to follow quality and safety (organic) standards, and are mostly community organisations without marketing activities. Therefore, the government could enhance the development of POs by supporting value addition in vegetable production, improving the management skills and entrepreneurship of the PO leaders, and providing assistance with contract negotiation mechanisms. To improve the added value of POs, the government could provide knowledge and training on quality and safety standards, and support investments in packaging houses and transportation. At the same time, the government could provide training and mentoring in entrepreneurship and enhance skills in management to help transform POs, empowering them to undertake more marketing activities. The government could also assist in contract negotiation with specialised wholesalers and modern retailers to strengthen the bargaining power of POs.

6.5. Limitations and future research

In this section, some limitations of the research are acknowledged and, subsequently, directions for future research are proposed. The first limitation of this study concerns the sample of respondents. The samples in this thesis were selected through a non-random convenience sampling method. Not all specialised wholesalers wanted to collaborate in providing data on market channels and vegetable farmers they worked with. Therefore, we selected respondents willing to share information and to be interviewed as actors involved in vegetable value chains. Under such conditions, the selected sample might be biased and may not cover all specifics of the vegetable value chains in the field. For instance, there may be other governance forms and coordination mechanisms that were not included in this research, and there may be retailers, wholesalers and POs with other characteristics and opportunities than those found. Future research could address this limitation by enlarging the sample size and looking deeper into specific governance mechanisms.

Second, the value chain analysis at the upstream level of the chain (coordination of farmers and buyers) was the focus of this thesis. The complexities of networks in value chains may not be captured by dyadic approaches (Choi and Wu, 2009), and the performance of the supply chain may be inadequately measured (Van Der Vorst, 2005). Value chains include the flow of products, exchange of information, distribution of added value and coordination among actors from farm to consumers (Kaplinsky and Morris, 2001). The coordination of activities from upstream to downstream in the chain has been explored in past studies and has been shown to influence chain performance (Gellynck et al., 2008, Mesic et al., 2018). The impact of value chain coordination on food quality and safety (Chapter 4) and relationship quality (Chapter 5) was analysed at the upstream level of the chain only (farmer–buyer dyad). Future studies may be expanded to include all actors in the value chain.

Third, the focus of this thesis was on economic relations and outcomes: in linking farmers to modern retail (Chapter 2), the preferences of farmers regarding CFAs (Chapter 3) and food quality and safety management (Chapter 4). The upgrading of value chains can be integrated with social and environmental aspects in future studies to pursue sustainable value chains in developing countries. Many scholars have explored concepts of the sustainability performance of value chains by integrating economic, social and environmental performance (Petit et al., 2018, Fearne et al., 2012).

Fourth, analysis of the value chain was focused on the coordination among chain actors (i.e., farmers and buyers). The coordination between chain and non-chain actors could be explored in future studies: for instance, NGOs, governments and certifiers could be considered. According to Doherty and Kittipanya-Ngam (2021), inclusive business conditions are created by hybrid organisations that, through their governance structures, collaborate and partner with private, public and non-profit actors. It is also shown in empirical studies that involving non-chain actors, such as NGOs and governments, is important in reducing the barriers for smallholders to participate in high-value chains (Mugwagwa et al., 2018).

SUMMARY

The growth of modern retail in Indonesia is an opportunity for smallholders to increase their income. However, smallholder farmers face constraints when entering modern retail markets, such as lack of capital, knowledge, market information, quality control and horizontal organisation. Many scholars have suggested that innovative institutional arrangements, such as contract farming arrangements (CFAs) and producer organisations (POs), can address these constraints. Through a CFA, the farmer receives inputs, technology, credit and access to high-value markets. A CFA also reduces transaction costs by minimising uncertainty and the risk of opportunistic behaviour. A PO provides services, such as inputs, quality control, technical assistance and safety certification, to improve the quality of the smallholders' products, enabling them to meet the requirements of the markets. Transaction costs are also reduced by the PO by pooling farm production and coordinating with buyers.

While in practice CFAs and POs are often combined in agri-food chains, in academic research they are usually studied separately. The main objective of this thesis was to explore the individual and combined role of the CFA and the PO in increasing the performance of smallholders. The theoretical framework used in this thesis consisted of value chain and network analysis and transaction cost economics. Empirical data was collected among farmers in Indonesian vegetable value chains for modern retail markets.

Chapter 2 explores the way POs have upgraded their value chains in order to link farmers with modern retailers. Value chain upgrading at the level of the PO supplying modern domestic retail has rarely been explored. The three critical elements in upgrading value chains are network structure, added value and value chain governance. This chapter used a qualitative approach by describing how three POs in Indonesia have upgraded their value chains in order to link smallholders with modern retail. The chapter showed that the POs have upgraded their network structure by increasing collaboration with modern retailers and specialised wholesalers as well as by coordination among the member farmers. The added value of the vegetables has been increased by the POs through providing technical assistance, facilitating organic farming, and supporting post-harvest handling (e.g., sorting, cleaning, packaging, labelling and organic certification) and distribution of the produce. Upgrading of the governance of the value chains can be seen in the vertical arrangements through contracts between the POs and their buyers, as well as in the horizontal relationships among the members of the PO. These three types of value chain upgrading can mitigate the constraints of smallholders to supply modern retailers.

Chapter 3 analysed the preferences of the farmers for specific CFAs in the modern retail markets. A CFA has trade-offs between incentives and risks. A better understanding of

the behavioural preferences of farmers in response to the diversity of contract attributes was aimed at in this chapter. A quantitative approach using a choice experiment (CE) was used to measure and analyse the preferences of smallholders in selecting a contract option. Attributes were derived from actual modern retail contracts besides a non-contract option to design the choice set in the CE. Farmers were asked to select a specific bundle of contract attributes in the CE. The results showed that smallholders are generally more inclined to choose the non-contract option, selling their products to traditional retailers. Most contract attributes in modern retail generated negative preferences except high price, perhaps because contracting in modern retail is perceived as requiring additional investment and involving high cost for quality, transport and greater risk than transactions in the traditional market.

Chapter 4 discussed the alignment between vertical coordination (VC) and horizontal coordination (HC) to comply with the food quality and safety standards required by modern retailers. A qualitative approach describing five cases of Indonesian vegetable value chains was taken in exploring vertical and horizontal chain coordination, along with the food quality and safety attainment at the level of farmers. The VC mechanisms between farmers and buyers were identified based on quality agreements, quality monitoring and resource allocation. HC mechanisms were operationalized as the services provided by the POs to comply with quality requirements. Food quality and safety were measured using intrinsic and extrinsic quality standards set by modern retailers. Data were gathered through semi-structured interviews with farmers, POs, specialised wholesalers, and modern retailers. Within-case and cross-case analyses were used for description and comparison and to develop propositions. The within-case analysis showed the diversity of VC mechanisms between farmers and buyers and HC mechanisms among farmers in POs to comply with food quality and safety requirements. Several propositions were developed on the basis of cross-case analyses. First, a correlation exists between the strength of VC and the quality and safety of the vegetables produced. Second, the relationship between VC and HC mechanisms can be substitutional or complementary; the presence of HC in the chain can reduce the need for strict vertical coordination to guarantee compliance with food quality and safety requirements. Third, efficiency is increased with the combination of VC and HC through the reduction of transaction costs.

The nature of the relationship between contracted farmers and buyers was analysed in Chapter 5, by examining the impact of VC (i.e., open communication and information exchange) and intra-organisational horizontal ties on the quality and continuity of the relationship. A strong relationship among partners in the chain is associated with lower transaction costs and higher performance. Data were gathered through structured interviews with the contracted farmers who supply through a PO and those who directly sell to the buyers. Structural equation modelling - partial least squares (SEM-PLS) -

was used to examine the relationship between construct variables with both direct and indirect effects. Relationship quality between the contracted farmers and buyers was improved by vertical coordination and horizontal ties, as was shown in the direct effect analysis. Relationship continuity was influenced by horizontal ties. The influence of open communication, information exchange, and horizontal ties on relationship continuity was mediated by relationship quality, as shown in the indirect effect analysis.

Chapter 6 has discussed the main findings of this thesis, its theoretical and methodological contributions, its managerial and policy implications, its limitations and suggestions for future research. This thesis has contributed to knowledge on upgrading value chains, preferences of smallholders concerning CFAs, food quality and safety management, governance structures in value chains, and determinants of relationship quality. Value chain upgrading at the PO level through strengthening network ties, adding value and enhancing governance can mitigate smallholders' constraints to link them to modern retail. Value chain upgrading is not only a matter of improving individual firms, as in most studies, but also of enhancing collective organisations like the PO. These findings provide important lessons for managers and policy makers in developing countries, as this show how smallholders can gain access to high-value markets.

The preferences of farmers for contracting in modern retail markets are diverse. The differences in perceptions of contract attributes result from the trade-offs between incentives and risks in the CFA. This thesis contributes to the literature on behavioural preferences of farmers concerning CFAs and informs the debate on trade-offs in contract arrangements.

Value chain coordination, both vertically and horizontally, has an impact on meeting food quality and safety requirements in modern retail markets. This finding contributes to the literature on food quality and safety management by adding the perspective of value chain coordination. The presence of HC in the value chain can reduce the need for strict VC, and hence lowers the need for hierarchy in the governance between farmers and buyers. In addition, the combination of HC and VC boosts efficiency by reducing transaction costs. Lastly, this thesis contributes to the literature on value chain relationships through providing an understanding of the process to be followed to achieve continuity in the relationship between contracted farmers and their buyers.

This thesis has implications for actors in the chains. When a PO collaborates closely with buyers it can better support its members in upgrading. This requires the PO to increase its capability to provide services to its members, thus to support them in meeting the quality requirements of modern retail. For buyers, these case studies help to design CFAs that are favoured by farmers. Also, this study suggests to the buyers that coordinating with

the PO to meet quality and safety requirements can be done more efficiently than with the individual farmers. To build relationship quality with the contracted farmers, buyers can facilitate communication openness, increase information exchange, and support the horizontal ties among farmers in the PO.

The main conclusions of this thesis can be summarised as follows:

- The POs that upgraded their value chains in terms of their network structure, added value and governance could mitigate the constraints of smallholders and play a role in linking smallholders with modern retail. Upgrading of the network structure was observed in horizontal and vertical coordination among actors of the chain. The capabilities of the PO in increasing production, post-harvest handling and distribution were considered to contribute to increase the added value. The PO has a function in the vertical value chain arrangement through the contract between the PO and buyers, and to the extent that the PO upgrades its governance both within the chain and internally.

- An examination of participation in contracting with modern retailers revealed diverse preferences among farmers, possibly due to the trade-offs between incentive and risk. Most farmers did not prefer contracts over non-contract options. The contract attributes drew negative preferences from the farmers, perhaps because contracting with modern retailers is perceived as requiring high investment, a high degree of effort to meet the quality standards, and high risk. A high level of education, a risk orientation, having adopted organic farming, and a relationship with a marketing PO positively influenced the probability of farmers choosing contracts.

- The VC and HC mechanisms played a crucial role in complying with quality and safety standards at the farmer level. Strict VC was correlated with high food quality and safety standards. The presence of the PO in the value chain reduced the strength of VC in ensuring adherence to food quality and safety requirements and reduced the level of hierarchy in the governance structure. Combining VC and HC in the value chain increases efficiency by reducing transaction costs associated with food quality and safety compliance.

- Open communication, information exchange and intra-organisational horizonal ties in the PO strengthened the relationship quality between contracted farmers and buyers. The impact of open communication, information exchange, and horizontal ties on relationship continuity was mediated by the quality of the relationship.

Overall, this thesis revealed that the CFA and the PO play a crucial role in improving the performance of smallholders in value chains. The performance increase can be seen as follows: First, upgrading value chains at the PO level can mitigate the constraints of smallholders to link them with modern retail (Chapter 2). Second, increasing the preference of smallholders to participate in CFAs can be achieved by involving the PO in the contract scheme and designing contracts that are more preferred by farmers (Chapter 3). Third, the CFA and the PO have a crucial role to play in the compliance of farmers with food quality and safety standards in modern retail markets. Combining the CFA and the PO in the value chain is more efficient, due to reducing transaction costs in chain coordination, compared with non-involvement of the PO (Chapter 4). Fourth, the relationship quality between the contracted farmers and buyers is influenced by VC through open communication and information exchange and intra-organisational horizontal ties in the PO (Chapter 5). CFAs and POs, as institutional innovations, support the inclusion of smallholders in value chains.

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APPENDIX

Questionnaire

Section 1. Vegetable value chains

Interview schedule for respondents: modern retailers, wholesaler, producer organisations, traditional wholesaler, and local collector.

Main Data/Questions:

1. Product: How is the product flow in the vegetable value chains for supermarkets?
2. Information: What information flows from sellers to buyers and from buyers to sellers?
3. Actors:Who are the actors involved in supermarket chains? What type of actors are these? What are the main activities?
4. Support: What supporting actors are involved in the supermarket chains? What support do they provide and to who?
5. Contracts: What are the contract attributes among actors in the supermarket vegetable value chains?

I. Modern retailers

1. What are the quality standards for vegetable that you require?
2. How many suppliers do you have for vegetable?
3. What type of suppliers do you have for vegetable? (Farmers/Producer organisations/wholesaler/internal supplier/ others_____)
4. What contractual agreement do you have with your main suppliers? In other words, what is in the contract?
5. Do you have partnerships with other parties (except the suppliers) for procuring vegetable? If any, who are the partners and what is the purpose of the partnership?
6. What information do you share with your suppliers?
7. Why do you share this information? How do you share the information?
8. What support do you give your suppliers?
9. Why do you give this support?

II. Wholesaler (Specialized Wholesaler Supplying to the modern retailers)

1. How long have you been a supplier to modern retailer A?
2. What are your main activities in order to supply vegetable to modern retailer A?
3. Do you have arrangements with producer organisation and/or individual farmers) for supplying vegetable?
4. What have you agreed upon in these arrangements? (Or: what is in the contract?)

5. Do you have any partnership with other parties (except the POs/farmers) in order to be able to supply vegetable? If yes, who are the partners and what is the purpose of this partnership?
6. What information do you share with producer organisation and/or individual farmers?
7. Why do you share this information?
8. What support do you give your suppliers?
9. Why do you give this support?

III. Producer Organisations

1. How long have you been supplying vegetable to modern retailer A?
2. How long have you been supplying vegetable to wholesaler 1?
3. What are the main activities that you undertake for supplying vegetable to wholesaler 1 and modern retailer A? (Provide list of potential activities)
4. What contractual agreement do you have with wholesaler 1? in other words, what is in the contract?
5. Do you also have an arrangement with modern retailer A? If so, what are the main provisions?
6. Do you have any partnerships with other parties (beyond wholesaler and supermarket) for the delivery of vegetable? If yes, who are the other partners and what is the purpose of this partnership?
7. What information do you share with the farmers to deliver to you?
8. Why do you provide this information?
9. What services do you provide to your members?

IV. Farmers

1. How long have you been a member of producer organisation X?
2. Why are you a member of producer organisation X?
3. How does membership of producer organisation X affect you decisions in growing vegetable X?
4. Next to the producer organisation, do you have other options for selling vegetables?
5. If you have other market options, what are the advantages and disadvantages of selling to other buyers, compared to selling to/through producer organisation X?
6. Do you have any partnership beyond your arrangement with the producer organisation that affects your decisions in growing vegetable? If yes, who are your partners and what is the purpose of the partnership?
7. Who is giving you support (e.g., technical assistance) in growing vegetable?
8. What information do you receive from your PO X (Regarding production and marketing of vegetable)?

V. Traditional wholesaler

1. What are your main activities in order to supply vegetable to wholesaler 1?
2. Do you have arrangements with wholesaler 1 for supplying vegetable?
3. What have you agreed upon in these arrangements? (Or: what is in the contract?)
4. Do you have any partnership with other parties in order tobe able to supply vegetable? If yes, who are the partners and what is the purpose of this partnership?
5. What information do you share with the partners?
6. Why do you share this information?
7. What support do you give your suppliers?
8. Why do you give this support?

VI. Local collector

1. What are your main activities in order to supply vegetable to traditional wholesaler?
2. Do you have arrangements with traditional wholesaler for supplying vegetable?
3. What have you agreed upon in these arrangements? (Or: what is in the contract?)
4. Where do you get the vegetables? Do you have contract arrangements with the farmers?
5. What information do you share with the farmers?
6. Why do you share this information?
7. What support do you give your suppliers?

Section 2. Contract Arrangements

In your relation with your partners (modern retailers/wholesalers/PO/farmers) what method do you use?

- Written agreement _____
- Verbal agreement _____

What is duration of this contract determined?

- Fixed quantity based arrangements (please specify)_____
- Time based arrangements (please specify)_____
- Arrangement continues until cancelled by one of the parties_____

Does the arrangement include a notice of termination period? (if so, please specify the period)

What terms are included in the contract attributes (please mark (x))

Terms	**Mark with "x"**
I. Main Attributes	
Pre-agreed price	
Pre-agreed volume	
Delivery at specific time	
Delivery at specific place	
Minimum quality standards	
Packaging requirement	
II. Additional Attributes	
Input provision	
Equipment for handling	
Finance provision	
Technical assistance provision	
Logistic provisions	
Other (please specify)	

Follow-up Questions (Detail Contract Attributes)

- **Price (***Identify the determination of price setting and duration changes)*

  How is price determined? _____

  - o Centralized markets (spot price)
  - o Reference markets (third-party)
  - o Parties to the transaction (buyers)
  - o Internal price (integrated supermarket and production)

  How many days before delivery the (base) price is determined? _____

  How long the duration of price agreement? _____

  - o Short-term (until 10 days)
  - o Medium/Long term (longer than 10 days)
  - o Indefinitely (no termination date is fixed)

  Is modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? If so, how much in advance? _

- **Volume/Quantity** *(Identify the minimum/maximum volume requirements)*

  Does modern retailer/wholesaler/traditional retailer/PO specify the amount to be delivered? _____

  Are deviations from requirements allowed? If so, to what extent? _____

  Does the penalties enforcement if the arrangements is not kept (fixed amount)? _____

  How long the duration of volume agreement? _____

  - o Short-term (until 10 days)
  - o Medium/Long term (longer than 10 days)
  - o Indefinitely (no termination date)

Is the modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? in advanced the quantity? If so, how much in advance?_____

- **Time and place delivery** (*Identify scheduling process of time and place requirements)*
  How far in advance is possible delivery planned? _____
  Are there any specific time of day or a day week arrangement to be delivered? _____
  How is the strict the time delivery of this arrangements? _____
  Are there any specific place of arrangements to be delivered? _____
- **Quality standards and Inspection rights** *(Identify minimum quality standards and monitoring to comply quality standards)*
  What are the minimum quality standards for vegetable X?_____
  Which actor sets quality standard? _____
  - o Public regulator
  - o Third-party
  - o Parties to the transaction
  - o Modern retailer unilaterally

  Which actors do monitoring or inspection to comply the quality standards?_____
  - o Public regulator
  - o Third-party
  - o Parties to the transaction
  - o Modern retailer itself

  What are the activities of monitoring or inspection?_____
- **Packaging requirement** *(Identify packaging arrangements)*
  Does Is modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? specify the packaging for vegetable x? ___ if yes, what are the packaging arrangements? _____
- **Input** *(Identify the input farming arrangements provided by supermarket)*
  Does modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? provide specific input farming (seeds, fertiliser, pesticide, etc.) for the suppliers? __If yes, what the items of input provided by the supermarket? _____
  To what extent does the inputs provide for the suppliers? _____
  Which actors providing inputs to the suppliers? _____
  - o Market/Public
  - o Third-party
  - o Parties to the transaction
  - o Modern retailer
- **Finance provision** *(Identify credit arrangements)*
  Does modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? provide credit to the suppliers?_____

If yes, is credit (financing) provided in favourable conditions?_____
Which actor providing credit to the suppliers?_____

- o Financial institutions (bank)
- o Third-party
- o Parties to the transaction
- o Modern retailer

❖ **Technical Assistance** *(Identify technical assistance provided by supermarket to suppliers)*
Does modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? provide technical assistance (packaging, wrapping, planting, harvesting, etc.) to the suppliers?_____
To what extent does the technical assistance provide advice and expertise?_____
Which actor providing technical assistance to the suppliers?_____

- o Public regulator
- o Third-party
- o Parties to the transaction
- o Modern retailers itself

❖ **Logistic arrangements** *(Identify transport and store arrangements)*
Doe modern retailer/wholesaler/traditional retailer/PO informing in advance of changes to the price? supermarket provide logistic service to the suppliers? _____
If so, What is the logistic arrangements provided by supermarket to the suppliers? _____
Which actors providing logistic service to the suppliers? _____

- o Market
- o Third-party
- o Parties to the transaction
- o Modern retailers itself

Section 3 Understanding Farmers' Choice of Market Channel and Preferences of contract attribute

Respondent: Vegetable farmers.

A. Farmers Socio-Economic Characteristics

1. What is your age (year)?
2. What is your highest level of education?
   ⓪ no formal education ③ tertiary
   ① primary ④ university
   ② secondary ⑤ other (specify) _____
3. What is the size of your family? (# of persons):
4. How many years of experience in farming do you have? (year):
5. What is the size of your farm size (m^2)

6. What is the (yearly average) area of vegetables you grow? (m^2): _
7. If farming your main occupation (yes/no): _____
8. Do you have a part-job outside farming? (yes/no), if any, what is your part-job? _____
9. What is your farming income (Rp/annual):
   a. < 200.000,-
   b. 200.000,- to 400.000,-
   c. 400.000,- to 600.000,-
   d. 600.000,- to 800.00,-
   e. 800.000., to 1.000.000,-
   f. 1.000.000,- to 1.200.000,-
   g. 1.200.000,- to 1.400.000,-
   h. > 1.400.000,-
10. What is your non-farming income (Rp/annual) :
   a. < 200.000,-
   b. 200.000,- to 400.000,-
   c. 400.000,- to 600.000,-
   d. 600.000,- to 800.00,-
   e. 800.000., to 1.000.000,-
   f. 1.000.000,- to 1.200.000,-
   g. 1.200.000,- to 1.400.000,-
   h. > 1.400.000,-
11. Are you a membership of a Producer Organisation (e.g. a cooperative, or marketing group)? (yes/no):
12. Did you adopt organic farming? (yes/no); _____
13. Do you have an organic certification? (yes/no) _____
14. What is the distance between your farm and the main road (km)_____
15. Do you have an own green house on your farm? (yes/no) _____
16. Do you have own irrigation equipment on your farm? (yes/no) _____

B. Market Channel Choice

17. What are the main marketing channels in which you sell your vegetables? Please choose the three channels where you sell most quantities and also give the percentage?

Marketing Channels	Rank 1= Highest quantity is sold 2= 2nd Highest quantity is sold 3= 3nd Highest quantity is sold	Quantities Percentage of Selling (%)
1. Independent middlemen		
2. Small traditional retailers		
3. Wholesalers		
4. Specialized supermarket wholesalers		
5. Producer organizations		
6. Supermarkets		
7. Processor Companies		
8. Exporters		
9. Other (please specify) _____		

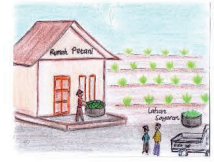
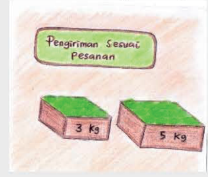
C. Risk Characteristics

	Not true at all				totally true
1. If there is a chance of high profit I am willing to take a high risk	O 1	O 2	O 3	O 4	O 5
2. I feel secure selling my vegetables to the middlemen, even against a low market price	O 1	O 2	O 3	O 4	O 5
3. I take more financial risk compared with other farmers	O 1	O 2	O 3	O 4	O 5
4. In farming, I would prefer planting species with high profit which could be easy lost to stable return but with lower profit	O 1	O 2	O 3	O 4	O 5
5. To achieve something in life one has to take risk	O 1	O 2	O 3	O 4	O 5

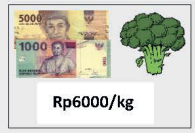
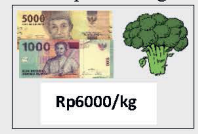
D. Smallholders' Preferences

Imagine your buyer offers you different contract options for supplying vegetables. Which one of the following contract options do you prefer the most?

Set 1

Contract Attribute	Option A	Option B	Option C
Price of Broccoli	Rp. 14.000/kg 	Rp. 16.000/kg 	Rp.6.000/kg 
Payment Methods	Payment delayed for two weeks 	Payment delayed for one weeks 	Payment immediately 
Vegetables post-harvest handling	Sorting and putting in crates 	Sorting, washing, packaging and organic labelling 	No further handling 
Place of sales	Near market 	Buyer place 	Farm gate 
Quantity delivered	Flexible quantity 	Fixed quantity 	Flexible quantity 
Your choice	☐	☐	☐

Set 2

Attribute Contract	Options A	Options B	Options C
Price of Broccoli	Rp. 6.000/kg 	Rp. 8.000/kg 	Rp.6.000/kg 
Payment Methods	Payment delayed for three weeks 	Payment cash 	Payment immediately 
Vegetables post-harvest handling	Sorting, washing customized packaging and organic labelling 	No further handling 	No further handling 
Place of sales	Near Market 	Farm gate 	Farm gate 
Quantity delivered	Fixed quantity 	Flexible quantity 	Flexible quantity 
Your choice	☐	☐	☐

Section 4. Relationship Quality

Respondent: Vegetable Farmers

Open Communication

Our communication with the buyer is open and honest	Strongly disagree O 1	O 2	O 3	O 4	Strongly agree O 5
Sometimes the buyer does not tell me everything I need to know (-)	O 1	O 2	O 3	O 4	O 5
We exchange relevant information with the buyer on a regular basis	O 1	O 2	O 3	O 4	O 5
We talk candidly with each other	O 1	O 2	O 3	O 4	O 5

Information exchange

We are frequently informed about quality requirements	O 1	O 2	O 3	O 4	O 5
The buyer helps us to plan our production according to the buyer's needs	O 1	O 2	O 3	O 4	O 5
The buyer gives us feedback to improve the quality of the vegetables we deliver to him/her	O 1	O 2	O 3	O 4	O 5
The buyer provides knowledge and technical assistance	O 1	O 2	O 3	O 4	O 5

Horizontal ties

I regularly participate in meetings with other farmers in the PO	O 1	O 2	O 3	O 4	O 5
I regularly communicate with the other farmers in the PO	O 1	O 2	O 3	O 4	O 5
I am willing to share my knowledge with other farmers in the PO	O 1	O 2	O 3	O 4	O 5
I trust the other farmers in the PO	O 1	O 2	O 3	O 4	O 5

Trust

The buyer pays on time	O 1	O 2	O 3	O 4	O 5
The buyer and I trust each other	O 1	O 2	O 3	O 4	O 5
I am confident that the buyer is telling the truth	O 1	O 2	O 3	O 4	O 5
The buyer works in our joint interests	O 1	O 2	O 3	O 4	O 5

Satisfaction

We are very satisfied with the buyer	O 1	O 2	O 3	O 4	O 5
It is a pleasure to have a good sales relationship with the buyer	O 1	O 2	O 3	O 4	O 5
This is the best sales relationship that I have experienced	O 1	O 2	O 3	O 4	O 5
We want this relationship with the buyer to continue for a long time	O 1	O 2	O 3	O 4	O 5

Commitment

We want this relationship with the buyer to continue for a long time	O 1	O 2	O 3	O 4	O 5
Our positive feelings towards the buyer are a major reason for continuing to work with him/her	O 1	O 2	O 3	O 4	O 5
I will not switch to another buyer, even if the other buyer offers a better price	O 1	O 2	O 3	O 4	O 5

Dependence

This buyer is important for our future sales	O 1	O 2	O 3	O 4	O 5
It is difficult to find another buyer	O 1	O 2	O 3	O 4	O 5
It is difficult to trust another buyer	O 1	O 2	O 3	O 4	O 5

About the author

Fanny Widadie was born on June 6, 1985 in Jombang, East Java-Indonesia. In 2008, he obtained Bachelor degree in Agricultural Socio-Economics at the Brawijaya University, Malang, East Java-Indonesia. He took a Master in Agribusiness Management at Muhammadiyah Malang University, Malang, completed in 2010. Since 2011, he started to work as lecturer at the Agribusiness Department, Faculty of Agriculture, University of Sebelas Maret, Surakarta, Central Java–Indonesia. In September 2015, he had opportunity to pursue a PhD study in the Business Management & Organisation Group at the Wageningen University and Research. The PhD study was fully funded by the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia (KEMENDIKBUDRISTEK) through Directorate General of Resources for Science Technology and Higher Education (DIKTI) with Grant/Award Number: 498/E4.4/K/2015.

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Fanny Widadie

Wageningen School of Social Sciences (WASS)

Completed Training and Supervision Plan

Wageningen School of Social Sciences

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
Writing research proposal	WUR	2015-2016	6
Economic Analysis of Coordination, AEP-31806	WUR	2016	6
Multidisciplinary perspective on quality improvement in value chains	WASS	2016	1
Quantitative Data Analysis: Multivariate Techniques, YRM-50806	WUR	2017	2
Advanced Econometrics, YSS-34306	WUR	2019	6
B) General research related competences			
WASS Introduction course	WASS	2015	1
Structural equation modelling (SEM) with Lisrel	University of Indonesia, Jakarta, Indonesia	2017	0.5
Workshop of qualitative research method	University of Gadjah Mada, Yogyakarta, Indonesia	2017	0.5
Systematic Literature Review	WASS	2018	4
The Young scholars workshop on cooperatives	WUR	2018	0.5
Bayesian statistics	PE&RC, SENSE	2018	0.6
'*Supply chain coordination through vertical and horizontal arrangements in the procurement process of vegetables in high-value markets*'	Wageningen Indonesia scientific exposure (WISE), Wageningen, the Netherlands	2017	1
'Assessment of smallholders farmers' preferences for accepting contract in modern retail: a choice experiment in Central Java, Indonesia'	WASS PhD day, Wageningen, the Netherlands	2019	1
'Influence of communication openness, information exchange, and horizontal relationships on contracted farmers-buyer business relationships'	International seminar on agribusiness: Agribusiness and economic recovery, IPB University, Bogor, Indonesia	2021	1
C) Career related competences/personal development			

Information literacy PhD including endnote introduction	WUR Library	2015	0.6
Techniques for writing and presenting a scientific paper	WGS	2016	1.2
Research data management	WUR Library	2018	0.5
Project and time management	WGS	2019	1.5
Scientific writing	Wageningen In'to Languages	2019	1.8
English skills lab – academic grammar and vocabulary refresher	Wageningen In'to Languages	2019	1.8
Total			**38.5**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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