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**Linking smallholder producers to high-value markets through
producer cooperatives: A case study of vegetable producer
cooperatives in Cambodia**

A thesis presented in partial fulfilment of the requirements for the degree of

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Abstract

The emergence of supermarkets and high-value markets (HVMs) in developing countries has implications for producers and whole agri-food markets. To bring benefits of this development to smallholder producers, governments and development agencies have paid great attention to the essential roles of producer cooperatives (PCs). Many studies show that PCs succeeded in linking producers to HVMs, but numerous cases indicated that PCs did not achieve their goal. Modern retail markets and supermarkets have grown in Cambodia, but vegetable growers were unlikely to gain benefits from this HVMs. PCs play critical roles in assisting smallholder producers in strengthening market competition, but only a very few PCs achieved their business goals. The purpose of this research is 1) to examine the role of producer cooperatives (PCs) in linking vegetable producers to (HVMs) and 2) analyse the factors affecting successful participation in (HVMs).

This study applied mixed research methods by integrating qualitative and quantitative approaches to examine vegetable value chains, the roles of PCs, and factor affecting smallholder producers' participation in HVMs. With this study, the primary data was collected by using a face-to-face interview with PCs' managers and a survey interview with PCs' members. This study used Qualitative Data Analysis, descriptive statistics, binary logistic regression, chi-square test, and independent samples T-Test to address research objectives.

The research indicated that the vegetable value chain in Cambodia consisted of two main marketing channels, such as traditional markets (TMs) and high-value markets (HVMs). The value chain of TMs was long and complicated with a number of chain actors, while the value chain of HVMs was short and high integration of the intermediaries. The research suggested that the value chain of HVMs provided a better price for producers, but volume supplied to supermarkets remains relatively small. In terms of the roles of PCs, all selected PCs provided agricultural input support, financial support, extension services, and market support to their members. However, PC-HVMs focused on both production and markets, while PC-TMs paid great attention to production. Based on these results, governments, and development agencies, and PCs should assist producers in both production technologies and business skills.

The study examined factors that influenced smallholder producer groups' participation in HVMs. The results indicate that the majority of respondents considered external factors, such as political, economic, social, environmental, and technological factors, as important factors affecting their participation in HVMs. This study suggested that wide ranges of supports provided to producers may help them to participate in HVMs. However, there is a need for favourite supporting policies and a macroeconomic environment from the government in the country. These could open up broader market opportunities for smallholder vegetable producers. The binary logistic regression results indicate that some internal factors, such as a vegetable farming experience, volume of vegetables, and average vegetable prices had a statistical significance with a positive sign. However, a vegetable farm size showed a negative sign.

Key words: Producer cooperatives, smallholder producers, vegetables, high-value markets, Cambodia

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Abbreviations

BFP	Boosting Food Projects
CamGAP	Cambodia Good Agricultural Practices
EMC	Emerging Markets Consulting
FAO	Food and Agriculture Organisation
GAP	Good Agricultural Practices
GDP	Gross Domestic Products
GTZ	German Technical Cooperation Agency
HIC	Heifer International Cambodia
HVM	High-Value Market
LWD	Life with Dignity Organisation
MAFF	Ministry of Agriculture, Forestry, and Fisheries
NGO	Non-Governmental Organisation
NIS	National Institute of Statistics
PC	Producer Cooperative
PO	Producer Organisation
PC-HVM	Producer Cooperative supplying vegetables to high-value market
PC-TM	Producer Cooperative supplying vegetables to traditional market
PDAFF	Provincial Department of Agriculture, Forestry, and Fisheries
SDC	Swiss Agency for Development and Cooperation
TM	Traditional Market
UN	United Nations
USD	United States Dollar
USAID	The United States Agency for International Development

Chapter 1 : Introduction

1.1. Background of the research

The recent development of supermarkets and high-value markets (HVMs) in developing countries has implications for immediate suppliers and the whole agri-food marketing system in those countries (Reardon, Timmer, & Berdegúé, 2005). This new trend has provided both new challenges and opportunities for smallholder farmers (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009). The emergence of HVMs has provided a valuable opening for farmers, but smallholder farmers in developing countries have often been left out of this opportunity (Poulton, Kydd, & Dorward, 2006). With market imperfections in developing nations, smallholder farmers face difficulties in accessing HVMs for numerous reasons. These include low prices, lack of technological information, poor marketing networks, absence of input and output markets, and financial constraints (Markelova et al., 2009). Reardon, Barrett, Berdegúé, and Swinnen (2009), Neven, Reardon, Chege, and Wang (2006), and Kaganzi et al. (2009) acknowledged that supermarkets need high quality products and that requires farmers to improve their production technology.

To tackle these barriers, governments, donors, and NGOs have paid attention to the crucial roles of producer organizations (POs) in strengthening smallholder farmers' capacity and assisting them to participate successfully in HVMs (Fischer & Qaim, 2012; Hernández, Reardon, & Berdegúé, 2007; Rao, Brummer, & Qaim, 2012). Stockbridge, Dorward, Kydd, Morrison, and Poole (2003) identify that POs could provide a wide range of services for improving agricultural productivity and market access. These POs help smallholder producers to access external services and products, such as market information and new technologies that are important for accessing HVMs (Kruijssen, Keizer, & Giuliani, 2007; Narrod et al., 2009). Since supermarkets require a stable and consistent supply of quality produce, POs are better suited than individual farmers to deal with supermarkets (Shiferaw, Hellin, & Muricho, 2011). Many studies indicated that POs could be successful in integrating smallholder producers in HVMs (Hellin, Lundy, & Meijer, 2009; Shiferaw et al., 2011; Stockbridge et al., 2003). However, several other cases showed that POs did not achieve their goals in linking their members to high-value markets (Markelova et al., 2009; Poulton, Dorward, & Kydd, 2010).

1.2. Research problem

The agriculture sector has been playing critical roles in providing national food security and nutrition to millions of people in Cambodia as well as maintaining sustainable growth for the national economy. In 2016, the contribution of this sector to the national GDP was around 26.3%, compared to industry and services sectors at approximately 31.3% and 42.4% respectively (MAFF, 2017). Growth of the agriculture sector contributed more than 60% to the alleviation of poverty in Cambodia, especially in rural areas (World Bank, 2015a). Vegetables were the second most important crop after rice products because they provided opportunities for sale and higher income for both smallholder and large-scale farmers in most Cambodian provinces (Sarith & Chea, 2003). The World Bank (2015a) indicated that an increase in vegetable production at 10% has contributed to the growth of agriculture gross production about 8.7% and its value added about 5.3%. The transition towards commercialization of these crops has been seen in recent years, due to higher domestic and international demand (MAFF, 2017).

This was similar to what Trebbin (2014) found in other South East Asia countries where spreading supermarket channels in the regions led to a concentration of commercial farming systems. This trend now exists in Cambodia, although it was slower to begin than other countries in the region. Vu (2016) and McCarthy, Jaffe, Longhurst, Curry, and Fink (2016) assert that the number of modern retail markets in Cambodia, mainly in urban areas, has constantly grown since 2013. However, smallholder growers in Cambodia were unlikely to gain benefits from this HVM transformation. They often have limited market access, low market competitiveness, and are excluded from HVM chains (Estelle, Célia, Jean-François, & Laurent, 2004). In addition, the problems are that there is often a lack of transportation infrastructure, agro-processing facilities, price control, and poor product quality (Estelle et al., 2004; World Bank, 2007). They face challenges in high input prices but receive a low output market price (GTZ, 2006).

It is believed that individual farmers may be unable to address these issues effectively unless those smallholder farmers organize institutions such as POs (Narrod et al., 2009). MAFF (2013) wrote that producer cooperatives (PCs) played critical roles in assisting producers in expanding their economic scale, increasing access to extension services, and strengthening market competition. Nonetheless, Theng, Keo, Nou, Sum, and Khiev

(2014) argue that only a very few PCs in Cambodia achieved their business goals. Previous studies conducted in developing countries found membership of POs enhances HVM participation (Ismail, Kavoi, & Eric, 2013; Markelova & Mwangi, 2010; Mukarumbwa, Mushunje, Taruvinga, Akinyemi, & Ngarava, 2018; Zivenge & Karavina, 2012). However, there is a dearth of research in the Cambodia context, including the roles of PCs in linking smallholder vegetable producer group to HVMs and discussing the factors affecting their participation in HVMs. Previous studies focused on the impact of smallholder PCs on market participation (Phon, 2016) and farmer's revenues (Hun, Ito, Isoda, & Amekawa, 2018). Therefore, this research is necessary to understand the ways to link smallholder producers to HVMs through PCs.

1.3. Research aim and objectives

Research aim: this research aims to 1) examine the role of producer cooperatives (PCs) in linking vegetable producers to (HVMs) and 2) analyse the factors affecting successful participation in (HVMs)

Research objectives: there are four specific research objectives:

1. To map the vegetable value chains in Cambodia
2. To examine the roles of producer cooperatives (PCs) in supporting smallholder producer groups to access HVMs.
3. To analyse factors affecting smallholder producer groups' participation in HVMs
4. To provide key policy implications for the government, NGOs, PCs, and private sectors to facilitate HVM access for smallholder vegetable producers

1.4. The significance of research

Cambodia's economic growth has derived mainly from the industry and service sectors over the past two decades, while the contribution of agriculture to GDP declined. However, the agriculture sector continues to play major roles in the national economy (World Bank, 2018). Vegetables remain strategic crops in the country, due to Cambodia's comparative advantages, such as fertile soil, favourite weather, and available irrigation systems (Gunjal, Sheinkman, Burja, Jeong, & Long, 2012; Ponciano, Sothea, & Mercy, 2011). This study contributes to the vegetable sector in Cambodia as well as the development of PCs:

- Firstly, the results of this study will help producers and PCs to be ready for the upcoming market transformation in Cambodia. Vu (2016) and McCarthy et al. (2016) pointed out that the transformation to HVMs in Cambodia was similar to the other countries in the region, such as Vietnam and Thailand.
- Secondly, the importance of this study is to promote a sustainable vegetable sector and strengthen market competition for smallholder producers. Therefore, by meeting consumers' concern for improved quality, Cambodia could reduce its vegetable imports from other countries. Moreover, this study also provides a roadmap for producers and PCs to open up new market opportunities - not only domestic markets but also international markets. Nuppun (2016) claimed that domestic vegetables had more comparative advantages than imported vegetables because consumers had high trust in their quality. Additionally, Cambodia has broad opportunities to export its vegetables to overseas markets if it improves its product quality and technology (Kula, Turner, & Sar, 2015).
- Lastly, this study can make a significant contribution to the current and future government's and NGOs' intervention project. For example, the Boosting Food Project (BFP) is supported by the government, with the main purpose of strengthening the domestic vegetable market and reducing the volume of imported vegetables. This project focuses on vegetable producer groups and promotes chemical-free vegetables for consumers. Therefore, the results of this study will provide important insights for designing project frameworks and appropriate policies.

1.5. Thesis overview

The thesis is structured into seven chapters. This first chapter begins with the introduction that comprises the background of the research, the research problems, research aim and objectives, and the significance of this research. Background to the research in Cambodia is used in chapter two to review key information of the study country: agricultural status; the vegetable sector; and producer cooperatives (PCs) in the country. Chapter three contains a literature review in relation to agricultural value chains, the roles of producer cooperatives (PCs), and the factors affecting members' participation in HVMs. Further, this chapter provides a research conceptual framework as the roadmap for conducting the study. The research methodology is highlighted in chapter four, including the background

of research approaches and design, the research strategy, study area, sampling methods, questionnaire development, data collection methods, and data analysis methods. Chapter five concentrates on the results of the study, based on the research objectives, while critical discussion of the results is presented in chapter six. The last chapter provides a summary of the whole thesis. This chapter ends with further research recommendations and policy implications.

Chapter 2 : Background to research in Cambodia

This chapter describes the general background of Cambodia and is divided into four main sections. The first section presents an overview of Cambodia, while Section 2 focuses mainly on the agriculture sector. Section 3 indicates the general status of vegetable development in Cambodia, and the last section highlights the development of agricultural PCs in Cambodia.

2.1. An overview of Cambodia

Cambodia is located in South-eastern Asia between 13°N and 105°E, with a total area of 181,035 square kilometres (a land area of 176,515 sq km and a water area of 4,520 sq km) (United Nations, 2018). The Cambodian climate is tropical with characteristically high temperatures and has two main seasons (World Bank, 2011). The total population of Cambodia is 16,005,373 (51.7% female), with a population density of 90.7 persons per square metre in 2017 (United Nations, 2018; World Bank, 2018). The majority of the Cambodian population in 2017 (about 64.7%) was in the 15-64 age group, followed by the 0-14 age group (31.0%) and the 65+ age group (about 4.3%) (CIA, 2018). Cambodia is one of the world's fastest economic growing countries with an annual growth rate of the GDP per capita about USD 6.5 in 2017 (World Bank, 2018).



Figure 2-1: Map of Cambodia

Source: UN (2018)

2.2. Cambodian agriculture sector

Cambodian agriculture has rapidly transformed from subsistence-based agriculture to commercial-oriented agriculture over the last two decades. The agriculture sector stood at the third rank by sharing around 23.38% of national GDP in 2017 (Statista, 2018; World Bank, 2018). Its share of national GDP has been declining over the last decade (about 6%) due to a high increase in the industry and service sector. Nonetheless, it has played crucial roles in Cambodia's economy by generating jobs and household income for rural people. Agriculture employed about 70.88 percent of the population and accounted for 5.2 million workers out of a total labour force of 7.3 million in 2007 (Trading Economics, 2018; World Bank, 2018).

The reform of the Cambodian macro-economy, mainly after the liberalization of the agriculture market from 1993, has influenced the whole agriculture market system (Gaiha, Azam, Annim, & Imai, 2012). Consequently, the modern markets and private

investment in agriculture sectors have mushroomed in major economic cities and provinces. This growth was alongside the government-friendly policy supports and improvement of major sectors (World Bank, 2015a). Thus, it provided more opportunities for farmers to shift from a subsistence-farming system to a market-oriented system (Rola & Coxhead, 2005) and to the global agri-food system (World Bank, 2015a). The major agricultural commodities in Cambodia include rice, cassava, soybeans, vegetables, maize, and sugar cane, which are the top six crops (Table 2.1). Harvested areas and production of these commodities show a downwards trend, except for rice, due to the emergence of a migration movement from rural to urban areas and overseas (MAFF, 2017).

Table 2-1: The total harvested areas of six major agriculture commodities (2012-2016)

Commodities	Harvested areas (in million hectares)					Production (in million tons)				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Rice, paddy	3.01	2.96	2.86	2.80	2.87	9.29	9.39	9.32	9.34	9.83
Cassava	0.34	0.33	0.33	0.37	0.39	7.61	7.89	8.58	9.41	10.21
Soybeans	0.07	0.10	0.10	0.10	0.10	0.12	0.16	0.16	0.16	0.16
Vegetables	0.10	0.09	0.08	0.08	0.08	0.63	0.61	0.54	0.54	0.54
Maize	0.22	0.21	0.12	0.09	0.07	0.95	0.93	0.55	0.40	0.35
Sugar cane	0.03	0.03	0.02	0.03	0.03	0.57	0.65	0.53	0.58	0.61

Source: FAOSTAT (2018)

2.3. Cambodian vegetable sector

2.3.1. The importance of vegetable sector for smallholder farmers

Vegetables play crucial roles in supporting the Cambodian economy, as well as providing food. In terms of household consumption and nutrition, vegetables were the third major crop after rice and fish in 2016 (Nuppun, 2016), which was commonly consumed by Cambodian people (98%) (NIS, 2016). Regarding income generation, vegetables are regarded as high-value products for smallholder and rural farmers. They provided the highest gross margin, presenting five times higher than that of rice production (World Bank, 2015a). Vegetables were ranked fourth amongst the six major agricultural commodities in terms of harvested areas and product volume (Table 2.1) (FAOSTAT, 2018). The growing vegetable production might contribute to the reduction of imported

produce by about \$130.9 million according to the author's calculation from UN Comtrade (2018). Since domestic vegetables have better quality than imported produce, an increase in vegetable production could replace the imported vegetables (Nuppun, 2016).

2.3.2. Vegetable production in Cambodia

The total area of vegetables expanded from about 42,360 hectares in 2007 to its peak at 54,160 hectares in 2012, before decreasing to about 48,720 ha in 2016 (Figure 2.2). This was because vegetables were the most profitable crops, and land under rice production was replaced by vegetable production (World Bank, 2015a). According to Nuppun (2016), shared vegetable cultivation areas in this country are relatively small, accounting for about 2%, compared to the total area where crops are cultivated. The decline of harvested areas and production was a result of unfavourable climate conditions and the increasing trend of the urban and overseas migration. Besides these, expanding land use for industrial crops, such as cassava, contributes to the decrease of vegetable harvesting areas (MAFF, 2017).

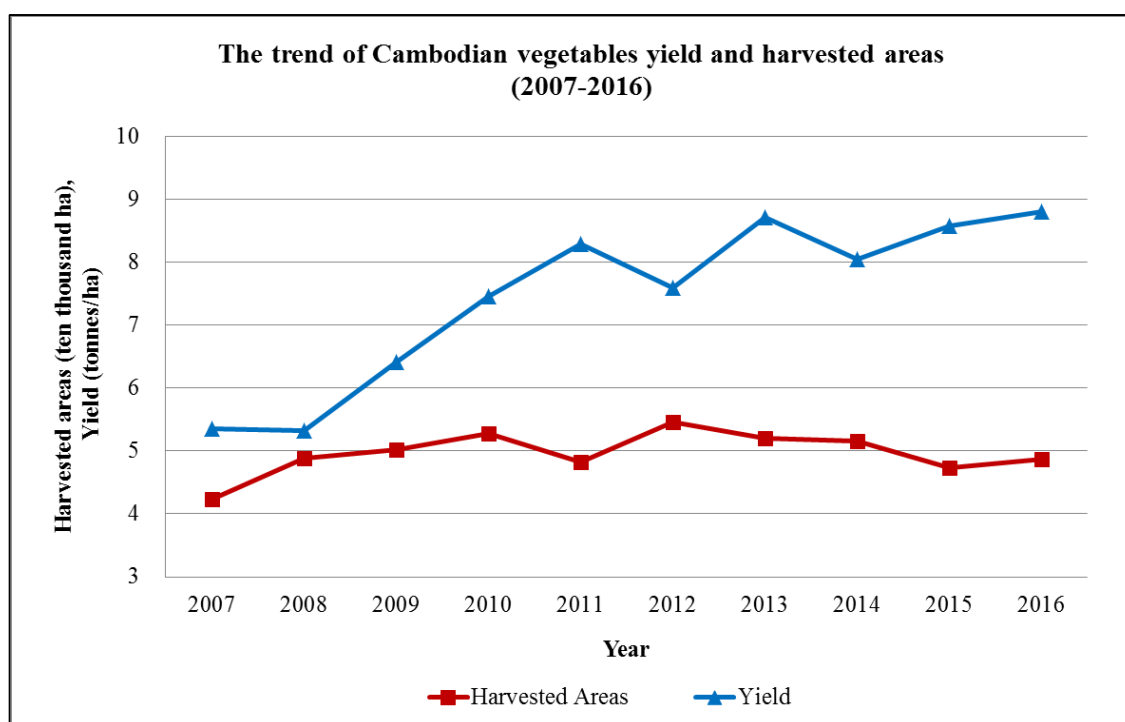


Figure 2-2: The trend of vegetable harvested areas and yield in Cambodia (2007-2016)

Source: MAFF (2017)

However, the average vegetable yield has seen high increases during this period. This is because the MAFF has introduced various policies to push this sector's growth. The ability of vegetable farmers to upgrade farm practices and access modern technologies and information has led to an increase in production yield (Nuppun, 2016; SDC, 2016). Figure 2.2 indicates that the average vegetable yield increased from about 5.4 tons per hectare in 2007 to approximately 8.8 tons per hectare in 2016.

Cambodia classifies vegetables into four major categories: leafy or stem vegetables; fruit-bearing vegetables; root, bulb, and tuberous vegetables; and leguminous green vegetables (NIS, 2015). Sarith and Chea (2003) note that the 15 most common types of commercial vegetable crops are: cauliflower; Chinese kale; Chinese cabbage; cabbage; swatow mustard; local lettuce; tomato; eggplant; chili; sweet pepper; yard long bean; spring onion; bitter melon; cucumber; and green papaya. However, Abdullah, Srun, and Umar (2002) argue that of 38 commercial vegetables, the most important vegetables for consumption in Cambodia are: tomato; cabbage; choy sum; Chinese cabbage; lettuce, cucumber; yard long bean; kang kong; cauliflower; eggplant; and mustard.

2.3.3. Trend of vegetable demand and supply in Cambodia

Total vegetable production in Cambodia increased from about 411.4 thousand tons in 2012 to about 428.85 thousand tons in 2016 (Table 2.2). The vegetable production yield has increased, but vegetable production in this country has slightly improved. This is because the total vegetable harvested areas declined between 2012 and 2016. The Cambodian vegetable demand in 2012 was about 565.4 thousand tons and increased to about 588.4 thousand tons in 2016 (Table 2.2). The average vegetable consumption per capita was about 37.5 kg per year (FAOSTAT, 2018). The vegetable consumption per capita is stable, but the demand for vegetable products in this country still grows. The two main factors driving this rise include an increasing population and the tourism industry.

Table 2-2: Vegetable production, consumption, imports, and exports (2012-2016)

Year	Production (a)	Consumption (b)	Imports (c)		Exports (d)	
			Volume	Value	Volume	Value
2012	411.4	565.4	154.6	126.8	0.7	0.6
2013	453.2	560.8	107.7	88.4	0.1	0.1
2014	415.2	570.2	154.9	127.0	0.1	0.1
2015	405.5	579.3	175.8	144.2	0.2	0.3
2016	428.9	588.4	159.7	130.9	0.1	0.1

Note: - Volume (in thousand tons) and value (in million US\$)

a) MAFF (2017)

b) the volume of vegetable consumption is calculated by the author based on consumption per capita (FAOSTAT, 2018) and of Cambodian population (World Bank, 2018)

c) the volume of vegetable imports is calculated by the author based on $(a - b - d) = c$

d) the volume of vegetable exports is calculated by the author based on data from the Ministry of Commerce and UN Comtrade (2018)

Production volume could not meet the domestic demand that requires Cambodia to import some necessary vegetables. This country imported most vegetables from neighbouring countries, which were often considered low quality. The most common imported vegetables included cucumber, chili, cabbage, tomato, and watermelon, from other countries to fulfil its domestic demand. It also imported some high-value vegetables, which could not be grown by local farmers. These vegetables were mainly supplied to supermarkets and restaurants. Kula et al. (2015) and SDC (2016) estimate that Cambodia imported about 70 percent of fresh vegetables from neighbouring countries. However, the Horticulture and Subsidiary Crops Department (as cited by V. Chea (2017)) project that the country imported around 50 percent of its vegetables to fulfil the domestic demand in 2016. The value of imports was predicted to be about US\$ 200 million (MAFF, 2017). The Mekong Institute (2018) found that the total volume of vegetables imported in 2013 from other countries (Thailand and Vietnam) was about 114 thousand tons. According to Nuppun (2016), there was no official record of the imports of vegetables across the borders with Vietnam and Thailand. Based on the author's calculations, the total vegetable imports to fulfil the country's demand was about 159.7 thousand tons with a total value of US\$ 130.9 million in 2016 (Table 2.2).

In regard to exports, Cambodia's vegetable exports have been negligible despite this country's good environmental conditions and export opportunities for high-value products (Kula et al., 2015; Nuppun, 2016). The total volume of vegetable exports from

Cambodia was about 110 tons with a total value of about US\$ 0.1 million in 2016. This decreased from a total volume of 700 tons with a US\$ 0.6 million value in 2012. However, according to the European Commission (2018), Cambodia exported vegetables in forms of fresh, chilled, and dried to European markets to the value of US\$ 3.5 million during 2013 and 2014. This value declined to US\$ 1.17 million during the period between 2015 and 2017. Kula et al. (2015) and the European Commission (2018) claim that the decline of vegetable exports was caused by growing concerns over quality standards required by international markets in the EU. A possible explanation may be that the differences in export value and volume may be due to the unofficial record of vegetable exports to other countries combined with a lack of accurate statistical control. According to Nico, Ujjwal, Ly, Sun, and Thoin (2012), Cambodia's vegetable producers unofficially exported to neighbouring countries, such as Vietnam, Thailand, and Laos.

2.3.4. Vegetable related development policies in Cambodia

The Royal Government of Cambodia regards agriculture as the backbone of the national economy. It develops various agriculture development policies in order to support the growth of this sector. At the national level, the government introduced the rectangular strategy phase III, which included agriculture in the priority sectors. With this national strategy, it aimed to modernise the agricultural sector and improve agricultural productivity along with diversification and promoting commercialization. Regarding the National Strategic Development Plan 2014-2018, the government focused mainly on the quality and safety of agricultural products. Other focuses were on the increasing farmers' incomes through value-added agriculture and ensuring market access for agricultural products. In 2013, the MAFF developed the agricultural sector strategy development plan 2014-2018 to accelerate and continue to support the agricultural growth over five years (MAFF, 2017). Local and international development partners, such as NGOs and donors, have played important roles in supporting and promoting the vegetable sector in this country (Kula et al., 2015; Nuppun, 2016).

As a further effort to push growth in the agriculture sector, the government and MAFF passed the law on agriculture cooperatives in 2013. It issued the Prakas (regulations) on the implementation of Good Agricultural Practices (GAP) (mainly fruits and vegetables) in 2010 (Nuppun, 2016). Numerous agricultural policies were designed and introduced, but the effectiveness of these policies was limited and still need to be improved in this

sector (Mekong Institute, 2018; Nuppun, 2016). In particular, a clear-cut policy direction with a specific focus on the development of the vegetable sector, has been missing. This lack has led to an increasingly large volume of these products being imported from neighbouring countries (Mekong Institute, 2018).

2.3.5. Vegetable value chains in Cambodia

The empirical evidence from vegetable value chain studies in Cambodia is limited and shows different structures. Kula et al. (2015) and Nuppun (2016) indicate that the vegetable value chains in this country comprise two main channels, including domestic value chain channel and an importing channel. With domestic markets, vegetable value chains are complicated with a number of different actors, who sell and purchase from each other (Nuppun, 2016). Chain actors in domestic vegetable value chains consist of growers, collectors, wholesalers, retailers, restaurants/hotels, and end consumers. Producers refer to a group of vegetable farmers, who grow vegetables for both commercial and household consumption purpose. According to Nuppun (2016), producers, who are members of producer organisations or cooperatives, represent only about 10% of the vegetable producers. Collectors generally locate at the village level and purchase vegetables directly from producers to supply wholesalers, retailers, and end consumers. Wholesalers buy vegetables from collectors or farmers and sell it to retailers, restaurants, hotels, or end consumers. Retailers play a direct role in supplying vegetables to consumers at local markets or provincial markets. Importers obviously purchase vegetables from overseas and distribute to the domestic vegetable chain actors.

There are two types of domestic vegetable market value chains in Cambodia, including TM value chains and HVM value chains. With the TM value chains, Nico et al. (2012) and Nuppun (2016) indicate that they are complex value chain structures, which comprise various chain actors. These include input suppliers, producers (individuals and groups), collectors, local wholesalers, inter-province wholesalers, retailers, and processors. These chain actors could play more than one role in vegetable value chains. The majority of vegetable producers sell their products directly to local collectors and wholesalers (about 80%). In contrast, Chhean, Diep, and Paule (2004) and EMC (2014) argue that vegetable value chains in Cambodia are short and simple across regions. The majority of produce is traded within the growing areas, such as district or provincial markets, rather than supplying long-distance markets. Vegetables are perishable products, so retailers prefer

communicating directly with producers and collectors rather than depending on intermediaries. Generally, there is no formal contract between upstream and downstream actors with the traditional vegetable value chains (EMC, 2014).

The domestic vegetable value chain for HVMs is highly integrated with few actors. The total volume of vegetables passed through this value chain is small compared to vegetable value chains for traditional markets. According to Nuppun (2016), hotels and restaurants purchased vegetables directly from collectors or wholesalers and serve these vegetables to consumers. Similarly, P. Chea (2014) and Nico et al. (2012) identify that vegetable value chains of HVMs are short. Vegetables, supplied to the supermarkets and modern retailed shops, were passed through three main chain actors, such as producers, producer cooperatives, and supermarkets. In this case, the majority of vegetable producers are members of PCs (Nico et al., 2012). The communication between upstream and downstream actors are through formal relationship and contract between purchasers and PCs (P. Chea, 2014).

The importing channel involves only three main chain actors: wholesalers; inter-provincial wholesalers; and restaurants or hotels. The majority of the imported vegetables are sold to wholesalers in the capital (Phnom Penh) or other main cities before redistribution to retailers or end consumers across the nation. In terms of export, there is no official record of vegetable export value chains, but some studies found that Cambodia exported a negligible volume with minimal value to international markets. Nico et al. (2012) assert that Cambodia exported vegetable products to neighbouring countries, but there are no official volume and value records. Nuppun (2016) indicates that there are no large-scale vegetable processors and exporters in Cambodia.

2.4. Producer cooperatives (PCs) in Cambodia

2.4.1. Background to PCs in Cambodia

Recognizing the significant roles of producer cooperatives (PCs), the Cambodian government established and supported the first PC organization in the 1960s. PCs have played crucial roles in securing the socio-economy and providing a wide range of benefits to Cambodian farmers, through expanding their social capital and improving the local community capacity (P. Chea, 2014). In 2001, the Government of Cambodia gave

approval to the Royal Decree regarding the (re-) establishment and functioning of PCs (HIC, 2011). After the Cambodian Government passed the Decree in 2003, the MAFF prepared the proclamation on the establishment and functioning of PCs countrywide (HIC, 2011). Figure 2.3 shows the number of PCs increased to 857 PCs in 2016 (MAFF, 2017).

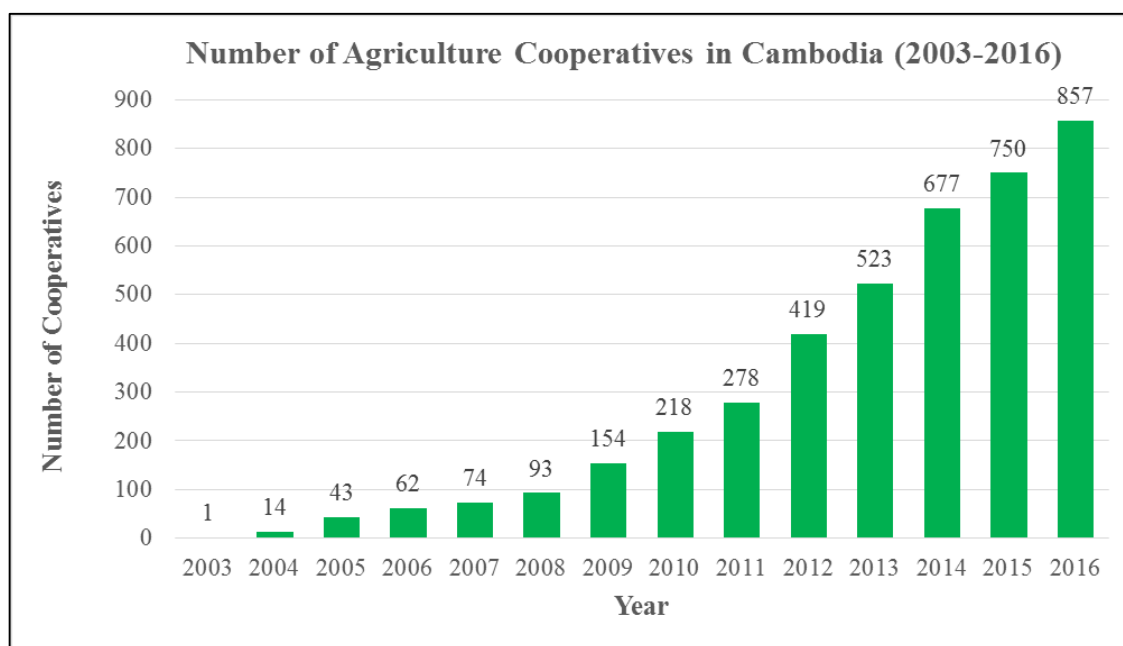


Figure 2-3: Number of producer cooperatives in Cambodia (2003-2016)

Source: MAFF (2017)

2.4.2. Concept and principles of PCs in Cambodia

The concept of producer cooperatives (PCs) in Cambodia is similar to international cooperative concept. Couturier, Savun, and Ham (2006) and P. Chea (2014) define a PCs as a collective entity of farmers that have common goals for agricultural and social economic benefits. Nou (2006) asserts that PCs in Cambodia are mixing origin, membership, functions, sizes, and relationships with supporting agencies. The main purposes of creating PCs in Cambodia are to promote producers' participation in agricultural production systems and to improve the economic, social, and cultural conditions of members (Theng et al., 2014). It also helps to bring farmers together to achieve common economic benefits in local communities (P. Chea, 2014). With PCs, producers could enhance agricultural productivity and quality, ensure food security (Couturier et al., 2006), and access to market information and inputs (P. Chea, 2014).

According to the Decree regarding the establishment and functioning of PCs in Cambodia in 2003, the organizations are formed, based on seven principles. These consist of voluntary participation and open memberships; democratic management; economic participation; education, training and dissemination; autonomy and independence; cooperation among cooperative members; and concern for the community (MAFF, 2013).

- **Voluntary participation and open memberships:** all persons in line with the agricultural sector are free to join regardless of gender, social, racial, political, and religious status
- **Democratic management:** democratic organizations that are controlled by their members, who set policies, make decisions, elect and vote for representatives, and manage the organizations in a democratic manner.
- **Economic participation:** members share their own capital with the PCs, and it becomes the common property of the organizations. The allocation of surplus capital is used for various organizational purposes in accordance with producer cooperative internal regulations.
- **Education, training, and dissemination:** PCs train their members about management, leadership, and rights for developing their organizations. These organizations share knowledge about decision-making and the right to elect their representatives.
- **Autonomy and independence:** autonomous organizations that are controlled by their members with respect to governance and capital
- **Cooperation among cooperative members:** within PCs, members could strengthen cooperation amongst their members and work together to achieve the organizations' goals.
- **Concern for community:** It promotes the sustainability of community development-based set policies.

2.4.3. Legal framework of PCs

The producer cooperatives (PCs) are formal organizations, which are legally registered with MAFF, under the Decree regarding the establishment and functioning of agriculture cooperatives in 2003 (Ngin, 2008; Theng et al., 2014; World Bank, 2015b). The MAFF have delegated this task to the Provincial Department of Agriculture, Forestry, and

Fisheries (PDAFF). Thus, it helps farmers to register their cooperatives and issues an official certificate to the cooperatives (HIC, 2011). Based on the Royal Decree, all PCs must have the same organizational structure (FAO, 2014; HIC, 2011). It should comprise a general assembly, a board of directors, a board of auditors, a managing director, as well as credit, supply, marketing, and information and education departments (Figure 2.4).

Under the agriculture cooperative law, before starting the first general assembly of their cooperatives, the Board of PCs has to request the official certificate at least 30 days (HIC, 2011). Members of PCs are required to be 18 years old or over and work primarily in agriculture or related agriculture sectors. They should pay membership fees, have at least one share, and comply with the provisions of law and internal regulations. Members are required to join the general meetings held monthly, quarterly, or annually to discuss the cooperative's issues, make a decision, or adopt the internal regulation. During this meeting, the cooperative members can determine internal working procedures, review budget and action plans, and make decisions on cooperative issues.

2.4.4. Management structure of PCs

Based on the Royal Decree about the establishment of PCs, all PCs must be established through general assembly and have the same organizational structure (MAFF, 2013). It consists of two main divisions: (1) a board of directors, and (2) a supervisory committee (Figure 2.4). The PC members elect new members, the chairperson, members of the board of directors, and members of the supervisory committee during a general meeting. The cooperatives can remove these people by using the same procedure. The members of PCs elect the board of directors, which is the executive body of the PCs having broad authority in leading and managing the PCs. It comprises five members including one chairman, one deputy chairman, one treasurer, secretary, and one member. Similar to the board of directors, the supervisory committee is elected during a general assembly. The primary roles of this committee are to monitor the activities of the board of directors and to ensure the accountability of PCs. It has three members such as chairman, a deputy chairman, and one member. There is no payment for members of the board of directors and the supervisory committee. However, PCs may allocate some portion of budgets for their working mission expenses or incentives (MAFF, 2013). Members of PCs adopt the portion of this budget during a general assembly.

All decisions and resolutions within the cooperatives can be adopted or passed if there is a sufficient proportion (2/3) of the total cooperative members. However, if there are not enough members to make a quorum, the second meeting is organised within the following ten days. This meeting is not based on the number of quorum. This policy is also applied to developing statutes, internal regulations, divisions, or amalgamations. The board of directors can make any decision on the cooperative's issues if they have a quorum of two-thirds of the total board members. The cooperative members elect members of a board of directors based on the proportion during the general meeting for their five-year-mandate. The PCs use the one-member-one-vote principle for adopting or making an amendment to the statute and internal regulations, regardless of the number of shares members have bought.

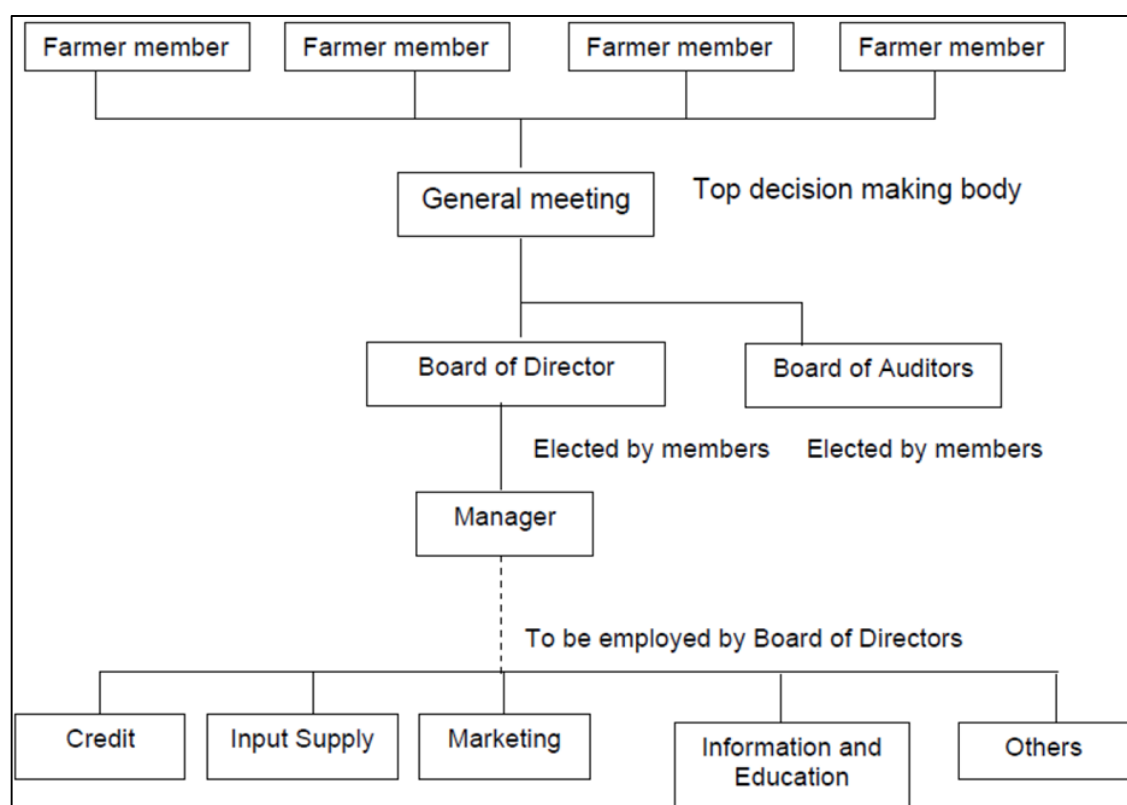


Figure 2-4: The organizational structure of PCs in Cambodia

Sources: FAO (2014) and HIC (2011)

2.4.5. Capital, shares, membership fees, and dividends

Based on the Cambodia Cooperative Law, members of a producer cooperative (PC) should buy at least one share and contribute membership fees. The value of a share and a

membership fee may be different in accordance with an agreement in the statutes during a general assembly. The members of PCs should be responsible for the PC's debts with their limitation that is stated in the statute. In the case of resignation or dismissing, they have rights to receive full payment for their share value together with interest. However, if the PCs lose their businesses, the liability of members should be in proportion to the number of their shares. The gross profits/surplus should be divided in accordance with the following principles, such as reserve fund (20%), training and managing fund (at least 3%), dividends, and other funds. Members of the PCs have rights to receive dividends based on the number of their shares with the PCs. The proportion and a division of funds are created and varied by each PC during a general assembly (MAFF, 2013). The capital of PCs could derive various sources: members' shares and participation fees; reserve fund; loan services from members and third parties; gifts or other contributions; and other funds (MAFF, 2013).

2.4.6. Challenges of PCs

There is wider recognition concerning the important functions of the producer cooperatives (PCs), but some challenges have impeded them from genuine progress. These challenges are grouped into two main categories, such as policy environment and institutional constraints (World Bank, 2015b). In terms of a policy environment, MAFF, through the Department of Agricultural Extension, plays a proactive role in supporting and promoting PCs. MAFF provides training for PCs in a technical and managerial capacity building and provides some capital for the initial stage. Even so, many PCs are not officially registered because of the excessive and complicated registration process, so there are no real benefits for them (Theng et al., 2014; World Bank, 2015b). On the institutional side, some PCs have experienced five key challenges. These comprise a lack of supporting capita; insufficient knowledge of the PCs' members; limited participation and weak internal regulation enforcement amongst members; lack of knowledge of agricultural techniques and marketing; and mistrust of PCs (Theng et al., 2014).

Chapter 3 : Literature Review

This chapter reviews the literature about the concept of value chains in agriculture and the producer cooperatives (PCs). It is divided into three main sections. The first section highlights the theory of value chains in agriculture, value chains in developing countries, value chains for perishable products, and value chains of high-value markets (HVMs). Section two specifies about PCs and their roles in facilitating smallholder producer groups to participate in the HVMs. The last section summarizes the literature review and provides the research conceptual framework for the study.

3.1. Value chain concept

3.1.1. The definition of value chains in agriculture

The concept of agricultural value chains is not a new phenomenon in the developed and developing world. The development practitioners applied the agricultural value chain concept in order to examine the relationship of dynamic and complex marketing systems in developing countries (Dolan & Humphrey, 2000; Kaplinsky, 2000; Trienekens, 2011). However, there is no universal definition of the agricultural value chains because it varies depending on the different perspectives and contexts used by researchers (Kaplinsky, 2000; Lazzarini, Chaddad, & Cook, 2001; Trienekens, 2011). The original concept of value chains was developed by Porter (1985). He defines a value chain as a set of firm's collective activities that are implemented to design, create, and distribute products or services to markets. With the agricultural context, Trienekens (2011) defines the agricultural value chains as vertical and horizontal networking coordination by all actors to supply products and services to markets. Vertical networking coordination is the process of product and service flow from primary producers to end consumers. The horizontal networking coordination refers to a relationship between chain actors at the same level.

Pietrobelli and Saliola (2008) describe agricultural value chains as the full range of value-added activities that all chain actors implement to bring their products and services to the final consumers and final disposal after use. This term is sometimes interchangeable with supply chain, commodity chain, product chain, activities chain, or product pipeline (Sturgeon, 2001). The fundamental concept of agricultural value chains is adding and

creating value principle through product marketing and processing innovation (Webber & Labaste, 2010). This concept is used to identify and map out the trade flows of agricultural commodities (Kaplinsky & Morris, 2001). It analyses the imbalance distribution of commodity values among value chain actors (Roberta & Pietrobelli, 2011).

3.1.2. The agricultural value chains in developing countries

With the emergence of middle- and high-income markets in developing countries, producers must take high emphasis on the product control, trade, and distribution chains (Trienekens, 2011). This phenomenon has put more constraints on agriculture producers in coordinating effective product value chains at both national and international levels (Daviron & Gibbon, 2002; Janvry & Sadoulet, 2005; Reardon & Barrett, 2000). The value chain structure in developing countries has changed towards high integration of all links and vertical coordination. In contrast, small-scale producers have limited advantages from this trend (Gereffi, Humphrey, & Sturgeon, 2005). This is because of an unfair distribution of costs and benefits over the chain participants and receiving low added-value from their products (Gereffi et al., 2005). Smallholders in developing countries have faced significant challenges with the governance capacity of product value chains for entry into the emerging markets (Rich, Ross, Baker, & Negassa, 2011).

The emergence of different value chain systems in developing countries is driven by increasing particular market requirements, such as safety and quality products, internationalization, and modern markets (Trienekens, 2011). According to Trienekens (2011), there are three types of value chain systems in developing countries. Table 3.1 shows that the value chains of A-system are relatively long and pass through a number of small-scale producers and many intermediaries. Generally, products are passed through complex networks for local markets, and producers receive low value. For instance, West African small-scale producers deliver cassava and sorghum to domestic markets. The B-value chain system is a medium chain. Purchasers, such as large retailers and supermarkets, organise contracts with small- and medium-scale producers through cooperatives. This type of value chain generates high value for agricultural producers. Reardon, Timmer, and Berdegue (2004) identify that this value chain system is used by small-scale Kenyan producers for vegetable products in modern retail markets in South Africa. The export market chain is the last value chain form in developing countries (C-

system). This value chain is more integrated with few actors and generates high value-added, but consumes small volumes.

Table 3-1: Summary of characteristics of value chain system in developing countries

Type of value chains	Characteristics of value chains
A-system	<ul style="list-style-type: none"> • Relatively long chains • Limited market information • Passing through various chain actors • Distributing large volume of commodities, but receiving low value
B-system	<ul style="list-style-type: none"> • Medium chain • Working with intermediary agents (supermarkets) under contract • Delivering low volume of commodities, but creating high value
C-system	<ul style="list-style-type: none"> • Integration of chain actors • Processing through few actors • Generating high value added

Source: Trienekens (2011)

3.1.3. The value chains for perishable products

Horticultural products, such as fruits and vegetables, require great care on the marketing system coordination due to their high perishability (Hichaambwa & Tschirley, 2006). The value chains of these perishable products are short from primary producers to final markets. This is because they are concerned about the variation of the quality condition during long transportation (Hichaambwa & Tschirley, 2006). Therefore, producers are under constraints of losing profit and unreliable and diversified market access (Hichaambwa & Tschirley, 2006). With export value chains, Dolan and Humphrey (2000) claim that vegetable value chains are linked from producers or export companies to supermarkets to UK consumers. They add that the largest UK retailers imported 70-90 percent of fresh products directly from Africa. Therefore, commodity value chains pass through a few actors, such as producers, exporters, and the largest retailers in the UK. Jaffee and Masakure (2005) and Mergenthaler, Weinberger, and Qaim (2009) identify that the value chains of perishable products are rapidly changing due to consumer preferences and market trend. This creates a diversity implication for value chain actors

and impacts on the whole value chain organization (Jaffee & Masakure, 2005; Mergenthaler et al., 2009).

3.2. The concept of high-value markets (HVMs)

The high-value market (HVM) concepts have originated in the western region (Mergenthaler et al., 2009; Neven et al., 2006; Reardon, Timmer, Barrett, & Berdegúe, 2003). They have spread to Latin America, Eastern Europe, and South Africa in mid-1990s and to Asia, South East Europe, and Central Africa in the late 1990s (Reardon & Minten, 2011). Some researchers, who have studied the modern agri-food market channel, have referred the term ‘the high-value market’ to the supermarkets or hypermarkets (Mergenthaler et al., 2009; Reardon et al., 2003). It is interchangeable with modern food markets, modern retail stores, or modern market (Maspaitella, Garnevska, Siddique, & Shadbolt, 2018). However, S. Chea (2010) and GTZ (2006) argue that, in addition to supermarkets, HVMs also include hotels, restaurants, agro-industry, and processing firms.

Some studies have regarded export markets as the HVMs (Kaganzi et al., 2009). A further explanation about the concept of the HVMs is that it pays great attention to the high level of food quality, safety, diversity, sustainable supply, and convenience services (Pingali, Khwaja, & Meijer, 2007). This market type mainly emphasizes consumer satisfaction for both high product quality and effective services (Martinez & Poole, 2004). Hagen (2003) and Jean-Joseph, Paule, Nigel, Phan, and Andrew (2006) point out that the characteristics of HVMs are self-service, clean environment, price-display, and strong marketing strategies. It generates higher added value for producers than traditional markets (Rao et al., 2012; Trienekens, 2011).

3.2.1. Transformation of agriculture value chains towards HVMs

The agriculture market value chains have transformed towards HVMs due to various factors. The increasing demand for high quality and safety standards of products requires chain actors to reorganize and improve value chain systems (Dolan & Humphrey, 2000; Lee, Gereffi, & Beauvais, 2012). Besides this, the fast growth of middle and high-income people in the developing world have contributed to the new adoption of value chain systems. This includes from product control to distribution in order to gain high added

value and cost-effective ways (Trienekens, 2011). Gibbon, Bair, and Ponte (2009) indicate that global and national value chain systems are driven by the increase of advanced technologies and dropping transportation costs between chain actors. New national and international modern market channels lead to the transformation of the modern market-oriented value chains in developing countries (Bair & Peters, 2006). In response to this, all chain actors need to take into account upgrading, reorganizing, and coordinating both vertical relationships and horizontal collaborations (Bijman, 2007; Rammohan & Sundaresan, 2003; Roy & Thorat, 2008).

Trienekens (2011) identifies that the characteristics of value chain models are driven by types of markets. However, Kaplinsky and Morris (2001) add that the models of value chains are driven by different market requirements, such as product safety, product quality, and type of actors. Producer and buyer power also play a critical role in shaping agricultural market value chains (Lee et al., 2012). These two key players have influenced and organized commodity value chains through direct contact with retailers. Figure 3.1 shows that producers influence value chains by supplying and processing large commodities, intervening on-farm activities, and controlling large-scale commodities' trade (Lee et al., 2012). These actors develop product quality, social, and environmental standards (Lee et al., 2012) and coordinate product network (Gereffi, 1999). With buyer dominance, large retailers, marketers, and manufacturers organise the value chain system by introducing private standards and setting product networks (Gereffi, 1999; Lee et al., 2012). The product value chains are channeled from producers to large retailers to end consumers through marketing networks (Gereffi, 1999). Figure 3-2 summarises the characteristics of producer- and buyer-driven chains.

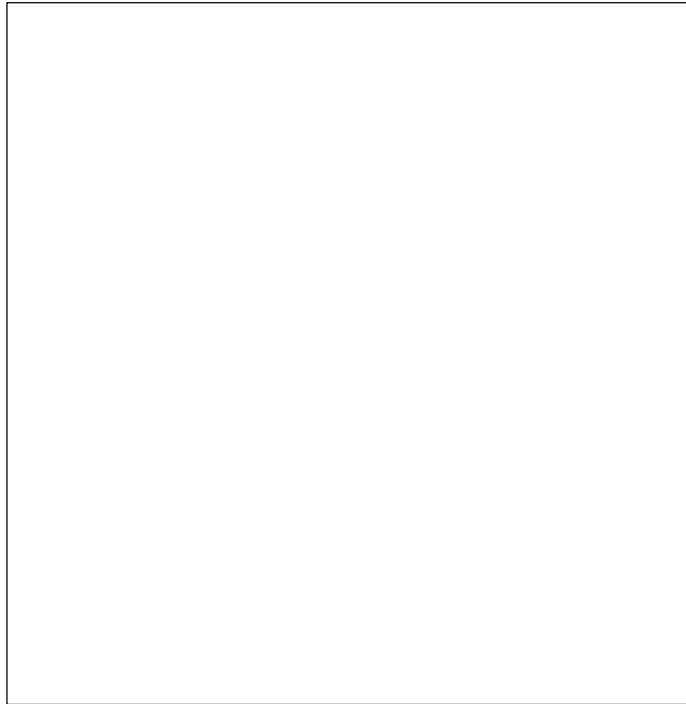


Figure 3-1: Global value chain structures and agri-food standards

Source: Lee et al. (2012)

3.2.2. The agriculture value chains of HVMs

The recent trend of agri-food market transformation has influenced the structure of agricultural value chains. With HVM, the value chain structures have seen a high integration of many marketing networks and the reduction of many chain layers by direct contact with intermediary wholesalers or producers (Neven & Reardon, 2004; Thomas & Berdegúe, 2002). Trienekens (2011) points out that the value chain structure of HVMs are medium chains and integrate many chain actors by focusing on intermediary actors. The basic difference between an HVM and a low-value market is that local low-value market (TM) consists of long chains connecting final markets (Ruben, Van Boekel, van Tilburg, & Trienekens, 2007; Trienekens, 2011). Small-scale producers supply products, which are made by using traditional practices, to many intermediaries (collectors, wholesalers, middlemen, retailers) before reaching end consumers. With this type of value chain, it focuses strongly on staple products for local markets. Lee et al. (2012) indicate that the value chains of low-value markets are complex systems.

In contrast, the value chains of the HVMs are simple because the product volume is distributed through a few actors (Lee et al., 2012). Suppliers deliver their products to

intermediary agents (supermarkets) individually, or under contract, or through collective markets. With the HVM value chains, it consolidates many supply networks, and shifts toward vertical coordination and contract farming with few suppliers (Lee et al., 2012). This value chain structure generates high added value (Trienekens, 2011) and reduces transactional costs. However, it delivers a small volume of commodities (Ismail et al., 2013; Mwambi, Oduol, Mshenga, & Saidi, 2013). The empirical evidence shows that, with value chains of HVMs, vegetables are directly sourced from producers and supplied to supermarkets through specialised wholesalers (Figure 3.2). Vegetables passed via this value chains are sorted, graded, and packed by producers and specialised wholesalers before being sent to supermarkets (Slamet, Nakayasu, & Ichikawa, 2017). However, they explain that value chains of TMs are long and complex structures. Vegetables are passed through a number of intermediaries, such as traditional wholesalers, local collectors, wholesale markets, traditional retailers, and traditional markets (Figure 3.2). With TM value chains, the local collectors and wholesalers buy vegetables regardless of grades.

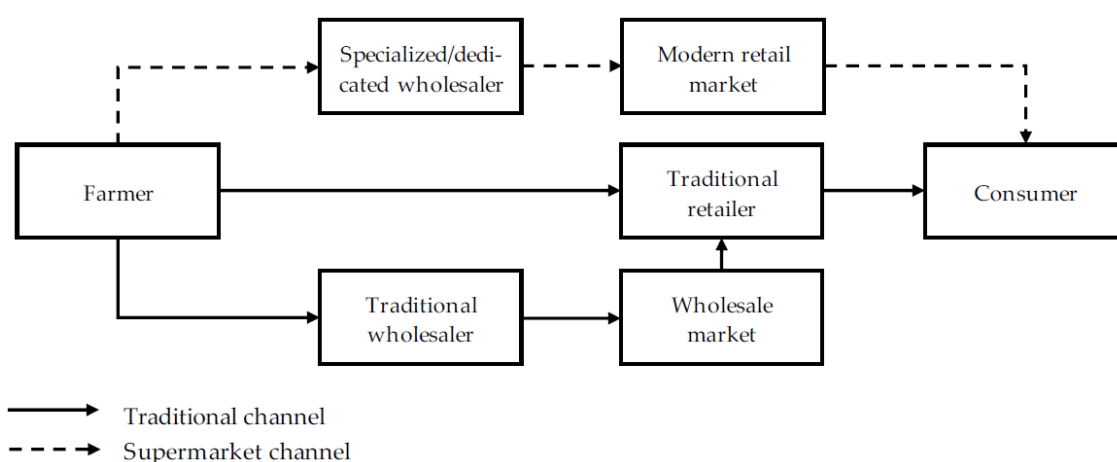


Figure 3-2: Vegetable value chains

Source: Slamet et al. (2017)

3.3. Cooperatives

3.3.1. The concept and principles of cooperatives in agriculture

Cooperatives have been widely recognised as important collective organisations, which promote social and economic development in both developed and developing countries. However, the concept of cooperatives has been confused by many development practitioners and researchers (Majee & Hoyt, 2011). According to the International Co-operative Alliance (2018), cooperatives are defined as the autonomous association owned

and run by their members to meet their common economic, social, and cultural needs. With the agricultural context, producer cooperatives (PCs) are kinds of producer organisations that producers own and control, and the distribution of benefits is based on their investment (Evans & Meade, 2006; Ortmann & King, 2007). They are the collective action forms that their operational process is managed by members (Devaux et al., 2009). Producers establish PCs in order to exchange knowledge, sell together, and create business opportunities. Hao et al. (2018) and Meike and Manfred (2007) argue that PCs are types of formal producer organisations. They are formed by groups of producers in order to coordinate and improve product market value chains.

Based on their primary activities, PCs are categorised into three types; marketing cooperatives, farm supply cooperatives, and service cooperatives (Ortmann & King, 2007). The main activities of marketing cooperatives are to strengthen bargaining power, to generate high product value-added through processing, and to sell agricultural products (Bernard & Spielman, 2009; Ortmann & King, 2007). With farm supply cooperatives, their functions are focused on the distribution of agricultural inputs (seeds, fertilizers, and chemical) and agricultural equipment (Ortmann & King, 2007). The main purpose of service cooperatives is to deliver wide ranges of services to support agricultural activities, including credit, insurance, and other utilities (Ortmann & King, 2007).

Although there are different types of cooperatives, the fundamental principles and values of these cooperatives are similar. The establishment of these cooperatives is based on seven common principles (International Co-operative Alliance, 2018). These consist of voluntary and open membership; democratic member control; member economic participation; autonomy and independence; provision of education, training, and information; cooperation among cooperatives; and concern for community. The ownership rights of members are in accordance with their participation or proportion of their shares with PCs (Cook & Chaddad, 2004). Hansmann (2000) and Iliopoulos and Chaddad (2013) explain that PCs follow democratic management by using the one-member-one-vote principle. Benefits and dividends are shared in accordance with each member's share. The sources of PCs' capital could be derived from members' shares and external support (Iliopoulos & Chaddad, 2013).

3.3.2. The drivers of PCs in developing countries

Producer cooperatives (PCs) are not new producer organisations in developed and developing countries. They have existed in Europe and some developing nations since the late 19th century (Ortmann & King, 2007). There are many underlining factors, which lead to the development of PCs, such as economic conditions, development of producer organisations, and the interest of public policy (Ortmann & King, 2007). Reardon et al. (2004) and Narrod et al. (2009) argue that increasing interest in organising producer organisations, such as PCs, is driven by transformation of agri-food markets and government public policies. With imperfect market conditions, smallholder producers in developing countries face wide ranges of challenges, such as access to input and output markets and high transactional costs. This motivates them to establish PCs to tackle these issues by acting collectively with their PCs' members (Bernard & Spielman, 2009; Markelova et al., 2009).

Another driver that encourages producers to form PCs is services and products provided by PCs (Abate, 2018). PCs enable producers to access wide ranges of services and products, which are necessary for upgrading productivity and markets (Abate, 2018). According to an emerging pattern of producer organisations, such as PCs in the agriculture sector, Vorley, Lundy, and MacGregor (2009) identify three main drivers (Table 3.2). These include producer-driven, buyer-driven, and intermediary-driven. The common form of producer-driven organisations is PCs (Vorley et al., 2009). Smallholder producers form PCs in order to open up new markets, increase market price, and sustain market position (Table 3.2). Through PCs, producers could use collective action to negotiate with purchasers (Markelova et al., 2009; Valentinov, 2007). Producers use collective action through their cooperatives when they face potential challenges in accessing extension services and capital for improving production systems (Reardon et al., 2009; Wiggins, Kirsten, & Llambí, 2010). Bernard, Taffesse, and Gabre-Madhin (2008), and Francesconi and Heerink (2010) claim that producers organise the PCs in order to access markets and increase bargaining power. For instance, fruit and vegetable PCs in Kenya and India supply their products to the UK and EU (Narrod et al., 2009)

The second type of PCs is formed by processors, exporters, and retailers (Vorley et al., 2009). The main reason for forming the PCs is to ensure efficient product supply chains

for processing and retailing and reduce middlemen to increase market competition (Bernard & Taffesse, 2012). Similarly, an intermediary-driven PC is built by traditional market actors, NGOs, supporting agencies, and the Government (Vorley et al., 2009). The aim of this formation is to improve efficient supply to clients, organize a sustainable market for rural people, and push regional development (Table 3.2).

Table 3-2: Drivers of producer cooperatives

Type of agencies	Drivers	Purpose
Producer-driven	• Smallholder farmers	<ul style="list-style-type: none"> • Access new market • Increase market price • Sustain market position
	• Large-scale farmers	• Increase more supply volumes
Buyer-driven	• Processors, exporters, retailers	• Ensure efficient supply chain
Intermediary-driven	• Traders, wholesalers, and other traditional actors	• Provide efficient supply to customers
	• NGOs and supporting agencies	• Organize sustainable markets for rural people
	• National and local government	• Increase regional development

Source: Vorley et al. (2009)

3.4. The roles of PCs in supporting smallholder producer groups to access HVMs

Wide recognition of critical roles of POs, particularly in the form of producer cooperatives (PCs), has been paid great attention among governments, NGOs, and private sectors. Stockbridge et al. (2003) argue that POs, such as PCs, play important roles in providing a series of services. These services enable smallholder producers to open up market access and improve productivity. The services provided by PCs comprise marketing services, facilitation of production services, financial support, technological support, education services, welfare services, policy advocacy, and management (Table 3.3). Marketing services provided by the PCs include input supply, output marketing and processing, and market information (Stockbridge et al., 2003). With financial services, PCs assist smallholder producers in accessing loans and other forms of credits for their agricultural business. PCs also play a role as community banks for members, who want to deposit savings (Stockbridge et al., 2003). Other roles of PCs are to provide technology and education services, such as extension, research, and business skills (Table 3.3).

Table 3-3: Products and services provided by producer cooperatives (PCs)

Types of PC's services	Service items
Marketing services	Input supply, output marketing and processing, market information
Facilitation of collective production activities	-
Financial services	Savings, loans and other forms of credit
Technology services	Education, extension, research
Education services	Business skills, health, general
Welfare services	Health, safety nets
Policy advocacy	-
Managing common property resources	Water, pasture, fisheries, forests

Source: Stockbridge et al. (2003)

Similarly, Bernard et al. (2008) and Valentinov (2007) assert that PCs are the dynamic organisations that play critical roles in improving agricultural production and expanding the economic scale of smallholder producers. They add that these PCs help producers to get important services, such as training, credit, input support, marketing, and internal quality control. Many organisational economics' studies indicate that the development of cooperatives in agriculture enables producers to minimise transactional costs and countervailing their bargaining power (Hansmann, 2000; Valentinov, 2007). Vorley, Fearn, and Ray (2007) point out that PCs play an essential role in bridging smallholder producers to supermarkets. The success of linking between these two actors needs wide ranges of provisions from PCs, such as specialised skill training, financial support, and transferring market information.

The emergence of PCs could fulfil the needs of producers by providing necessary products and services to them. Valentinov (2007) and Cook and Chaddad (2004) determine two main critical challenges, including production improvement and markets, for smallholder producers in developing countries. These challenges are because of lack of access to external supports and high transactional costs. PCs enable smallholder producers to overcome these issues by their important roles in linking producers to extension services and input market providers (Valentinov, 2007). Regarding transactional costs and market access, PCs assist producers in reducing marketing costs

and strengthening market power with downstream traders (Bernard & Taffesse, 2012; Valentinov, 2007).

PCs facilitate producers to access agricultural inputs and market outputs by using collective action principles for procurement (Ménard, 2007; Williamson, 2000). It is one of the transactional governance structures of the PCs in the agricultural context. In many developing countries, PCs assist their members in governing market transactions both at the upstream and downstream levels (Abate, 2018). At the upstream level, PCs coordinate market transactions between agricultural input suppliers and credit institutes and producers. With the downstream side, PCs facilitate formal communication between producers and purchasers related to standard requirements, grading, and contract (Abate, 2018; Ménard, 2007).

Widely known functions of PCs are to improve agriculture production and markets, increase market competition, and include smallholder producers in modern markets (Chaddad & Cook, 2004; Meinzen-Dick, 2009). Bernard et al. (2008) acknowledge that the expected roles of PCs are to promote smallholder producer's market participation. They help producers to enhance bargaining positions by leveraging collective action. Thus, smallholder producers could create new market opportunities and existing domestic markets by innovating value chain systems that are best suited for them (Weatherspoon & Reardon, 2003).

3.5. The challenges for producer cooperatives (PCs)

Producer cooperatives (PCs) have been developed significantly in both developed and developing countries. While striving for success with the organisations' goals, the PCs face various challenges. Changing external environments, such as economic, social, and political environments, alongside internal demands, put great pressure on the PCs (Aref, 2011). According to Cook (1995), there are five general challenges for PCs to reach their development goals. These include free-rider problems, horizon problems, portfolio problems, control problems, and influence cost problems.

The internal free-rider problem is associated with patronages from which existing and new members receive their investment in PCs. With the external free-rider problem, it is related to benefits that non-members receive from trade with PCs. Royer (1999) explain

that this problem happens because of ill-defined common property rights. The horizon problem of PCs occurs as a result of members' wrong expectations about benefits from their investments. Members may receive benefits lower than the value of assets they invest in their PCs (Royer, 1999). With the portfolio problem, members of PCs lose their trust in cooperatives because of risk to shares of their investments with their cooperatives. A control problem is involved with insufficient information about the cooperatives' managerial performance and lack of incentive for cooperatives' managers (Royer, 1999). The influence cost problem arises when the decisions of PCs are under the influence by members, who have their own interests in PCs' activities (Cook, 1995).

Some empirical evidence from previous studies found similar problems for PCs. Baldwin (2001) identifies that PCs encounter some common problems, such as members' expectations, member decision-making, control power, skill and knowledge of managers, and performance incentives. In Iran, Aref (2011) found some problems, including financial constraints, marketing of agricultural products, lack of producer's trust, and legislative and legal support. In the case of PCs in China, Garnevskaya, Liu, and Shadbolt (2011) assert that PCs faced some problems. These range from horizon problem, free-rider problem, decision-making problems, control problem, influence on cost problem, to conflict among household members. The cocoa cooperative study in Papua New Guinea of Garnevskaya, Joseph, and Kingi (2014) indicates some critical problems, which impede PCs from development. These include membership participation, communication and coordination, unstructured organisations, lack of management skill and knowledge, lack of promotion programmes, and members' financial constraints.

3.6. Factors affecting smallholder producer groups' participation in HVMs

Producers' decision-making to participate in markets could be affected by various factors. Some literature studies identify key factors influencing smallholder producers' participation in HVMs through PCs, such as Hao et al. (2018), Trebbin (2014), and Moustier, Tam, Anh, Binh, and Loc (2010). According to Hao et al. (2018), smallholder producers' choice of market participation is affected by four main factors. These range from producer demographics, producer characteristics, geographical location, transaction uncertainty, and institutional environment.

Similarly, Macharia, Mishili, and Sumari (2018) claim that smallholder vegetable producers' decisions to participate in HVMs are influenced by their demographics, farm characteristics, and institutional environment support. Shiferaw et al. (2011) argue that a sociopolitical and macroeconomic environment are the key factors, which affect PCs and smallholder producers to access markets. Thus, this study groups these factors into two broad key factors, being internal and external factors. With the internal factors, this study focuses mainly on the characteristics of the vegetable producers and product and service provision of PCs. Concerning external factors, they cover political, economic, social, technological, and environmental factors.

3.6.1. Internal factors

Producers' characteristics and institutional support from their PCs are the critical factors, which affect their decision to participate in markets. The producers' decisions to participate in a particular marketing channel depend on the incentive for producers (Markelova & Mwangi, 2010; Vorley et al., 2009) and a capacity of producers' adaptation (Fischer & Qaim, 2012). Producers' incentives consist of high prices and low transactional costs (Reardon et al., 2009). With regard to the adaptation capacity of producers, Miyata, Minot, and Hu (2009) and Schipmann and Qaim (2010) emphasise mainly the producers' demographics and farms' characteristics. However, Reardon et al. (2009) argue that the institutional support from producer organisations, significantly contribute to producers' adaption capacity.

Producers' demographics

Producers' demographics influence their decision to choose a particular market in which to participate. Previous empirical studies have identified a number of producers' demographics affecting their participation in markets, such as age, education, and farm experience (Fischer & Qaim, 2012; Hernández et al., 2007; Ismail et al., 2013; Matsane & Oyekale, 2014). Many studies indicate that younger producers are more likely to participate in the HVMs than their older counterparts (Bellemare & Barrett 2006; Hernández et al., 2007). Younger producers appear to have a high level of adaptation with modern techniques and good negotiation skills with purchasers. Thus, they could produce consistent quality and quantity produce to meet the HVMs' requirement. On the contrary, the studies of Rao and Qaim (2011) and Chagwiza, Muradian, and Ruben (2016) assert

that when producers get older, a possibility of participation in a particular market is higher. They give a further explanation that this is because older producers have greater experience in product marketing and production than younger producers do.

In terms of educational level, several studies found an association between the producers' educational level and a probability of market participation (Ismail et al., 2013; Mutura, Nyairo, Mwangi, & Wambugu, 2015; Rao & Qaim, 2011). The higher educated producers have an adequate capacity to adapt to modern practices and new market requirements (Qaim & Rao, 2012). They have better understanding and knowledge of marketing and business which are the key factors for organising the product value chain, contract, and negotiations (Ismail et al., 2013). Producers with a higher educational level appeared to participate in supermarkets instead of TMs because they could reap the advantages from these new markets (Ismail et al., 2013; Mutura et al., 2015). However, some studies found there was no relationship between educational level and producers' decisions to participate in markets (Blandon, Henson, & Cranfield, 2009; Matsane & Oyekale, 2014; Zivenge & Karavina, 2012).

Experience of producers in vegetable production and marketing affects their decisions to participate in a particular marketing channel. Producers with extensive experience were better in upgrading the product quality (Markelova et al., 2009) and building good networking with the other chain actors (Vakis, Sadoulet, & de Janvry, 2003). Compared to less experienced producers, experienced producers were more likely to participate in markets. Ouma, Jagwe, Obare, and Abele (2010) and Bellemare and Barrett (2006) explain that long experience in farm production and markets have enabled producers to gain high trust and good marketing relationships with purchasers. Nonetheless, the study of Sahara, Minot, Stringer, and Umberger (2015) indicates that producers seem to be reluctant to make a decision regarding participating in supermarkets. The long-experienced producers had low willingness to take the risk of shifting from traditional farm practices to modern farm practices.

Farm characteristics

Producers' decisions to participate in the supermarkets could depend on their adaptation capacity to access these supermarkets. Reardon et al. (2009) assert that this adaptation capacity involves farm assets, collective capital, and institutional support. Previous

studies show that farm characteristics and asset endowments significantly affected producers' decisions to participate in markets (Ataul & Elias, 2015; Dlamini-Mazibuko, Ferrer, & Ortmann, 2019; Matsane & Oyekale, 2014; Reardon et al., 2009).

The empirical results of Matsane and Oyekale (2014) and Dlamini-Mazibuko et al. (2019) indicate that farm size positively influenced producers' participation in supermarkets. Producers with large farmlands preferred dealing with HVMs rather than TMs. With a large farm size, they had adequate capacity to produce consistent vegetable quality and volume that met supermarkets' requirements (Matsane & Oyekale, 2014). However, this cannot be made a generalization because some studies revealed no relationship between farm size and producers' decision-making to participate in the markets. Fischer and Qaim (2012), Bandon et al. (2009), and Hernández et al. (2007) indicate that vegetable farm size had no correlation with producers' decisions to participate in supermarkets.

Similarly, the total quantity of produce is another factor of farm characteristics, which affects the possibility of producers' participation in markets. Producers with large quantities of produce were more likely to participate in markets. The reason is that they could produce surplus products for supplying to markets (Mukarumbwa et al., 2018; Omiti, Otieno, Nyanamba, & McCullough, 2009). This is similar to what Reardon et al. (2009) referred to as the capacity to access markets between small-scale producers and large-scale producers. The quantity of produce significantly affected the producers' decisions to participate in the markets. Birachi et al. (2011) explain that smallholder producers producing larger farm outputs were more likely to supply a larger proportion of products to markets. Producers with high volume produce seemed to be more involved in the commercialized farm than ones with small quantity produce.

The membership of producer organisations could influence producers' decisions to participate in markets. Several studies identified that the probability of producers' participation in markets was associated with their membership of producer organisations (Ismail et al., 2013; Markelova & Mwangi, 2010; Mukarumbwa et al., 2018). With producer organisations, smallholder producers could work collectively to increase their bargaining power (Mukarumbwa et al., 2018). They could share production technologies and market information within their producer groups in order to enhance market competition (Ismail et al., 2013). Reardon et al. (2009) argue that individual producers

faced great challenges to access markets because they had limited production techniques, marketing skills, and financial constraints. Thus, PCs helped them to tackle these barriers.

Asset endowments, such as transportation and communication assets, are essential for producers to bring their products to markets and receive market information. Some studies suggested that transportation assets, such as motorbikes, bicycles, or cars, significantly influenced producers' participation in markets (Alene et al., 2008; Neven & Reardon, 2006). With these transportation assets, the producers in Kenya could reduce transport costs and increase market information access (Alene et al., 2008). Similarly, Camara (2017) explains that producers owning transport could distribute produce to markets and receive information. In contrast, previous studies of Martey, Annin, Wiredu, and Attoh (2012), Balint and Wobst (2006), and Sahara et al. (2015) reveal no relationship between ownership of transportation assets and producers' participation in supermarkets.

With respect to communication assets, such as mobile phones, some empirical studies have indicated a positive correlation with producers' participation in markets (Dlamini-Mazibuko et al., 2019; Martey et al., 2012; Zivenge & Karavina, 2012). Producers' decisions to participate in a particular marketing channel could be attributed to the level of information they received. This communication ownership enabled producers to make contact with purchasers and the other chain actors to update market information (Dlamini-Mazibuko et al., 2019). Martey et al. (2012) argue that access to a mobile phone allows producers to have better market information that is important for them to make a decision about market choices. However, in some cases, producers' decisions to participate in markets were not related to mobile phone ownership (Byron, Nelson, Kefasi, & Shephard, 2014; Slamet et al., 2017).

Marketing aspects

With regard to the marketing aspects, produce price is the dynamic factor influencing producers to make a decision about a marketing channel (Mukarumbwa et al., 2018). In Zimbabwe, instead of selling vegetables at local markets with a low price, producers travelled a long distance to an urban area in order to sell vegetables at a high price (Mukarumbwa et al., 2018). Similarly, Bandon et al. (2009) and Zivenge and Karavina (2012) assert that output prices were the most important factors affecting smallholder producers' participation in the supermarkets. This is similar to what Reardon et al. (2009)

referred to as an incentive for producers participating in HVMs. As they received high prices, producers upgraded production technologies in order to produce high quality products to meet supermarkets' requirements (Macharia et al., 2018). Nonetheless, Mukwevho and Anim (2014) in South Africa, and Maspaitella et al. (2018) in Indonesia, identify that output prices did not affect smallholder producers' decisions to participate in markets.

Another factor of the marketing aspects is the distance to the point of sale. The distance to markets, or the point of sale, could be a critical issue for producers' decisions to choose a marketing channel. This is because it contributes to a certain rate of a transactional cost on transportation and communication (Rao et al., 2012; Reardon et al., 2009). The previous studies of Hernández et al. (2007) and Alene et al. (2008) show that there was a negative correlation between the distance to markets and the main road and the probability of producers' market participation. Taye, Degye, and Assefa (2018) and Chagwiza et al. (2016) acknowledge that long distance to the point of sale reduced the possibility of smallholder producers to participate in markets. On the contrary, Byron et al. (2014) and Mukarumbwa et al. (2018) identify the positive relationship between distance to markets and producers' market participation. Although urban markets were far from their homes, the producers were more likely to sell vegetables to these markets because they received high prices (Byron et al., 2014; Mukarumbwa et al., 2018).

Institutional factors

In developing countries, smallholder producers experience various challenges to access to markets. Owing to a small number of assets, these producers are often impeded from accessing a wide range of necessary services such as financial support, extension services, and market support (Barrett, 2008; Reardon et al., 2009). The previous studies referred these services to the institutional factors (Benard, Job, Hillary, & Japheth, 2015; Blandon et al., 2009; Hernández et al., 2007; Neven, Odera, Reardon, & Wang, 2009; Omiti et al., 2009). This is because the services contributed to the promotion of production and opening up of existing and new market opportunities for producers. Markelova et al. (2009) and Rao and Qaim (2011) claim that producer organisations, such as cooperatives and any forms of collective action, play critical roles in facilitating and providing these services. In addition to this service provision, the producer organisations facilitate

agricultural inputs' supply between smallholder producers and private sectors (Stockbridge et al., 2003).

Financial constraints of smallholder producers impede them from upgrading agricultural production and accessing HVMs. Numerous studies have indicated a positive correlation between producers' market participation and access to financial support (Alene et al., 2008; Benard et al., 2015; Taye et al., 2018). In Kenya, smallholder rice producers accessing credit were more likely to participate in the market because they improved production capacity (Benard et al., 2015). However, many studies show no association between these two variables (Ataul & Elias, 2015; Dlamini-Mazibuko et al., 2019; Macharia et al., 2018; Ouma et al., 2010). Rao and Qaim (2011) and Macharia et al. (2018) explain that access to financial support enables producers to increase their production by accessing and improving agricultural inputs. However, it did not indicate any significant influence on the probability of producers' participation in a particular market.

The enhancement of smallholder producers' capacity to access markets is attributed to the provision of various extension services. Alene et al. (2008) and Byron et al. (2014) assert that access to extension services had a positive effect on producers' decisions to participate in markets. With the extension services, smallholder producers could improve production technologies and update market information (Benard et al., 2015; Kyaw, Ahn, & Lee, 2018). Through interaction with extension workers, producers upgrade productivity, technologies, and marketable surplus that meet a market's requirement (Byron et al., 2014). Divya, Wolfgang, and Eric (2017) found that an increase in the access to the extension services results in the increase in a probability of smallholder vegetable producers' participation in the cooperatives' markets. However, other studies of Ismail et al. (2013) and Dlamini-Mazibuko et al. (2019) indicate a negative association between extension service access and market participation. This means producers accessing extension services were less likely to participate in markets. The quality and methods of extension service could be the possible reason behind these negative results (Dlamini-Mazibuko et al., 2019; Ismail et al., 2013). Besides these studies, other studies reveal no significant correlation between these variables (Macharia et al., 2018; Mukwevho & Anim, 2014; Zivenge & Karavina, 2012).

Previous studies highlight the importance of market support for market access of smallholder producers. Markelova et al. (2009) and Valentinov (2007) explain that the improvement of the smallholder producers' market access involves a wide range of the market supports provided by the PCs. The primary purpose of market support is maximising bargaining power and minimising transactional costs (Valentinov, 2007). To be successful in promoting producers' market participation, the market supports provided by PCs should focus on the producers and markets facilitation (Martinez, 2002; Orsi, De Noni, Corsi, & Marchisio, 2017). Moreover, many empirical studies show a significant association with market information access (Mukarumbwa et al., 2018; Nandi, Gowdru, & Bokelmann, 2017; Omiti et al., 2009). Having access to market information, producers can figure out a price, a quality, a demand, and a standard requirement of supermarkets (Nandi et al., 2017). Nevertheless, studies by Ataul and Elias (2015), Aku, Mshenga, Afari-Sefa, and Ochieng (2018), and Macharia et al. (2018) assert that there was no relationship between market information and producers' participation in markets.

3.6.2. External factors

Political factors

The external environment substantially influences the certain level of producer decision to participate in HVMs. The external environment could be associated with two main aspects, including financial and non-financial support (Vanni, 2014). At the starting stage of establishing PCs, financial support is necessary as it requires higher transactional costs than individual producer's activities (Mills et al., 2011). Regarding non-financial support, government rules, policies, and regulation systems potentially affect the implementation of PCs and determine its operational activities (Marr, 2004; Shepherd, 2007; Stockbridge et al., 2003). The support from the government, through its legal system, enables producer groups to decrease transactional costs, access market markets, and get better infrastructure systems (Hellin et al., 2009). It could help smallholder POs to strengthen their market competition against large agribusiness firms (Trebbin & Hassler, 2012). The provision of primary infrastructure systems, such as road networks, education, water, and agricultural extension, help producers to access markets (Hazell, Poulton, Wiggins, & Dorward, 2007).

Instead of relying on governments, non-government organisations (NGOs) have been regarded as the best-suited coordinators in assisting producers (Thorp, Stewart, & Heyer, 2005). Kruijssen, Keizer, and Giuliani (2009) argue that collaboration between public extension agencies and NGOs provides fruitful results in solving producers' marketing barriers. External organisations, such as NGOs and governments, assist POs by facilitating and providing information and technical support to build group capacity (Best, Westby, & Ospina, 2006; Chirwa et al., 2005; Devaux et al., 2009; Kaganzi et al., 2009). Private sectors could be the significant driving force for facilitating and providing sufficient services to POs to access HVMs (Ferrand, Scott, & Gibson, 2004; Miehlabradt & McVay, 2003). They support producers to produce high quality and safe products to meet the market requirement (Markelova et al., 2009). The empirical studies indicate that building a partnership with private sectors enables Kenyan and Indian producers to improve product quality to meet HVM demands (Narro et al., 2009).

Economic factors

The increase in food quality and safety demand in developing nations is attributed to the growth of economic development. The change of these countries' economies has led to shifting food consumption composition and pattern toward cereal, vegetables, meat, fish, and dairy foods (Kearney, 2010). Burch and Lawrence (2005) assert that the demand for, and the consumption of, the high-quality products has been changed as the result of the economic changes. They add that this changing trend leads to the emerging roles of supermarkets in supplying the high-quality standard of agri-food commodities. The substantial transformation of food markets in developing countries is the consequence of economic growth, integration of international markets, and urbanisation (Pingali et al., 2007). As a result of this transformation, a number of modern retail outlets, requirement of food safety and quality standards, and vertical market integration in these nations have shown an upwards trend (Pingali et al., 2007; Reardon et al., 2003). Mergenthaler et al. (2009) identify the four major factors of an economic development influencing an agri-food market transformation in the developing countries. These include diffusion of specialized or formal markets, the demand for safety and quality food, growth of households' incomes, and growth of urbanisation.

The diffusion of supermarkets is attributed to the demand for supermarket services amongst consumers and the supply of supermarket services (Reardon et al., 2004). The

spread of supermarket chains impacts agriculture production and market systems in developing countries (Hernández et al., 2007). Ismail et al. (2013) point out that the presence of supermarkets in developing nations enables smallholder producers to diversify market opportunities. They could increase the household income by receiving a better price (Rao et al., 2012) and agricultural production through upgrading production technologies (Minten, Randrianarison, & Swinnen, 2009). However, smallholder producers with limited resources face various challenges to gain the ultimate benefits from these supermarkets (Markelova & Mwangi, 2010; Narrod et al., 2009).

The demand for safe and quality food and household's income growth are inter-related factors. In the case of the Chinese agri-food market development, Wang, Mao, and Gale (2008) identify that the tendency towards the demand for high quality and safe food occurs in relation to peoples' income growth. The improvement of a consumers' income affects their decision to purchase food from supermarkets or formal retail outlets that they have high trust in food quality (Mergenthaler et al., 2009). The effect of people's income shifted agri-food markets towards HVM systems. Berdegué, Balsevich, Flores, and Reardon (2005) and Henson and Reardon (2005) acknowledge that income growth, alongside changes of socio-demographics, influences the transformation from TMs to supermarkets in developing nations. The empirical study of My, Rutsaert, Van Loo, and Verbeke (2017) shows an income or an expenditure of consumers have a positive effect on the demand elasticity for safe and quality fruit and vegetables in Vietnam. The consumers with high incomes preferred purchasing fruit and vegetables from formal markets. This is similar to what Reardon and Timmer (2014) identified in the relationship between a diet change of Asian people and income increases.

Social factors

An increase in public awareness of the health-related issues influences consumers' perceptions towards safe and quality food. Consumers believe that safe or organic agricultural products have better quality for their health (Roitner-Schobesberger, Darnhofer, Somsook, & Vogl, 2008). This encourages them to purchase safe and quality products from formal retail outlets or supermarkets because they have high trust in these distributors (Mergenthaler et al., 2009; My et al., 2017). In Thailand, Roitner-Schobesberger et al. (2008) point out that awareness of vegetable quality and its impact on health are the two main motives to encourage consumers to buy organic vegetables.

This is similar to the study of Coulibaly, Nouhoheflin, Aitchedji, Cherry, and Adegbola (2011) in Ghana. They found that consumers' awareness of a negative effect from pesticide residues in vegetables influence their attitudes towards chemical-free vegetables.

A change of public perception from conventional commodities to safe and quality commodities results in shifting their price. Consumers are willing to travel to supermarkets and pay high prices for safety and quality products as they were concerned about their health (Padel, McEachern, & Foster, 2005). This social phenomenon brings a significant restructuring of the agri-food market supply chain. According to Burch and Lawrence (2005), the emergence of supermarkets' own brands increased as a result of consumers' awareness about safety, and quality food. Consumers purchase food at supermarkets, or formal markets, because they have high trust in these service providers (Burch & Lawrence, 2005). The trust in the supermarkets is not only at the downstream level, but also the upstream level. Bandon et al. (2009) assert that Honduran producers were satisfied with supplying their products to supermarkets since they had higher trust in these buyers than sport markets. This supports what William and Robert (2002) found that producers intended to participate in contemporary supply chains if they had high trust in purchasers. The study of Bandon et al. (2009) also indicates that the probability of producers' participation in supermarkets had a positive relationship with the level of trust.

Technological and Environmental factors

Modern technologies influence the improvement of agricultural production and market access. Supermarkets need consistent quality and quantity produce that meets their consumers' requirements (Berdegué, Reardon, Balsevich, Flores, & Hernández, 2007; Neven & Reardon, 2004; Weatherspoon & Reardon, 2003). With modern production technologies, producers could upgrade both quality and quantity produce, which are the primary requirement by markets. Narrod et al. (2009) and Devaux et al. (2009) point out that new technologies enable smallholder producers to minimize their production costs and maximize productivity and profits. These are incredibly important factors to tap them into HVMs and compete with large-scale agribusiness (Kaganzi et al., 2009; Shiferaw et al., 2011). Besides production technologies, Ismail et al. (2013) and Neven and Reardon (2006) argue that post-harvest management technologies play critical roles in bridging smallholder producers to supermarkets. Perishable produce, such as fruits and vegetables,

are very susceptible to quality damage, so it requires high post-harvest technologies to maintain their consistent quality (Ismail et al., 2013).

Similarly, with communication technologies, previous studies identified that the improvement of technologies had a significant effect on the possibility of a producer's participation in markets. Aku et al. (2018) and Macharia et al. (2018) explain that an increase in communication technologies enables producers to access wide ranges of market information, such as price and demand information. Market information plays an essential role in assisting producers in making the right decision about types of marketing channels in which they should participate. With the market information, smallholder producers can build a strong relationship with cooperatives and other chain actors along product value chains (Bernard & Spielman, 2009; Markelova et al., 2009). Communication technologies assist producers in reducing transactional costs and receive market information (Kruijssen et al., 2009; Stockbridge et al., 2003). It is of the most importance for smallholder producers to compete with large farms and agribusiness, and access HVMs (Kaganzi et al., 2009; Narrod et al., 2009).

Agricultural practices substantially contribute to environmental degradation, such as air pollution, water quality degradation, and soil erosion. Gomiero, Pimentel, and Paoletti (2011) point out that the difference in agricultural practices has different impacts on environmental sustainability. Therefore, rising concern over these impacts amongst consumers has become widespread in recent decades over in not only the developed nations but also developing countries. This phenomenon has strongly influenced consumption patterns and the structure of the whole agri-food market systems in these nations (Burch & Lawrence, 2005). In Costa Rica and Latin America, increasing awareness of environmental consequences amongst consumers leads to emerging roles of supermarkets by replacing traditional markets (Berdegué et al., 2005). Consumers pay great attention to safe, chemical-free, or organic agricultural produces since they believe that they have a minimum effect on an environment (Coulibaly et al., 2011; Pinthukas, 2015). This is similar to what My et al. (2017) found in Vietnamese vegetable cases. The awareness of the importance of environmental consequences had a positive influence on the consumers' attitudes towards safe and high quality vegetables. Thøgersen, Zhou, and Huang (2016) and Tait, Saunders, Guenther, and Rutherford (2016) identify that environmental awareness in developing and emerging countries contributes to an

increased interest in environmentally friendly products. This provides substantial opportunities for both producers and processors to diversify their agriculture products in these nations (Philip, Kerry, & Bill, 1999).

3.7. Summary and research conceptual framework

This chapter reviews literature related to linking smallholder producers to access high-value vegetable markets. The first section of this chapter reviews the concepts of the agricultural value chain, characteristics of HVMs, and value chains for perishable products in developing countries. This part provides a general overview of distinguishing characteristics of the HVM and TM value chains that could affect producer groups' decisions. The second section of this chapter, the main part of this research, provides reviews about the PCs that focus on PCs' functions and factors affecting producer groups' participation in HVMs.

To enable producer groups to access HVMs, the PCs play crucial roles in providing all necessary services and products such as marketing services, product facilitation, financial supports, technological services, training, and other marketing infrastructure. The literature gives important insights into factors affecting smallholder producers' participation in HVMs, such as internal and external factors. The internal factors include members' demographics, members' farm characteristics, marketing aspects, and institutional supports. With the external factors, they are composed of political, economic, social, technological, and environmental factors. From this summary, the conceptual framework for this research is designed as Figure 3.3:

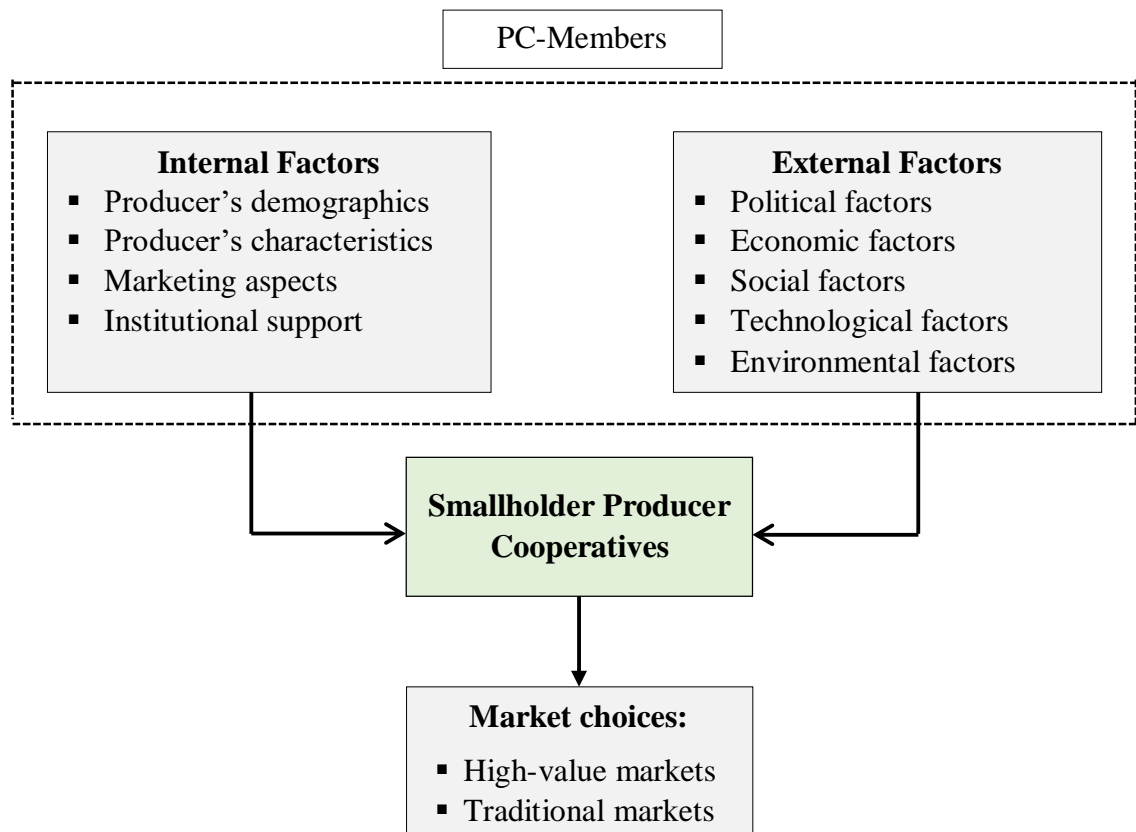


Figure 3-3: The research conceptual framework

Chapter 4 : Research Methodology

This chapter describes the research methodology applied in this study. The first section presents the research aim and objectives, followed by Section 2, which explains the research design and approaches. The research strategy used to achieve the research objectives is highlighted in Section 3. Section 4 outlines how the study area was selected. The sampling technique used to select the targeted participants is explained in Section 5. The questionnaire's design and data collection methods are discussed in Section 6, while Section 7 describes the data analysis methods. Sections 8 and 9 present the ethical considerations and limitations of the research. The last section presents a summary of the chapter.

4.1. Research aim and objectives

Research aim: this research aims to 1) examine the role of producer cooperatives (PCs) in linking vegetable producers to (HVMs) and 2) analyse the factors affecting successful participation in (HVMs).

Research objectives: there are four specific research objectives:

1. To map the vegetable value chains in Cambodia
2. To examine the roles of PCs in supporting smallholder producer groups to access HVMs.
3. To analyse factors affecting smallholder producer groups' participation in HVMs
4. To provide key policy implications for the government, NGOs, PCs, and private sectors to facilitate HVM access for smallholder vegetable producers

4.2. Research approaches and design

Research approaches refer to the plan that consists of a wide ranges of step from broad assumptions to the detailed research design and methods (Creswell, 2014). The three common research approaches applied in social science research are qualitative, quantitative, and mixed methods approach (Carrie, 2007; Creswell, 2014; Tashakkori & Creswell, 2007). Carrie (2007) argues that researchers choose a particular research approach based on their philosophical assumptions and the nature of research problems they want to solve.

With a qualitative research approach, researchers want to explore and understand a social phenomenon through investigation from the respondents' viewpoints (Carrie, 2007). It is the purposeful research approach for describing, explaining, and interpreting issues occurring in society (Creswell, 2014). This research approach is conducted within a poststructuralist paradigm, which is less structured and is built more on inductive than deductive reasoning (Leedy & Ormrod, 2010). Neuman (2011) and Gray (2014) assert that by using the qualitative approach, researchers have more flexibility with the research situation and objectives. Nevertheless, this approach also has some drawbacks in relation to validity and reliability because it is generated from a small number of participants, so it is difficult for researchers to make a generalisation (Leedy & Ormrod, 2010). The most common five research designs applied with this approach consist of a case study, an ethnography, a grounded theory, a phenomenological study, and a narrative study (Carrie, 2007; Creswell, 2014).

With a quantitative research approach, researchers aim to test the existing theory by examining the correlation amongst variables (Creswell, 2014). The features of this research approach focus mainly on the numeric and statistical approach rather than describing (Carrie, 2007). Leedy and Ormrod (2010) argue that a quantitative research approach involves deeply testing the research hypothesis in order to establish, confirm, validate, and develop a generalisation about theory. With this research approach, the researchers can control bias through sampling techniques and design (Williman, 2011), so the assumption from the research is reliable and able to make a generalisation (Creswell, 2014). However, the results of this research approach also have limitations regarding social science study since it cannot capture participants' perceptions behind their answers (Clark, Garrett, & Leslie-Pelecky, 2010). The best-suited research design for this type of research approach is survey and experiment (Creswell, 2014)..

Based on the strengths and weaknesses of the quantitative and qualitative research approach, researchers suggest mixed research methods as another research approach. Integrating quantitative and qualitative approaches provides an alternative for researchers to solve complex research problems (Johnson & Onwuegbuzie, 2004). Therefore, this approach enables researchers to perceive a complete understanding of triangle research problems (Tashakkori & Creswell, 2007). Creswell (2014) and Johnson and Onwuegbuzie (2004) argue that the incredible importance of applying the mixed methods

research approach is maintaining the strength and minimising the weakness of both qualitative and quantitative approaches. It is a pragmatic approach applied in a single research study by incorporating methods of the qualitative and quantitative approaches (Carrie, 2007; Creswell, 2014; Johnson & Onwuegbuzie, 2004). In contrast, the constraints of this approach would be that it is time and cost-consuming and dealing with the complexity of interpreting results (Carrie, 2007; Creswell, 2014; Gray, 2014; Johnson & Onwuegbuzie, 2004; Leedy & Ormrod, 2010).

4.3. Research strategy

Based on the research aim, objectives, and nature of this research, a mixed method research approach is used as the main research strategy. The quantitative approach is applied to measure participants' experience (Morse, 2009) and examine the correlation between a theory and a research phenomenon (Bell, Bryman, & Harley, 2015). The quantitative information explains perception, reaction, social phenomenon, and understanding about research-related issues in greater detail based on numeric results (Bazeley, 2013; Flick, 2013). With a qualitative research approach, it is used to describe and explain participants' experience and perceptions towards research problems (Bell et al., 2015). Therefore, this research mixes these two approaches to deal with its research aim and objectives. Mixing both research approaches is the best-suited strategy for in-depth research and greater than using a single quantitative or qualitative method (Creswell, 2014; Tashakkori & Creswell, 2007). It enables the researchers to explore complex research questions and examines the relationship between qualitative and quantitative data (Clark et al., 2010).

A survey approach was used as the main strategy in the quantitative research approach. It provides much empirical data and information about the focused issues which researchers want to explore (Floyd & Fowler, 2014). The benefits of survey research are to enable researchers to discover in-depth information about issues and allow them to build effective strategic plans to deal with their problems (Leeuw, Hox, & Dillman, 2008). In addition, the survey approach enables the researcher to gain insight into internal and external factors influencing smallholder producer groups' participation in HVMs. This research applied a face-to-face interview strategy to collect qualitative data PCs' managers. This method allows the researchers to gather a wide range of information,

such as characteristics of PCs' members and services and products provided by PCs. The strength of the face-to-face interview approach is that researchers can potentially gather insights into participants' situations and problems (Cassell & Symon, 2004). This approach enables interviewers to build trust with and respond appropriately to participants (Cassell & Symon, 2004).

4.4. Study area selection

Three provinces were selected in the Great Lake Tonle Sap region of Cambodia, namely Kampong Chhnang, Pursat, and Battambang, as the targeted study areas for various reasons. It is the second largest region in Cambodia in terms of agriculture cultivated area and the combination of the three selected provinces cover about 41% of total agricultural land in the region (NIS, 2015). The Tonle Sap Lake region stands at the second largest area regarding vegetable cultivated areas and production in Cambodia. Of the eight provinces in the region, Kampong Chhnang, Pursat, and Battambang represent around 50 percent of both cultivated areas and production of vegetables (MAFF, 2017). In terms of the number of PCs, the three selected provinces cover about one-fifth of the total number of PCs in the country. Battambang and Pursat province represent the second and third highest number of PCs after Takeo (MAFF, 2017).

Another reason for the selection of these provinces as targeted study areas is that the geographical location is suitable for producing and selling vegetables to HVMs. There was a lack of secondary data about HVMs in these three selected provinces. Based on personal communication with some related authorities in these provinces, it showed that the number of HVMs in this region is still small. However, PCs could transport their products to nearby provinces and city. PCs in Battambang and Pursat could transport vegetables to Siem Reap province or Poi Pet city. Vegetable producers in Kampong Chhnang province could sell their products to Phnom Penh city, the largest HVMs in Cambodia. It could be convinced that these provinces have potential for developing vegetable cooperatives that could link smallholder producers to the growth of HVMs.



Figure 4-1: The map of study areas (UN, 2018)

4.5. Sampling approach and sample size

In research, sampling refers to the process of selecting groups of participants, objects, and items that represent a large number of the population in order to generalise the research results (Palinkas et al., 2015). The primary purpose of the sampling methods of all research approaches is to maximise the level of efficiency and validity, but they must be in line with research aims and objectives (Morse & Niehaus, 2009). Kenneth and Bruce (2011) and Taherdoost (2016) point out that research sampling techniques comprise probability sampling and non-probability sampling techniques. With the probability sampling technique, researchers could minimise bias and receive a representative sample for the whole population (Johnson & Onwuegbuzie, 2004; Kenneth & Bruce, 2011). The common five techniques of probability sampling consist of simple random sampling, systematic sampling, stratified random sampling, cluster sampling, and multi-stage

sampling (Kenneth & Bruce, 2011; Taherdoost, 2016). In contrast, non-probability sampling does not require representative samples since it intends to examine an experience and a perception, rather than make a statistical inference (Sakaran & Bougie, 2016; Taherdoost, 2016). Non-probability sampling comprises quota sampling, snowball sampling, convenience sampling, and purposive or judgmental sampling (Taherdoost, 2016).

Figure 4-2: The research sampling techniques

Source: Taherdoost (2016) and Sakaran and Bougie (2016)

This research applied a purposive sampling technique for both qualitative and quantitative approaches for many reasons. With this sampling technique, researchers could determine and select individuals or groups which fit with the research interest (Creswell & Plano Clark 2011). It is the most effective technique for the research with limited information resources such as accurate, complete, and updated lists of targeted respondents (Patton, 2002). The purposive sampling technique focuses mainly on particular samples, so it requires lower costs and is less time-consuming (Ilker, Sulaiman, & Rukayya, 2016). Nevertheless, the drawbacks of this sampling technique are possible biases due to known and unknown confounders. Therefore, it is difficult to ensure generalisation from research results (Palinkas et al., 2015). To minimise this bias, Morse and Niehaus (2009) and Palinkas et al. (2015) suggest that the sampling procedures must be based on the specific criterion and the precise rationality for recruiting participants.

The study applied the following criteria for selecting PCs and producers:

Producer cooperatives (PCs): there are two types of PCs selected for this research, such as:

- **Type 1:** PCs collected vegetables from members and supply to HVMs (PC-HVMs). The criteria for PC-HVMs include:
 - Officially registered by Ministry of Agriculture, Forestry and Fisheries
 - Operate vegetable business and marketing for more than one year
 - Buy and supply at least three types of vegetables such as cucumber, wax gourd, and long yard bean to HVMs
- **Type 2:** PCs collected from members and supply to TMs (PC-TMs). The criteria for PC-TMs include:
 - Officially registered by Ministry of Agriculture, Forestry and Fisheries
 - Operate vegetable business and marketing for more than one year
 - Buy and supply at least three types of vegetables such as cucumber, wax gourd, and long yard bean to TMs.

Vegetable producers:

- Members of the five selected PCs
- Having a main household income source from vegetable farming
- Growing at least one of the three main vegetables such as cucumber, wax gourd, and long yard bean
- Selling more than 50% of total vegetable volume to either traders or PCs

Types of vegetables: this research selected three types of vegetables, such as cucumber, wax gourd, and long yard bean because:

- They were amongst the top 16 common vegetables grown by smallholder producers in Cambodia (Abdullah et al., 2002; Sarith & Chea, 2003)
- They were amongst top ten vegetables in Cambodia in terms of harvested areas (NIS, 2015)
- These are most consumers' preference vegetables and high demand for Cambodian markets (Chhean et al., 2004; Nuppun, 2016)

Applying purposive sampling techniques, seven managers from five PCs and 120 vegetable producers were selected for the interview.

Table 4-1: Total samples of the research

Types of producer cooperatives	Manager	Producers
PC-HVMs	4	71
PC-TMs	3	49
<i>Total</i>	<i>7</i>	<i>120</i>

However, the researcher decided to exclude five questionnaires of vegetable producers because they were incomplete and inaccurate information. Therefore, the final sample size of producers is 115 samples, which consist of 71 producers from PC-HVMs and 44 producers from PC-TMs.

4.6. Questionnaire development

With social science research, three common forms of questionnaires comprise a structured questionnaire, a semi-structured questionnaire, and an unstructured questionnaire (Brace, 2004). In this study, semi-structured and structured questionnaires were designed, based on several reasons.

4.6.1. Qualitative questionnaire

There was limited secondary data and information about PCs in the studied region of Cambodia. The study designed a semi-structured questionnaire with open-ended questions for face-to-face interview to obtain basic qualitative data about them. This enabled the researcher to build up background information about these PCs that led to selecting targeted PCs for quantitative data collection. Open-ended questions were prepared and structured based on research objectives and the previous literature (Best et al., 2006; Devaux et al., 2009; Kaganzi et al., 2009; Trebbin, 2014). Therefore, the researcher could collect the necessary information from the PCs' managers. This allowed the researcher to revise and add some questions to the quantitative research questionnaire before pre-testing it. In addition, the results from the qualitative questionnaire also enabled the researcher to identify the vegetable value chains in the studied areas. This questionnaire was made up of five main sections. Section (I) focused on the background information about managers such as age, education, and experience. The background of PCs, including reasons for creating, key milestones, operations, and a membership condition were indicated in Section (II). Section (III) covered information about products

and services of PCs; while section (IV) and (V) focused mainly on management and opportunities and challenges.

4.6.2. Quantitative questionnaire

With the PCs' members, the quantitative data were collected by using a structured questionnaire that consisted of structured closed- and open-ended questions. Closed questions were designed for respondents to select single and multiple choices and to give an exact number. Open-ended questions were also designed in this questionnaire so that the research could explore additional information to support the quantitative data. The process of the questionnaire design consisted of four main steps including (1) reviewing the literature and consulting with supervisors and related stakeholders, (2) drafting and revising a questionnaire, (3) pre-testing the questionnaire, and (4) finalising the questionnaire.

The draft questionnaires were developed based on the previous studies about linking smallholder farmers to HVMs and other related topics (Aku et al., 2018; Blandon et al., 2009; Divya et al., 2017; Macharia et al., 2018; Matsane & Oyekale, 2014; Nandi et al., 2017). Following this, the structured questions were prepared for conducting a pre-test. The main purpose of conducting a pre-test of the draft questionnaires is to measure and determine if questionnaires consist of relevant and necessary questions to achieve the research objectives. Another purpose of pre-testing is to assess the reliability, feasibility, and quality of structured questions. It ensures that the questionnaire used in the final survey was understandable by respondents and met the research objectives. The draft questionnaire was pre-tested with five vegetable producers in the studied region. The final questionnaire included three main sections: (I) internal factors influencing smallholder producer groups' participation in HVMs, (II) products and services of PCs, and (III) external factors influencing smallholder producer groups' participation in HVMs.

4.7. Data collection methods

The data sources used in the research were classified into two main types: (1) secondary data and (2) primary data (Figure 4.3). The secondary data was derived from reviewing previous research results and other available documents (Kenneth & Bruce, 2011; Williman, 2011). It was gathered from various sources such as journals, articles,

government documents, reports from NGOs, websites, and other publications. This data provided significant insights into the research aim and objectives. The primary data refers to the original data collected from research participants (Kumar, 2011). Primary and secondary data were used in previous studies about linking smallholder farmers to HVMs (Best et al., 2006; Birthal, Jha, & Singh, 2007; Fischer & Qaim, 2012; Garnevska et al., 2011; Markelova & Mwangi, 2010; Stockbridge et al., 2003).

The primary data of the research was collected by the researcher by using the face-to-face interviewer interview technique for qualitative questionnaire and survey interview for quantitative questionnaires. The advantages of applying this interview technique were to reduce misunderstood questions and encouraged respondents to provide deeper information (Brace, 2004). With regard to qualitative data from PCs' managers, the researcher collected data by using face-to-face semi-structured interview and spending between 30 to 40 minutes to complete it. The face-to-face interview allows researchers to gather detailed information from respondents (Cassell & Symon, 2004). This study used a structured questionnaire to gather quantitative data from PCs' members and took between 25 to 30 minutes by using survey interview technique. The survey questionnaire enables researchers to cover every aspect of the research objectives and manage time (Creswell, 2014). Quantitative data included the characteristics of members, marketing aspects, and factors affecting smallholder producer groups' participation in HVMs.

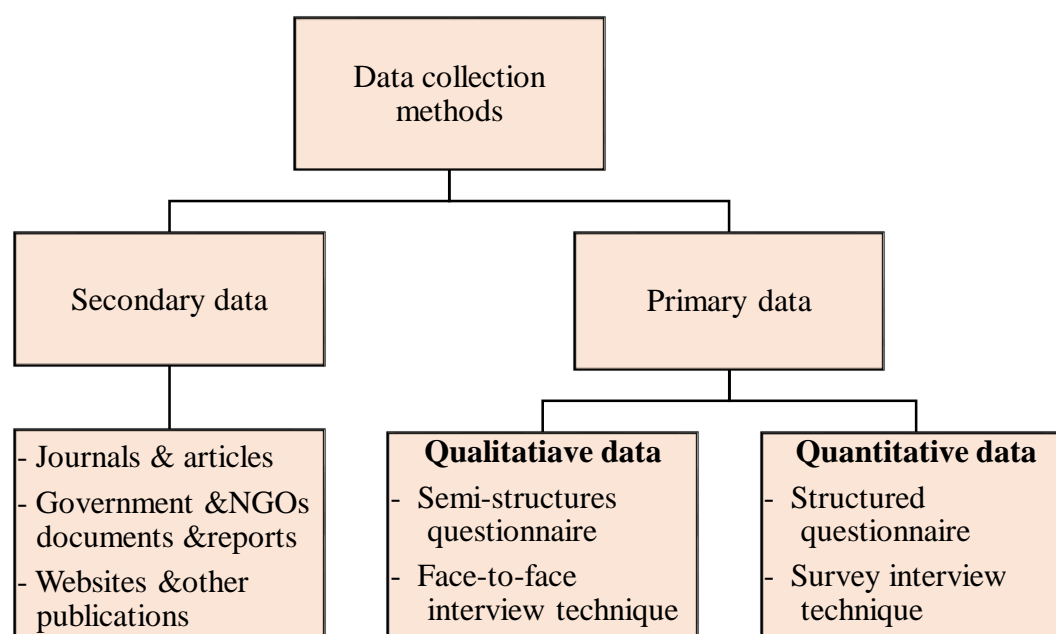


Figure 4-3: Data collection methods

4.8. Data analysis methods

4.8.1. Qualitative data analysis

The qualitative data analysis may proceed during an interview stage or after some data are collected (Creswell, 2014). This type of data can be processed to aggregate into a small number of themes. Greg, Kathleen, and Emily (2012) argue that the qualitative data analysis consists of two levels, including general procedure and specific qualitative design. Since this type of data contains much information, researchers may focus on the most important parts of data by excluding other parts of it (Greg et al., 2012). According to Sakaran and Bougie (2016), the process of analysing qualitative data comprises three main steps, such as a data reduction, data display, and drawing conclusions. At the data reduction step, researchers classify qualitative data into its sub-categories, so it enables them to reconnect it. All the reduction data can be organized at the data display step in many ways, such as charts, graphs, or tables. Finally, researchers draw a conclusion and explain in accordance with data pattern and relationship. This process is similar to what Dey (1993) refers to the Qualitative Data Analysis (QDA) that consists of describing, classifying, and connecting (Figure 4.4). The qualitative data from this study were analysed by applying the QDA technique. With this technique, the researcher categorised data into sub-categories by using tables. This enabled the researcher to understand precisely a PCs' background.

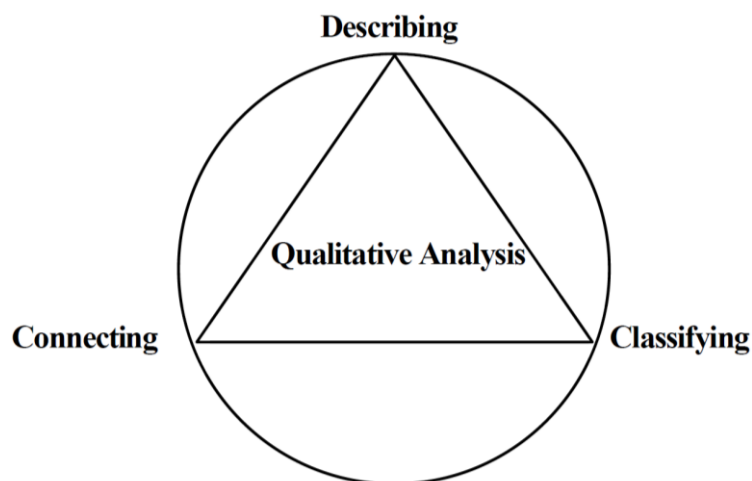


Figure 4-4: Qualitative data analysis process

Source: Dey (1993)

4.8.2. Quantitative data analysis

Data entry, cleaning, and validating

Prior to data analysis, the data cleaning and validating was an important step to ensure the completeness, accuracy, and validity information. This process was done both on hard and soft copies so that the researcher could check consistencies, outliers, and missing information from each collected questionnaire (Johnson & Christensen, 2014). Following this, the pre-analysis was conducted to find out any error values from the data before conducting the final analysis. Each questionnaire was coded to help the researcher to easily identify any problems. Members' questionnaires were entered into the SPSS data entry spreadsheet. The research applied two main statistical data analysis techniques, including the descriptive statistics and the binary logistic regression to answer and meet the research objectives.

Descriptive statistical analysis

This study applied the descriptive statistics to describe the characteristics of smallholder producers selected for the research. It was applied to explain and summarise the basic features of participants and interpret quantitative description in simple ways (Bickel & Lehmann, 2012). They add that with the descriptive statistics' technique, a researcher could simply illustrate and interpret data with graphics or tables. Average, minimum, maximum, percentage and standard deviation were used to describe and explain respondents' answers from selected PCs. In this research, the descriptive statistics also was used to analyse and describe the level of satisfaction of services and products provided by PCs to producer groups. It examined the external factors that impacted smallholder producers' participation in HVMs. The descriptive statistics were applied to analyse five-point Likert scale questions to determine the level of satisfaction for each service and product that members of the PCs received. Thus, the researcher could rank the position of products and services and provide pragmatic recommendations to relevant stakeholders.

Chi-square test

Chi-square test (χ^2) of independence is a nonparametric test that is applied to determine if two or more categorical variables have a significant relationship or are independent (McHugh, 2013). The Chi-square test is used to analyse normal variables by comparing

between frequencies of observed variables and frequencies of expected variables (Franke, Ho, & Christie, 2011; McHugh, 2013). The results of the Chi-square test is determined in accordance with the level of statistical significance (p-value ≤ 0.05), so it can infer if there is an association between two variables (Franke et al., 2011). The most frequent model of the Chi-square tests includes Goodness-of-fit, Homogeneity, and Independence (Franke et al., 2011). Based on the nature of this study, the Chi-square test of independence was applied. The equation of the Chi-square test was presented in detail below:

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{i,j} - E_{i,j})^2}{E_{i,j}}$$

$$df = (r - 1) \times (c - 1)$$

$$\chi^2 \leq \chi^2_{1-\alpha} \quad (1a)$$

Where χ^2 denotes to a value of the Chi-square statistics and the number of rows and columns in the contingency table are represented by r and c . $O_{i,j}$ is the observed value of frequency counts in the cell of row (factor) i and column (factor) j , while $E_{i,j}$ refers to the expected value of frequency counts in the cell of row (factor) i and column (factor) j . $(r - 1) \times (c - 1)$ is the degree of freedom. $1 \leq i \leq r$ refers to the observation related to the first factor, and $1 \leq j \leq c$ is the observation associated with the second factor (Franke et al., 2011). In this study, the Chi-square test of independence is applied to determine whether there were associations between dependent variables and independent variables. The dependent variables are types of producer cooperatives (PC-HVMs and PC-TMs), while independent variables consist of farmers' demographics, farm's characteristics, marketing aspects, and institutional support.

Independent samples T-Test

The independent samples t-test is applied to compare the means of two independent variables and check for a statistically significant difference (George, Nancy, Gene, & Karen, 2004; Marques de Sá, 2007). It is also applied to test whether two unrelated variables derive from a normally distributed population with the same or different means (Marques de Sá, 2007). The independent samples t-test is a kind of parametric test where variables are continuous (George et al., 2004). Marques de Sá (2007) suggest that before comparing the mean of two independent groups, it is necessary to consider two situations (equal variances and unequal variances). In this study, the researcher applied the

independent sample t-test to compare the mean of vegetable volume sold to the PCs and traders. It was also used to compare the mean difference of vegetable prices between TMs and HVMs. The following equation for unequal variances was applied in this study:

$$t^* = \frac{\bar{x}_A - \bar{x}_B}{\sqrt{\frac{s_A^2}{n_A} + \frac{s_B^2}{n_B}}}$$

Where t is the computed test statistic. \bar{x}_A is the mean of vegetable volume or prices of PC-HVMs, whereas \bar{x}_B is the mean of vegetable volume or prices of PC-TMs. s_A and s_B is the standard deviation of vegetable volume or prices for PC-HVMs and PC-TMs respectively. n_A and n_B denote to the number of vegetable producers selected from PC-HVMs and PC-TMs respectively. To determine whether the mean of two independent variables is a statistically significant difference, Marques de Sá (2007) and George et al. (2004) suggest to examine the sig. (2-tailed) in t-test for the equality of means at ≤ 0.05 .

Binary logit regression

Several studies applied different regression analysis models to determine factors affecting producer choices of particular marketing channels (Taye et al., 2018). These decision models are expressed in binary choices and analysed by using the most common regression models, such as Logistic Model, Probit Model, Tobit Model, and Linear Probability Model (Greene, 2012). Many studies about determinants of the market participation of producers applied Probit Model (Ataul & Elias, 2015; Hernández et al., 2007; Masuku, Makhura, & Rwelarmira, 2001). However, various studies in similar topics used Logistic Models (Mukarumbwa et al., 2018; Mutura et al., 2015; Nandi et al., 2017; Zivenge & Karavina, 2012). Greene (2012) points out that the Logistic Model and the Probit Model produce similar results in terms of accuracy, but the Logistic Model is simpler to compute and interpret than the Probit Model. Thus, this study applied the Logistic Regression Model to analyse internal factors influencing smallholder producers' decision to participate in HVMs or TMs.

The theoretical model of binary regression analysis

The binary logit regression model was used to analyze factors that affect the smallholder producers' participation in HVMs. This analysing technique identified the probability of

dominant factors that influence producer groups' decisions to participate in HVMs. With this regression model, the dependent variable is a dichotomy category that takes only two values (zero and one) (Wooldridge, 2013). The binary logit regression is applied to predict the probability of the observation by classifying the dependent variable into one or two categories in accordance with a number of independent variables (King, 2008).

Producers' decisions to participate in a particular marketing channel can be conceptualized by using the Random Utility Model suggested in the economic theory of Greene (2012). This theory suggests that farmers choose types of markets if they receive utility maximisation. The benefits from new market channels are influenced by the set of variables that determine the utility. If the HVMs provide farmers higher utility than TMs, smallholder farmers might participate in HVMs. The research assumes that vegetable producers decide to participate with HVMs if they gain greater utility from these markets (U_s) than from TMs (U_T). The characteristic and attribution of choices are observed in this research, even though the researchers do not know farmers' market choices. The probability of producers selling vegetables to the HVMs (P) is not observable. Thus, the estimated model used in this study was the following equation.

$$P(MP=1/X) = MP(U_s > U_T) = \beta X_i + \epsilon_i \quad (1b)$$

$$\text{Where } MP = 1 \text{ if } U_s > U_T \text{ and } MP = 0 \text{ if } U_s \leq U_T \quad (1c)$$

and P denotes the probability of a dependent variable, where MP is the choice of marketing channels. β denotes a vector of parameters to be estimated. ϵ_i is the error term. X_i is the function of a vector of exogenous variables (observable), while the subscript i denotes the i th vegetable producer.

It is necessary to compute the marginal effects in this model as there is no direct interpretation in the coefficient of the Logit Model. The marginal effects represent a unit change of the effect in each of the explanatory variables on the dependent variable (market decision). The prediction from the marginal effect model is based on the first partial derivatives of the equation (1b) with respect to x_i , where x_i denotes the relevant explanatory variables (observed variables). Thus, the equation of the marginal effects is presented as below (1d):

$$\frac{\partial \Pr(PM=1/x_i)}{\partial x_i} = \frac{\partial E(PM/x_i)}{\partial x_i} = \Omega(x'_i\beta)[1 - \Omega(x'_i\beta)\beta_i \quad (1d)$$

Where $\Omega(.)$ is the cumulative standard density function of the logistic distribution, assuming the based category is the HVM choice. Thus, the probability of a smallholder producers' participation in HVMs through PCs is shown in the following equation:

$$\Pr (MP = 1) = \frac{1}{1+e^{x\beta}} \quad (1e)$$

Where **Pr** refers to the probability of the marginal effects

Empirical model specification, variable description, and expected signs

The probability of a smallholder producer's decision was assumed to be a binary choice, so the logistic regression model was applied for empirical analysis. The HVMs and TMs were the dependent variables for assessing the market choices of smallholder vegetable producers. This study assumed that farmer demographics, farm characteristics, marketing aspects, and institutional support were independent variables. Therefore, the empirical model for analysing the logistic regression in the research could be presented as the following equation:

$$\begin{aligned} \Pr (PM=1/X) = & \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Edu.} + \beta_3 \text{Exper.} + \beta_4 \text{FarSize} + \beta_5 \text{ToVeget} + \beta_7 \text{MobilePhone} \\ & + \beta_8 \text{SellPrice} + \beta_9 \text{MarkSupport} + \beta_{10} \text{AgriInput} + \beta_{11} \text{FinSupport} + \\ & \beta_{12} \text{ExtService} + \mu \end{aligned} \quad (1f)$$

The farmers' demographic variables consisted of age, education level, and vegetable farming experience. Farm characteristic variables included farm characteristics and asset endowment factors ranging from vegetable farm size, total volume of vegetables, and mobile phone ownership. The marketing aspects cover the prices of vegetables and market support. Institutional factors consist of agricultural input support, financial support, and extension services. The prior expectation from independent variables is listed below:

Farmers' demographics

Age of the respondents was measured in the number of years as a continuous variable. It was expected that young vegetable producers were more likely to adopt new modern

techniques and take less risk compared to older producers. Thus, this study expected that age had a negative influence on HVM choice.

Education (Edu.) of vegetable producers was a continuous variable that was measured in the number of years attending formal education. It was expected that education had a positive effect on the possibility of vegetable producers' participation in HVMs. Well-educated producers were more likely to join market channels (Ouma et al., 2010; Rao et al., 2012; Sahara et al., 2015).

Vegetable farming experience (Exper.) was expected to have a positive effect on vegetable producers' participation in the HVMs. Producers with extensive experience appeared to participate more in HVMs due to high bargaining power, good networks, and negotiation skills. Producers with extensive experience had greater knowledge and skills for upgrading product quality that would meet HVM requirements (Chagwiza et al., 2016; Fischer & Qaim, 2012; Markelova et al., 2009).

Farms' characteristics

Vegetable farm size (FarSize) was a category of a continuous variable that was calculated in hectares of producers' vegetable growing areas. This study hypothesized that it had a positive influence on a market choice of smallholder vegetable producers. Producers with large farmland could produce large volume and consistently supply to HVMs (Ataul & Elias, 2015; Schipmann & Qaim, 2010; Zivenge & Karavina, 2012).

Total Volume of vegetable (ToVeget.) was measured in tons per year of total vegetable production through continuous variables. It was assumed that producers who produced large volumes of vegetables tend to participate in HVMs compared to other producers. Therefore, it was expected that it had a positive influence on the possibility of producers' participation in HVMs. A unit increase in the quantity of vegetable production led to an increase in the probability of selling to urban markets (Mukarumbwa et al., 2018).

Mobile phone ownership (MobilePhone) was set as a dummy variable where value one (1) represented mobile phone access, while zero (0) indicated otherwise. This study hypothesized that it had a positive effect on a vegetable producer's decision to participate in HVMs. Producers owning a mobile phone could communicate with other vegetable chain actors, so it provided opportunities for them to access markets (Dlamini-Mazibuko et al., 2019).

Marketing aspects

Average selling price (SellPrice) was expected to have a positive influence on the HVM participation of vegetable producers. Gaining higher prices of vegetables could increase the probability of producers' participation in the HVMs. Price was the main determinant that encouraged producers to participate in market channels (Balint & Wobst, 2006; Martey et al., 2012; Zivenge & Karavina, 2012). This study measured the average prices of vegetables in (USD/kg) by using a continuous variable.

Market support (MarkSupport) was set as a dummy variable with value one (1) indicating access to marketing support and zero referred to otherwise. This variable was measured as the opportunity of vegetable producers to receive market support from the PCs. Producer's participation in HVMs was expected to have a positive correlation with market support. Accessing market support enabled producers to make a better decision about market choices (Nandi et al., 2017; Omiti et al., 2009).

Institutional factors

Agricultural input support (AgriInput) was measured as a dummy variable that used value one (1) for accessing agricultural inputs and zero (0) for otherwise. Agricultural input access was hypothesized to have a positive effect on HVM participation of vegetable producers. The agricultural input support comprises seeds, fertilizers, nets, row cover plastics), and drip irrigation.

Financial support (FinSupport) is an important determinant that contributes to HVM access of producers. This study expected that accessing financial support had a positive influence on the vegetable producers' participation in the HVMs. Producers accessing financial support could enhance production capacity and techniques (Rao & Qaim, 2011). This variable was set as a dummy variable with one (1) denoting to accessing financial support from PCs and 0 indicating otherwise.

Extension services (ExtService) were expected to be positively correlated with the producers' participation in HVMs. With extension service access, producers could improve their production techniques and product quality that meet the needs of HVMs (Byron et al., 2014; Ismail et al., 2013).

Table 4-2: The description of the variables in the binary logistic regression model

Variables	Definition	Type of variable	Type of measurement	Expected signs
Dependent variables:				
MP	Market participation (dummy)	Categorical	1= PC-HVM, 0= PC-TM	
Independent variables:				
<i>Farmer demographics:</i>				
Age	Age of respondent	Continuous	Number of years	-
Education	Years of formal education	Continuous	Number of years	+
Vegetable farm experience	Number of years involving in vegetable farming	Continuous	Number of years	+
<i>Farm characteristics:</i>				
Vegetable farm size	Vegetable cultivated areas	Continuous	hectares	+
Total vegetable volume	Total vegetable volume	Continuous	Tons/year	+
Mobile Phone	Mobile phone ownership of producers	Dummy	1= Yes, 0= otherwise	+
<i>Marketing aspects:</i>				
Average vegetable price	The average vegetable price	Continuous	USD/kg	+
Market support	Farmers receive market support from PCs	Dummy	1= Yes, 0= otherwise	+
<i>Institutional factors:</i>				
Agricultural input support	Agricultural inputs provided by PCs	Dummy	1= Yes, 0= otherwise	+
Financial support	Farmers access credit services from PCs	Dummy	1= Yes, 0= otherwise	+
Extension services	Farmers access extension services from PCs	Dummy	1= Yes, 0= otherwise	+

4.9. Ethical considerations

This research involved various types of participants, such as members and managers of PCs. To be successful, the research complied with ethical principles and the requirements of the Massey University Human Ethics Committee (MUHEC). In doing so, the research ensured that there was no physical or mental harm for recruited participants. Prior to conducting the interview, the participants were given information about the purpose of the research and the benefits of getting involved in the study. They were also informed about their rights of participation, such as participation being voluntary and the option to opt out of answering any sensitive questions. The participants were assured that their information and their answers would be kept confidential and only used for the research purposes. Finally, the participants were provided with a consent form to complete and sign for oral and written evidence.

4.10. Limitations of the research

According to the research design and methods, there were various limitations that could be identified.

- The scope of the research was small because it covered only one region and five PCs with 120 samples. Therefore, this sample size could not represent the entirety of views of all producers in Cambodia.
- The site selection and sampling process were based on the consultation with the relevant authority. This might lead to some bias related to whether participants' responses and the information they provided.
- Another limitation of the research is inadequate information for analyzing the issues of whole PCs.
- Time and budget limitation were other issues for this research

These are critical considerations in terms of providing effective policy implications to the government and development partners. The research tries to minimize these biases to a certain level.

Chapter 5 : Research Results

This chapter presents the results of the research conducted in the Great Lake Tonle Sap region of Cambodia from January to February 2019. The chapter is divided into five sections. The first section provides the background information of the PCs, and the second section describes the vegetable value chains in Cambodia. The descriptive results from PCs' members are highlighted in section three. The roles of PCs and members' satisfaction with the products and services provided by PCs are outlined in section four. Section 5 explains the external and internal factors influencing smallholder producer groups' participation in the HVMs. The last section summarizes results from the research.

5.1. Background information of PCs

5.1.1. Tasey Samaki Agricultural Cooperative (TSAC)

Background of the PC

Tasey Samaki Agricultural Cooperative (TSAC) was registered by the Ministry of Agriculture, Forestry, and Fisheries (MAFF) in 2017 with 63 members. It was situated in Battambang province, in the northwest of Cambodia. The cooperative was established by the Boosting Project. This project was funded by the Government of Cambodia, which aimed to help farmers improve agricultural production and quality, promote market competition and reduce vegetable imports, and exchange best farm practices and market information. To be members of the PC, producers shall subscribe a share of 50,000 riel (12.5 \$) and membership fees: 10,000 riels (2.5\$). The gross profits of the cooperative were divided, based on the following principles: reserve fund (20%), training fund (3%), managing member fund (10%), business expansion (15%), dividends (40%), social fund (2%), and office building (10%).

The PC ran two main businesses, such as a vegetable marketing and a credit and saving operation. It collected vegetables from only its members and sold them to supermarkets and middlemen. Over its approximate 1.5 year-operation, TSAC has some achievement. Two members of TSAC received GAP certificates from MAFF of Cambodia, and this certificate was recognised by all ASEAN countries. The PC received the national award for the best cooperative from MAFF. This based on the best services provided to its members and the best accountability of management and operation (P. Chea, 2014; MAFF, 2013). It was the largest cooperative in the province in terms of supplying safe

vegetables to supermarkets. These kinds of vegetables were grown by using a limited amount of fertilizers and pesticides as set out in the guidelines from MAFF. TSAC was the only cooperative in Battambang province that had a packinghouse for horticultural products with a cold storage system funded by the USAID project. The PC increased the number of members from 63 (2017) to 75 (2018) and capital from about 2506 USD to 12,595 USD. The capital increase was mainly from a high increase in shares (6,471USD).

Products and services of the PC

TSAC bought 14 types of vegetables from its members, approximately between 500 and 700 kg per day. Of these, the top six vegetables were long parsley, wax gourd, kang kong, bitter gourd, cucumber, and long yard bean. The cooperative sold the majority of these vegetables to supermarkets in Phnom Penh (70%) and to middlemen about 30%. The main reason was that it received a stable and high price. In addition, it wanted to expand market opportunities and build business collaboration with these supermarkets. Another reason was that it received motivation from the government through the provision of technical and service support. TSAC also sold vegetables to middlemen (traditional markets) because it wanted to create more alternatives for its members. Supermarkets bought only grade one and high-quality vegetables, so PC sold grade two or three to traditional markets.

To deal with these market requirements, TSAC worked closely with its members by dividing producers into sub-groups in accordance with types of vegetables grown and a cropping calendar. Therefore, it ensured that it could supply vegetables to these markets regularly. The cooperative used price in advanced contract strategy to deal with these supermarkets in order to maintain a stable price. This price was set for a one-month period based on negotiation, and it was reviewed at the end of each month. With supermarkets, producers did not require quality certificates such as GAP or CamGAP. However, they required the PC to supply only safe and the first grade vegetables. These vegetables were justified based on their physical appearance and level of fertilizer and pesticide residue. To organise the agreement with supermarkets, TSAC invited third parties such as PDAFF or NGOs to help with technical support. Generally, producers needed to wait for two or three weeks to receive payment from these supermarkets.

TSAC provided a range of services to enable members to produce vegetables to supply these markets. Under Boosting project, the PC provided agricultural inputs (seeds and

fertilizers), agricultural equipment (nets and row cover plastics), and irrigation system (dripping tubes). The cooperative made contact with companies to sell high-quality products and seeds. Regarding extension services, it shared best farm practices, experience, and new knowledge with members by collaborating with agencies from the Provincial Department of Agriculture, Forestry, and Fisheries (PDAFF) and NGOs. It also provided technical training on vegetable production and business planning and gave loans with low-interest rates to members. In terms of marketing support, the cooperative played the roles of middleman and facilitator in buying vegetables and coordinating vegetable markets between farmers and buyers. In addition to price and product information sharing, the PC facilitated a meeting between buyers and its members to arrange a price contract and detailed product quality requirement.

Challenges of the PC

The cooperative encountered some challenges to participate in the supermarket channel. The main ones include:

- Ensuring regular supply and consistent quality to meet these supermarkets' requirements.
- Organising sub-group of producers in accordance with PC's cropping calendar with members
- Lack of transportation to collect vegetables from members.
- Lack of capital to pay for farmers because these supermarkets usually pay late
- Some producers lost trust in the cooperative as these supermarkets bought only a small volume

Future strategies of the PC

The managers of the cooperative found some potential opportunities from current farming practices and supplying its vegetables to supermarkets. With regard to the marketing aspect, it increased market opportunities for its members.

The PC's manager stated:

“Currently, three supermarkets in Phnom Penh city contacted and wanted to make supply contracts with us. However, we will choose Remex, Koma Komprea, and Khmer Baitang as future partners because these supermarkets purchase large volume.”

Apart from supermarkets, middlemen in the region were also interested in building a partnership with the cooperative.

“There were about ten middlemen who made contact with our cooperative and wanted us to supply vegetables to them because they knew that in the future we would collect all vegetables from farmers.” the PC’s manager added.

Based on the increase of market demand opportunities, it would increase sale volume from about one ton to about ten tons in the future. In addition, 50 vegetable PCs in the province wanted to integrate with the cooperative in order to supply vegetables to supermarkets.

In response to these opportunities, the next five-year strategic plan of the PC will focus mainly on three dimensions, including production, marketing, and services. With production, the cooperative will support its members to increase the quality and volume of vegetables. The PC keeps motivating members to apply for a GAP certificate because most supermarkets will need this certificate to assert vegetable quality in the future. In order to supply vegetables to HMs regularly and sufficiently, the cooperative will recruit new members every year. In terms of the marketing aspect, the cooperative will create a vegetable collection center in the Battambang province to strengthen supply and bargaining power. TSAC will seek large retailers and supermarkets to sell its vegetables of at least one ton per day. Besides this, the cooperative continues to share knowledge and train its members to produce chemical-free vegetables and provide technical support for its members.

5.1.2. Ang Kamping Pouy Agricultural Cooperative (AKPAC)

Background of the PC

MAFF registered Ang Kamping Pouy Agricultural Cooperative (AKPAC) as a PC in 2017 with 57 members. This PC was located in Battambang province, in the northwest of Cambodia, and established by the government’s Boosting Project. Its main purpose was to strengthen farmers’ bargaining power and prevent price fluctuations. The additional goals were to grow and sell vegetables collectively and to share knowledge, experience, and techniques amongst members. The requirements to be a member of the cooperative was subscribing a share of 50,000 riel (12.5 \$) and membership fees: 10,000 riels (2.5\$).

The gross profits of the PC were shared into the following parts: reserve fund (20%), training fund (3%), managing member fund (7%), business expansion (18%), dividends (40%), social fund (2%), and office building (10%).

Vegetable marketing and credit and saving were the two main businesses of AKPAC. However, credit and saving was the most important business of this PC. With respect to the vegetable marketing, the cooperative bought vegetables from its members for supply to middlemen in the province. Since its establishment in 2017, it achieved some success. The foremost success was that farmers changed their attitude towards market-oriented farming by focusing on production techniques and vegetable quality. A further achievement was organising sub-groups of producers that could supply safe vegetables to supermarkets in the future. Under fund support from the Boosting project, the PC established a packinghouse for storing vegetables collected from members. Besides this, the number of members increased from 57 in 2017 to 67 in 2018, and capital increased from about 860 USD to 11,720 USD. The main sources of the PC's capital were from selling shares to its members and the government's funds.

Products and services of the PC

The PC bought six types of vegetables, including cucumber, wax gourd, cabbage, long yard bean, luffa gourd, and spring onion leaves. It sold these vegetables only to only middlemen at Phou Poy market (largest vegetable market in the province). The reason that it chose middlemen as the main buyers is because the PC has just classified vegetable producer into sub-groups in accordance with types of vegetables grown and PC's business plan. Members of the PC could not grow vegetables that met the supermarket's requirements, such as quality and types of vegetables.

AKPAC's manager stressed:

“Currently, our members could grow and supply only cucumbers regularly, but the other vegetables could not be grown and supplied regularly. Farmers still grew the same types of vegetables at the same time. That was the main challenge for the PC to contact and make a contract with supermarkets.”

The PC's manager noted that it was lack of communication and facilitation between its cooperative and supermarkets. The PC currently bought vegetables from members and supplied to only traditional markets. However, it aimed to sell its vegetables to

supermarkets in the future. This was because members grew safe vegetables that were the best suited for these markets. Moreover, supermarkets bought vegetables at a higher price than middlemen from the traditional markets. Therefore, the PC was organising sub-groups of producers and prioritizing some important vegetables such as cucumber, wax gourd, luffa gourd, and long yard bean for supplying these supermarkets. Producers could grow these vegetables in every season in the region.

The AKPAC's manager claimed, *"Our PC goal was focusing on the high-value markets such as supermarkets because they give a high price even though they need high quality vegetables."*

With middlemen, the PC's managers pointed out that there was no challenge with them in terms of kinds of vegetables, volume, quality, and price. It sold all kinds of vegetables that were available from its members, regardless of grade. The price of vegetables was dependent on the daily market price. The PC sent vegetables to these middlemen, and payment was made within one or two days.

In order to help members to produce vegetables for supplying to supermarkets, the PC provided some services to its members. In terms of agricultural inputs, the PC distributed fertilizers, seeds, and other material to some members. The PC provided loans and subsidies to members, so they could use it as a capital for growing vegetables. It collaborated with PDAFF to transfer technical knowledge and experience and share marketing information such as price and quality demand. Members of the PC also received short training courses about good agricultural practices. However, the main marketing support that PC currently provided to members was to share vegetable market price and demand information.

Challenges of the PC

The AKPAC faced some challenges to participate in supermarket channels such as:

- The PC's side:
 - Lack of commitment from members to grow safe vegetables to supply these markets.
 - Organising producer groups to grow vegetables based on the PC's plan.
 - Lack of participation from members of the management committee to support the PO's business.

- Lack of transportation to collect vegetables from farmers and facilities to preserve vegetable quality.
- The supermarkets' side:
 - Requiring consistently high quality vegetables
 - Having no specific information about the quality requirement from supermarkets
 - The number of supermarkets in the province was relatively small, so the PC depended only on some supermarkets in the main city.

Future strategies of the PC

The main opportunities of the PC were an increase in vegetable production, markets, and a number of members. The PC pointed out that PC's members in the region had large farms, so they could produce a large volume of vegetables to supply to both HVMs and TMs.

“Most of our members had large farm land for growing vegetables. Thus, if we organize producer groups and they follow our cropping calendar, our PC could make a contract with supermarkets.” AKPAC's manager stated.

With marketing, the PC's manager had an optimistic view that AKPAC could expand its markets into HVMs such as hotels, restaurants, supermarkets, and retail outlets. This was because members of the PC upgraded their farm practice and techniques for producing high quality vegetables that were suitable for these markets' requirements. Moreover, the trend of good quality vegetable consumption had increased significantly in the urban areas; thus, there was an opportunity for the PC to supply to these markets.

With a five-year strategic plan, the PC will focus mainly on vegetable production and vegetable business. In terms of production, the PC will work closely with PDAFF and NGOs to provide technical training to its members to grow high-quality vegetables and increase production. AKPAC also encourages members to grow safe vegetables that meet HVM demand. With respect to the vegetable business, the cooperative will create a vegetable collection center and package vegetables, so it is expected to add value to its vegetables.

“We collect and pack vegetables from our members then we distribute these vegetables to different markets in order to get a high price.” claimed by the PC's manager.

The PC will find support from the PDAFF to sell its vegetables to supermarkets because PDAFF has good networking and communication with many supermarkets in cities. As a part of market support, PDAFF is official agency, which facilitate and organise a formal contract between the PCs and supermarkets. This will ensure a long-run business of the PC because members could generate a high income through diversifying markets and selling vegetables at a better price.

5.1.3. Svay Meanchey Sattrey Samaki Agricultural Cooperative (SMAC)

Background of the PC

Svay Meanchey Sattrey Samaki Agricultural Cooperative (SMAC) was founded in 2011 and registered by MAFF in 2012 with 90 members. It was located in Kampong Chhnang province, in the center of Cambodia. The PC was established by a local NGO named LWD organisation. The original purpose of creating this cooperative was to alleviate the poverty rate among rural farmers, especially smallholder farmers in the commune. It aimed to provide alternative ways for farmers to access credit with low interest rates and convenient ways. To be a member of the PC, farmers are required to subscribe at least one share of 10,000 riel (2.5 \$), contribute membership fees of 5,000 riels (1.25\$), and save some money. The gross profits of the PC were divided based on the following principles: reserve fund (20%), training fund (5%), managing member fund (15%), business expansion (20%), dividends (30%), the social fund (5%), and office building (5%).

The cooperative had four main businesses, such as credit and saving, agricultural input supply, agriculture marketing, and weaving. Of these, vegetable marketing and credit were the most important business of the PC. It bought vegetables from its members and some other PCs to supply to markets. Prior to 2017, the cooperative ran only credit and saving business because there was no support from the government and NGOs for vegetable marketing. The cooperative decided to expand its business into the vegetable business in 2017. The reason behind this was that LWD and PDAFF helped the PC to organize producer groups and provided technical support on vegetable growing to producers. Another achievement was changing farmers' farming practices from traditional farming to commercial farming. The majority of producers produced safe vegetables that met the HVM's requirements and demands. Further success of the PC was

organising producer groups to produce safe vegetables to supply supermarkets and local markets. SMAC also created a collective vegetable center for storing and supplying safe vegetables to supermarkets in Phnom Penh and local markets. Moreover, SMAC was recognised as one of the best PCs both at the provincial and national level by MAFF and LWD. This was because the PC provided the best services for its members and had a good operation and accountable management. The PC received many visits from other PCs and shared best practices with them. From 2011-2018, the number of members of the PC increased from 90 to 224. The PC's capital rose from about 8,473USD to 18,608USD due to an increase of shares and profits from businesses.

Products and services of the PC

SMAC bought 11 types of vegetables from its members including cucumber, wax gourd, long yard bean, cherry tomato, kang kong, bitter gourd, eggplant, round eggplant, curly wrap pak choy, choy sum, and pak choy. The top five vegetables included cucumber, wax gourd, long yard bean, cherry tomato, kang kong. Between 70-80 percent of vegetables were sold to middlemen and the end consumers in the region. The PC supplied about 20-30 percent of its vegetables to supermarkets in Phnom Penh. These vegetables were first grade and safe vegetables. Supermarkets bought a small volume of vegetables, but they gave a higher price than middlemen in the region. Thus, it motivated producers to upgrade their vegetable quality and volume. Producers and the PC wanted to supply all their vegetables to supermarkets, but they only bought a small amount. They selected only first grade and high-quality vegetables. In addition, the PC had to wait around one month to get payment from these supermarkets, whereas TMs paid within one or two days. Members produced a large volume of vegetables, so the PC needed to buy some produce from its members and sold to middlemen. This could help members have broad market opportunities.

Supermarkets required a regular supply of both kinds of vegetables and volume with consistent quality. To deal with this, the PC organised six sub-groups of producers with a particular growing schedule for each sub-group to ensure that members could supply vegetables regularly. SMAC selected four potential vegetables such as cucumber, wax gourds, long yard beans, and tomatoes to supply to these markets. This was because members could grow them year round. With respect to prices of vegetables, the PC applied the price in an advanced contract, which was set for a month based on negotiation

between the PC and these supermarkets. This price was reviewed at the end of each month based on the vegetable market price. With respect to quality, producers were not required to have a GAP certificate in order to sell their vegetables to these supermarkets. However, they required the PC supply only grade one and safe vegetables. The quality requirement was set based on the agreement between the PC and supermarkets. To meet their requirements, various agencies such as HVMs, NGOs, and MAFF spot checked regularly on farming practices and techniques at a field.

The PC provided a wide range of support to its members to help them in growing vegetables to supply these markets. Vegetable producers received seeds, fertilizers, nets, dripping tubes, row cover plastics, and other material from LWD's and the Boosting project. Since the PC did not run an agricultural input supply business, it contracted with companies to sell high-quality products and seeds to its members. Members of the PC could access loans from the PC with convenient and flexible terms. The amount of loan the PC lent its members were dependent upon on internal regulation and available capital of the PC. A number of extension services were provided to members such as sharing best farm practices, techniques, and new knowledge. Furthermore, members also received a short technical training course about vegetable production and farm business planning (market-oriented farming). This could assist producers in preparing their cropping schedule and resources for producing vegetables. Regarding marketing support, the cooperative played roles as a middleman and a facilitator in buying vegetables and coordinating vegetable markets between farmers and buyers. Rather than sharing market price and vegetable information, the PC found both supermarkets and traditional markets for its members. With supermarkets, the PC facilitated a price contract between producers and these supermarkets through organising many discussions. On behalf of its members, the PC negotiated with supermarkets about standard vegetable quality requirement before signing a contract.

Challenges of the PC

SMAC faced some main challenges to participate in these supermarkets, although several opportunities were found from these supermarkets.

- The most important concern of the PC was that it depended only on supermarkets in Phnom Penh city that bought a small volume
- There were no such kinds of supermarkets in the Kampong Chhnang province

- Members lost trust in the cooperative as it could not find markets for them.
- A further challenge involved the cooperative's capital for running a business as supermarkets paid late.
- Most farmers depended heavily on climate conditions for their vegetable farming, so they may not produce a consistent vegetable quality that meets supermarkets' requirements.
- Supermarkets required high quality products (first grade products), but did not give a suitable price for these types of vegetables.

Future strategies of the PC

The managers pointed out some important opportunities for the PC from current vegetable markets. The foremost opportunity of the PC was new market opportunities because many supermarkets in Phnom Penh city and end consumers were interested in vegetables from the PC.

According to the PC's manager: *"currently, some supermarkets in Phnom Penh contacted our PC in order to buy vegetables from our PC. These supermarkets required our members to supply to them regularly."*

Besides supermarkets, it was growing interest from groups of end consumers in regions and in the cities who made contact directly to the PC. Moreover, an increase in the number of small retail outlets both the province and main city will provide good opportunities for the PC to expand markets. A further opportunity of SMAC was an increase in the number of members that were interested in growing vegetables, from 90 people in 2012 to 224 people in 2018. This would be great potential for the PC to increase supply volume in the future. SMAC will join with the other two vegetable PCs in the region to strengthen the supply volume.

"Our PC contacted the other two PCs that produced vegetables in the region to supply some kinds of vegetables that our members could not produce. Thus, we could supply to these supermarkets all kinds of vegetables they needed", the PC marketing manager said.

The PC stressed that its strategic plan for the next 5 years would focus mainly on production, marketing, and creating added-value of vegetables. With respect to vegetable production, SMAC wanted to have a volume contract with supermarkets. Thus, it will

recruit more members and motivate them to grow vegetables for commercial purposes. The cooperative will seek agricultural input supply companies to supply high-quality seeds and input material for members. Apart from the production aspect, expanding markets for members is the first priority for SMAC to ensure future growth. In addition to selling at its own retail outlets in provincial towns, the PC will create community markets in the area. Therefore, members can reduce their high dependency on middlemen. The next strategic plan relates to creating product value-added through processing and packaging into semi-processed products or final products.

5.1.4. Peam Meanchey Agricultural Cooperative (PMCAC)

Background of the PC

The cooperative was established by LWD organisation and registered by MAFF in June 2011 with 160 members. It was located in Kampong Chhnang province, in the center of Cambodia. The original purposes for creating this cooperative were to create more job opportunities, selling and purchasing collectively, and provide loan support for producers. In order to be a member of the cooperative, farmers should purchase at least one share of 10,000 riels (2.5 \$) and contribute membership fees of 5,000 riels (1.25\$). Total gross profits/surplus were divided into seven parts: reserve fund (20%), training fund (5%), managing member fund (15%), business expansion (20%), dividends (30%), social fund (5%), and office building (5%).

The PC had four main businesses, including credit and saving service, fertilizer supply, pure water supply, and vegetable marketing. However, with vegetable marketing, the PC just collected and bought small amount of vegetables (less than 10%) from its members in the last year. Since established in 2011 until 2018, the PC identified three main achievements. The most important achievement over the seven-year-operation was increasing the membership number from 160 (2011) to 352 (2018). In addition, the PC increased its capital from 16,400 USD to 41,120 USD. The main drivers of the capital increase derived from the rising numbers of shares and annual profits from credit business.

“We collected a lot of money from members through selling shares for running credit business compared to other cooperatives. This was because our members had high trust

in our PC's management committee that had high transparency.” the PMCAC's manager stressed.

The PC also expanded another new business (pure water supply business) in 2017. This enabled PMCAC to generate more income for its members and increase its capital. Another output of the cooperative was organising sub-groups of safe vegetable producer and marketing. Under LWD's support, PMCAC created a vegetable marketing business in 2017. It bought some types of vegetables only from its members and sold them to middlemen in the region and sometimes sent them to markets in Phnom Penh and provincial towns.

Products and services of the PC

The most common vegetables that the PC collected from members were cucumber, cherry tomato, bitter gourd, eggplant, wax gourd, round eggplant, and long yard bean. However, the top five vegetables, in terms of volume, were cucumber, eggplant, wax gourd, cherry tomato, and long yard bean. The PC sold these vegetables to only middlemen and collectors in the region. There was no vegetable supply to HVMS such as supermarkets. The reason behind this was that the PC just started vegetable marketing last year. It organised some sub-groups of vegetable producer, so the PC could not make a contract with supermarkets.

“There was no formal contract with specific buyers yet because we just started our business in last two years and organized a few vegetable producer groups.” indicated by the PC's manager.

Nonetheless, the PC had to plan to grow safe vegetables for supply to supermarkets in the future. This is because these markets were the best suited for producers' vegetables and they buy vegetables at a high price.

The PMCAC's manager added that *“we had not supplied to supermarkets yet because we needed to increase the number of vegetable producers to guarantee a stable and consistent supply. Currently, the number of vegetable producers increased, so we contacted supermarkets to organize a contract.”*

With respect to current PC's buyers (middlemen and collectors), it was found that there were not any challenges to supply vegetables to them. These buyers bought all types of

vegetables from the PC, regardless of grades. Types of vegetables, volume, and price were based on the negotiation between these buyers and the PC. PMCAC had no volume and price contract with them because it usually fluctuated in accordance with market demand.

To assist members in growing vegetables for these supermarkets, the PC provided a wide range of supports. With support from LWD, the PC provided agricultural input support such as seeds, fertilizers, nets, dripping tubes, row cover plastics, and other material to members who grew vegetables. The PC also sold fertilizers to its members at a lower price than market price because it had a contract with supply companies. To help members to produce vegetables successfully, the PC also provided loans for them. The loan service from the PC was more convenient than from microfinance institutes or banks. Producers were not required to have collateral in order to receive a loan. Members of producer groups received extension services such as technical training about safe vegetable production, post-harvest, and packaging from LWD and PDAFF agencies.

The PC's manager noted: *“NGO supported our vegetable growers by transferring techniques. Meanwhile, our PC tried to find new production techniques from other PCs to share with our members.”*

With respect to marketing support, PMCAC communicated with other PCs, NGOs, and government agencies to find markets for members. However, the most important market support that the PC provided to its members was only price information.

Challenges of the PC

The PO experienced some major challenges in supplying vegetables to the HVMs.

- *Communication with supermarkets:* Communication with these supermarkets was usually getting through NGOs or government agencies. It would be very challenging for the cooperative to contact these markets directly.
- *Internal challenges of the PC:* The PC assigned roles and responsibilities of members of the Board of Directors, but the level of participation and support was very limited.
- The number of producers was still limited because the PC just organized sub-groups of producers.

- Some producers found that changing farm practices from traditional to good practices as guided by technical experts from NGOs and government was difficult.

“Our PC’s main challenge started from our committee’s members because they not participated actively with the PC. Only some members actively involved in the PC’s business”, the PC’s manager said.

Future strategies of the PC

The most important opportunity for the PC was increasing vegetable production. Producers increased their vegetable production and quality if these markets needed a large volume. This was because vegetable growing was the easy job for producers in the region. Another opportunity for the PC was an increase in the number of vegetable producers. Selling vegetables to supermarkets, producers will receive a better price. This will attract a number of vegetable growers to the PC's participation.

The PC had set its strategic plan for the next five years that will emphasise three main sectors, being vegetable production, marketing, and expanding capital. The vegetable production aspect will put great attention on providing training to producers. Thus, it enables them to change their farm practices and improve vegetable production and quality. In addition, the cooperative will recruit a number of vegetable producers to ensure a stable supply volume. With the marketing sector, the cooperative will build strong communication with NGOs and the government to seek more market partners, especially HVMS. The last strategy is expanding the cooperative’s capital through mobilizing farmers in the community to participate with the cooperative. It also motivates members to buy more shares, so the cooperative can expand its business in the future.

5.1.5. Phalitphal Sovathipheap Agricultural Cooperative (PSAC)

Background of the PC

Phalitphal Sovathipheap is a producer cooperative (PC) founded by the PDAFF and officially registered in January 2018 with 37 members. The cooperative, located in Pursat province, in the western part of Cambodia, was established with the three main purposes. These comprise providing credit and saving services, strengthening purchasing power, and boosting vegetable production in the area. Producers could become a member of the PC by purchasing at least one share of 50,000 riel (10.25 \$) and paying for a membership

fee of 5,000 riels (1.25\$). The gross profits/surplus were divided, based on the following principles: reserve fund (20%), training fund (3%), managing member fund (15%), business expansion (12%), and dividends (50%).

The PC had two businesses, including credit and saving service and vegetable marketing, but the current primary business was credit and saving. Since it has only been developed for about one year, the manager pointed out that only two key achievements were identified. These include forming vegetable producer groups and creating retail outlets for selling PC's vegetables, which were collected from its members. Vegetable retail outlets were created by the Boosting project in order to expand markets for PCs in Pursat province. With these retail outlets, PCs could promote their safe vegetable markets in the province. The PC organised sub-groups of vegetable producers for growing safe vegetables for supply to provincial markets and supermarkets in the future. Under the support from Boosting project, the PC created its retail outlets in the provincial town, so it could promote its vegetable products and seek new market opportunities.

Products and services of the PC

PSAC bought some varieties of vegetables from farmers such as cucumber, cherry tomato, bitter gourd, wax gourd, and long yard bean. The middlemen in the provincial towns and end consumers were the main buyers of the PC. The reason behind this was that PSAC had just been created, so the PC had not yet found HVM partners. However, the PC wanted to sell its vegetables to these supermarkets because they gave a high price and also expanded markets for members.

The PC's manager stated that *“our PC and PDAFF officers had tried to contact supermarkets for our members, but currently we could not get one. Some supermarkets contacted our PC, and then they had not given any replies to our PC yet.”*

Although PSAC had not yet sold its vegetables to supermarkets, the PC worked closely with PDAFF officers to seek detailed information about these market requirements and types and quality of vegetables they needed. The PC organised sub-groups of producer based on types of vegetable growing calendar, so they could grow vegetables for supplying to supermarkets. Currently, the important services that the PC supported its members were extension services that mainly emphasized vegetable production and quality. It also shared and trained producers on how to make compost fertilizers and use

pesticides. Furthermore, PDAFF provided some agricultural input such as seeds, fertilizers, nets, dripping tubes, and row cover plastics to some vegetable producers. The PC also provide loan services to its members for agriculture production purposes. The PC contacted markets and shared price information with members.

Challenges of the PC

The PC faced challenges with selling vegetables to these markets.

- The main challenge was that a number of HVMs in the region and across the country were relatively small. Therefore, it was very challenging for the PC to produce a large volume of safe vegetables.
- Supermarkets needed only high-quality and grade one vegetables
- The producers' knowledge and techniques for producing safe vegetables was still limited

“Supermarkets needed only good vegetables. For example, cucumbers that could be sold to these supermarkets must be between 13 to 14 cucumbers/kg and very low chemical residue”, the PC's manager claimed.

Future strategies of the PC

The cooperative's manager identified that selling or supplying vegetables to HVMs will help producers obtain a better price. Another opportunity from these markets is that producers growing safe vegetables reduced production costs because they used a limited amount of fertilizers and pesticides. They replaced chemical fertilizers and pesticides by using compost fertilizers and natural pesticides. The manager pointed out that producers could also reduce environment- and health-related risks due to these chemical substances and vegetable consumption. With regard to the consumer's perception, particularly in city and town, formal vegetable retail outlets were the best places that they could trust in a vegetable quality. Thus, the PC expected that it could expand its markets into these new emerging markets.

The next five-year-strategy for the PC will focus mainly on vegetable production and marketing. Marketing is the most important priority for the PC because it will ensure sustainable growth and running of the PC. To achieve this goal, the PC's manager addressed that the cooperative will seek NGOs or government support to sell its vegetables. It will contract with HVMs to make an agreement on vegetable supply. With

vegetable production, the cooperative continues to motivate its members to grow safe vegetables with support from NGOs or government.

5.1.6. Summary of products and services of PCs

With upstream supports (Table 5.1), members of PC-TMs received similar agricultural input support, such as agricultural inputs (seeds, fertilizers), irrigation equipment (dripping tubes), and production equipment (nets and row cover plastics) from their PC. Regarding financial support, all PC-TMs provided loan and saving services for their members. However, PMCAC had largest capital compared to other two PC-TMs, so it could provide large amount of loan to its members. The extension services provided by PC-TMs were focused mainly on vegetable production rather than marketing. The most common market support was particularly for price and product information, even though these PCs bought small amount of vegetables from their members.

There were very similar products and services provided by PC-HVMs regarding agricultural input support, financial support, extension services, and market support. The two PC-HVMs provided agricultural input support for their members in order to help them improve vegetable production and quality. Besides this, these PCs provided loan for their members in order to assist them in producing vegetable production. With regard to extension services, these PCs focus on both production-oriented and market-oriented training. Likewise, besides sharing price and demand information, these PCs support their members in making a formal contract with purchasers and facilitating vegetable markets.

Table 5-1: Upstream supports from PCs

Products & Services of PCs	PC-HVMs		PC-TMs		
	TSAC	SMAC	AKPAC	PMCAC	PSAC
Agricultural input support	****	****	****	****	****
Financial support	****	****	****	*****	****
Extension services	****	****	**	**	**
Market support	****	****	**	***	**

Note: *, **, ***, ****, ***** refers very poor, poor, fair, good, and very good

With the downstream facilitation (Table 5.2), all PC-HVMs' manager reported that there were few challenges to deal with TMs and traders. Price and contract was the main challenges for PC-TMs because traders from TMs not preferred to make a contract with

these PCs. Besides these, PC-TMs' managers explained that there were no problems with types and quality of vegetables because traders bought all vegetables regardless of grades.

With respect to HVMs, PC-HVMs' managers reported that to deal with these markets they organised sub-groups of producers and cropping calendar with their members. Therefore, they could ensure stable supply with consistent quality and volume to these supermarkets. In addition, these PCs organised a formal contract between these PCs and supermarkets in relation to prices, types of vegetables, and quality of vegetables. However, these PCs' could not make a volume contract with supermarkets because these supermarkets concerned about unstable vegetable demand in markets.

Table 5-2: Downstream facilitation between PCs and HVMs

Products & Services of PCs	PC-HVMs		PC-TMs		
	TSAC	SMAC	AKPAC	PMCAC	PSAC
Types of vegetables	****	****	-	-	-
Volume	*****	*****	-	-	-
Prices	****	****	-	-	-
Quality	****	****	-	-	-
Contract	****	****	-	-	-

Note: *, **, ***, ****, ***** refers very poor, poor, fair, good, and very good

5.2. Mapping the vegetable value chains in Cambodia

The study focused on vegetable value chains in Cambodia, which consisted of eight chain actors such as input suppliers, producers, PCs, supermarkets, traders, middlemen, retailers, and end consumers. In the study, the input suppliers included companies, agricultural input shops, the government, NGOs, and PCs. These suppliers sold and provided agricultural inputs such as fertilizers, pesticides, seeds, nets, drip tubes, row cover plastics, and other material to vegetable producers. The producers were the members of the PCs who grew vegetables for supply to two main market value chains, such as (1) supermarkets and (2) traditional markets.

Regarding HVM value chain (Figure 5.1), five chain actors, such as input suppliers, producers, PCs, supermarkets, and end consumers, played critical roles in these value chains. The primary purpose of the PCs collecting vegetables from members was to

supply to supermarkets. They sorted vegetable grades based on high-quality vegetables before supplying directly to supermarkets in Phnom Penh city and other provinces. The standard grade and quality of these vegetables were set based on the agreement between PCs, which were producer representatives, and supermarkets. These standards and quality were in accordance to the standard level of chemical residues and physical appearance of vegetables. With this vegetable value chain, the PCs, on behalf of producers, arranged formal contracts with supermarkets about the kinds of vegetables supplied to these supermarkets. Payment method and prices of vegetables were also included in this contract. The PCs and supermarkets applied the price in an advanced contract, which locked vegetable prices for a period of one month and renewed at the end of each month. Generally, these supermarkets paid producers between two weeks and a month. These supermarkets sold vegetables directly to end consumers, restaurants, and hotels.

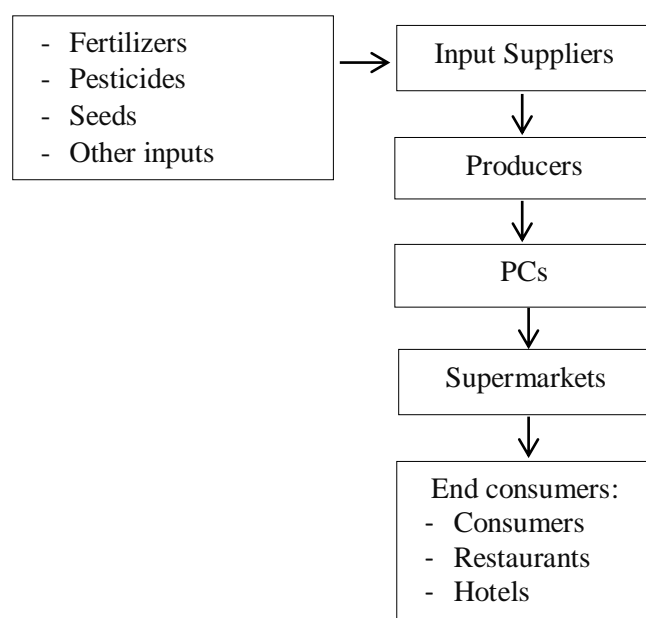


Figure 5-1: Mapping the vegetable value chains of HVMs in Cambodia

With the traditional vegetable value chain (Figure 5.2), it flew through two main value chains, including the PCs and trader value chains. The type of vegetable value chain was long and complicated compared since vegetables were passed through many intermediaries before reaching consumers. With vegetable value chain through PCs, PCs bought vegetables from producers, who were members of their PCs regardless of grades. They played the roles of collectors and retailers in their communities by purchasing some vegetables from producers at a little higher than the market price. Vegetables were sold to middlemen in the region and end consumers in their retailed outlets. The price and

volume of vegetables were based on daily market price and demand. There were no volume and price contract between these PCs and buyers, and the quality of vegetables was not seriously restricted. In the case of this study, the major role of middlemen was distributing vegetables to retailers in local markets.

Another traditional vegetable value chain was through traders. Producers sold their vegetables to traders that usually collected at farm gates or at farmers' homes. The majority of vegetables were passed through this channel (about 74%), while through the PCs about 26%. In this study, traders referred to collectors/middlemen/wholesaler/retailers. The reason behind this was that these traders played overlapping roles, not only one role. Although they bought vegetables directly from producers, they sold these vegetables to other middlemen, to retailers, and sometimes to end consumers at local markets. These traders bought all types of vegetables from farmers regardless of grades but gave a lower price than the PCs. However, these traders paid money to producers faster than supermarkets. Some producers reported that they could receive payments from these traders between one or two days after they sold vegetables.

One farmer confirmed that: *"I did not know clearly if they were collectors or retailers because they bought my vegetables and sold them to other traders and to consumers in local markets. When they could not sell all vegetables to their buyers, they sold the remaining vegetables to consumers in local markets by themselves."*

With respect to middlemen, they did not purchase vegetables directly from producers because they not lived in the communes or villages. These middlemen generally bought vegetables from collectors at provincial town or district markets. They distributed these vegetables to local retailers in the region and other areas. Retailers usually bought vegetables from middlemen and sold them directly to end consumers in local markets. The last chain actors of vegetable value chains were consumers who bought vegetables for their household consumption or final use.

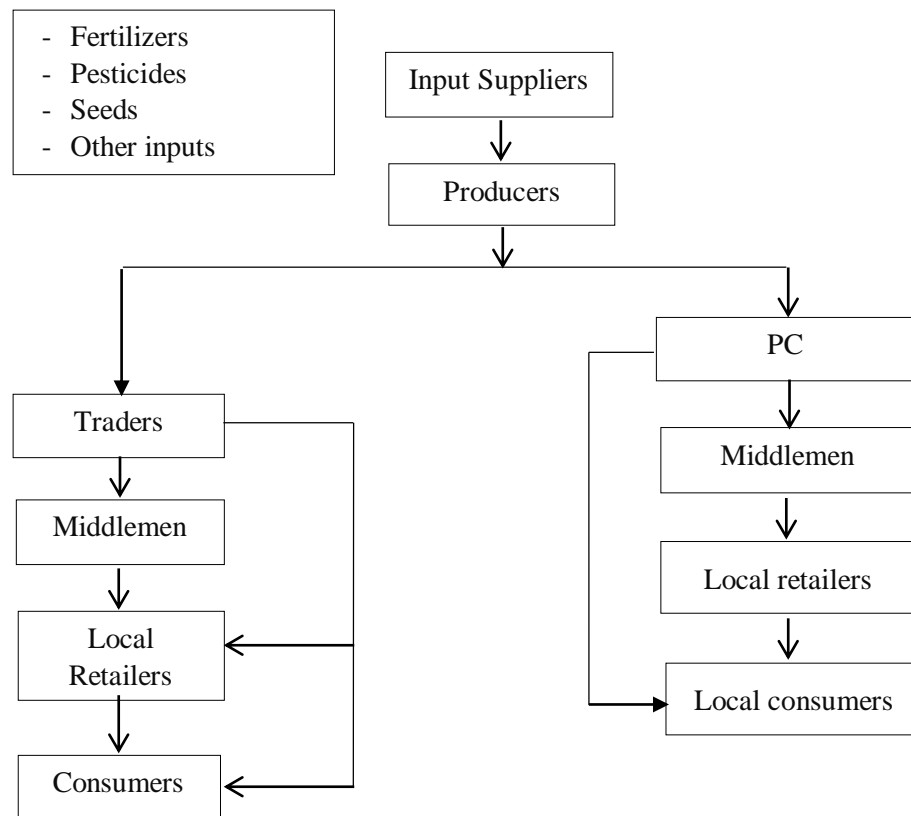


Figure 5-2: Mapping the vegetable value chains of TMs in Cambodia

5.3. Descriptive analysis results

5.3.1. Farmer's demographics

This section presents the characteristics of respondents' demographics, including gender, age, education, household size, farming experience, and vegetable farming experience.

Gender of respondents

Table 5.3 shows that of the total samples, male and female respondents presented a similar proportion, at 48.7% and 51.3% respectively. With a type of PC groups, however, female respondents were dominant in the PC-HVM group with more than 60%, while more 60% of the total respondents from PC-TMs were males. The chi-square test results in Table 5.3 were statistically significant between two groups of PCs ($\chi^2 = 6.368$, $p = 0.012$). This indicates that farmers' marketing decisions may be associated with the gender of respondents or headed household if they want to sell vegetables to HVMs or TMs.

One respondent explained: “Men usually worked in the vegetable production, such as ploughing, planting, managing farm, and harvesting. Women more actively involved in marketing, trade, and communication.”

Table 5-3: Gender of respondents

Gender	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Male	28	39.4	28	63.6	56	48.7
Female	43	60.6	16	36.4	59	51.3
Total	71	100.0	44	100.0	115	100.0

$\chi^2 = 6.368$, $p = 0.012$

Age of respondents

The age distribution of respondents ranged from 23 to 70 years, with an average of 44.6 years. The results indicated that the majority of vegetable producers in the selected areas were in middle age (Table 5.4). The highest percentage age group of vegetable growers was between 41 and 60 (53.9%); whereas producers aged above 60 years were the lowest group (7%). This reveals that young people tend to choose other occupations besides the agricultural sectors. Table 5.4 shows the age of respondents was not correlated with types of market participation because the chi-square test result was no statistical significance ($\chi^2 = 2.417$, $p = 0.299$).

Table 5-4: Age distribution of respondents

Age Group	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
20-40	27	38.0	18	40.9	45	39.1
41-60	37	52.1	25	56.8	62	53.9
Above 60	7	9.9	1	2.3	8	7.0
Total	71	100.0	44	100.0	115	100.0

$\chi^2 = 2.417$, $p = 0.299$

Educational level of respondents

The year of education of respondents in the study was classified into three levels, including primary (1-6), secondary (7-9), and upper secondary (10-12). As illustrated in Table 5.5, the highest percentage education level of farmers was in primary school (61.8%), while 10.4% attained upper secondary. Most vegetable producers from PC-HVM and PC-TM groups had a similar educational level, at 57.7% and 68.2%

respectively. Table 5.5 shows that there was no statistical difference between PC-HVM and PC-TM groups ($\chi^2=1.577$, $p=0.455$).

One respondent claimed: *“During my generation, we could not go to school because of civil war and schools were not as many as today. Some people studied at Buddhist temples with monks.”*

Table 5-5: Educational level of respondents

Educational Level	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Primary (1-6)	41	57.7	30	68.2	67	61.8
Secondary (7-9)	21	29.6	11	25.0	32	27.8
Upper secondary (10-12)	9	12.7	3	6.8	12	10.4
Total	71	100.0	44	100.0	115	100.0

$\chi^2=1.577$, $p=0.455$

Household size of respondents

The average number of sample producer households was five persons, which ranged from 2 to 11 persons. Overall, the majority of household size groups was between four and six persons (66.1%), followed by a group of 1-3 (20.9%). Only 13.0 % of the total sample had more than six people in the household. This result reveals a similarity between respondents of PC-HVM group and PC-TM group. The chi-square result in Table 5.6 shows that there was no statistically significance ($\chi^2=1.065$, $p=0.587$).

Table 5-6: Household size of respondents

Household size	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
1-3	17	23.9	7	15.9	24	20.9
4-6	45	63.4	31	70.5	76	66.1
Above 6	9	12.7	6	13.6	15	13.0
Total	71	100.0	44	100.0	115	100.0

$\chi^2=1.065$, $p=0.587$

Vegetable farm experience

In general, the selected household producers had extensive experience in vegetable growing activities. The average years of experience were about 10 years, which ranged from 1 to 40 years. The highest percentage experience group was less than ten years,

representing about 54.8%, followed by between 10 and 20 years, around 33.0% (Table 5.7). Only about 12% of producers were experienced in vegetable production for more than 20 years. The chi-square result shows that there was no statistical significance ($\chi^2=3.944$, $p=0.139$).

“I have been working in vegetable and rice farms since 1993. The government distributed land to people after the national election, so we started planting vegetables and rice for household consumption and sale.” One producer stated.

Table 5-7: Vegetable farming experiences of respondents

Farming experience	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Less than 10	34	47.9	29	65.9	63	54.8
10-20	28	39.4	10	22.7	38	33.0
Above 20	9	12.7	5	11.4	14	12.2
Total	71	100.0	44	100.0	115	100.0

$\chi^2=3.944$, $p=0.139$

5.3.2. Farm characteristics

The section describes the characteristics of respondents' farms, ranging from total farm size, vegetable farm size, types of vegetables, and off-farm activities. It also highlights the asset endowment of respondents that impacts selling their vegetables to different types of markets.

Total farm size of respondents

Overall, the respondents in the selected provinces had large total farm areas with more than 1 hectare. The average farm size was about 1.39 hectare, with ranged from 0.02 to 14 hectares (Table 5.8). There was a significant difference in the total farm size between both groups of PCs (p -value=0.027). Table 5.8 shows that members of PC-HVMs had smaller farmland than that of PC-TMs. With PC-HVM group, the average farm size of respondents is about 1.03 hectares, with ranged from 0.02 hectare to 8.01 hectares. However, the average farm size of PC-TM members is 1.97 hectares, ranging from 0.05 hectare to 14.00 hectares.

Table 5-8: Average total farm size of respondents

Type of PCs	Average	Min	Max	STD
PC-HVM	1.03	0.02	8.10	1.667
PC-TM	1.97	0.05	14.00	2.402
<i>Both PC group</i>	<i>1.39</i>	<i>0.02</i>	<i>14.00</i>	<i>2.023</i>

Mean difference = -0.93, Sig. = 0.027

Vegetable farm size of respondents

In general, vegetable producers of both PCs had small vegetable farmland with less than 0.5 hectares. Table 5.9 reveals that the average vegetable farmland of respondents of both PCs is about 0.43 hectare, with ranged from about 0.01 hectare to 3 hectares. There was a significant difference between both groups of PCs (p-value=0.000). The average vegetable farmland of members of PC-HVMs is about 0.26 hectares, ranging from about 0.02 hectares to 1.00 hectare. Regarding members of PC-TMs, the average farmland is about 0.72 hectares, ranging from about 0.01 hectare to 3.00 hectares (Table 5.9). Therefore, it could be concluded that members of PC-HVMs had smaller vegetable farmland than that of PC-TMs. A possible reason about this may be that members of PC-HVMs lived in areas where the majority of producers had small farmland.

One member of PC-HVMs claimed: *“In this areas, producers have small vegetable farms and mostly are close to our homes compared to rice farms. However, they grow many types of vegetables all year round for supporting their living.”*

According to Table 5.8 and Table 5.9, it shows that producers of both PC groups shared only small part of their farmland for vegetable production (about 30% of total farmland).

Table 5-9: Average vegetable farm size of respondents

Type of PCs	Average	Min	Max	STD
PC-HVM	0.26	0.02	1.00	0.190
PC-TM	0.72	0.01	3.00	0.783
<i>Both PC group</i>	<i>0.43</i>	<i>0.01</i>	<i>3.00</i>	<i>0.551</i>

Mean difference = -0.460, Sig. = 0.000

Types of vegetables

In general, vegetable producers in the selected region grew two to four types of vegetables for the year-round by using a crop-rotating system. The study focused on only three main

vegetables that were generally grown by members of selected PCs. These included cucumber, wax gourd, and long yard bean. Table 5.10 indicates that most farmers grew cucumber (40.7%), followed by long yard bean (38.9%), and wax gourd (20.4%). Producers of the PC-HVM group grew a similar proportion of the three main vegetables, while farmers of PC-TM group focused mainly on cucumber (56.8%) and long yard bean (39.2%). There was statistically different between PC-HVM and PC-TM producers in terms of types of vegetables grown ($\chi^2=21.555$, $p=0.000$). This may be because PC-HVM producers were required to grow these three main vegetables to supply the demand for HVMs. In addition, the PCs organised producer groups that grew vegetables based on their groups' plan.

One of the selected producers asserted: *“Our PC has a contract with supermarkets in Phnom Penh city, so our PC’s members have to grow these vegetables to supply to these supermarkets.”*

Table 5-10: Type of vegetables

Type of vegetables	PC-HVM		PC-TM		Total	
	Number	Percent	Number	Percent	Number	Percent
Cucumber	48	32.6	42	56.8	90	40.7
Wax gourd	42	28.6	3	4.0	45	20.4
Long yard bean	57	38.8	29	39.2	86	38.9
Total	147	100.0	74	100.0	221	100.0

$\chi^2=21.555$, $p=0.000$, *** *percentage calculated by number of responses*

Off-farm activities of respondents

The results from this study showed that of the total samples, the highest percentage of household respondents had only one occupation in the agricultural sector (76.5%). However, 23.5% had both farming and off-farming activities (Table 5.11). Most off-farm activities in which they were involved included garment job, construction, trade, and civil service (Appendix 7.1). Table 5.11 reveals that there was no statistical significance ($\chi^2=2.273$, $p=0.132$).

“My husband worked at construction sometimes to earn some more money after he was free from farming activities, but vegetable farming provided my family daily income.” claimed by one vegetable producer.

Table 5-11: Off-farm activities of respondents

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	20	28.2	7	15.9	27	23.5
No	51	71.8	37	84.1	88	76.5
Total	71	100.0	44	100.0	115	100.0

$\chi^2=2.273$, $p=0.132$

Transportation assets of respondents

The respondents of this study had one or more transportation assets. The majority of them had motorbikes and bicycles, 94.8% and 55.6% respectively. However, of the total samples, only 11.3 % had tractors, followed by cars (5.2%) and Tuk Tuks (3.5%). As shown in Table 5.12, there was no statistical significance for cars ($\chi^2=2.162$, $p=0.141$), motorbikes ($\chi^2=0.065$, $p=0.799$), Tuk Tuks ($\chi^2=2.368$, $p=0.124$), and tractors ($\chi^2=1.507$, $p=0.220$). Nonetheless, there was statistical significance for bicycles ($\chi^2=3.038$, $p=0.081$).

Table 5-12: The transportation assets of respondents

Types of Transportation	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Car ^a						
Yes	2	2.8	4	9.1	6	5.2
No	69	97.2	40	90.9	109	94.8
Motorbike ^b						
Yes	67	94.4	42	95.5	109	94.8
No	4	5.6	2	4.5	6	5.2
Bicycle ^c						
Yes	36	50.7	15	34.1	64	55.6
No	35	49.3	29	65.9	51	44.4
Tuk Tuk ^d						
Yes	1	1.4	3	6.8	4	3.5
No	70	98.6	41	93.2	111	96.5
Tractor ^e						
Yes	6	8.5	7	15.9	13	11.3
No	65	91.5	37	84.1	102	88.7

a: $\chi^2=2.162$, $p=0.141$, b: $\chi^2=0.065$, $p=0.799$, c: $\chi^2=3.038$, $p=0.081$, d: $\chi^2=2.368$, $p=0.124$, e: $\chi^2=1.507$, $p=0.220$

Communication assets of respondents

Table 5.13 showed that the most common communication assets owned by household respondents were mobile phones, about 90%, followed by television (84.4%) and radio (16.5%). The means of communication may influence farmers' decisions to sell their vegetables to different types of markets. The reason behind this was that through these communication means, producers could receive adequate information about marketing information. The chi-square test for television shows that there was statistical significance ($\chi^2=4.717$, $p=0.030$), while mobile phone ($\chi^2=0.142$, $p=0.706$) and radio assets ($\chi^2=0.622$, $p=0.430$) show no statistical significance.

Table 5-13: The communication assets of respondents

Types of communication	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Radio ^a						
Yes	11	15.5	8	18.2	19	16.5
No	60	84.5	36	81.8	96	83.5
Television ^b						
Yes	64	90.1	33	75.0	97	84.4
No	7	9.9	11	25.0	18	15.6
Mobile phone ^c						
Yes	63	88.7	41	93.2	104	90.4
No	8	11.3	3	6.8	11	9.6

a: $\chi^2=0.142$, $p=0.706$, b: $\chi^2=4.717$, $p=0.030$, c: $\chi^2=0.622$, $p=0.430$

The influence of PCs on type of vegetable grown

Table 5.14 shows that around 82% of the total sample respondents were influenced by PCs in selecting vegetables for growing, but only 18 % of them were not influenced by PCs. The PCs influenced them through finding markets for their vegetables, providing technical and agricultural input supports, and sharing market information about these vegetables (see detail in Appendix 7.2). With respect to the chi-square result ($\chi^2=1.021$, $p=0.312$), there was no statistical significance.

“Our PC advised us to grow cucumbers and long yard bean because they are high market demand. They share growing techniques, find markets, and give farm inputs to our PC’s members”, said one of the PC’s members.

Table 5-14: PCs' influence on members and vegetables grown

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	56	78.9	38	86.4	94	81.7
No	15	21.1	6	13.6	21	18.3
Total	71	100.0	44	100.0	115	100.0

$\chi^2=1.021$, $p=0.312$

5.3.3. Marketing aspects

This section presents an important finding in relation to vegetable marketing of the respondents in the study. It focuses on markets, prices, and quality requirement.

Vegetable markets

Vegetable producers of selected PCs sold their vegetables to two types of markets, which were PCs and local traders. Table 5.15 shows that the percentage of producers selling vegetables to the PCs and traders were almost in equal proportion of 47% and 53% respectively. Members decided to sell their vegetables to the PCs for several reasons (see detail in Appendix 7.3). The most important reason was that the PC bought vegetables at a higher price than traders (81.8%). Being a member of the PC (46.5%) was also another reason that producers sold vegetables to their PCs. The next reasons were that the PC collected vegetables at their homes (25.3%) and provided technical training and farm inputs to them (22.2%).

One of the PC's members explained: *"I sell some vegetables to collectors and some to our PC because I am a member of this PC. So I want to work with my PC."*

Table 5-15: The vegetable markets

Types of buyers	PC-HVM		PC-TM		Total	
	Number	Percent	Number	Percent	Number	Percent
PCs	67	48.9	32	42.7	99	46.7
Traders	70	51.1	43	57.3	113	53.3
Total	137	100.0	75	100.0	212	100.0

$\chi^2=0.758$, $p=0.384$,*** *the percentage was calculated based on a number of responses*

Volume of vegetables sold

Overall, producers sold their vegetable through traders higher than they did via PCs. The average total volume of three selected vegetables sold to the PCs was about 0.9 tons per year, which ranged from 0.14 tons to 3.0 tons. However, about 4 tons of vegetables were sold to traders, ranging from 0.09 tons to 12.9 tons. As indicated in Table 5.16, the average difference between both buyers in terms of sales volume was about 3.1 tons per year. The T-test results show a highly significant difference between both buyers (p-value=0.000).

The results also show that there was a similar sale volume for PC-HVM and PC-TM group. The total volume of three selected vegetables that PC-HVM and PC-TM producers sold to PCs per year was about 1.0 tons and 0.8 tons respectively, with an average of about 0.9 tons (Table 5.16). In contrast, both producer groups sold their total volume of vegetables to traders about 4.3 tons and 3.6 tons respectively, with an average about 4 tons (Table 5.16). The t-test result in Table 5.16 showed that there was a highly significant difference for both producer groups (p-value=0.000).

Most producers reported that they wanted to sell their vegetables to their PCs because they could receive better price, but there were many reasons that impeded them from selling to their PCs. About 80% of producers indicated that they sold their vegetables to traders in the region was because their PCs bought a small and limited volume of vegetables. Another reason (13.3%) was that the PCs bought only first grade and safe vegetables, so they sold the remaining vegetables to traders. Some producers (5.3%) claimed that collectors tended to pay faster than the PCs (see detail in Appendix 7.4).

One of the PC's members who sold her vegetables to her PC acknowledged: *"I wanted to sell all my vegetables to our PC, but they could not buy all my vegetables because they had to buy some from all members. Our PC selected only very good vegetables."*

Table 5-16: The average selling volume by types of buyers and PCs (tons/year)

Type of buyers	PC-HVM ^a		PC-TM ^b		Both ^c	
	Average	STD	Average	STD	Average	STD
PCs	1.0	0.753	0.8	0.649	0.9	0.721
Traders	4.3	3.408	3.6	2.425	4.0	3.070

a. Mean difference = -3.3, Sig. = 0.000, b. Mean difference = -2.8, Sig. = 0.00, c. Mean difference = -3.1, Sig. = 0.000

Sale price of vegetables

In general, the average sale price of three selected vegetables given by traders was lower than by the PCs. Table 5.17 indicates that the average price of three selected vegetables given by traders was about 0.34 USD/kg. However, PCs purchased the same types of vegetables at an average price of 0.42 USD/kg. The t-test result shows that there was a significant difference between the price of traders and the PCs (p-value=0.000).

Table 5.17 also shows that the average price of the three selected vegetables that PC-HVM producers received from their PCs was about 0.44 USD/kg. In contrast, the average price of the same vegetables received from traders was about 0.36 USD. There was a statistically significant difference (p-value=0.000). Likewise, PC-TM producers received different prices from traders and the PCs, at about 0.37 USD and 0.31 USD respectively. There was a significant difference in vegetable prices between these two purchasers (p-value=0.000). The study noted that the average sale price of three selected vegetables was also a significant difference between the two groups of PCs. This may be because PCs have different influence on the bargaining of these vegetables with traders.

“Our PC buys vegetables at a higher price than a market price. If collectors or middlemen increase vegetable prices, our PC also increase higher prices than those traders”, said one of the PC-HVM’s members.

Table 5-17: The average selling price by types of buyers (US\$/kg)

Type of buyers	PC-HVM ^a		PC-TM ^b		Both ^c	
	Average	STD	Average	STD	Average	STD
PCs	0.44	0.107	0.37	0.109	0.42	0.113
Traders	0.36	0.100	0.31	0.099	0.34	0.102

a. Mean difference = 0.09, Sig. = 0.000, b. Mean difference = 0.06, Sig. = 0.012, c. Mean difference = 0.08, Sig. = 0.000

***** Exchange rate on March 14, 2019 (1 USD=4010 Riels)**

Quality requirement of vegetables

Supermarkets did not require producers to have a certificate scheme such as GAP to sell their products to these supermarkets. However, they seriously restricted the quality of vegetables. All vegetables sold to these supermarkets must be safe vegetables and first grade. Table 5.18 shows that the majority of household respondents (84%) claimed that

HVMs required high-quality vegetables. The result of the chi-square test ($\chi^2=3.714$, $p=0.054$) in Table 5.18 indicates that there was statistical significance at 10%.

One of PC-HVM's members explained: *“Our vegetables supplied to these supermarkets must be 100% safe vegetables with the standard level of chemical residue. We experienced serious problems with them one time when they found our vegetables containing high pesticide residue over their standards. They cut 50% of our total price.”*

Table 5-18: Quality vegetables for selling through PCs

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	63	88.7	33	75.0	96	83.5
No	8	11.3	11	25.0	19	16.5
Total	71	100.0	44	100.0	115	100.0

$\chi^2=3.714$, $p=0.054$

5.3.4. Strategic intention of respondents

This section describes the producers' future strategic plans for their vegetable production and membership of the PCs.

Growing vegetables

Nearly all household respondents showed their intention to continue to grow vegetables for the next five to ten years (Table 5.19). The primary reason behind this is that vegetable producers selected in the study had the main occupation and income from a vegetable farm (more than 50%). Therefore, it is not surprising that the majority of them keep growing vegetables for the next five or ten years. Respondents wanted to grow vegetables because it provided many benefits (see detail in Appendix 7.9). The chi-square test indicates that there was no statistical significance ($\chi^2=1.628$, $p=0.383$).

Table 5-19: The respondents planning to grow vegetables

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	71	100.0	43	97.7	114	99.1
No	0	-	1	2.3	1	0.9
Total	71	100.00	44	100.0	115	100.0

$\chi^2=1.628$, $p=0.383$

Membership of PCs

Of the total household respondents, over 98% would continue to be members of the PCs for the next five to ten years. The most important reason was that the PCs provided technical training and support to them (43.4%), followed by sharing growing knowledge, experience, and techniques (35.4%). Further reasons included providing input material (seeds, fertilizers, farm material) (25.7%) and buying vegetables and facilitating markets for members (19.5%). Some producers also reported that being a member of the PCs, they could access financial support easily (12.5%) (see detail in Appendix 7.14).

Table 5-20: The respondents planning to be a member of PCs

Response	PC-HVM (n=71)		PC_TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	70	98.6	43	97.7	113	98.3
No	1	1.4	1	2.3	2	1.7
Total	71	100.0	44	100.0	115	100.0

$\chi^2=0.119$, $p=0.730$

5.4. Roles of PCs in supporting smallholder producer groups to access HVMs

This section highlights the products and services that PCs supported their members to produce and sell vegetables to the HVMs. These were ranging from agricultural input support, financial support, extension services, and market support. It also ranked the level of producers' satisfaction on the quality of these services.

5.4.1. Agricultural input support

The results in Table 5.21 shows that the majority of respondents received agricultural input support (86%). Only about 14% of household respondents did not get this support from their PCs. There was a similar percentage amongst producers from PC-HVMs and PC-TMs receiving this kind of support. The chi-square test results ($\chi^2=0.005$, $p=0.946$) illustrates that there was no significant difference between both groups of PCs. The agricultural input support provided by the PCs included fertilizers, dripping tubes, row cover plastics, nets, and seeds. Under support from the government's and NGOs' project, the PCs subsidized these agricultural inputs to vegetable producers. In the case of this study, there was only one PC that ran a fertilizer supply business. Vegetable producers

bought some additional agricultural inputs from input supply shops if subsidized agricultural inputs were not enough for their vegetable production.

Table 5-21: Agricultural input support

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	61	85.9	38	86.4	99	86.1
No	10	14.1	6	13.6	16	13.9
Total	71	100.0	44	100.0	115	100.0

$\chi^2=0.005$, $p=0.946$

Overall, about 80% of members of both groups were satisfied with the quality, price, and services of the agricultural inputs received with a mean score of between 3.8 and 4.2 (Table 5.22). Producers of both PC groups ranked the volume as fourth satisfaction with a percentage of about 70 and a mean score of between 3.6 and 3.7 (Table 5.22).

Table 5-22: The level of satisfaction of respondents with agricultural input support

Description	1	2	3	4	5	Mean Score	STD
PC-HVMs							
Quality	1.6	3.3	6.6	49.2	39.3	4.2	0.839
Price	3.3	4.9	9.8	54.1	27.9	4.0	0.940
Delivery Services	1.6	4.9	11.5	67.2	14.8	3.9	0.777
Supply volume	3.3	9.8	16.4	63.9	6.6	3.6	0.881
Overall	2.5	5.7	11.1	58.6	22.1	3.9	0.881
PC-TMs							
Quality	2.6	5.3	10.5	44.7	36.8	4.1	0.969
Price	5.3	5.3	7.9	50.0	31.6	4.0	1.052
Delivery Services	5.3	7.9	10.5	55.3	21.1	3.8	1.044
Supply volume	7.9	10.5	7.9	52.6	21.1	3.7	1.165
Overall	5.3	7.2	9.2	50.7	27.6	3.9	1.057

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

5.4.2. Financial support

Besides subsidizing the agricultural inputs, all PCs provided loan services to support their members. Members of these PCs received this financial support without putting up collateral and with flexible time. The study indicates that more than 90% of the total sample had financial support for their vegetable production. Only a few producers (about

6%) did not have financial support for their vegetable production (Table 5.23). Producers could borrow money from the PCs to support their farm production. Table 5.23 also shows that there was no statistical evidence that indicated that producers participating in different types of markets was related to their financial support ($\chi^2=0.067$, $p=0.796$).

“Our PC gives loans to farmers, and any incomes from an interest rate is shared with us at the end of the year. Moreover, they bought vegetables from us, so we got a lot of benefits from our PC,” acknowledged by one of PC’s members.

Another source of loan providers in the study areas was traders (middlemen/collectors) through contracts with vegetable producers. Some local traders gave money to producers in order to have priority in buying vegetables from them. There was no formal contract between producers and traders, but producers had to pay back during harvesting.

One producer explained: *“Traders gave me a loan at the start of the vegetable growing season, then they bought vegetables from me when I harvested.”*

Table 5-23: The financial support

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	67	94.4	41	93.2	108	93.9
No	4	5.6	3	6.8	7	6.1
Total	71	100.0	44	100.0	115	100.0

$\chi^2=0.067$, $p=0.796$

The result in Appendix 7.6 indicates that over 77% of selected producers in the study were satisfied with financial support from their PCs (mean score=3.8). The overall level of satisfaction on financial supports was similar between PC-HVM and PC-TM group with more than 75% of sample respondents, at a mean score of 3.8 and 3.7 respectively (Table 5.24). More than 80% of both groups of PCs were satisfied with loan services and duration with a mean score of between 3.7 and 4.1 (Table 5.24). Table 5.24 reveals that between 70% and 76% of respondents indicated their satisfaction with interest rate and loan amount at a mean score from 3.6 to 3.8. The reason may be that the PCs did not use complicated borrowing procedures, such as collateral requirement or any forms of service charges. The interest rate that producers paid to their PC was shared back to them at the

end of the year. This was another reason that the majority of producers were satisfied with financial support from their PCs.

One of the PCs' members said that: *"If I want to borrow money from our PC, I just complete form then I can receive a loan. If I borrow money from banks or microfinance institutes, they require me to put up collateral and charged for some services."*

Table 5-24: The level of satisfaction of respondents with financial support

Description	1	2	3	4	5	Mean Score	STD
<i>PC-HVM</i>							
Loaning service	1.5	3.0	10.4	56.7	28.4	4.1	0.804
Loaning duration	3.0	6.0	10.4	68.7	11.9	3.8	0.839
Interest rate	4.5	7.5	11.9	61.2	14.9	3.8	0.959
Loaning amount	6.0	7.5	10.4	64.2	11.9	3.7	0.988
<i>Overall</i>	3.7	6.0	10.8	62.7	16.8	3.8	0.906
<i>PC-TM</i>							
Loaning service	2.4	4.9	7.3	53.7	31.7	4.1	0.905
Loaning duration	4.9	7.3	12.2	65.9	9.8	3.7	0.934
Loaning amount	4.9	14.6	9.8	56.1	14.6	3.6	1.070
Interest rate	7.3	9.8	14.6	56.1	12.2	3.6	0.934
<i>Overall</i>	4.9	9.1	11.0	57.9	17.1	3.7	1.007

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

5.4.3. Extension services

Overall, the majority of producers had access to extension services (about 94%) from various sources. Only about 6% of them expressed that they did not receive these forms of support. Table 5.25 depicts that there was no statistical significance between the two groups of PCs ($\chi^2=1.125$, $p=0.289$). In this study, all the PCs played critical roles as the facilitators who organised meetings between vegetable producers and the service providers. They also transferred knowledge and techniques gained from extension agencies to producers of their PCs. The extension service agencies in the study areas included government agencies, NGOs, and agricultural input supply companies. Amongst these, the government and NGOs' agencies were the key players providing extension services ranging from vegetable production and quality, business planning, to marketing

aspects. However, agricultural input supply companies provided only extension services in relation to their companies' products, particularly focusing on vegetable production.

Table 5-25: The extension services

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	68	95.8	40	90.9	108	93.9
No	3	4.2	4	9.1	7	6.1
Total	71	100.0	44	100.0	115	100.0

$\chi^2=1.125$, $p=0.289$

Appendix 7.7 indicates that a mean score of the satisfied level from respondents was about 3.7, with over 70% of total respondents. The majority of producers from both groups of PCs (about 90%) were satisfied with production and quality and safety extension services provided via PCs, at a mean score of 4.3 and 4.1 respectively (Table 5.26). Table 5.26 shows the statistical difference of overall satisfaction level between PC-HVM group (80%) and PC-TM group (55%) with mean scores of 3.9 and 3.3 respectively. The primary difference was due to three main extension services, such as production cost, business plan, and product marketing.

With PC-HVM group, about 80% of total respondents expressed their satisfaction with production cost and marketing training provided via their PCs. The mean scores of these services were 3.9 and 3.7 respectively (Table 5.26). However, only between 25% and 47% of respondents of PC-TMs were satisfied with production cost and marketing training provided by their PCs with a mean score of 3.1 and 2.5 respectively. Table 5.26 also shows that about 66% of respondents of PC-HVMs were satisfied with business plan, whereas only 20% of respondents of PC-TMs were satisfied with this extension service. More than 40% of respondents of PC-TMs were not satisfied with production cost, marketing, and business plan. This may be that PC-TMs provided only some extension services and focus mainly on vegetable production. A possible explanation about this could be because these PC-TMs depended on project intervention activities. Thus, kinds of extension services varied in accordance with these projects' plans.

One of the PC's members indicated that: *"I follow my PC's plan, such as choosing types of vegetables for growing and using a crop-rotating plan. Our members do not grow the same vegetables at the same time, so this enabled us to sell vegetables at a better price."*

Table 5-26: The level of satisfaction of respondents with extension services

Types of extension services	1	2	3	4	5	Mean Score	STD
<i>PC-HVM</i>							
Production training	-	-	5.9	48.5	45.6	4.4	0.602
Quality&safety training	-	-	10.3	69.1	20.6	4.1	0.550
Production cost training	4.4	5.9	10.3	55.9	23.5	3.9	0.985
Marketing training	2.9	5.9	16.2	67.6	7.4	3.7	0.811
Business plan training	4.4	14.7	14.7	47.1	19.1	3.6	1.093
<i>Overall</i>	<i>2.4</i>	<i>5.3</i>	<i>11.5</i>	<i>57.6</i>	<i>23.2</i>	<i>3.9</i>	<i>0.876</i>
<i>PC-TM</i>							
Production training	-	-	5.0	67.5	27.5	4.2	0.530
Quality&safety training	-	-	12.5	57.5	30.0	4.2	0.636
Production cost training	17.5	22.5	12.5	30.0	17.5	3.1	1.403
Marketing training	25.0	32.5	17.5	15.0	10.0	2.5	1.301
Business plan training	20.0	37.5	22.5	15.0	5.0	2.5	1.132
<i>Overall</i>	<i>12.5</i>	<i>18.5</i>	<i>14.0</i>	<i>37.0</i>	<i>18.0</i>	<i>3.3</i>	<i>1.299</i>

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

5.4.4. Market support

The overall results show that vegetable producers receiving market support were about 87.8% (Table 5.27). The chi-square results show that there was no statistical significance between the two groups of PCs ($\chi^2=0.930$, $p=0.335$). The common market support provided to producers were price and product information. Besides these, ranges of market support varied from PCs to PCs. Some PCs included market facilitation services, arranging market contracts, and providing better prices. There were different kinds of market support provided to producers, but at least they could receive product and price information. This enables them to make decisions about market choice and increase their bargaining power.

One producer confirmed that: “Now it is easy for me to know about vegetable prices and kinds of vegetables that have high market demand because our PC share this information with us. I do not need to find traders because our PC contact them for me.”

Table 5-27: The market support

Response	PC-HVM (n=71)		PC-TM (n=44)		Total (n=115)	
	Number	Percent	Number	Percent	Number	Percent
Yes	64	90.1	37	84.1	101	87.8
No	7	9.9	7	15.9	14	12.2
Total	71	100.0	44	100.0	115	100.0

$\chi^2=0.930$, $p=0.335$

The overall mean score of market support was 3.3 (Appendix 7.8). Compared to about 32.6% of respondents who were not satisfied with these services, 52.3% of them indicated their satisfaction. Of market support, price information, marketing cost, market facilitation, and product information were the highest satisfied services (above 50% of respondents) with a mean score of over 3.4. However, producers had the least satisfaction (20% - 40% of respondents) with buyers' information, ensuring vegetable demand, and contract information, at a mean score of about 2.5 to 3 (see detail in Appendix 7.8) . This is because the majority of PC-TM members were not satisfied with most of the market support provided by their PCs.

Regarding the level of satisfaction by types of PCs, this study shows that over 60% of members of both PC groups were satisfied with price information and product information provided by their PCs (Table 5.28). However, about 60% of respondents of both PC groups were not satisfied with vegetable demand required by their PCs with a mean score of less than 3. This is because these PCs bought only a small amount of vegetables from their members, while they grew the large volume of vegetables. Table 5.28 indicates that of the eight market support, producers ranked five market support differently, such as marketing cost, market facilitation, vegetable prices, buyer's information, and contract information. More than 70% of members of PC-HMV group were satisfied with these market support provided by their PCs, while between 10% and 20% of members of PC-TM group expressed their satisfaction with these market support (Table 2.28). This study identified that the PC-HVM group appeared to provided wide ranges of market supports to their members although they bought a small volume of vegetables from members. In contrast, members of the PC-TM group received only a price and product information from their PCs.

“PC advised me to grow safe vegetables because it was high market demand, but our PC could not buy all the vegetables from us. I could sell my vegetables to the PC only a small amount, so the rest of the vegetables were sold to traders.” One of PC’s members complained.

Table 5-28: The level of satisfaction of respondents with market support

Types of marketing support	1	2	3	4	5	Mean Score	STD
<i>PC-HVM</i>							
Price information	3.1	9.4	10.9	54.7	21.9	3.8	0.985
Marketing cost	4.7	3.1	14.1	64.1	14.1	3.8	0.894
Market facilitation	4.7	9.4	12.5	43.8	29.7	3.8	1.101
Vegetable prices	4.7	15.6	14.1	40.6	25.0	3.7	1.158
Buyers’ information	6.3	14.1	15.6	46.9	17.2	3.6	1.126
Contract information	7.8	12.5	14.1	48.4	17.2	3.6	1.154
Product information	9.4	12.5	9.4	53.1	15.6	3.5	1.181
Ensure vegetable demand	15.6	42.2	14.1	21.9	6.3	2.6	1.177
<i>Overall</i>	7.0	14.8	13.1	46.7	18.4	3.5	1.155
<i>PC-TM</i>							
Price information	2.7	5.4	18.9	64.9	8.1	3.7	0.812
Product information	8.1	18.9	13.5	35.1	24.3	3.5	1.283
Marketing cost	10.8	37.8	16.2	24.3	10.8	2.9	1.228
Market facilitation	10.8	48.6	18.9	13.5	8.1	2.6	1.117
Buyers’ information	10.8	51.4	18.9	16.2	2.7	2.5	0.989
Ensure vegetable demand	8.1	59.5	21.6	10.8	-	2.4	0.789
Vegetable prices	16.2	51.4	18.9	13.5	-	2.3	0.909
Contract information	16.2	51.4	21.6	10.8	-	2.3	0.871
<i>Overall</i>	10.5	40.5	18.6	23.6	6.8	2.8	1.128

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

5.5. Factors affecting smallholder producer groups’ participation in HVMs

This section summarises key factors that affect smallholder vegetable producers’ participation in the HVMs. The study focused on two main factors including external and internal factors. In terms of external factors, this study particularly examined political factors, economic factors, social factors, technological and environmental factors. The internal factors consisted of producers’ demographics, farm characteristics, marketing aspects, and institutional supports.

5.5.1. External factors

This section describes the external factors, which influence producer groups' decision making to participate in the HVMs. These factors comprise political, economic, social, technological and environmental factors.

Political factors

Overall, the majority of household respondents regarded all political factors as important factors that had an impact on the sale of vegetables to the HVMs with an average mean score from 3.5 to 4.4. Table 5.29 reveals that of the three political factors, about 90% of sample respondents ranked vegetable quality promotion policies as the most important factor with a mean score of 4.4. With support from relevant partners, it enabled vegetable producers to upgrade their vegetable production and quality. This study found that, with vegetable supporting policies from the government and NGOs, smallholder producers could improve production technologies and access to broader market opportunities. A further reason was that the majority of these producers grew safe vegetables, thus the policies on vegetable quality promotion substantially contributed to an increase in market opportunities. This crucial factor could open up the HVM opportunity for smallholder vegetable producers for not only domestic markets but also international markets.

“It is difficult for me and my PCs to grow vegetables that meet supermarkets' need because we have little knowledge and skills. With the government and NGOs' support, I and other producers are able to improve our vegetable quality and sell to these supermarkets.” One vegetable producer addressed.

The majority of producers considered government stability as another most important political factor that affected their participation in HVMs. Most respondents reported that government stability is incredible importance for ensuring stable vegetable markets and the future market growth. Without the stability of the government, macroeconomic environment and development in countries might not be ensured (Chirwa et al., 2005; Thorp et al., 2005). However, more than half of the farmers ranked regulation on safety and quality vegetable production as the least important factor among three political factors, at a mean score of 3.5.

One producer asserted that: *“Having a strong regulation on the vegetable quality contributes to the reduction of imported vegetables, so it enhances domestic vegetable markets and encourages domestic producers as well.”*

Economic factors

Of the six economic factors, increasing vegetable demand and stable vegetable prices were the foremost important factors that affected producers (Table 5.29). Over 96% of the respondents indicated that with an increase interested in safe vegetables amongst consumers, it provided broader market opportunities for them. This was similar to what Coulibaly et al. (2011) found about an association between changing consumers' preference and market growth.

Following this, stable vegetable prices were the second most important factor of the economic factors reported by about 90% of respondents with a mean score of 4.4. Vegetable producers acknowledged that high fluctuation of vegetable price strongly affected not only themselves but also buyers. Therefore, supermarkets preferred using price in an advanced contract to prevent this fluctuation. Similarly, the growth of supermarkets in the country was reported by 73% of the respondents as the most important external factor that impact their vegetable selling to the HVMs. Producers pointed out that an increase in the number of supermarkets will increase vegetable demand.

Social factors

Table 5.29 shows that over 90% of respondents considered health awareness of safe vegetable consumption as the most important social factor that had an effect on their participation in HVMs, with a mean score of 4.5. Producers stated that concern over the impact of low quality vegetables from TMs encouraged consumers in urban areas to choose formal or well-recognized markets. High trust relationship was ranked by more than 80% of members of both PC groups as the second most importance of external factors, with a mean score of 4.1. About 60% of respondents ranked effective communication as the third important factors that had positively impacted selling vegetables to HVMs with a mean score of 3.7.

One producer claimed that: *“As far as I know, people living in the city know widely about the low quality of vegetables bought from traditional markets. For those who can afford safe vegetables, they now prefer buying these vegetables from supermarkets.”*

Technological and environmental factors

With respect to technological factors, farmers ranked cropping technologies as very important factors that influenced them with a mean score of 4.2. The majority of producers in the study areas (86%) indicated that modern agricultural technologies widely contributed to the improvement of their vegetable quality and production. This is very important factor that enabled producers to integrate their product into HVMS. With these technologies, producers could reduce production costs and increase farm profits.

“I think agricultural technologies and equipment now are far better than in the past. With high-quality seeds and planting techniques, I got a high yield with good quality vegetables and saved much time.” One cucumber producer acknowledged.

Likewise, information and communication technology was also reported as an important external factor that contributed to the success of selling vegetables to the HVMS amongst smallholder vegetable producers. This study reveals that about 90% of the selected samples had at least one mobile phone. The majority of them claimed that with these devices, they received information about market prices and types of vegetables that had high market demand.

One vegetable producer explained that: *“It is easy for me and other producers to know about vegetable prices now. Before I sell my vegetables, I just call other producers or my PC’s manager, so I know a market price today.”*

Of the environmental factors, over 80% of farmers accepted that environmental awareness of the impact of agricultural input use was a major factor that affected their vegetable supply to HVMS. Producers reported that the awareness of environmental impact from agricultural inputs was also external factor influencing their vegetable sales. Most of the traditional vegetable farming practices polluted a wide range of the environment such as water, soil, and air. Some producers claimed consumers might buy safe vegetables from HVMS when they understand widely about these impacts.

Table 5-29: The external factors affecting producer groups' participation in HVMs

Types of factors	1	2	3	4	5	Mean Score	STD
<i>Political factors</i>							
Quality vegetable promotion policies	-	-	5.2	47.0	47.8	4.4	0.593
Government stability	-	0.9	36.5	39.1	23.5	3.9	0.786
Regulations on safety and quality vegetable production	-	6.1	49.6	27.8	16.5	3.5	0.840
<i>Economic factors</i>							
Vegetable demand	-	-	3.5	45.2	51.3	4.5	0.567
Stable vegetable prices	-	1.7	8.7	40.0	49.6	4.4	0.719
Market growth	-	0.9	6.1	57.4	15.7	3.9	0.664
Increasing people's income	-	1.7	33.9	45.2	9.1	3.8	0.756
Availability of loan/subsidy	-	5.2	33.0	37.4	24.4	3.8	0.867
Sufficient infrastructure	-	8.7	40.9	36.5	13.9	3.6	0.840
<i>Social factors</i>							
Health awareness of safety of vegetable consumption	-	-	7.8	30.4	61.7	4.5	0.639
High trust relationship	-	-	5.6	55.7	28.7	4.1	0.656
Effective communication	-	5.2	3.0	49.6	12.2	3.7	0.754
<i>Technological and environmental factors</i>							
Cropping technologies	-	-	13.9	48.7	37.4	4.2	0.680
Environmental awareness of GAP practices	-	0.9	16.5	45.2	37.4	4.2	0.736
Information and communication technology	-	2.6	44.4	40.0	13.0	3.6	0.741

1. Not Important, 2. Little Important, 3. Important, 4. Very Important, 5. Extremely Important

5.5.2. Internal factors

The study used the Logistic Regression Model to determine the internal factors that affected the possibility of smallholder vegetable producers' participation in the HVMs. The dependent variables in this study were two types of markets, including high-value markets (PC-HVM=1) and traditional markets (PC-TM=0). The study selected twelve predicted variables to include in this model. These variables consisted of age, education, a vegetable farming experience, a vegetable farm size, a mobile phone asset, a volume of the vegetables, average selling price, market support, agricultural input support, financial support, and extension services. In the Logistic Regression Model, the result of coefficients could not provide full meaning for interpreting. This is because it could explain only the direction of the relationship between dependent variables and predicted

variables. In this case, the results of marginal effects were used to present the correlation of a unit change between predicted variables and the dependent variables.

The results in Table 5.30 reveal that the Wald chi-square value was 42.2 with the p-value of 1%, so there was a highly statistical significance between dependent variables and independent variables. This indicates that the predicted variables had significant effects on smallholder vegetable producers in choosing HVMs or TMs (dependent variables). The value of Pseudo R^2 was 0.49, so it showed that the Logistic Regression Model used in the study was moderately fit with a dataset and could explain the variation of dependent variables at 49%. Hu, Shao, and Palta (2006) assert that if the value of Pseudo R^2 comes closer to value 1, the model is a higher fit with the dataset. However, the assumption of this value varies depending on a formula of calculation (Greene, 2012). In the study, the level of accurate prediction from predicted variables was high with 84%.

Significant variables

Table 5.30 indicates that five variables, such as a vegetable farming experience, a vegetable farm size, a volume of vegetables, and an average selling price showed a statistical significance between 10% and 1%. The logistic regression results from Table 5.30 shows that vegetable farming experience of household respondents had a positive statistical significance at the 10% level. A nature increase in a unit experience of vegetable producers will increase the possibility of their participation in HVMs was about 1.6% ($dy/dx=0.016$). Producers with greater experience in vegetable farming were more likely to choose HVMs than did less experienced producers.

This study also showed that, with extensive vegetable growing experience, smallholder producers could adopt and improve their vegetable production systems. This enabled them to produce vegetables that met the supermarkets' needs. This was consistent with several previous studies (Chagwiza et al., 2016; Corsi, Marchisio, & Orsi, 2017; Fischer & Qaim, 2012; Markelova et al., 2009). These studies indicated that producers with extensive experience acquired skills for improving product quality to meet the markets' requirements. Similarly, Ouma et al. (2010) in Central Africa and Bellemare and Barrett (2006) in Ethiopia argue that experienced producers were more likely to participate in the markets. They could achieve market access by receiving a long-term relationship and improving trust with buyers.

However, the results of this study were inconsistent with the previous study conducted by Sahara et al. (2015). In Indonesia, smallholder chilli growers with extensive farming experience were reluctant to participate in the supermarkets compared to less experienced growers. The possible reason is that they may be not very confident in changing their farming practices to produce a high-quality product to meet supermarket requirements. In contrast, this study showed that experienced vegetable producers were willing to adopt new production practices provided by NGOs and government agencies. This is because they perceived the advantages of new market opportunities, health, and production costs from these new practices. This supports Kebede, Gunjal, and Coffin (1990) and Gregory (1987) who found the contradictory direction of farmers' experience and adopting new technology.

The coefficient and marginal effects' value of vegetable farm size showed a highly statistical significance with a negative sign at 1%. This result may infer that a unit increase in vegetable farm size decreases at about one time of producers' possibility to participate in HVMs via the PCs ($dy/dx = -0.960$). A possible explanation may be that producers with large vegetable farm sizes faced challenges in adopting vegetable quality standards required by supermarkets. Another reason may be these supermarkets bought a relatively small volume from producers and only some kinds of vegetables. Further reason might be that although some farmers had large farm sizes, their vegetable productive might be low because they still depended heavily upon traditional technology. Majority of them grew single type of vegetable seasonally. Vegetable producers with a large farm size appeared not to participate in HVMs through PCs.

The result contradicted by previous studies that found it was a positive relationship with HVM participation such as Ataul and Elias (2015), and Schipmann and Qaim (2010). In Swaziland, Dlamini-Mazibuko et al. (2019) further explain that farmland had a positive influence on the producers' participation in supermarkets. The producers with more farmland had a higher probability of choosing supermarkets and less likely to participate in TMs. This was because they produced consistent vegetable quality and volume for these supermarkets.

Nonetheless, in the case of this study, a possible explanation may be that it focused only on producers who were members of PCs. The majority of these producers participating with PCs were smallholder producers with small farmland, whereas there were very few

large-scale producers. This finding was similar to a previous study of Hun et al. (2018). They explain that the producers with small farmland in Cambodia were more likely to join a membership of the PCs than the large-scale producers did. Another reason may be that supermarkets bought relatively small volume of vegetables with high quality standard requirement. Thus, large-scale producers did not want to sell their vegetables to these supermarkets. This supports the study of Meike and Manfred (2007) in Costa Rica that argue that producers with larger farmland were less likely to participate in coffee cooperative markets compared to small-scale producers. Further study reveals that an increase in vegetable farming areas decreased the probability of selling vegetables through PCs (Divya et al., 2017). They assert that smallholder producers with small vegetable farmland or land constraint tend to sell vegetables through cooperative markets.

The total volume of vegetables had statistical significance on household respondents' decision at 5% based on the result of the coefficient and marginal effects in Table 5.30. The value of marginal effects was 0.059, so it may be assumed that with one unit increase in producers' total vegetable production, the probability of vegetable producers participating in HVMS increases by 5.9 %. This study indicates that the volume of vegetable production had a positively significant influence on the probability of producers' participation in HVMS. The producers, who produced a large volume of vegetables, were more likely to join supermarkets than those who produced a small volume.

This finding is consistent with previous studies conducted in other developing countries. For example, in Tanzania, smallholder cabbage and tomato producers increased their probability of participation in HVMS in accordance with increasing vegetable yields (Omiti et al., 2009). In Zimbabwe, a unit increase in vegetables produced increases the smallholder vegetable producers' possibility to sell vegetables to urban markets (Mukarumbwa et al., 2018). The study revealed that entering supermarkets required producers to supply a consistent vegetable quality and volume for a year-round through a formal contract. There was no volume contract between producers and supermarkets, but producers had to supply agreed kinds of vegetables to these supermarkets constantly. This finding concurred with the previous studies, which identified that HVMS required producers to supply consistent product quality and quantity to them (Chagomoka, Afari-Sefa, & Pitoro, 2014; Moustier et al., 2010; Slamet et al., 2017; Trebbin, 2014).

With respect to an average selling price, it indicates that smallholder vegetable producers were more likely to participate in HVMs if they could get a higher price from these markets. The statistical value in Table 5.30 shows a positive relationship between these two variables. The probability of producers' participation in HVMs increases by more than one time if their vegetable prices increase one unit (marginal effects=1.015). That is, the price of vegetables may be the most important factor that highly motivates producers to participate in the HVMs.

The results were consistent with numerous studies conducted in developing countries such as Mukarumbwa et al. (2018) and Martey et al. (2012). The study indicated that the majority of producers preferred selling their vegetables to supermarkets, as these supermarkets bought vegetables at a higher price than traders. This study supports Martey et al. (2012) who argue that output price was the significant determinant affecting smallholder producers in their choice of markets. It was an important incentive for producers to produce and determine which types of markets in which they should participate. Smallholder vegetable producers were more likely to participate in urban markets than local markets because they received a high price, even though they faced some challenges such as transportation (Mukarumbwa et al., 2018). Likewise, Zivenge and Karavina (2012), Alene et al. (2008), Balint and Wobst (2006) give a further explanation that the key determinant of producers' decisions about market choices was product price. Their studies showed that smallholder producers participate in a particular market if they received a higher price from this market.

Insignificant variables

Of twelve predicted variables, seven other variables were not statistically significant at 10%. The results could not assume that these factors were not important for smallholder vegetable producers. However, the possible reason is that producers from both groups of PCs may give similar value to these factors. The insignificant variables were categorized into two groups, such as no statistical significance with a positive sign and statistical significance with a negative sign. The results show that age, education, market support, and extension services positively affect the probability of participating in HVMs, but they were not statistically significant ($p\text{-value} > 10\%$). Nonetheless, mobile phone asset, agricultural input support, and financial support had negatively affected smallholder

vegetable producers' participation in HVMs with no statistical significance (p -value>10%).

The result showed that age and education of vegetable producers were the insignificant effects on producers' HVM participation. That is, these two predicted variables were not the important factors that influence smallholder vegetable producers to participate in HVMs. The results concurred with previous studies conducted by Matsane and Oyekale (2014) and Ataul and Elias (2015). These studies revealed that age and education of producers did not influence their ability to adopt new techniques and access market information as they learned and observed from other producers in communities. Thus, they were not the main factors that influenced producers to make a decision in choosing marketing choices. This study also acknowledged that producers from both groups of PCs were of very similar age and educational level. This implies that the probability of participation in HVMs may be affected by other factors.

In contrast, Hernández et al. (2007) argued that the age of producers had a significant influence on their decision-making to select market choices. In Guatemala, young tomato producers were more likely to participate in supermarkets than older producers by adopting modern techniques (Hernández et al., 2007). Similarly, the educational level of producers significantly affected their choices of market participation (Kyaw et al., 2018; Ouma et al., 2010; Sahara et al., 2015; Slamet et al., 2017). This supports the argument of Rao et al. (2012) who claims that well-educated Kenyan producers were more likely to join supermarkets because they could adjust to new market requirements and production practices.

Accessing market support had a non-significant effect on smallholder vegetable producers participating in the HVMs. Thus, it was not the key factor to determine the producers' probability to join the HVMs. A possible explanation may be that producers selected for this study were members of PCs. This enabled them to access market support such as vegetable prices and quality requirement via their PCs. This result was consistent with numerous studies in developing countries by Matsane and Oyekale (2014) and Aku et al. (2018). These studies suggested that accessing market information tended to have no significant influence on smallholder vegetable producers' decision-making to join particular markets.

In contrast, various studies about factors influencing smallholder vegetable producers' market participation revealed that market supports such as market information had a significant effect on producers' decision to join a particular type of market. In Kenya, Omiti et al. (2009) identified accessing market information as an important determinant affecting vegetable producers to choose market choices. This finding was also contrary to the previous studies by Nandi et al. (2017) in India and Mukarumbwa et al. (2018) in Zimbabwe. They reported that access to marketing information enabled smallholder farmers to know a price, quality, demand, and specific market standards.

The logistic regression results in Table 5.30 indicate that all the institutional factors had no significant influence on producers' decision-making to participate in the HVMs. The findings were in line with results from previous studies which showed that access to financial support had a non-significant influence on producers' participation in a particular type of market (Ataul & Elias, 2015; Matsane & Oyekale, 2014). On the contrary, Alene et al. (2008) and Rao and Qaim (2011) argue that access to financial support had a significant effect on producers' market choices. These studies suggested that access to financial support was an important factor that influences smallholder producers to participate in the supermarkets.

Similarly, access to extension services did not affect smallholder vegetable producers' decisions to participate in markets. The results concurred with several studies conducted by Mukwevho and Anim (2014), Zivenge and Karavina (2012), and Macharia et al. (2018). These studies indicated that access to extension services for smallholder producers did not significantly affect their market choices. Nonetheless, some previous studies suggested that access to extension services had a significant influence on smallholder producers' supermarket participation (Byron et al., 2014; Dlamini-Mazibuko et al., 2019; Ismail et al., 2013). A plausible explanation about this could be that all selected respondents in this study were members of PCs. Therefore, they could access a loan from their PCs for vegetable production because all selected PCs provided loan support for their members. With POs, smallholder producers in developing countries have to overcome various challenges such as capital constraint and production technologies (Bernard & Spielman, 2009; Fischer & Qaim, 2014; Shiferaw et al., 2011; Vorley et al., 2009).

Table 5-30: Binary logistic and marginal effects results

Variables	Binary Logistic			Marginal Effects		
	Coef.	Std. Err	p-value	dy/dx	Std. Err	p-value
1. Farmers' demographics						
Age	0.013	0.033	0.701	0.003	0.007	0.700
Education	0.129	0.113	0.256	0.027	0.024	0.248
Vegetable farm exper.*	0.074	0.044	0.093	0.016	0.009	0.086
2. Farm characteristics						
Vegetable farm size***	-4.535	1.387	0.001	-0.960	0.332	0.004
Volume of vegetables**	0.279	0.119	0.019	0.059	0.025	0.017
Mobile phone	-0.246	1.055	0.815	-0.052	0.224	0.816
3. Marketing aspects						
Average selling price*	4.798	2.771	0.083	1.015	0.581	0.080
Market support	0.973	1.191	0.414	0.206	0.254	0.417
4. Institutional factors						
Agricultural input support	-0.507	0.901	0.573	-0.107	0.191	0.573
Financial support	-1.440	1.478	0.330	-0.305	0.311	0.327
Extension services	0.534	1.375	0.698	0.113	0.290	0.697
Constant	-2.162	3.277	0.509			

Note: *, **, and *** referred to 10%, 5%, and 1% statistical significance level

Wald Chi-square= 42.2, p-value= 0.000, Pseudo R2= 0.49, Correct prediction=84%

5.6. Summary

This chapter describes all information related to the research objectives of the study. The five selected producer cooperatives (PCs) were established between June 2011 and January 2018 with supports from NGOs and the government's projects. They bought vegetables from their members and sold to four main markets such as middlemen, HVMS, retailers, and end consumers. The challenges of PCs include consistent volume and quality supply, post-harvest management, capital, and HVMs' demand. PCs' future strategies included expanding markets, increasing vegetable volume and quality, increasing membership, and creating value added.

The vegetable value chains in Cambodia consisted of two main market value chains, such as TMs and HVMS. The value chains of TMs were long and complicated with a number of chain actors such as input suppliers, producers, PCs, traders, middlemen, local retailers, and consumers. However, with the HVMS, the value chains of the vegetables were short and high integration of the intermediaries, such as input suppliers, producers, PCs, supermarkets, and end consumers. In terms of the roles of PCs in supporting smallholder

producers to access HVMs, over 80% of producers received agricultural input support, financial support, extension services, and market support from their PCs. Overall, household respondents expressed similar satisfaction with agricultural input support and financial support of PCs. However, producers from PC-HVM and PC-TM group showed different satisfaction with some services of extension services and market support.

The study examined factors that influenced smallholder producer groups' participation in HVMs by classifying into internal factors and external factors. Concerning external factors, results reveal that majority of respondents considered external factors, such as political, economic, social, environmental, and technological factors, as important factors affecting their participation in HVMs. In terms of the internal factors, a vegetable farming experience, total volume of vegetables, and average vegetable prices had a statistical significance with a positive sign. However, a vegetable farm size showed a negative sign. Nonetheless, the other seven variables such as age, education, mobile phone, market support, agricultural input support, financial support, and extension services had no statistical significance.

Chapter 6 : Discussion

This chapter provides discussions about the research findings in relation to linking smallholder vegetable producer groups to HVMs through PCs with previous studies. It was divided into four main sections beginning with section one about the vegetable value chains in Cambodia. Section two discusses the roles of PCs in supporting producers to access HVMs. Internal and external factors that affect smallholder producers' participation in HVMs was discussed in section three. The last section summaries the discussion.

6.1. Mapping vegetable value chains in Cambodia

In the case of this study, mapping value chains focused mainly on the flow of vegetables from producers, as members of PCs, to end consumers. The research also highlighted that the vegetable value chain of HVMs were short and high integration from producers to end consumers. The volume of vegetables passed through the value chain of the HVMs was relatively small (about 20%), but it provided a better price (the average price of around 0.42 USD/kg). Vegetables were passed through three main actors, including producers, PCs, and supermarkets. The PCs were the vegetable collectors/middlemen who bought vegetables from their members to supply to supermarkets in the city.

This finding was consistent with the previous studies about value chain structures of the HVMs in Kenya and Latin America. In Kenya, Neven and Reardon (2004) identify that the value chain of HVMs was a high amalgamation and direct contact with producers or intermediary traders. This value chain minimises the number of intermediaries to ensure effective product flow. Thomas and Berdegúe (2002) argue that the value chain of HVMs (supermarket) was short in Latin America. Nevertheless, they consumed the small volume and focused mainly on product quality and procurement. Similarly, Trienekens (2011) adds that the value chain of HVMs was focused primarily on intermediary actors and consolidation of chain actors in order to minimise the transactional costs.

This finding was also similar to previous studies in other developing countries such as Lee et al. (2012), Aparna and C.V.Hanumanthariah (2012), Ismail et al. (2013), and Mwambi et al. (2013). They indicate that HVMs preferred working with POs via contract to ensure sustainable and consistent volume and quality supply. In Cambodia, P. Chea

(2014) pointed out vegetables supplied to HVMs were directly from Svay Rieng Agro-products Cooperative to supermarkets and modern retail stores. This PC plays the roles of collectors/middlemen in buying vegetables from its members and packaging these vegetables to supply to restaurants, casinos, and its own shops in the city. Another study about vegetable value chains in India also revealed that modern market value chains of vegetables were short and highly integrated (Reddy, Murthy, & Meena, 2010). The vegetables were passed through only four main actors, such as farmers, collectors, packaging house, and retailers.

Nevertheless, the vegetable value chain of the TMs was a bit long and complicated with a large number of actors, but it consumed the large volume of vegetables (over 80% of their total vegetables). The prices of vegetables received from the value chain of the TMs were lower than HVMs (about 0.34 USD/kg). The main actors in this channel consisted of producers, traders, middlemen, local retailers, and end consumers. The results were very similar to previous research about vegetable value chains of TMs in India, Malawi, and Mozambique. In the case of Indian traditional vegetable value chains, Reddy et al. (2010) assert that it was done through many markets and scattered over various actors. It took a longer time before reaching the consumers' hands, but less restricted on vegetable grades and standard procurement. Likewise, Takemore, Victor, and Raul (2014) in Malawi and Mozambique discussed that with traditional value chains, vegetables were distributed vertically and complexly through many actors before reaching consumers. The profits' distribution of this type of value chain led to an increase in consumer prices in final markets. Compared to the value chains of HVMs, the traditional markets consist of a large number of chain actors and is more complicated (Ruben et al., 2007; Trienekens, 2011).

However, the results of this study showed some differences from previous studies. Vegetable producers in Cambodia only sold their vegetables directly to traders and their PCs. Traders in Cambodia played mixed roles such as collectors, intermediaries, or retailers. Nuppun (2016), Chhean et al. (2004), and EMC (2014) indicates that the majority of producers sold their vegetables to more than two chain actors. These studies identified that vegetable producers sold most of the vegetables to collectors and middlemen, while some vegetables were sold to local retailers and consumers.

Similarly, various studies about TM value chains of fresh vegetables in developing countries such as Thailand, Vietnam, and Lao revealed similar results. In Thailand, Srimanee and Routray (2012) show producers generally sold their vegetables to collectors (30%), wholesalers (25%), PCs/groups (20), retailers (10%) and export agents (10%). Jean-Joseph et al. (2006) in Vietnam, and Christian et al. (2006) in Lao identified the similar value chains' pattern of traditional vegetable markets. Vegetable producers in these countries sold the majority of their vegetables to collectors (over 60%), to wholesalers (about 30%) and to wet market vendors and consumers (about 10%). Based on these studies, vegetable producers sold to at least four chain actors.

There were three possible reasons that the results of this study show some differences from previous studies. Regarding types of vegetable producers, this study focused only on producers who are members of PCs. However, previous studies involved general vegetable producers. Nico et al. (2012) identified that producers, members of Svay Rieng Agro-Products Cooperative, sold their vegetables to only two main marketing channels, such as village collectors and their own cooperative. Another reason might be due to the types of vegetables selected in the studies. This research selected only three kinds of fruit-bearing vegetables such as cucumber, wax gourd, and long yard bean. Nonetheless, the previous studies selected general vegetables such as leaf-vegetables, fruit-bearing vegetables, and root-vegetables. Some studies about value chains of fruit-bearing vegetables showed that the majority of producers (over 95%) sold their vegetables to only one or two main actors such as collectors or middlemen (Chhean et al., 2004; Narith, 2018).

A further reason might be the quality of vegetables. Producers selected for this study mostly grew high-quality vegetables to be sold at HVMs. Thus, the price and quality of these vegetables were better than vegetables from selling to TMs. This result was similar to what Montague and Pawat (2011) identified in organic vegetable value chains in the East West Economic Corridor of Thailand and Lao. They showed that the value chains of organic vegetables in EWEC countries consisted of two main channels, including PCs and consolidators (collectors). The location of studies might be another reason that led to producing different results. For instance, Nuppun (2016) selected four provinces in the coastal region, upland region, lowland region, and Tonle Sap region. However, this study selected three provinces around the Great Lake Tonle Sap region. Furthermore, the results

of this study were in line with Olaf, Cheryl, and Sanphirom (2015), who analyzed value chains of the same vegetables in the same region. They found that producers sold almost all these vegetables directly to local collectors and a very small volume to retailers. Based on the above discussion, the study suggests that vegetable value chains in the studied areas were similar to previous studies in other developing countries.

6.2. Roles of PCs in supporting smallholder producer groups to access HVMs

6.2.1. Agricultural input and financial support

This study identified that all five selected PCs in the studied region provided critical product and service support, such as agricultural input support, financial support, extension services, and market support to their members. These findings were consistent with previous studies of Poulton et al. (2006) in Sub-Saharan Africa, Shiferaw et al. (2011) in Africa, and Kaganzi et al. (2009) in Uganda. In sub-Saharan Africa, the POs assisted smallholder farmers in getting market access through delivery agricultural services, providing fund support, and strengthening agricultural market development. In Africa, POs play crucial roles in facilitating economic coordination (financial support and input suppliers) and providing services (extension and marketing services). However, what was interesting in this study was that these PCs were established by and had a strong association with external supporters, such as government projects and NGOs' projects. The POs that had a great collaboration with other organizations were more likely to provide better agricultural support services to their members (Ragasa & Golan, 2014). Similarly, Karami and Rezaei-Moghaddam (2005) and Bernard et al. (2008) acknowledge that the likelihood of providing agricultural inputs and extension services increased if the relationship with external organizations increased.

In contrast, the result of this study indicates that none of the selected PCs ran farm input supply businesses to support their members. Producers received many forms of agricultural input support from their PCs under projects supported by the government and NGOs. This finding seems to be contradictory to results from previous studies by Bijman (2007), Orsi et al. (2017), and Trebbin (2014). All these studies indicated that POs facilitated agricultural input access between input suppliers and smallholder producers. They were intermediaries that help and facilitate smallholder producers to purchase agricultural inputs at a lower price than the market prices. One of the possible

explanations may be because of limited business skills of managers and a high dependency on subsidies from projects. According to Moustier et al. (2010) and Reardon and Berdegue (2002), some POs could not scale-up their business operation due to high dependency on development projects. This may be risky for maintaining the sustainable development of the PCs in the future (Ragasa & Golan, 2014).

6.2.2. Extension services

All the selected PCs provided the same extension services for their members, but this study identified some specific differences between PC-HVMs and PC-TMs in terms of extension services and marketing services. Compared to PC-HVMs producers, the majority of PC-TM producers were not satisfied with a business and marketing extension provided by their PCs. The majority of extension services provided by the PC-TMs may focus mainly on vegetable production. In contrast, PC-HVMs did provide a wide range of extension services that also include agricultural entrepreneurship and market skills. This finding supports previous studies of Corsi et al. (2017) in Chad and Trebbin and Hassler (2012) in India. They explain that most of the producers from traditional POs were satisfied with production support from their POs. However, they were dissatisfied with commercial service support because their POs placed a high emphasis on production improvement rather than market-oriented purposes.

Another possible explanation could be that these PC-TMs were in the start-up phase of the vegetable business and depended highly on external supporters. This study identified that one of the selected PC-TMs was established for a year. Another two PC-TMs were established for more than two years at the time of data collection, but they seemed to be slow in developing their vegetable business. This supports Chad's case of Orsi et al. (2017), who argue that young POs were likely to place greater emphasis on production improvement than on sales opportunities at the start-up phase. Another possible reason might be in relation to the ability of the PCs' leaders in business skills. The success of PCs in linking producers to markets needed leaders, who had strong capacity and the skill in businesses (Banaszak, 2008; Shiferaw, Obare, & Muricho, 2008). Therefore, to integrate smallholder producers into modern agri-food value chains, PCs should build a business culture for managers and producers (Vorley et al., 2009). They should shift their

focus from production-oriented purpose to broad and more market-oriented emphasis (Barham & Chitemi, 2009).

6.2.3. Market support

The results of this study highlight that producers of PC-TMs were satisfied with only two market supports related to price and product information. However, producers of PC-HVMs were satisfied with almost all marketing services, except for sustainable vegetable demand. The finding was in line with numerous empirical studies (Markelova et al., 2009; Narrod et al., 2009; Valentinov, 2007). These studies indicated that POs enabled smallholder producers to improve market access by reducing transactional costs (marketing costs) and increasing bargaining power. Furthermore, the critical roles of POs in supporting smallholder producers to open market access opportunities were facilitation and motivation by a relational linkage between producers and potential buyers (Orsi et al., 2017). They were intermediaries building networks (Yang, Klerkx, & Leeuwis, 2014) and organising vertical contract (Hellin et al., 2009; Martinez, 2002) between producers and markets. This result also concurred with the previous study that revealed the relationship between HVM participation and other actors' information provided by PCs (Corsi et al., 2017).

In contrast, the results of this study reveal that the majority of respondents from PC-HVMs and PC-TMs were not satisfied with unstable vegetable demand from their PCs. These PCs did not guarantee regular vegetable purchases from their members, so most producers appeared to be dissatisfied with their PCs. This finding was contradictory to various studies that asserted that POs could ensure a sustainable market supply (Bernard et al., 2008; Markelova & Mwangi, 2010; Narrod et al., 2009). Through vertical coordination, the POs could guarantee sustainable markets for smallholder producers and integrate them into new marketing channels (Key & Runsten, 1999; Miyata et al., 2009).

The reason behind this was that these PCs did not have a volume contract with buyers, both supermarkets and traditional markets. Unstable vegetable market demand may be a key concern for buyers to make a volume contract with the PCs. Another possible explanation may be that vegetable markets in the country were strongly depended on imported products that were generally lower priced than domestic vegetables. However, this study identified that domestic vegetables appeared to have higher market demand and

opportunities than imported vegetables since consumers had high trust in their quality. This study also shows that PC-HVMs bought a small volume of vegetables from producers and not regularly. This was due to low market demand and a small number of HVMs, such as supermarkets in the country, as well as in the studied region. The result was consistent with the previous study of Trebbin (2014) which indicated that producer companies in India faced challenges with their members due to low demand from modern retailers in the studied areas. Another possible reason may be that these PCs had capital constraints and a limited marketing network. Thus, they could not collect all vegetables produced by their members to supply to both TMs and HVMs.

6.3. Factors affecting smallholder producer groups' participation in HVMs

Numerous studies analysed factors influencing producers, particularly smallholder producers, to choose particular marketing channels (Aku et al., 2018; Ataul & Elias, 2015; Macharia et al., 2018; Zivenge & Karavina, 2012). These empirical studies discussed mainly internal factors such as farmers' demographics, farm characteristics, marketing factors, and institutional factors. However, besides internal factors, this study also discussed the external factors that affected smallholder vegetable producers' participation in HVMs. They ranged from political, economic, social, technological, and environmental factors.

6.3.1. External factors

This study selected the top three factors from each external factors that affected smallholder vegetable producers' participation in the HVMs. These top three factors were ranked based on the mean score of a Five-Point-Likert-scale.

With the political factors, this study suggests that a quality vegetable promotion policies government stability, and regulation on safe vegetables were the key factors, which enables producers to sell vegetables to the HVMs. A possible reason may be that selected respondents were smallholder producers with small farmland and limited capital and knowledge. Under policy support from these agencies, they could upgrade vegetable quality, access financial support, and integrate their products into supermarkets. In addition, through a government policy for promoting chemical-free vegetables, it provided a wide range of opportunities for producers who grew safe vegetables to supply

supermarkets. This finding was in line with numerous studies that identified the important roles of government policies and outsiders in engaging smallholder producers in market access (Hazell et al., 2007; Kaganzi et al., 2009; Markelova et al., 2009). It also supports the findings of Hazell et al. (2007) that the favorable government policies for smallholder producers enabled them to compete with and integrate into agri-food markets. Similarly, outsiders such as the government, NGOs, and private sectors played crucial roles in facilitating members of POs to gain access to the profitable markets (Kaganzi et al., 2009; Markelova et al., 2009).

Regarding economic factors, growing vegetable demand, stable prices, and increasing people's income were ranked as the most important economic factors that significantly affected producers in supplying vegetables to supermarkets in this study. Producers of the selected PCs received support from the government and NGO projects for producing safe vegetables. Therefore, increasing these kinds of vegetable demands enabled them to open up broader market opportunities by increasing production and supply to markets. These factors were the incentive factors for smallholder vegetable producers in the selected region to upgrade vegetable production and quality as well as to generate more household income.

This result concurred with a previous study of Reardon et al. (2009) in Kenya, Pingali et al. (2007), and Mergenthaler et al. (2009) in Vietnam. These studies confirmed that an increase in demand for high quality food required supermarket supply chains to adopt vertical coordination with POs. This provided good opportunities for smallholder producers to integrate their products in these supermarkets. In Kenya, Neven et al. (2009) acknowledged that, through receiving good vegetable prices, producers participating in supermarkets could gain high-income opportunities. In contrast, Okello and Swinton (2007) in Kenya and Balsevich, Berdegué, Flores, Mainville, and Reardon (2003) in Latin America argued that this increasing trend could negatively impact smallholder producers with poor resources. They often faced challenges such as high transactional costs, technical constraints, and limited capital to produce agricultural products that met these supermarket requirements. In the present study, this concern may be solved because these producers were members of PCs, so they may overcome production and marketing challenges through strong support from their PCs.

In terms of social factors, the research findings indicate that the internal factors that impacted farmers selling vegetables to HVMs, including health awareness of safe vegetable consumption, high trust relationship, and effective communication. A growing concern of food consumption affected the agri-food system in Cambodia because consumers preferred the consistent and high vegetable quality, particularly in supermarkets. Thus, producers had to follow quality standards, including physical quality and residue standards that were required by these supermarkets. This standard requirement put producers under a significant constraint in selling their vegetables to these markets. This finding was consistent with various studies about smallholder producers participating in HVMs (Berdegué et al., 2005; Markelova et al., 2009; Moustier et al., 2010; Trebbin, 2014; Vorley et al., 2007). In order to supply their vegetables to modern markets, producers had to ensure regular supply and consistent quality standards (Markelova et al., 2009; Vorley et al., 2007). Berdegué et al. (2005) and Blandon et al. (2009) give a further explanation that these supermarkets required producers to supply vegetables with exact standards in relation to both physical and residue level.

A high trust relationship between producers and HVMs was another important factor that encouraged smallholder producers to sell their vegetables to HVMs. The majority of producers (about 85%) had a higher degree of trust and satisfaction with supermarkets than did intermediaries or traditional markets. One of the main possible explanations may be that these supermarkets have a formal contract with vegetable producers, but traditional markets did not. In the studied region, PCs played significant roles in facilitating a contract between producers and supermarkets. Both parties made this formal contract under coordination by the government and NGOs agencies, so producers had high trust in these supermarkets. Unlike supermarkets, intermediaries in the traditional markets often changed demand volume and prices of vegetables depending on their daily market demand and prices. This finding was consistent with a previous study of Blandon et al. (2009) who point out that vegetable producers participating in supermarkets had greater trust in their buyers than those who joined TMs. Trust was an important factor and a positive relationship with the possibility of farmers' participation in supermarket supply chains (Blandon et al., 2009). It had a positive significant effect on producers' decision-making to sell their products to supermarket supply chains, but it needed time to build it (William & Robert, 2002).

With respect to technological and environmental factors, the study identified that production and information and communication technologies affected smallholder vegetable producers' participation in HVMs. These technological factors had a significant impact on the opportunities of smallholder producers to integrate their products into new markets (Poulton et al., 2010; Shiferaw et al., 2011). The results of this study indicate that smallholder producers perceived these technological factors as very important, positively affecting their vegetable supply to HVMs. Farmers of PC-HVMs used some modern technologies, ranging from land preparation, irrigation system, greenhouse, to fertilizer and pesticide measurement. Nonetheless, farmers of PC-TMs still used traditional methods and limited integration with modern technologies. These findings corresponded with several previous studies on factors affecting smallholder producers' market access (Devaux et al., 2009; Kaganzi et al., 2009; Narrod et al., 2009; Shiferaw et al., 2011).

A possible explanation was that with modern production technologies, it enabled smallholder vegetable producers to maximise vegetable quality and volume. Thus, they could get a high probability of accessing supermarket value chains and income. According to Coulter (2007), new production systems and technologies brought about vital changes in production quality and quantity. It reduced production cost and enabled producers to improve product quality that met HVMs' requirements (Kaganzi et al., 2009). Similarly, although selected respondents were members of PCs, information and communication technology was necessary for them. With this technology, smallholder producers could gain access to market information such as price and product information (Aku et al., 2018; Macharia et al., 2018; Shiferaw et al., 2011). It assists them in building a tight network with their cooperatives and other chain actors and opening up great market opportunities (Bernard & Spielman, 2009; Hellin et al., 2009; Meike & Manfred, 2007).

Vegetable producers selected in this study were safe vegetable producers belonging to the PCs and aiming to supply to supermarkets. Thus, the result of this study was not surprising that environmental awareness of good agricultural practices positively affected their vegetable supply to HVMs. This study suggests that rising concern about the negative impact of traditional agricultural practices in the country could have a positive effect on their vegetable supply to HVMs. This finding was consistent with previous studies (Coulibaly et al., 2011; Philip et al., 1999; Pinthukas, 2015; Thapa & Rattanasuteerakul,

2011). These studies reported that an increasing environmental concern amongst consumers in their countries was substantial market opportunities for producers and processors.

This phenomenon exists in the Cambodian context these days due to overuse of synthetic pesticides and fertilizers for vegetable production. The majority of consumers broadly perceived the negative effect of traditional agricultural practices on their health and environment. Therefore, they preferred safe vegetables, even though it was a higher price than conventional vegetables. This study supports what had been identified by Coulibaly et al. (2011) who claim that because of environmental and health awareness, consumers preferred purchasing vegetables from formal markets rather than TMs. Furthermore, they were willing to pay higher prices for vegetables grown in safety methods (Coulibaly et al., 2011; Philip et al., 1999; Pinthukas, 2015; Thapa & Rattanasuteerakul, 2011).

6.3.2. Internal factors

Of the three predicted variables in farmers' demographics, the logistic regression results indicate that vegetable farm experience of producers had a significant influence on their decision to participate in HVMs with a positive sign. Macharia et al. (2018) and Vakis et al. (2003) argue that producers with extensive experience could adopt and improve their vegetable production and build networking with traders. This is an important factor for improving product quality to meet the markets' requirements. This study shows that experienced vegetable producers were willing to adopt new production practices provided by NGOs and government agencies. However, Sahara et al. (2015) argue that extensive experienced producers were reluctant to participate in the supermarkets.

Age and education of vegetable producers had no significant effects on producers' participation in HVMs. The reason may be that producers from both groups of PCs were of very similar age and educational level. The previous studies show that age and education of producers did not influence their decision making to participate in HVMs (Bandon et al., 2009; Macharia et al., 2018; Ziveng & Karavina, 2012). However, Bellemare and Barrett (2006) and Rao et al. (2012) argued that the age and education of producers significantly affect their market choices.

Regarding farms' characteristics, this study indicates that vegetable farm size had a negatively significant influence on HVM participation of smallholder producers. Vegetable producers with a large farm size appeared not to participate in HVMs through PCs. The result is inconsistent with previous studies of Zivenge and Karavina (2012) and Matsane and Oyekale (2014). The producers with more farmland were more likely to participate in supermarkets since they have the capacity to grow vegetables to supply these markets all year-round. However, producers with larger farmland were less likely to participate in coffee cooperative markets compared to large-scale producers in Costa Rica (Meike & Manfred, 2007).

The volume of vegetables significantly affected producers' participation in HVM with positive sign. This finding is consistent with previous studies conducted in other developing countries, such as Omiti et al. (2009) and Mukarumbwa et al. (2018). The producers, who produced a large volume of vegetables were more likely to join supermarkets because they could ensure a consistent vegetable quality and volume for these supermarkets.

Ownership of mobile phones indicated a non-significant effect on the choice of HVM participation. This finding was inconsistent with the empirical results from various studies by Zivenge and Karavina (2012), Martey et al. (2012), and Dlamini-Mazibuko et al. (2019). These studies acknowledged that mobile phone ownership was one of the most important factors that significantly influenced their participation in markets. Through a mobile phone, producers could communicate with buyers and agricultural input suppliers and access market information (Dlamini-Mazibuko et al., 2019).

The prices of vegetables had a significant influence on producers' decision-making in participating in HVMs with a positive sign. It shows that the motivation to participate in HVMs was triggered by an increase in prices of vegetables provided by supermarkets. The results were consistent with studies of Zivenge and Karavina (2012) and Blandon et al. (2009) conducted in developing countries. The study indicated that prices of produces are the key determinants, which encourage producers to sell their producer to supermarkets.

Accessing market support had no significant effect on smallholder vegetable producers participating in the HVM. This may be because selected producers were members of PCs, so they could access market support via their PCs. This result concurred with study of Macharia et al. (2018), which indicate no relationship between producers' market participation and market support. In contrast, some studies show a significant effect of market support on producers' participation in markets (Nandi et al., 2017; Omiti et al., 2009).

There was no significant influence of all institutional support on producers' participation in the HVM. The findings were consistent with results from previous studies (Dlamini-Mazibuko et al., 2019; Macharia et al., 2018). On the contrary, Taye et al. (2018) argue that producers' market choices were associated with financial support. This study found that producers' participation in HVMs was not significantly affected by accessing to extension services. The result is in line with study of Mukwevho and Anim (2014), which show that access to extension services did not significantly affect their market choices.

6.4. Summary

This chapter provides a critical discussion about key research findings by comparing and contrasting with the previous literature review. The results of this study show that HVM value chains of vegetables in the studied areas were very amalgamating and direct from growers to end consumers. However, with TM value chains, this study highlights that producers sold their vegetables to only traders and PCs, which was inconsistent with some previous studies.

Regarding the roles of PCs, the study indicates that all the selected PCs provided four important services, such as agricultural input support, financial support, extension services, and market support. Nonetheless, this study highlights that both groups of PCs provided a different quality of services in relation to extension and market support. PC-HVMs appeared to focus mainly on both production and market-oriented services, and this was contradictory to PC-TMs that focused mainly only on the production.

In terms of external factors, the study showed producers perceived that political, economic, social, technological, and environmental factors affected smallholder producers' participation in HVMs. These finding concurred with previous studies in

developing countries. Some internal factors significantly influenced the probability of smallholder vegetable producers' participation in the HMV. These include producer experience, vegetable farm size, total vegetable produce, and average prices of vegetables.

Chapter 7 : Conclusion and Recommendation

This chapter summarises the results from the study and provides recommendation in relation to the research question and objectives. It is divided into five sections including (1) summary of the research objectives and methods, (2) summary of key results, (3) implication of research and recommendations, (4) limitations of research, and (5) future research.

7.1. Summary of key results

The descriptive results show that females played dominant roles in vegetable farming of the PC-HVM group, while males had active roles in the PC-TM group. The majority of producers of both groups were in middle age between 41-60 and belonged to extended households (five people). They had a low educational level (primary school) but had extensive experience in vegetable farming (around ten years). With respect to vegetable land ownership, the selected producers in this study had small vegetable farmlands with less than one hectare. More than 70% of them had only a single job in agriculture, while others had one or two secondary occupations. Motorbikes and bicycles were the popular transportation assets for them, whereas common communication ownership was TV and mobile phones. PCs influenced almost all household producers in choosing types of vegetables for growing. Interestingly, almost all respondents intended to continue to grow vegetables and stay with their producer cooperatives for the next five to ten years. This implies that these producer cooperatives may run for a longtime with sustainable development.

With regard to mapping vegetable value chains in Cambodia, the study identified that there were two types of vegetable value chains in the country; vegetable value chains of TMs and of HVMs. Over 80% of their total vegetables were passed through TMs value chain, while only about 20% was passed through HVM value chain. The research also highlighted that the HVM were short and high integration from producers to end consumers. Nevertheless, the TMs was a bit long and complicated with a large number of actors.

In terms of the roles of PCs, the study revealed that the selected PCs provided four important services such as agricultural input support, financial support, extension services, and market support. This finding was mostly consistent with the previous studies. Interestingly, the research highlighted some important differences between PC-HVMs and PC-TMs in relation to extension and market support. In this study, PC-TMs appeared to place more emphasis on vegetable production than business aspects, while PC-HVMs gave equal priority to both vegetable production and vegetable business. PC-TM producers were satisfied with price and product information. In contrast, PC-HVM producers expressed their satisfaction with price information, marketing cost, market facilitation, vegetable prices, buyers' information, contract information, and product information.

The research investigated the factors influencing smallholder producer groups' participation in HVMs. From the external factors' side, this study indicated that the majority of external factors had an effect on smallholder producer groups' participation in HVMs. These external factors were ranging from political, economic, social, environmental, and technological factors. This study indicated that amongst twelve internal factors, four factors were identified as significant effects on the probability of producer groups' participation in HVMs. Vegetable farming experience, total vegetable produce, and average vegetable prices had a statistically significant influence on producers with a positive sign. However, vegetable farm size showed a negatively significant effect on producer groups' participation in HVMs. The other seven internal factors such as age, education, mobile phone, market support, agricultural input support, financial support, and extension services had no statistical significance.

7.2. Recommendations and policy implications

By integrating qualitative and quantitative analysis, this study provided critical insights into the roles of the PCs and factors influencing producer groups' participation in HVMs. This research pointed out the primary roles of PCs in improving smallholder producers' access to HVMs. Nonetheless, not all selected PCs have successfully bridged their members towards HVMs yet. There were no universal blueprints for the success of linking smallholder vegetable producers to supermarkets. However, based on the results

of this study, some pragmatic policy recommendations that are best suited to the study context were provided for key stakeholders.

Policy markers

The government has introduced various policies and interventions to support and stimulate agricultural sector development, also including vegetables. These range from extension policy, financial services-related to smallholders, contract-farming, agricultural cooperative law, to good agricultural practices (GAP) promotion. However, these policies still have either gaps or limited applicability and effectiveness, particularly with the linking of smallholder producers to national and internal HVMs. Thus, the research suggests the following policy recommendations:

- With extension services, the specific production policies should assist smallholder producers in upgrading not only vegetable production but also quality with low production cost. This enables them to produce vegetables that meet the supermarkets' requirements.
- Improving vegetable production techniques may not be the only way to link producers to HVMs. Enabling market policies should be put in place to support smallholder producers and their cooperatives. Actionable policies should focus on entrepreneurship skills, such as business planning and communication training. This may enhance their capacity of producers and leadership of PCs to expand market opportunities.
- The safe vegetables-related regulatory framework should be fully implemented to ensure fair competition between domestic vegetables and imported vegetables and stable environment. This may be achieved through promoting CamGAP, GAP, or Global GAP standard nationwide.
- Raising public awareness of safe and high-quality vegetable consumption should be introduced via effective means, such as TVs, radios, and public places. This might provide more opportunities for domestic producers who are willing to produce high-quality vegetables.
- Research and development funds should be shared for the vegetable sector, especially related to upgrading vegetable value-added and market development. Vegetable producers and PCs should receive training in processing, grading, and

packaging. Thus, they might increase vegetable value-added and compete with national and internal HVMs.

- Public-private partnership policies should be promoted in order to build strong networking between the PCs and private companies. For example, enabling policies that promote long-term partnership between smallholder PC and agricultural input companies should be prioritised.
- Besides domestic market-oriented support, particular vegetable export policies should be developed because a number of HVMs in this country were still small. This enables vegetable growers to open up wide ranges of market opportunities and ensure the growth of vegetable sector in Cambodia.

Development partners-NGOs and private companies

This research and other numerous studies indicate that POs, such as PCs, were the dynamic players that could successfully help smallholder producers to access HVMs. Therefore, with development partners, the study provides the following recommendations for taking further actions:

- With NGOs, project intervention should not focus solely on production technical aspects, but it should integrate actionable and effective business models that assist smallholder producers in generating high income by engaging market access. Increasing market access opportunities would maintain vegetable markets and provide benefits for them. This is an incredibly important incentive for smallholder producers to continue growing vegetables and stay with the PCs long-term.
- With regard to private sectors, such as agricultural input companies, supermarkets, and microfinance institutes, they should assist smallholder vegetable producers through PCs. For instance, agricultural input suppliers should build a partnership with the PCs in terms of collective purchase. Supermarkets play key roles in not only buying vegetables from the PCs but also providing extension services and coordinating between the PCs and input suppliers. In this regard, the contract farming with PCs may be the best-suited strategies because it ensures the efficient payment system for producers.

Producer Cooperatives (PCs)

Besides external coordination and support, the PCs themselves play active roles in bridging smallholder vegetable producers towards HVMs. Based on the results of this study, some applicable recommendations are provided below:

- For the managers of the PCs, they should build not only leadership and management skills but also strong business skills. These skills and knowledge enable managers of the PCs to make the right business decision. Moreover, it helps the PCs to develop an effective business and strategic plan that responds to a highly competitive environment of vegetable markets.
- Marketing and communication skills are crucial for the success of PCs. For long-run vegetable business, the PCs may not depend on external agencies such as the government and NGOs for coordinating market access. The PCs may open up new market opportunities through upgrading and promoting products and building broader networks with other value chain actors.
- The PCs should keep motivating their members to produce high-quality vegetables that meet HVM demand. Most importantly, they should encourage their members to follow the Good Agriculture Practices (GAP). This could provide them with more market opportunities not only domestic supermarkets but also overseas supermarkets opportunities.

Vegetable producers

Agri-food markets in Cambodia had changed a bit slower than some countries in the region, but the phenomenon already exists now. Consumers, especially in the urban area, shifted their vegetable purchase from traditional markets to formal markets or retail stores higher quality. Thus, in responding to the new trend of market demand and requirement, the research suggests the following recommendations for vegetable producers:

- They should keep their membership because there may be a better possibility of accessing HVMs, obtaining higher and more stable vegetable prices, and receiving both new technologies and marketing supports. Through collective sales, the producers could have higher bargaining power for dealing with HVMs.
- The producers should learn new production techniques, especially good agricultural practices (GAP), which enable them to upgrade their vegetable

quality and production in order to receive high value-added of vegetables. Thus, they could have strong market competition in relation to vegetable markets compared to imported vegetables.

- In addition to the improvement of production techniques, vegetable producers should learn and enhance their entrepreneurship and business knowledge and skills. In order to achieve this, the producers should join extension training.

7.3. Limitations of the research

The research makes a substantial contribution to previous studies about the roles of PCs and factors affecting smallholder producer groups' participation in HVMs. Since this study examined, in particular, vegetable producers, who were members of PCs, and used both qualitative and quantitative approach, it appears that this is one of the first research in this topics in Cambodia. However, the results from this study may be not generalised for the wider context of the whole country. This was due to some limitations of the study as noted below:

- It may be difficult to generalise these results for the whole country context since the geographical area of this study covered a small region of the country. A number of PCs in other regions may also successfully link their members to HVMs by using different business models. It means that these results may be not representative of all PCs in the country.
- This study used purposive sampling methods to select PCs and producers that received supports from NGOs' and the government's project. It may have other successful PCs that were established and run by producers themselves. This is another limitation to generalising about these research results.
- The qualitative data was collected only from the PCs' managers and members, but other relevant stakeholders such as the government, NGOs, and supermarkets were excluded. This may be questionable about sufficient information for making an assumption.
- The study applied a Logistic Regression Analysis Model that requires a large sample size to achieve high accuracy and generalisation. However, the selected samples in this study were relatively small (120 respondents) due to time and budget constraints and available targeted samples in the studied region.

7.4. Future research

Based on the significant contribution and the limitations of this research, it is important that further study should be encouraged.

- The future research may consider not only the sample topic but also an increasing number of samples and including all relevant stakeholders, such as wholesalers, middlemen, retailers, input suppliers, and government's and NGOs' agencies. This would be incredibly important for making a general assumption about strategies of the PCs used to integrate their members into HVMs.
- This study was conducted in only a small region of the country, thus the future research should be investigated in the other regions, such as the Lower Mekong region where the majority of producers are growing leaf-vegetables.
- Furthermore, this research identified the roles of PCs and factors affecting smallholder producer groups' participation in HVMs, but it did not examine the transactional costs and revenues. Therefore, future research may regard these two factors as new objectives for understanding more about the effectiveness of participating in HVMs.

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Appendices

Appendix 1: Research questionnaire for PC's manager

Questionnaire for producer cooperative's director/manager

Part I: General background about the producer cooperative's director/manager

1. Name:
2. Gender: Male ☐ Female ☐
3. Age: (year-old)
4. Education: (years)
5. Position:
6. Experience in current position: (years)

Part II: Background of the producer cooperatives

1. When and why the producer cooperative was established? How many founding members?
2. What are the evolution/key milestones of the producer cooperative?
3. What are current activities/operations of the producer cooperative?
4. How to become a member of the producer cooperative? Fees, buying shares, price of share?

Part III: Products and services of the producer cooperatives

1. What types of vegetables are you buying from producer cooperative's members?
Please rank from the top 1 to top 5
.....
.....
2. Who do you sell your vegetables to? How many percent of your vegetables sold to each market?
3. Why do you choose that markets? Please give me the top 3 main reasons
 - High-value markets?
 - Traditional markets?
4. With high-value markets, how are you dealing with them in terms of:
 - Types of vegetables:
 - Volume:
 - Price:
 - Certificate:
 - Quality:
 - Contract:

- Relationship with HVM customers:
5. How do you support your members to produce vegetables to supply to high-value markets?
- Production:
 - Extension:
 - Training:
 - Loan:
 - Marketing:
 - Others (specify:):
6. How are you dealing with traditional markets in terms of:
- Types of vegetables:
 - Volume:
 - Price:
 - Certificate:
 - Quality:
 - Contract:

Part IV: Management of the producer cooperative

1. What is the organizational structure? Voting rights?
2. Did you receive any cooperative management training courses? What are they?
3. How does the producer cooperative make the decision or adopt rules and regulation?
4. How does the producer cooperative share any forms of benefits related to diffident?

Part V: Challenges and future strategies of the producer cooperative

1. What are the main opportunities of the producer cooperative from current vegetable practices and the high-value markets?
2. What are the main challenges of producer cooperative to participate in the high-value markets?
3. Are there any challenges with the members to supply quality produce for high-value markets?
4. What are your next 5-year strategies in terms of products, markets, and operational activities? Any changes looking for future opportunities?

Appendix 2: Research questionnaire for PC's members

Questionnaire for producer cooperative's members

Name of producer cooperative: Questionnaire ID:

Contact number: Date of interview:..../...../.....

Section I: Internal factors influencing smallholder producers' participation in HVMs

Part I: Farmer's demographics

1. Gender of respondent: Male ☐ Female ☐ 2. Age of respondent: (years)
3. Education level: (years) 4. Family size: (people)
5. Farming experience: (years) 6. Vegetable experience: (years)

Part II: Farm characteristics

1. What types of agricultural activities are you involving?

.....

.....

2. Total farm size: (m²)

3. Total vegetable farm size: (m²)

4. What types of vegetables did you grow in 2018? Please rank the top 3 of vegetables

Types of vegetables	Total areas (m ²)	Volume (kg/year)

5. Why do you choose these vegetables? Please give me the top 3 main reasons

.....

6. Does the producer cooperative influence your decision making on product choices?

Yes ☐ No ☐

6.1. If yes, how?

7. Are you involve in any off-farm activities: Yes ☐ No ☐

8. If yes, what kinds of off-farm activities are you involving? How are they important for you?

.....

9. Total annual income from off-farm activities: (% of total income)

10. Transportation assets:

Car ☐ Motorbike ☐ Bicycle ☐

Tuk tuk ☐ Tractor ☐ Others (specify:...) ☐

11. Communication assets:

Radio ☐ Television ☐ Mobile phone ☐
Smartphone ☐ Others (specify:) ☐

Part III: Marketing aspects

1. Do you sell your vegetable products? Yes ☐ No ☐
2. If yes, how many percent did you sell? (%)
3. If yes, to whom did you sell your vegetables? Please list the top 3 buyers

Type of buyers	Type of vegetables	Volume (kg/year)	Price (Riel/kg)

4. If selling to the producer cooperative, why? Please indicate your top 3 reasons
.....
5. If not selling to the producer cooperative, why? Please indicate your top 3 reasons
.....
6. Do you need quality safety requirement or certificate to get products to HVM?
Yes ☐ No ☐
7. If yes, what types of certificate schemes or quality safety requirement? Is it easy to get this certificate or meet this requirement?
.....
8. What is the distance from your home to the producer cooperative? (km)
9. What is the distance from your home to the nearest markets? (km)

Part IV: Products and services of the producer cooperatives

1. Have you received any kinds of support from your producer cooperative?
 - 1.1. Agricultural input support Yes ☐ No ☐ , if no, please skip q.2.1
 - 1.2. Financial support Yes ☐ No ☐ , if no, please skip q.2.2
 - 1.3. Extension services Yes ☐ No ☐ , if no, please skip q.2.3
 - 1.4. Market support Yes ☐ No ☐ , if no, please skip q.2.4

1.5. Other (specify:.....) Yes ☐ No ☐ , if no, please skip q.2.5

2. Please indicate your level of satisfaction or dissatisfaction with above services and products

Services and products	Strongly Dissatisfied	Dissatisfied	Neutral	Satisfied	Strongly satisfied
2.1. Agricultural inputs (<i>Fertilizers, chemicals, planting material, and seeds</i>)					
Price					
Quality					
Supply volume					
Services					
Other (specify:.....)					
2.2. Financial support					
Loaning amount					
Loaning duration					
Interest rate					
Loaning service					
Other (specify:.....)					
2.3. Extension services					
Production technology					
Quality and safety					
Production cost					
Product marketing					
Business plan					
Other (specify:.....)					
2.4. Market supports					
Price information					
Buyer's information					
Contract information					
Product information					
Market facilitation					
Vegetable prices					
Stable vegetable demand					
Marketing cost					
Other (specify:.....)					
2.5. Others					
.....					
.....					
.....					

Section III: External factors influencing smallholder producers' participation in HVMs

- How important are the following factors, and what is their impact, on selling your vegetables to the HVM?

Factors	Not Important	Little Important	Important	Very Important	Extremely Important
<i>Political factors</i>					
Quality vegetable promotion policies					
Government stability					
Regulations on safety and quality vegetable production					
<i>Economic factors</i>					
Vegetable demand					
Stable vegetable prices					
Market growth					
Increasing people's income					
Availability of loan/subsidy					
Sufficient infrastructure					
<i>Social factors</i>					
Health awareness of safety and quality of vegetable consumption					
High trust relationship					
Effective communication					
<i>Technological and environmental factors</i>					
Information and communication technology					
Cropping technologies					
Environmental awareness of GAP practices					

- Are you going to grow vegetables in the next 5 to 10 years? Yes ☐ No ☐
- If yes/no, why?
- What types of vegetables are you intending to grow the most in the next 5 to 10 years?
 - Existing vegetables, why?
 - New vegetables (specify:), why?
- Are you going to continue to be a member of the cooperative in the next 5 years?

Yes ☐ No ☐

 - If yes/no, why?

Appendix 3: Research ethics approval



Date: 18 December 2018

Dear Bunthan Tray

Re: Ethics Notification - 4000020434 - Linking smallholder farmers to high-value markets through collective action: A Case study of smallholder vegetable farmer groups in producer organizations in Cambodia

Thank you for your notification which you have assessed as Low Risk.

Your project has been recorded in our system which is reported in the Annual Report of the Massey University Human Ethics Committee.

The low risk notification for this project is valid for a maximum of three years.

If situations subsequently occur which cause you to reconsider your ethical analysis, please contact a Research Ethics Administrator.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named in this document are responsible for the ethical conduct of this research."

If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director - Ethics, telephone 06 3569099 ext 85271, email humanethics@massey.ac.nz."

Please note, if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to complete the application form again, answering "yes" to the publication question to provide more information for one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

Research Ethics Office, Research and Enterprise

Massey University, Private Bag 11 222, Palmerston North, 4442, New Zealand T 06 350 5573; 06 350 5575 F 06 355 7973
E humanethics@massey.ac.nz W <http://humanethics.massey.ac.nz>

Human Ethics Low Risk notification



Professor Craig Johnson
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

Appendix 4: Research information sheet

Research Information Sheet

Dear Sir/Madam,

My name is Bunthan Tray, a student of the Massey University in Palmerston North, New Zealand. I am doing Master of AgriCommerce. Currently, I am conducting a research to complete my master thesis. The research title is “*Linking smallholder producers to high-value markets through collective action: A case study of smallholder vegetable farmer groups in producer organisations in Cambodia*”. This proposed research is crucially important for vegetable growers to open up the opportunities to maintain sustainable market supplies, reduce risks of losing, and secure vegetable market prices. It would give practical roadmap and concrete implications to the government, NGOs, and other development partners to path the ways for success in implementing collective action.

Your participation in this research interview is very important for us to achieve the objectives of this research. Please be assured that all the necessary steps will be taken to maintain data security and your anonymity. Our data management and confidentiality processes and procedures have been approved by Massey University’s Human Ethics Committee. If you decide to participate in the interview, you will be asked to sign a consent form on which you can choose to have your name and position acknowledged in the study. The interviews will take approximately half hour. With your permission, I would like to record this interview session.

Thank you and best regards,

Bunthan Tray (Postgraduate researcher), Keiller Place, Palmerston North, New Zealand,
Email: [REDACTED], Phone: [REDACTED]

Dr. Elena Garnevskia, (Chief Supervisor), Massey University, New Zealand, Email: E.V.Garnevskia@massey.ac.nz, Phone: +64(06) 356 9099 ext. 84794

Professor Nicola Shadbolt (Supervisor), Massey University, New Zealand, Email: N.M.Shadbolt@massey.ac.nz, Phone: +64 (06) 356 9099 ext 84793

Appendix 5: Research consent form



MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WAHANGA PŪTAIAO

PARTICIPANT CONSENT FORM- INDIVIDUAL

I have read or the information sheet has be read out for me and I have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may be asked further questions at any time.

I agree to participate in this study under the conditions and participant rights set out in the information sheet.

I agree/ do not agree to the interview being sound recorded

Full name.....

Signature.....

Date

Appendix 6: Summary of producer cooperatives' information

Summary results of PCs

Description	Producer Organizations (PCs)				
	TSAC	AKPAC	SMAC	PMCAC	PSAC
<i>Background of the PCs</i>					
Date of Establishment	• September 2017	• September 2017	• November 2011	• June 2011	• January 2018
Purpose of Establishment	<ul style="list-style-type: none"> • Improve agricultural production and quality • Promote market competition and reduce vegetable import • Exchange best farm practices and market information 	<ul style="list-style-type: none"> • Strengthen bargaining power • Grow and sell vegetables collectively • Share best farm practices 	<ul style="list-style-type: none"> • Alleviate the poverty in commune • Provide alternative ways for farmers to access credit 	<ul style="list-style-type: none"> • Create more job opportunities • Sell PO's products and purchase farm inputs collectively • Provide loan support for farmers 	<ul style="list-style-type: none"> • Provide credit and saving services • Strengthen purchasing power • Boost vegetable production
Founders	<ul style="list-style-type: none"> • The government (Boosting project) • Members: 63 	<ul style="list-style-type: none"> • The government (Boosting project) • Members: 57 	<ul style="list-style-type: none"> • Local NGO-LWD • Members: 90 	<ul style="list-style-type: none"> • Local NGO-LWD • Members: 160 	<ul style="list-style-type: none"> • The government (Boosting project) • Members: 37
Membership	<ul style="list-style-type: none"> • Price of share: 12.5 \$ • Membership fee: 2.5 \$ 	<ul style="list-style-type: none"> • Price of share: 12.5 \$ • Membership fee: 2.5 \$ 	<ul style="list-style-type: none"> • Price of share: 2.5 \$ • Membership fee: 1.25 \$ 	<ul style="list-style-type: none"> • Price of share: 2.5 \$ • Membership fee: 1.25 \$ 	<ul style="list-style-type: none"> • Price of share: 12.5 \$ • Membership fee: 2.5 \$
Gross Profit/ Surplus sharing (%)	<ul style="list-style-type: none"> • Reserve fund: 20 • Training fund: 3 • Managing member fund: 10 	<ul style="list-style-type: none"> • Reserve fund: 20 • Training fund: 3 • Managing member fund: 10 • Business expansion: 15 	<ul style="list-style-type: none"> • Reserve fund: 20 • Training fund: 5 • Managing member fund: 15 • Business expansion: 20 	<ul style="list-style-type: none"> • Reserve fund: 20 • Training fund: 5 • Managing member fund: 15 • Business expansion: 20 	<ul style="list-style-type: none"> • Reserve fund: 20 • Training fund: 3 • Managing member fund: 15 • Business expansion: 12

	<ul style="list-style-type: none"> • Business expansion: 15 • Dividends: 40 • Social fund: 2 • Office building: 10 	<ul style="list-style-type: none"> • Dividends: 40 • Social fund: 2 • Office building: 10 	<ul style="list-style-type: none"> • Dividends: 40 	<ul style="list-style-type: none"> • Dividends: 40 	<ul style="list-style-type: none"> • Dividends: 50
Current business	<ul style="list-style-type: none"> • Vegetable marketing • Credit and saving 	<ul style="list-style-type: none"> • Vegetable marketing • Credit and saving 	<ul style="list-style-type: none"> • Credit and saving • Farm input supply • Vegetable marketing • Weaving 	<ul style="list-style-type: none"> • Credit and saving • Farm input supply • Pure water supply • Vegetable marketing 	<ul style="list-style-type: none"> • Vegetable marketing • Credit and saving
Key milestones	<ul style="list-style-type: none"> • Received 2 GAP certificates • Receive the best PC award • Largest PC supplying safe vegetable to HVMS in the province • Have packing house • Members: 63→75 • Capital: 2,506\$→12,594\$ 	<ul style="list-style-type: none"> • Change farmers' farm practices • Organize produce groups to grow safe vegetables • Have packing house • Members: 57→67 • Capital: 860\$→11,720\$ 	<ul style="list-style-type: none"> • Created vegetable marketing • Supply safe vegetables markets • Create vegetable collecting center • One of the best PCs • Members: 90→224 • Capital: 8,473\$→18,608\$ 	<ul style="list-style-type: none"> • Expand business-pure water supply • Create safe vegetable producer groups • Create vegetable marketing business • Increase number of members: 160→352 • Capital: 16,400\$→41,120\$ 	<ul style="list-style-type: none"> • Form vegetable producer groups • Have own retail outlets in provincial town • Buy and supply some vegetables
Marketing, products, and services of the PCs					
Marketing channels	<ul style="list-style-type: none"> • Supermarkets: 70% • Collectors/Middlemen: 30% 	<ul style="list-style-type: none"> • Middlemen in provincial town: 100% 	<ul style="list-style-type: none"> • Supermarkets: 20%-30% • Collectors/Middlemen/consumers: 70-80% 	<ul style="list-style-type: none"> • Middlemen/collectors in region: 100% 	<ul style="list-style-type: none"> • Middlemen and consumers in the province:100%
Strategies with HVMS	<ul style="list-style-type: none"> • Organize producer groups • Prepare crop-rotating plan 	<ul style="list-style-type: none"> • Select potential vegetables to supply to HVMS 	<ul style="list-style-type: none"> • Organize 6 producer groups • Prepare crop-rotating plan 	<ul style="list-style-type: none"> • Recruit more vegetable producers 	<ul style="list-style-type: none"> • Organize safe vegetable producer groups • Increase volume and quality vegetables

	<ul style="list-style-type: none"> • Use price in advanced contract • No volume contract • Not require GAP certificate, but safe vegetables • Invite third party to proof vegetable quality 	<ul style="list-style-type: none"> • Encourage farmers to grow safe vegetable • Organize producer groups 	<ul style="list-style-type: none"> • Select potential vegetables • Use price in advanced contract • No volume contract • Not require GAP certificate, but safe vegetables • Invite third party to proof vegetable quality 	<ul style="list-style-type: none"> • Organize safe vegetable producer groups • Prepare contract with supermarkets both volume, quality, and price 	<ul style="list-style-type: none"> • No specific strategies with volume and price yet
Strategies with TMs	<ul style="list-style-type: none"> • There were no specific requirement or contract with these traditional markets 	<ul style="list-style-type: none"> • Sell all kinds of vegetables to them • No price and volume contract 	<ul style="list-style-type: none"> • There were no specific requirement or contract with these traditional markets 	<ul style="list-style-type: none"> • They bought all kinds of vegetables • Types of vegetables, volume, and price were based on market 	<ul style="list-style-type: none"> • Supply some kinds of vegetable that were available from members regardless grade • No volume and price contract
Supporting members	<ul style="list-style-type: none"> • Distribute and subsidy farm inputs • Share best farm practices, experience, and knowledge • Provide technical training • Provide loan • Facilitate between members and markets 	<ul style="list-style-type: none"> • Distribute and subsidy farm inputs • Transfer technical knowledge and experience • Provide short-training courses • Provide loan • Share marketing information 	<ul style="list-style-type: none"> • Sell and subsidy farm inputs • Share best farm practices, techniques, and new knowledge • Provide technical training • Help members to prepare business plan • Provide loan 	<ul style="list-style-type: none"> • Provide farm inputs • Sell fertilizers at cheaper price • Provide technical training • Provide loan • Build partnership with other PCs • Find markets for members via PDAFF and NGOs 	<ul style="list-style-type: none"> • Provide training about safe vegetables • Distribute farm inputs • Work PDAFF officers to seek new markets, especially supermarkets

			<ul style="list-style-type: none"> • Buy vegetables and find markets for members 		
Challenges of PCs	<ul style="list-style-type: none"> • Ensure consistent supply to supermarkets • Integrate members into producer groups • Convince members to follow crop-rotating plan • Lack of transportation • Lack of capital • Build trust with PC's members 	<ul style="list-style-type: none"> • Lack of commitment from members • Organizing producer groups • Lack of participation from members of management committee • Lack of transportation • Lack of specific requirement from HVMs 	<ul style="list-style-type: none"> • Supermarkets bought small volume of vegetables • Members lost trust on PC • Lack of capital • Ensure consistent vegetable quality • Supermarkets required high quality products 	<ul style="list-style-type: none"> • Communication with supermarkets • Lack of support from members of the board of directors • Increase number of producers • Change growers' farming practices 	<ul style="list-style-type: none"> • Lack of HVMs in regions • The quality requirement of HVMs was very high
Future strategies of the PCs	<ul style="list-style-type: none"> • Expand markets by seeking big retailers and supermarkets • Increase volume and quality of vegetables • Help all members to get GAP certificate • Recruit a number of vegetable growers • Create vegetable collecting center • Continue to support members to grow safe vegetables 	<ul style="list-style-type: none"> • Increase volume and quality of vegetables • Increase a number of members growing safe vegetables • Expand markets, especially HVMs • Establish vegetable collecting and package center • Diversify markets and vegetables 	<ul style="list-style-type: none"> • Increase new markets • Increase of a number of members • Increase supply volume and quality • Build partnership with farm input supply companies • Build partnership with other PCs • Prepare volume contract • Create product value added 	<ul style="list-style-type: none"> • Increase safe vegetable production and quality • Increase number of vegetable growers • Build strong connection with HVMs • Increase PC's capital 	<ul style="list-style-type: none"> • Increase vegetable production and quality • Increase market opportunities through finding new markets in the province and in Phnom Penh

Appendix 7-1: The types of respondents' off-farm activities

Occupation	Responses		Cases (n=27)
	Number	Percent	Percent
Garment worker	11	36.7	40.7
Seller	3	10.0	11.1
Chef	3	10.0	11.1
Construction	3	10.0	11.1
Civil servant	2	6.7	7.4
Furniture worker	1	3.3	3.7
Hairdresser	1	3.3	3.7
House decoration	1	3.3	3.7
Motor driver	1	3.3	3.7
Palm sugar processor	1	3.3	3.7
Rice miller	1	3.3	3.7
Sculptor	1	3.3	3.7
Car driver	1	3.3	3.7
Total	30	100.0	111.1

Appendix 7-2: The ways of PC's influence on members and vegetables grown

Reasons	Responses		Cases (n=94)
	Number	Percent	Percent
Providing technical support and training	77	60.6	81.9
Providing agricultural input material	25	19.7	26.6
Facilitating market support	6	4.7	6.4
Sharing growing techniques	6	4.7	6.4
Sharing market information	5	3.9	5.3
Sharing best experience and advice	3	2.4	3.2
Giving good advice about vegetable growing	1	0.8	1.1
Providing credit	1	0.8	1.1
Buying vegetables from members	1	0.8	1.1
Helping famers design crop calendar	1	0.8	1.1
Provide technical support and training	1	0.8	1.1
Total	127	100.0	135.1

Appendix 7-3: The reasons of respondents selling vegetables through PCs

Reasons	Responses		Cases(n=99)
	Number	Percent	Percent
PC gives high and stable price	81	32.5	81.8
Being member of PC	46	18.5	46.5
PC buys vegetables at home and farm gate	25	10.0	25.3
PC provides training and input material	22	8.8	22.2
It is easy to sell through PC	16	6.4	16.3
PC finds markets for members	14	5.6	14.1
PC needs these vegetables	15	6.0	15.2
PC buys regularly	7	2.8	7.1
Markets is far from home	6	2.4	6.1
Support PC	6	2.4	6.1
PC shares experiences and knowledge	4	1.6	4.0
Knowing vegetable price in advance	3	1.2	3.0
PC has good communication	2	0.8	2.0
Having contract with PC	2	0.8	2.0
Total	249	100.0	251.5

Appendix 7-4: The reasons of respondents selling vegetables through traders

Reasons	Responses		Cases (n=113)
	Number	Percent	Percent
PC buys only small and limited volume	88	46.1	77.9
Middleman gives flexible price	17	8.9	15.0
PC buys only grade 1 and safe vegetables	15	7.9	13.3
Growing a number of producers	14	7.3	12.4
Having contract with middleman	11	5.8	9.7
Middleman buys all vegetables and regularly	8	4.2	7.1
Remain from selling to PC	7	3.7	6.2
Middleman gives faster payment than PC	6	3.1	5.3
Having a lot of market choices	6	3.1	5.3
Difficult to bring to PC	5	2.6	4.4
Middleman buys at home and farm gate	4	2.1	3.5
Living near market	4	2.1	3.5
Lack of communicate with PC	3	1.6	2.7
Share to other middleman	2	1.1	1.8
Knowing market price in advance	1	0.5	0.9
Total	191	100.0	169.0

Appendix 5-5: The level of satisfaction of producers with agricultural input support

Description	1	2	3	4	5	Mean Score	STD
Quality	2.0	4.0	8.1	47.5	38.4	4.2	0.889
Price	4.0	5.1	9.1	52.5	29.3	4.0	0.979
Services	3.0	6.1	11.1	62.6	17.2	3.9	0.885
Supply volume	5.1	10.1	13.1	59.6	12.1	3.6	0.994
Overall	3.5	6.3	10.4	55.6	24.2	3.9	0.953

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

Appendix 7-6: The level of satisfaction of producers with financial support

Description	1	2	3	4	5	Mean Score	STD
Loaning service	1.9	3.7	9.3	55.6	29.6	4.1	0.839
Loaning duration	3.7	6.5	11.1	67.6	11.1	3.8	0.874
Interest rate	5.6	8.3	13.0	59.3	13.9	3.7	1.003
Loaning amount	5.6	10.2	10.2	61.1	13.0	3.7	1.015
Overall	4.2	7.2	10.9	60.9	16.9	3.8	0.947

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

Appendix 7-7: The level of satisfaction of producers with extension services

Types of extension services	1	2	3	4	5	Mean Score	STD
Production technology	-	-	5.6	55.6	38.9	4.3	0.580
Quality and safety	-	-	11.1	64.8	24.1	4.1	0.582
Production cost	9.3	12.0	11.1	46.3	21.3	3.6	1.216
Product marketing	11.1	15.7	16.7	48.1	8.3	3.3	1.165
Business plan	10.2	23.1	17.6	35.2	13.9	3.2	1.234
Overall	6.1	10.2	12.4	50.0	21.3	3.7	1.098

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

Appendix 7-8: The level of satisfaction of producers with market support

Types of marketing support	1	2	3	4	5	Mean Score	STD
Price information	3.0	7.9	13.9	58.4	16.8	3.8	0.923
Product information	8.9	14.9	10.9	46.5	18.8	3.5	1.213
Marketing cost	6.9	15.8	14.9	49.5	12.9	3.5	1.118
Market facilitation	6.9	23.8	14.9	32.7	21.8	3.4	1.257
Vegetable prices	8.9	28.7	15.8	30.7	15.8	3.2	1.255
Buyer's information	7.9	27.7	16.8	35.6	11.9	3.2	1.189
Contract information	10.9	26.7	16.8	34.7	10.9	3.1	1.222
Ensure vegetable demand	12.9	48.5	16.8	17.8	4.0	2.5	1.055
Overall	8.3	24.3	15.1	38.2	14.1	3.3	1.206

1. Strongly Dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Strongly satisfied

Appendix 7-9: The reasons for growing vegetables

Reasons	Responses		Cases (n=114)
	Number	Percent	Percent
Main occupation in family	45	31.0	39.5
Increase income to support family	27	18.6	23.7
Receive daily and quick income	24	16.6	21.1
Easy to grow and manage	14	9.7	12.3
Have existing experience and techniques	8	5.5	7.0
Get quick and high yield	7	4.8	6.1
Easy job and close to home	6	4.1	5.3
High market demand	4	2.8	3.5
Daily consumption	4	2.8	3.5
Like growing these vegetables	3	2.1	2.6
Member of vegetable growing group	3	2.1	2.6
Total	145	100.0	127.2

Appendix 7-10: The vegetables grown in the next 5 to 10 years

Types of vegetables	HVM (n=71)		TM (n=43)		Total (n=114)	
	Number	Percent	Number	Percent	Number	Percent
Existing vegetables	64	90.1	32	74.4	96	84.2
New vegetables	7	9.9	11	25.6	18	15.8
Total	71	100.0	43	100.0	114	100.0

$\chi^2=4.979$, $p=0.026$

Appendix 7-11: The reasons of choosing existing vegetables

Reasons	Responses		Cases (n=96)
	Number	Percent	Percent
Easy to grow, manage, and harvest	53	36.6	55.2
Having existing experience in growing these vegetables	21	14.5	21.9
Having good market demand	20	13.8	20.8
Getting quick and high yield	16	11.0	16.7
Receiving stable and high price	10	6.9	10.4
Best suited with soil climate condition	7	4.8	7.3
Receiving good income	7	4.8	7.3
Harvesting for a long time	4	2.8	4.2
Having existing markets	4	2.8	4.2
Reducing negative effect on health	3	2.1	3.1
Total	145	100.0	151.0

Appendix 7-12: The reasons of choosing new vegetables

Reasons	Responses		Cases (n=18)
	Number	Percent	Percent
Receiving good price and meeting market demand	7	36.8	38.9
Easy to grow and manage	5	26.3	27.8
Getting new experience with other vegetables	3	15.8	16.7
Best suited with soil and climate condition	2	10.5	11.1
Need low labor force	2	10.5	11.1
Total	19	100.0	105.6

Appendix 7-13: The types of new vegetables

Types of vegetables	Responses		Cases (n=18)
	Number	Percent	Percent
Long parsley	3	14.3	16.7
Ginger	3	14.3	16.7
Chilli	2	9.5	11.1
Spring onion leave	2	9.5	11.1
Tomato	2	9.5	11.1
Carrot	1	4.7	5.6
Cabbage	1	4.7	5.6
Chinese kale	1	4.7	5.6
Chinese radish	1	4.7	5.6
Bitter melon	1	4.7	5.6
Ivy gourd	1	4.7	5.6
leaf vegetables	1	4.7	5.6
Pineapple	1	4.7	5.6

Salad	1	4.7	5.6
<i>Total</i>	<i>21</i>	<i>100.0</i>	<i>116.7</i>

Appendix 7-14: The reasons of PC membership

Reasons	Responses		Cases(n=113)
	Number	Percent	Percent
Providing technical training and support	49	26.3	43.4
Sharing growing knowledge, experience, and techniques	40	21.5	35.4
Providing input material (seeds, fertilizers, farm material,...)	29	15.6	25.7
Buying vegetables and facilitating markets for members	22	11.8	19.5
Easy to access credit	14	7.5	12.4
Having high truth and good communicate with PC	12	6.5	10.6
Supporting PC to have sustainable running	7	3.8	6.2
Supporting vegetable sector	5	2.7	4.4
Receiving high and stable price	3	1.6	2.7
Strengthening market competition	3	1.6	2.7
Improve household income	2	1.1	1.8
<i>Total</i>	<i>186</i>	<i>100.0</i>	<i>164.6</i>