

Lincoln University Digital Thesis

Copyright Statement

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- you will use the copy only for the purposes of research or private study
- you will recognise the author's right to be identified as the author of the thesis and due acknowledgement will be made to the author where appropriate
- you will obtain the author's permission before publishing any material from the thesis.

**Measuring smallholder competitiveness in the tomato value chain
in Cambodia: A transaction costs perspective**

A thesis
submitted in partial fulfilment
of the requirements for the Degree of
Master of Commerce (Agricultural)

at
Lincoln University
by
Narith Roeun

Lincoln University
2018

Abstract of a thesis submitted in partial fulfilment of the requirements for the Degree of Master of Agricultural Commerce .

Measuring smallholder competitiveness in the tomato value chain in Cambodia:
A transaction costs perspective

by
Narith Roeun

Smallholders in developing countries face many challenges in participating in high-value agri-food value chains. High transaction costs are an important constraint, but there is little in the value chain literature that quantifies these effects. While Cambodia has an agriculturally-based economy with a strong demand for vegetables, it relies on tomatoes imported from neighbouring countries, namely Vietnam and Thailand. Given that Cambodia has comparably favourable climatic conditions, an important research gap concerns why Cambodian smallholder farmers cannot competitively supply these markets. This study hypothesises that transaction costs are an important source of low competitiveness for Cambodian smallholders. There are three main objectives in this study: 1) to characterise the trade and marketing patterns of the tomato value chain in Cambodia; 2) to quantify the transaction costs that affect the competitiveness of tomato smallholders; and 3) to examine and quantify the role that alternative governance mechanisms could play in reducing transaction costs. This study uses a combination of value chain analysis (VCA) with the policy analysis matrix (PAM) to address transaction costs in value chains, adding value to both types of analysis. Data used for the computation and analysis were collected from focus groups, key informants, and available secondary sources.

This research revealed interesting results contributing to the research gaps. There is a high level of transaction costs faced by tomato smallholders in Cambodia as a result of loose coordination in the domestic tomato value chain. The adapted PAM result indicates that

profits at private prices (which include transactions costs) are substantially lower than optimal profits at social prices, with transactions costs reducing private profits by almost 60 percent.

Computations of domestic resource costs (DRC) indicate that tomato production has a comparative advantage over imports, even in the baseline. However, a variety of market failures hurt the ability of smallholders to capitalise on this. Based on this result, farmers are encouraged to move to one of two alternative models which have a comparative advantage over the currently prevailing market-based governance structure. The first one is a structure where a sponsor provides advanced technology and collateral-free credit, and uses informal contracts in vertically coordinating both inputs and output transactions. The second structure relies on formal contracts with farmers as well as a vertical integration of input supply and targets a domestic niche market. Model results show that these two models can bring about higher profits for smallholders, lead firms and the sponsor.

Keywords: Value chain; smallholders; competitiveness; transaction costs; policy analysis matrix

Acknowledgements

Taking this opportunity, firstly, I would like to express my sincere gratitude to my supervisors: Associate Professor Karl Rich and Dr. Birgit Schulze-Ehlers. I have been extremely fortunate to have such wonderful supervisors who have played a great role in supervising me since my first day. They have managed to have regular weekly meetings with me throughout the year and have provided great support and care, not only for my academic progress, but also on a personal level. Without them, this thesis would have not been successfully completed.

I am thankful for the support of NZAID/ MFAT. The two-year financial support has helped to make my academic dream come true. I also appreciate the great coordination provided by the scholarship administrative team. My special thanks go to Lincoln University for not only taking care of and enhancing the quality of education through academic support and helpful facilities, but also providing highly qualified academic staff, including lecturers and my wonderful supervisors.

Wholehearted thanks go to my family who have always encouraged me to reach this study level. My parents, Mrs. Nan Un and Mr. Chea Bunthoeun have guided me towards a high academic dream even though we were trapped in poverty. If they had not placed importance on my education since primary level, I would not have had this academic achievement. My wife, Syne Song and son, Ryoolong Rith have always stayed patiently with me through ups and downs. I would like also to express my gratitude to my French godparents, Jean Patrick and Francoise LAFON who helped motivate me to pursue higher education at a world-ranking university.

Table of Contents

Abstract.....	i
Acknowledgements.....	iii
Table of Contents	iv
List of Tables	vi
List of Figures	vii
List of abbreviations.....	viii
Chapter 1 Introduction.....	1
1.1 Background for the study	1
1.2 Rationale for the study.....	2
1.3 Research objective and research questions	3
Chapter 2 Literature and the Theoretical Framework	4
2.1 An overview of the vegetable sector in Cambodia	4
2.1.1 General background of Cambodia.....	4
2.1.2 The vegetable sector in Cambodia	5
2.1.3 General aspects of vegetable value chains in Cambodia	7
2.2 Theoretical framework.....	10
2.2.1 Value chain analysis.....	10
2.2.2 Knowledge gaps in the VCA literature	14
2.3 Transaction costs and value chain competitiveness	14
2.3.1 Theoretical framework of transaction cost economics	14
2.3.2 Types of transaction costs.....	15
2.3.3 Drivers of transaction costs.....	18
2.3.4 Methodologies and key findings of previous research in transaction costs measurement in developed and developing countries	20
2.4 The policy analysis matrix.....	24
Chapter 3 Research Methodology	30
3.1 The application of the VCA in this study of competitiveness and transaction costs	30
3.2 The application of PAM on value chains, smallholder competitiveness, and transaction costs	31
3.3 Research design and data collection.....	35
3.3.1 Commodity selection for the study	35
3.3.2 Study areas	35
3.3.3 Data collection methodology	36
3.4 Data analysis.....	39
3.5 Ethical considerations	40
3.6 Human and safety considerations	40
Chapter 4 Value chain structures and governance: Results and discussion	41
4.1 Overview	41
4.2 Seasonality of the tomato value chain and tomato smallholder producers in Cambodia.....	41

4.2.1	Tomato value chain maps in Battambang and Kandal	42
4.3	An assessment of current governance mechanisms identified in domestic tomato value chains in Battambang and Kandal provinces	50
4.4	The types and quantification of transaction costs faced by tomato smallholders in Cambodia.....	57
4.4.1	The level of transaction costs on tradeable input transactions	58
4.4.2	The level of transaction costs on non-tradeable inputs	59
4.4.3	The level of transaction costs on the output side	61
4.5	Summary	63
Chapter 5 Application of the policy analysis matrix to assess the competitiveness of the tomato value chain in the context of transaction costs		65
5.1	Introduction	65
5.2	Computation of producer revenue in the PAM	65
5.2.1	Tomato price situation throughout the year	66
5.2.2	Social prices of tomatoes in Cambodia	69
5.3	Tradeable and non-tradeable input costs used in smallholder tomato production vs the border prices.....	71
5.3.1	Tradeable input costs in smallholder tomato production	71
5.3.2	Non-tradeable input costs in smallholder tomato production	75
5.4	Competitiveness of smallholders measured in the PAM	77
Chapter 6 Estimation of the effects of alternative governance structures recently introduced in Cambodia on tomato smallholder competitiveness.....		80
6.1	Alternative Governance Model 1: Relationship based on an informal contract	80
6.2	Alternative Governance Model 2: Relationship between smallholders and a sponsor based on formal contracts.....	82
6.3	Alternative Governance Model 3: Partnership approach based on a formal written contract	84
6.4	Costs faced and revenues received by smallholders in the three different business models	88
6.5	A comparison of alternative governance structures using the adapted PAM	91
Chapter 7 Discussion and Conclusions.....		93
7.1	Introduction	93
7.2	Research synthesis and conclusions	94
7.3	Limitations and future research	95
List of References		97
Annexes.....		101

List of Tables

Table 2.1: Aggregate vegetable production in Cambodia from 2000 to 2014	6
Table 2.2: Vegetable trade in Cambodia in a ten-year period from 2007 to 2016	6
Table 2.3: Trade flow and value of specific types of vegetables	7
Table 2.4: Summary of the methods and key findings of previous research on transaction costs measurement.....	23
Table 2.4: Continued	24
Table 2.5: Policy analysis matrix.....	25
Table 2.6: Summary of previous research using PAM	28
Table 2.6 Continued	29
Table 3.1: Policy analysis matrix with transaction costs and governance relationships.....	34
Table 3.2: The number and categories of respondents in this study.....	39
Table 4.1: Summary of actors' activities of domestic tomato value-chain actors.....	49
Table 4.1: Continued	50
Table 4.2: Expected governance structures being used by actors in their tomato trade relationship.....	54
Table 4.2: Continued	55
Table 4.2: Continued	56
Table 4.3: Transaction costs on tradable inputs	58
Table 4.4: Transaction costs on non-tradable inputs.....	60
Table 4.5: Transaction costs reducing smallholder revenues.....	63
Table 5.1: Average supply and price of domestic tomatoes and imported tomatoes.....	68
Table 5.2: Computation of social prices for tomato production	70
Table 5.3: Tradeable input costs and border prices for the average land size of 1600 m ²	74
Table 5.4: Non-tradeable input costs.....	77
Table 5.5: The result of the policy analysis matrix showing the influence of transaction costs on tomato smallholder competitiveness (in 1600m ²).....	79
Table 6.1: A comparison of the three alternative business models	86
Table 6.1: Continued	87
Table 6.1 Continued	88
Table 6.2: Estimation of input costs faced, revenues received by tomato growers and transaction costs in the alternative models at private prices.....	89
Table 6.3: Estimation of input costs faced, revenues received by tomato growers and transaction costs in the alternative models at social prices	90
Table 6.4: Adapted PAM for alternative governance structures	92
Table 6.5: EPC and DRC calculations from baseline and adapted PAM	92

List of Figures

Figure 2.1: Relationship between uncertainty, asset specificity, governance structures, and transaction costs (Williamson, 1991: 284)	20
Figure 3.1: The map of Cambodia (The United Nations, 2004).....	36
Figure 4.1: Value chain map for tomatoes in Battambang Province (based on primary data)	46
Figure 4.2: Value chain map for tomatoes in Kandal Province (based on primary data).....	48
Figure 5.1: Wholesale prices of tomatoes and other high-value vegetables in Cambodia (Nuppun, 2016)	66
Figure 6.1: Main actors and their roles in the informal contract-based relationship in Cambodia (based on primary data)	82
Figure 6.2: Main actors and their roles in the formal contract-based relationship in Cambodia (based on primary data)	83
Figure 6.3: Partnership approach recently introduced in Cambodia (based on primary data)	85

List of abbreviations

ASEAN	Association of Southeast Asian Nations
CDRI	Cambodia Development Resource Institute
DRC	Domestic Resource Costs
EPC	Effective Protection Coefficient
FAO	Food and Agriculture Organisation
GVC	Global Value Chain
HARVEST	Helping Addressing Rural Vulnerability and Ecosystem Stability
MAFF	Ministry of Agriculture, Forestry and Fishery
NAV	Natural Agricultural Village
NGOs	Non-Governmental Organizations
NPC	Nominal Protection Coefficient
NPP	Net Private Profitability
PAM	Policy Analysis Matrix
RPC	Real Protection Coefficient
SNV	Stichting Nederlandse Vrijwilligers
UN	The United Nations
UNDP	The United Nations Development Program
USAID	The United States Agency for International Development
USD	United States Dollar
VC	Value Chain
VCA	Value Chain Analysis
WTO	World Trade Organisation

Chapter 1

Introduction

1.1 Background for the study

Smallholders in developing countries face many challenges which hinder their participation in high-value agri-food markets. Some of these factors include a lack of economies of scale (Kydd, Pearce, & Stockbridge, 1997; Narrod et al. (2009, p. 1086)) resulting from limitations in resources such as land and labour (Pearson, Gotsch, & Balhri, 2003), poor physical infrastructure (Pearson et al., 2003; Reardon, Barrett, Berdegue, & Swinnen, 2008; Reardon & Timmer, 2007; Sok, Chap, & Chheang, 2011), underdeveloped institutional arrangements (Narro et al., 2009; Sartorius & Kirsten, 2007; Trienekens, 2011), high and rising quality standards (Narro et al., 2009; Sok et al., 2011), low technology (Pearson et al., 2003; Sartorius & Kirsten, 2007), lack of access to credit (capital) (Dolan, Humphrey, & Harris-Pascal, 1999; Pearson et al., 2003; Reardon et al., 2008), lack of reputation or brand (Narro et al., 2009; Reardon & Timmer, 2007); and high transaction costs (Azam, Imai, & Gaiha, 2012; Gong, Parton, Cox, & Zhou, 2007; Key, Sadoulet, & De Janvry, 2000; Renkow, Hallstrom, & Karangja, 2004; Sartorius & Kirsten, 2007; Vakis, Sadoulet, & De Janvry, 2003). These constraints limit the ability of smallholders to raise their profitability through new income-generating opportunities, making it difficult for them to escape from poverty.

In the last two decades, the Cambodian government has instituted a range of regulatory frameworks including laws, decrees and sub-decrees (Prakas in Khmer) to develop the agricultural sector for the purpose of improving rural farmer livelihoods. They include Land Law 2001, Sub-decree on Social Land Concessions (No. 19 ANK/BK/ March 19, 2003); Strategy for the Improvement of the Agricultural Market Information Service 2006; Seed Law 2009; Policy Paper on the Promotion of Paddy Production and Rice Export 2010; Sub-decree (Prakas in Khmer) on Good Agricultural Practice (GAP) 2010; Sub-decree on Contract Farming 2011; Law on Pesticide and Chemical Fertiliser Control 2012; Law on Agricultural Cooperatives 2013; Agricultural Strategic Development Plan 2014-2018; Agricultural Extension Policy 2015; Financial Services-Related Policies for Smallholders; and a draft of a Law on Food Safety in February 2016 (Nuppun, 2016).

However, smallholders have not been able to access these opportunities. Despite the decrease in the proportion of poor people from 53 percent in 2004 to 20.5 percent in 2011 (Nuppun, 2016), 8.1 million people earn just above the poverty line, set at USD 2.50 per day (The World Bank, 2014), and the majority of the poor and near-poor are farmers (The World Bank, 2015). There is also a downward trend in the annual growth rate of the agricultural sector in this 10-year period, slowing from 5.3 percent in 2004 to 1 percent in 2014 (The World Bank, 2015). In addition, despite the policy support given to agriculture, Cambodia is still a large importer of agricultural products, and interestingly, according to the FAO (2014), vegetables are among the top three imported agricultural commodities in Cambodia. CRDI (2011, p. 6) states that “Cambodia benefits least and is less competitive than the other ASEAN countries in agricultural trade.”

1.2 Rationale for the study

While developing countries focus a great deal of attention on producing cereal crops such as rice and maize, Weinberger and Lumpkin (2007) argued that the diversification of the agricultural sector into vegetables is more beneficial for farmers given their higher value. The World Bank (2015) indicated that there are higher profits in vegetable production in comparison with other crops. In this sense, the vegetable sector has a significant role to play in poverty reduction. In comparison to other crops, it is much easier for smallholders to participate in the vegetable sector as vegetables can be grown in small plots of land and have shorter production cycles (Nuppun, 2016). The Royal Government of Cambodia also has a priority to promote rural incomes through crop diversification which is clearly stated in the fourth angle of rectangular strategy. Based on these arguments, it is important to analyse and quantify the constraints that occur in vegetable value chains to determine possible opportunities for smallholder farmers.

In the case of Cambodia, one would expect smallholders to be competitive in the vegetable value chain. A number of studies have confirmed that Cambodian agriculture has a comparative advantage, due to good soil, weather, water sources, and low labour costs, over its regional competitors (Gunjal, Sheinkman, Burja, Jeong, & Long, 2012; Intal, Oum, & Simorangkir, 2008; Sok et al., 2011). Cambodian smallholders have also received significant support in relation to agricultural technology improvement in the last two decades (Royal

Government of Cambodia, 2011, 2014; The World Bank, 2015). In addition, the government imposes zero tariffs on imported agricultural inputs such as seeds, fertilisers, pesticides and agricultural equipment (Hem, 2012), and does not distort markets through direct interventions associated with input and output subsidies (The World Bank, 2015). Despite this, Cambodia remains a net importer of most vegetable products, suggesting other constraints might limit the ability of Cambodian farmers to successfully meet this growing demand.

This research study will measure the competitiveness of smallholder vegetable producers vis-à-vis imported products, by identifying and quantifying transaction costs incurred in the exchange between smallholders and other key players in the vegetable supply chain in Cambodia, using a case study of tomatoes. The hypothesis of this study is that tomato smallholders in this country face high transaction costs leading to low profitability in tomato production. This reduces the competitiveness of smallholders relative to imported products.

1.3 Research objective and research questions

The main question to be answered by this study is “Why is Cambodia unable to competitively satisfy domestic demand for tomatoes, and is instead reliant on imported products?” To answer this question, the research has three main objectives. The first objective is to understand the structure and practice of tomato value chains in Cambodia. Insights into key stakeholders and their relationship patterns will help in understanding the flow of products and finance, the distribution of benefits among value chain actors, the governance of transactions, and different actors’ roles in adding to or reducing value from the product. The second objective is to quantify the transaction costs that affect the competitiveness of smallholder vegetable farmers. As this study hypothesises that low competitiveness results from high costs which are induced by high transaction costs, it is necessary to identify and quantify these types of costs and analyse their influence on profitability. The third objective is to examine and quantify the role that alternative governance mechanisms could play in reducing transaction costs.

Chapter 2

Literature and the Theoretical Framework

In this section, a review is provided of relevant theoretical and applied literature on value chains to illustrate the issues associated with competitiveness and transaction costs that influence the Cambodian vegetable value chain. The first part provides an overview of Cambodian agriculture and its vegetable sector. The second part reviews the definitions of and relationships between value chain characteristics, competitiveness and governance structures, while the third part is dedicated to discussing in more detail the notion of transaction costs and their theoretical drivers, as well as empirical measurement. The last part is motivated by the use of the policy analysis matrix as a means to quantify transaction cost issues in value chains.

2.1 An overview of the vegetable sector in Cambodia

2.1.1 General background of Cambodia

Cambodia is a developing country where about one-third of its economy depends on agriculture (CDRI, 2011; Dynamic Alliance Consulting, 2011; Gunjal et al., 2012; Sok et al., 2011; The World Bank, 2015; Theng & Koy, 2011; UNDP, 2013). The agricultural sector is responsible for employing around 70% (FAO, 2014; Royal Government of Cambodia, 2014) of the total population of 15.4 million (FAO, 2015). Cambodian agriculture is dominated by smallholder farmers who have less than two hectares of land (FAO, 2014). Because of this, the target of poverty alleviation participated in by development agencies, including the government, is the rural areas, and the agricultural sector is a significant part, at 60 percent of poverty reduction (The World Bank, 2015). Since 2008, agriculture has been promoted and identified as a prominent sector of the government's development strategy (Gunjal et al., 2012).

A common thread in all of these policies in relation to the agricultural sector is the improvement of agricultural productivity and diversification for economic growth and poverty reduction. The government, however, maintains a relatively small budget for the agricultural sector at around 1.5% of total GDP per year (The World Bank, 2011), with much of the support

for agriculture funded by local and international development agencies (FAO, 2014; Intal et al., 2008).

After becoming a member of the United Nations in 1955, Cambodia has subsequently joined both regional and global organizations with the main purpose of promoting trade, especially increasing exports. For instance, it became a member of ASEAN in 1999 and the WTO in 2004. After decades of civil wars, Cambodia reformed its economy along free market guidelines in 1993 (Em, Yutaka, Fukuda, & Kai, 2007). Its major export products comprise of textiles and clothes, rice, rubber, maize and cassava, yet nearly all agricultural products are exported as raw products (Gunjal et al., 2012). However, this country still largely depends on the import of agricultural products, including both fresh and value added products and high value vegetables (FAO, 2014, 2015; Gunjal et al., 2012).

2.1.2 The vegetable sector in Cambodia

Vegetables are considered as one of the agricultural crops (along with staple goods such as cassava, maize, soy beans and mungbeans) that can be grown on small sized farms in Cambodia (Gunjal et al., 2012). Compared to other crops, vegetables in Cambodia have the highest average farm gross margin of US\$ 1,393 per hectare, about five times higher than that of rice (The World Bank, 2015). Given government policies promoting crop diversification, the area of vegetable cultivation and its yield saw an increasing trend from 2005 to 2012, while there was a slight decrease in both planting area and yield from 2013 (Table 2.1).

Table 2.1: Aggregate vegetable production in Cambodia from 2000 to 2014

Year	Cultivated area (ha)	Yield (kg/ ha)	Total production (t)
2000	74,040	64,175	475,150
2001	76,000	62,237	473,000
2002	74,499	63,759	475,000
2003	75,738	63,731	482,685
2004	76,116	63,742	485,179
2005	77,000	62,500	481,250
2006	75,690	63,549	481,000
2007	78,000	62,436	487,000
2008	79,157	63,651	503,847
2009	82,413	63,756	525,436
2010	85,273	63,862	544,569
2011	88,329	63,968	565,022
2012	96,000	65,417	628,000
2013	94,677	64,063	606,533
2014	83,646	64,100	536,170

Source: FAOSTAT, assessed on February 25, 2017

The trade value of all vegetables has been increasing for both imports and exports since 2007. It is notable that the export value of vegetables as a product class¹ are markedly higher than that of imports in the last five years. Imports increased from USD 1,858,519 in 2012 to USD 3,508,638 in 2016. Exports, on the other hand, have grown significantly since 2012 (from USD 8,337,853 to USD 21,431,408 in 2016), with stable to declining levels between 2014 and 2016 (Table 2.2).

Table 2.2: Vegetable trade in Cambodia in a ten-year period from 2007 to 2016

Year	Import	Export
2007	505,607	1,170,974
2008	1,170,974	493,178
2009	2,388,145	1,007,019
2010	1,847,516	835,575
2011	2,531,892	2,531,417
2012	1,858,519	8,337,853
2013	4,199,174	13,076,746
2014	3,434,092	23,379,030
2015	2,109,516	22,475,053
2016	3,508,638	21,431,408

Source: www.comtrade.un.org, accessed on January 18, 2018

¹ Vegetables are defined as products found in Chapter 7 of the Harmonized Schedule for the classification of international trade data.

While the trade in vegetables seems to suggest a change in Cambodia’s status from a net importer to a net exporter, a closer inspection of the data reveals something different. Based on the available data reported by UN Comtrade (Table 2.3), the increase in exports has been driven almost entirely by the significant surge in exports of cassava, which are part of the trade classification in Table 2 but not always considered as a vegetable variety in some reports (FAO, 2014; Nuppun, 2016; SNV, 2014; The World Bank, 2015; Weinberger & Lumpkin, 2007) and in this thesis. By contrast, imports of more traditional types of vegetables have been rising. Among high value vegetables, tomatoes also have a trade imbalance, with no exports and rising imports to meet domestic demand. However, based on UN Comtrade data, the import values are considerably small. Nuppun (2016) reported that there is inconsistency of vegetable data used in reports of different organisations, and there is a large underreported data of both formal and informal trade of vegetables in Cambodia, suggesting a need for the improvement of trade statistics.

Table 2.3: Trade flow and value of specific types of vegetables

Types of crops	Trade flow	Years/ USD				
		2012	2013	2014	2015	2016
Potatoes	Import	3,466	710	163	22,187	19,407
	Export	-	-	-	-	-
Tomatoes	Import	7,368	7,506	15,223	14,227	9,929
	Export	-	-	-	-	-
Onions	Import	422,211	1,227,085	589,091	461,243	1,181,192
	Export	-	-	-	-	-
Cabbages	Import	115,657	265,359	114,615	175,710	467,083
	Export	-	-	-	-	-
Lettuces	Import	6,005	7,648	33,581	16,850	28,097
	Export	-	-	-	-	-
Cucumbers	Import	1,113	1,154	-	-	57
	Export	-	-	-	-	-
Other vegetables	Import	7,591	29,107	62,323	65,691	122,003
	Export	209,461	77,430	43,881	70,243	73,271
Cassava	Import	61	-	13,576	4,767	2,169
	Export	7,779,471	12,989,040	23,290,862	22,379,067	21,333,132

Source: www.comtrade.un.org, accessed on January 18, 2018

2.1.3 General aspects of vegetable value chains in Cambodia

The lack of scholarly work on agri-food value chains in Cambodia is a great challenge for this review, and this is considered an important research gap. Because of this issue, most of the

information collected here is drawn from reports produced by several non-profit organizations (NGOs) working in relevant areas.

Cambodian farmers find it difficult to meet domestic market demand even though Cambodia is situated in a favourable geographic location with good climatic conditions (Chhean, Diep, & Moustier, 2004; Gunjal et al., 2012; Intal et al., 2008; Palada et al., 2008; Sok et al., 2011). The Mekong River is the main water source. The climate is also favourable for planting tropical vegetables given average weather conditions ranging from 25-30 degrees Celsius (Palada et al., 2008). Some possible reasons for farmers having low profits from their vegetable farming are the use of traditional technology (for watering and practice) and vegetable varieties do not match the preferences of domestic consumers (Palada et al., 2008). The agricultural sector in Cambodia in all stages of the value chain lacks domestic investment (Hem, 2012) and Cambodian farmers generally have small plots of land for vegetable production. The high seasonality of domestic vegetable production also reduces competitiveness (Nuppun, 2016; SNV, 2014). However, Palada et al. (2008) pointed out that Cambodian vegetable growers have a huge opportunity to improve their vegetable yields by improving their technology in water management and cultivation practices.

There have been a few reports focusing on the vegetable sector in the Cambodian context in the last two decades. The brief discussion of those value chain studies is provided below.

There is mixed evidence regarding the structure of vegetable supply chains in Phnom Penh, the capital city of Cambodia. According to Chhean et al. (2004), vegetable supply chains in the study area are short, in which retailers directly communicate and coordinate with producers. This indicates an absence of middlemen playing their role in the value chain. Aside from buying domestic vegetables to supply increasing vegetable demand, retailers, and wholesalers in Phnom Penh city, which is the largest vegetable market in Cambodia, need to import vegetables from neighbouring countries. These imports mainly come from Vietnam which supplies up to 91% of the total volume of vegetables sold in Phnom Penh (Chhean et al., 2004).

Kusakabe (2006) found different results compared to Chhean et al. (2004), noting that there are a number of important actors in the vegetable supply chain in Cambodia such as producers (farmers), local collectors, local markets, wholesalers in public markets, retailers with stalls, micro vendors, traders outside public markets and consumers. However, this analysis lacks an

adequate description of the governance structures or types of trading relationships used between actors in this chain. There are a number of challenges which cause poor institutional arrangements in the agricultural sector in Cambodia, including the lack of human resources in cooperatives, limited promotion from government and development agencies, lack of knowledge in running businesses, infrastructure constraints (lack of warehouses and marketing facilities), lack of training in cooperative management, capital constraints for farmers, and low trust from financial institutions or banks (Heifer International, 2011).

SNV (2014) stated that all vegetables in Cambodia are based on the same value chain. This means that all actors are transacting in non-specific vegetables. They trade all type of vegetables that are available and marketable and none of the actors in the vegetable value chain in Cambodia transacts in only a specific type of vegetable. The inconsistency of supply leads to a lack of trust among downstream actors, especially wholesalers which causes considerable reliance on imported vegetables. SNV (2014) also found that all vegetable transactions between actors from upstream to downstream depend on informal relationships.

Nuppun (2016) published the most recent report on the vegetable sector in Cambodia. In this report, vegetables traded in the Cambodian market are mainly from two different channels: domestic products and imported products. In total, these two channels supply around 0.93 million tonnes of vegetables, 56 percent of which are sourced from neighbouring countries and another 44 percent are the domestically produced vegetables. In terms of the value chain actors, it is similar to that which Chhean et al. (2004) has reported. Nuppun (2016) indicated that the vegetable value chain in Cambodia is largely informal and simple by nature and roughly 10 percent of farmers are members of agricultural communities, farmer organizations or cooperatives. Additionally, these institutional arrangements have been found to have weaknesses associated with coordination and failure in linking smallholder vegetables with the market. In relation to contractual arrangements, it is reported that there are no written contracts found in the relationship between all actors from upstream to downstream of the vegetable value chains in Cambodia.

In summary, the above studies present the following reasons for the low profitability of vegetable farming in Cambodia. The use of traditional technology results in low yields, leading to low returns. The inconsistent supplies of domestic vegetables creates needs for imported

products. There is also the considerable challenge faced by farmers because of the absence of market coordination in most parts of the country, or the existing institutional arrangement is inadequate to link farmers to market places.

However, based on this review of the general aspects of the value chain, it is concluded that none of the previous research relevant to vegetable value chains provides a deep discussion in terms of transaction costs and competitiveness. At the same time, there is no consistent view of the vegetable value chains in Cambodia, either. These findings underline the research gap that this thesis aims to fill.

2.2 Theoretical framework

2.2.1 Value chain analysis

The concept of the value chain (VC) was first defined by Porter (1985, p. 36) as *“a collection of activities that are performed to design, produce, market, deliver, and support products.”* Porter’s concept of the value chain was at the level of the individual firm, which seeks to gain competitive advantage by using its primary and support activities to add value in the given competitive structure of its industry. Primary activities are all activities directly associated with the product or service, i.e., inbound logistics, operations, outbound logistics, marketing and sales, and service, while support activities include the company’s infrastructure, technology, human resources and procurement. Porter contends that each activity’s contribution to the firm’s success as well as its linkages with other activities need to be thoroughly understood in order to optimise the firm’s value chain.

Porter’s “five forces model” highlights the competitive structure of an industry as shaped by the ability of new competitors to enter the market, the threat of substitute products, the relative bargaining power of buyers and suppliers, and the degree of rivalry among existing competitors (Miller, 1998). Given this structure, the goal of an individual firm is to develop strategies (cost-focused or differentiation-focused) that position it in a way to maximise its competitive advantage, aligning its value chain activities with these strategies. Moving beyond the individual firm, Porter (1985, p. 34) conceptualises value systems, which represent sequences of a firm’s value chains from raw material to final consumer, which are aligned to deliver value to the end consumers.

In the international development literature (Gereffi & Fernandez-Stark, 2016, p. 7; Gereffi, Humphrey, Kaplinsky, & Sturgeon, 2001, p. 3; Kaplinsky, 2000, p. 121; 2004, p. 80; Kaplinsky & Morris, 2001, p. 4), value chains have a similar definition to the value system used by Porter. A commonly used definition from Kaplinsky and Morris (2000, p. 121) defines the value chain as *“the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use”*. Value chain analysis (VCA) used by development practitioners expands upon Porter by establishing a diagnostic tool for studying the interactions of chain actors among others in developing country markets (Rich, Ross, Baker, & Negassa, 2011; Trienekens, 2011) where systemic competitiveness induced by globalisation is becoming an important aspect to be considered (Kaplinsky & Morris, 2001). Issues of adding value to value chains are combined with an identification of key chain actors (mapping), the assessment of institutional arrangements in the chain (governance), addressing the means of value addition (chain upgrading), and assessing the benefits of chain participation (Kaplinsky and Morris 2000). These four components are also discussed in the six dimension framework for global value chain (GVC) analysis introduced by Gereffi and Fernandez-Stark (2016).

One of the crucial determinants of competitiveness and VC performance is the concept of governance (Kaplinsky & Morris, 2001). Governance refers to institutional arrangements, or coordination mechanisms used by trading parties (producers and buyers) (Gereffi, Humphrey, & Sturgeon, 2005; Williamson, 1979) in their transactions (Humphrey & Schmitz, 2000).

There is a range of theoretical literature discussing governance mechanisms which contribute to VCA. The foundation can be traced back to the new institutional economics literature, with Williamson (1975, 1979, 1985, 1991) as the most influential author, whereas the analysis of global value chains introduced by Gereffi et al. (1994) is situated more in the political economy space and puts more emphasis on the analysis of power relations in the chains, which they see reflected in governance structures (Gereffi et al., 2005; Kaplinsky & Morris, 2001).

Governance forms vary across a spectrum, ranging from simple, market-based forms of transactions that are based on price and availability (*“sharp in by clear agreement, sharp out by clear performance”* (Macneil, 1974, p. 738)), to hierarchies in which activities are

established in one firm, and non-negotiable orders are the main coordination mechanism (Williamson, 1979). Hybrid forms are characterised by a mix of coordination mechanisms, including price and specification negotiations, with both parties involved in decision making. Global value chain analysis basically takes up the notion of markets, hybrids, and hierarchies (vertical integration) and further distinguishes three hybrid forms: modular, relational, and captive (Dolan & Humphrey, 2004; Gereffi & Fernandez-Stark, 2016; Gereffi et al., 2005). According to this research stream, the degree of explicit coordination and power asymmetry between buyers and suppliers is low in market-based governance and increases as coordination needs increase.

Related to the power relationships between smallholders and other actors in value chains, Lee, Gereffi, and Beauvais (2012) developed four trajectories of value chain governance: buyer-driven chains, producer-driven chains, bilateral oligopolies, and traditional markets. Buyer-driven chains refer to relationships in which (private) quality and safety standards are imposed by retailers. This is usually to be found in the large-scale export chains of the large supermarket chains which use contracts with plantations or large-scale farmers, but also smallholder-based production. Producer-driven chains, at the other extreme, have middle actors acting as processors processing products and coordinating the products from producers to consumers, and these processors are responsible for quality and safety issues. This type of chain is commonly found in the transactions of niche products such as high-value bean crops (e.g., coffee, cocoa) and processed foods (e.g., processed tomatoes). In comparison with buyer-driven chains, farmers in the producer-driven chains gain less revenue as they face high levels of competition. They need to compete with other high-value branded products. Bilateral oligopolies are the chains participated in by concentrated producers and retailers in tight relationships coordinated to produce differentiated products for a premium (e.g., fair trade products). Lee et al. (2012) asserted that chains of this type create higher entry barriers for smallholders as they are tightly controlled by intermediaries such as exporters and traders. Farmers in bilateral oligopolies are tightly contracted and controlled by lead firms to enhance the required safety, quality, social and environmental standards. Contracted farmers are heavily reliant on the substantial investment and market assistance offered by leader firms.

Upgrading opportunities are identified as ways to improve the value chain and enhance greater participation in globalised markets (Kaplinsky & Morris, 2001). According to Kaplinsky

and Morris (2001, p. 37), upgrading is based on *“the capacity to innovate, and to ensure continuous improvement in product and process development”*. Four main types of upgrading in the VC: process upgrading, product upgrading, functional upgrading and chain upgrading are distinguished (Trienekens, 2011). Process upgrading is defined as the activities used to increase the efficiency of internal processes (in individual links and the chain as a whole) to make them considerably better than those of competitors (Kaplinsky & Morris, 2001) through the application of superior technologies (Gereffi & Fernandez-Stark, 2016; Humphrey & Schmitz, 2000). An example of this type of upgrading is the reduction of excess inventory or use of faster delivery methods along the value chain (Kaplinsky & Morris, 2001). Product upgrading refers to chain actors or overall chains developing new, value-added products to generate higher profits (Gereffi & Fernandez-Stark, 2016; Kaplinsky & Morris, 2001). Functional upgrading means that actors within a chain, e.g., smallholders, engage in further value adding activities, e.g., processing, to achieve higher profits (Kaplinsky & Morris, 2001). The fourth type of upgrading, chain upgrading, describes the shift to a new sector, where prior skills can be used but higher value is achieved by participating in a new chain altogether (Gereffi & Fernandez-Stark, 2016; Kaplinsky & Morris, 2001).

In addition to mapping the actors, characterising the governance structure, and identifying chain upgrading possibilities for higher competitive advantage, it is extremely important for VCA researchers to understand the income distribution dynamics in VCs to obtain insight into the returns shared among chain actors (Kaplinsky & Morris, 2001). The result of this stage is a calculation of total profit throughout the chain and disaggregating the share of this profit to different actors of the VC. However, such information does not fully capture or quantify the dynamics of the way VCs evolve and change based on new upgrading strategies, investments, or public policies, and limits the ability of VCA to prioritise among different options (Rich et al. 2011). It also does not explicitly measure transaction costs incurred in the exchange of goods and services throughout the value chains, thereby neglecting an important determinant of competitiveness, and not making full use of the potential of their analysis of governance structures. In the following, these gaps in the literature are briefly summarised, before the theoretical foundations of transaction cost analysis and the policy analysis matrix (PAM) are explained.

2.2.2 Knowledge gaps in the VCA literature

While VCA has a range of advantages for researchers, a number of gaps remain in measuring the competitiveness of smallholders in developing countries. Three particular gaps are highlighted. First, VCA is very much a descriptive tool, which lacks the ability to quantify the benefits of participating in a value chain (Rich et al. 2011). Second, and related to the first gap is the inability of VCA to quantify the trade-offs and impacts associated with different policy options (Rich et al. 2011). Finally, and especially relevant for this study, while VCA addresses the role of transaction costs in the analysis of governance, these costs are also not quantified, making it difficult to determine how large or small an influence they have on stakeholder competitiveness. However, transaction costs could potentially play an important role as a constraint on competitiveness in value chains. Therefore, the use of a VCA approach alone is unable to capture detailed pictures of the competitiveness of smallholders in developing countries. In order to address these gaps, it is important to consider (1) enhancing our understanding of the role that transaction costs could play for value chain competitiveness, and (2) mechanisms that could improve our ability to quantify phenomena in the value chain, including transaction costs. In the next sections, more theoretical background on transaction costs and the potential for a policy tool called the Policy Analysis Matrix (PAM) will be discussed as a way of quantifying competitive advantage and transaction costs within the Cambodian vegetable value chain.

2.3 Transaction costs and value chain competitiveness

2.3.1 Theoretical framework of transaction cost economics

Transaction cost economics was originally introduced by Coase (1937, p. 396), who defined transaction costs as *“the cost of using the price mechanism or the full costs of carrying out exchange and include marketing costs”*. Kenneth Arrow (1969, p. 48) defined transaction costs more simply, stating that transaction costs are the *“costs of running the economic system”*. Acknowledging the presence of transaction costs represents a departure from the neoclassical microeconomic theory assumption that economic exchange is costless, as actors are assumed to be fully informed and perfectly rational (homo economics). Transaction cost economics instead postulates that actors are boundedly rational (Simon, 1958), i.e., have limited access to information as well as limited information processing capacity, and behave

opportunistically, i.e. are not only self-interest seeking, but also use guile to pursue their objectives. Parties to an exchange are then required to organise their transactions so that associated transaction costs are minimised. The organisation of a transaction refers to the institutional framework, or governance structure, in which a transaction takes place. Before different governance structures are introduced, the types of transaction costs are explained in the next section.

2.3.2 Types of transaction costs

Williamson (1985, p. 20 *et seq.*) distinguished between *ex ante* and *ex post* transaction costs, where the signing of the contract marks the dividing line. *Ex ante* transaction costs include the costs of “*drafting, negotiating, and safeguarding an agreement*”, which occur prior to the signature. Further costs related to this might be the costs of searching for information or potential exchange partners. *Ex post* transaction costs, on the other hand, include monitoring costs, but also “*maladaptation costs*” (when agreements are not properly fulfilled), “*haggling costs*” incurred in the efforts to realign partner activities with the initial agreement, and “*set up and running costs associated with the governance structures [...] to which disputes are referred*” (Williamson 1985, p. 21). Williamson further stresses the problem of these transaction cost types being interlinked.

In the literature, other classifications have evolved, which use a variety of alternative categories of transaction costs. Hobbs (1997) remained closest to Williamson’s original categories and divides transaction costs into three main categories: information costs, negotiation costs, and monitoring costs. A number of further researchers have adopted this categorisation in their studies (Gong et al., 2007; Royer, 2011; Vakis et al., 2003). Information costs refer to the costs incurred *ex ante* in business-to-business transactions, and these costs also include the costs of searching for price and product information as well as identifying potential buyers or sellers. Access to market information is of particular importance in developing countries as a result of a high level of price uncertainty and increased product specifications (Hobbs, 1997; Vakis et al., 2003). Farmers in developing countries often lack information about the price of products and the required quality standards. This type of information is particularly important for perishable high-value products such as fish, vegetables and grains (Pigali, Khwaja, & Meijer, 2005). Producers in developing countries

especially require information associated with the number of buyers and market demand, due to the fact that the limited number of buyers increases the market power that buyers have in such markets (Vakis et al., 2003). It is also notable that information is costly for farmers in developing countries (Vakis et al., 2003), while in developed countries where the information systems are greatly developed, information cost is lower (Hobbs, 1997).

Negotiation costs refer to costs occurring during business transactions and encompass commission costs, opportunity costs of trading partners for any physical negotiation regarding terms of exchange, and the costs of drafting contracts (Hobbs, 1997). In some countries, informal fees (bribes) might need to be considered as well. Several authors also consider transportation as an important variable to measure negotiation costs (Azam et al., 2012; Hobbs, 1997; Key et al., 2000; Royer, 2011; Vakis et al., 2003). It is argued that transportation costs tend to be high for producers in rural areas due to long distances from markets and poor road conditions, and this cost is influenced by trade frequency (Hobbs, 1997; Vakis et al., 2003). Furthermore, communication costs and opportunity costs of time spent by both parties are also included as a part of negotiation costs (Azam et al., 2012).

Monitoring costs or enforcement costs that arise *ex post* in business exchange concern the costs of ensuring the quality standards, payment agreement, and so forth (Hobbs, 1997). These types of costs can be essential to prevent trading partners from opportunistic behaviour after the agreement. For example, buyers (traders, retailers, or wholesalers) are concerned with the quality of products transported from and delivered by producers (farmers), whereas farmers might face costs to monitor and enforce payment. This means that if there is any damage to products caused by long distance transport, poor road conditions, or poor quality maintenance, buyers might request discounts from farmers. If the responsibility for the failure is not clearly attributable to either party, this can lead to opportunistic behaviour (Hobbs, 1997; Royer, 2011). The longer the distance from the farms to markets, the greater the enforcement costs faced by farmers, particularly if transport time adversely affects quality (Azam et al., 2012; Gong et al., 2007; Hobbs, 1997; Royer, 2011; Vakis et al., 2003).

Other researchers separate transaction costs into two different types: tangible and intangible (Birthal, Joshi, & Gulati, 2005; Cuevas & Graham, 1986). Tangible costs refer to transportation costs, communication costs, legal costs, and so forth, while intangible costs relate to the costs

which are influenced by uncertainty and moral hazard occurring “*when one party is subjected to the hazard that the other party will engage in activities that are undesirable from their perspective, such as shirking, cost cutting or debasing quality.*” (Gow & Swinnen, 1998, p. 334).

This classification implies that tangible transaction costs can be calculated through the actual expenses in the business transactions, i.e., petrol and meal costs for any travel; phone cards used for negotiation or any communication involved in trade transactions with partners; or fees used to employ experts or lawyers for contract enforcement or problem solving. These costs can be easily recorded using invoices or other recording methods. Unlike tangible transaction costs, intangible transaction costs are generally difficult to measure. For example, these could include the time spent by each partner on searching for or screening the most appropriate buyers or sellers; negotiating for better prices to increase profit possibly gained from partners; and monitoring or enforcing partners to ensure that they are reliable. As there is no expenditure recorded for accounting systems, intangible transaction costs seem to be calculated through the estimation of opportunity costs.

Another category of literature also divides transaction costs into two types, but with a different rationale. The first type is called fixed transaction costs, and the second is variable (proportional) transaction costs (Azam et al., 2012; Goetz, 1992; Key et al., 2000; Renkow et al., 2004; Vakis et al., 2003). Fixed transaction costs are the costs required in: (a) searching for a buyer (or market) who can provide the best price, (b) negotiating and bargaining for a better price from buyers and (c) screening (enforcement, bribery and supervision) buyers who wish to buy products on credit to make sure that they are reliable. Fixed transaction costs are invariant to the quantity of the products sold or bought by trade partners (Key et al., 2000). For instance, farmers may have invariant costs related to the search for partners to buy a tonne or two tonnes of vegetables. Variable transaction costs, on the other hand, are proportional to good quantity. Two key determinants of variable transaction costs are distance between exchange partners and transportation costs (Azam et al., 2012; Key et al., 2000).

These three typologies overlap in their use of variables. Because of this, this thesis integrates those main variables encompassing travel cost, communication cost and commission cost and puts them in the framework of Hobbs (1997). In this research, the transaction costs arising in

the tomato value chain can be quantified in three steps: *ex-ante*, during the transaction and *ex-post*.

2.3.3 Drivers of transaction costs

According to Williamson, transaction costs are influenced by three important drivers - the uncertainty surrounding a particular transaction, the level of asset specificity, and the frequency of transactions.

Uncertainty refers to unanticipated changes in circumstances surrounding a transaction (Grover & Malhotra, 2003). A further distinction is made between environmental and behavioural uncertainty. The former includes unpredictable circumstances regarding, among others, the environment, technology, demand volume, or varieties (Grover & Malhotra, 2003), behavioural uncertainty and information asymmetry (Royer, 2011) as well as price uncertainty (Royer, 2011; Wever, Wognum, Trienekens, & Omta, 2012). Behavioural uncertainty, on the other hand, refers to agency problems and particularly moral hazard caused by information asymmetry and the consequential risk of opportunistic behaviour. Moral hazard problems occur after a contract has been signed, when trade parties attempt to take advantage of their partners (Gow & Swinnen, 1998) by not fulfilling the agreed tasks in the agreed quality. The transaction parties are then required to safeguard specific assets (see below), monitor partner behaviour, and eventually enforce the contract – with each of these actions causing transaction costs (Williamson, 1985).

Williamson (1991, p. 281) defined asset specificity as *“the degree to which a relationship-specific asset can be redeployed to alternative uses and by alternative users without sacrificing the productive value”*. Williamson defined six types of asset specificity: (1) site specificity which refers to locations that have positive effects on cost minimization in relation to inventory and transport; (2) physical asset specificity i.e., the specialised tools used in production; (3) human asset specificity, referring to skilled labourers who have been trained for specialised tasks in production (i.e. on-the-job training); (4) brand name capital; (5) dedicated assets, defined as the discrete investment to be flexible at customers’ behest; and (6) temporary specificity which is akin to technological non-separability or a type of specific site which can be temporarily used to complete specific agreements between both exchange parties. Asset specificity can have important effects on investment relationships such as when

the requirement of asset specificity increases in the investment, it increases the need for negotiation between trading partners. This can lead to hold-up problems (Gow & Swinnen, 1998; Wever et al., 2012) caused by partner self-interest seeking *ex-post* adjustments to the contract, especially in terms of price. Thus, safeguarding specific assets incurs transaction costs.

Finally, the frequency of transactions in trade relationships between buyers and sellers is one of the key elements used to categorise the governance structure in the work of Williamson (1979). There are three types of transaction frequency: one transaction, occasional transactions, and recurrent transactions. The focus of transaction cost theory is on occasional and recurrent types (Williamson (1979). Williamson (1985) further postulates that in a comparative static analysis, a given transaction will cause different levels of transaction costs dependent on the chosen governance structure, and that, everything else being equal, the governance structure that minimizes transaction costs should be chosen.

Figure 2.1 illustrates the relationship between uncertainty and specificity on the one hand, and transaction costs as they are moderated by the chosen governance mechanism, on the other. When there is a low degree of required specific investment and a low level of uncertainty, market-based governance *ceteris paribus* incurs the lowest level of transaction costs, while with a high degree of specific investment, the hierarchical form would be relatively favourable with respect to transaction costs incurred. In a medium range of both uncertainty and asset specificity, hybrid structures of various kinds would be the transaction cost minimising governance form (Williamson, 1991).

Market-based structures are generally suitable in the case of commodities. Branded products, at the other extreme, which rely on specific inputs to deliver on their value proposition, will require the brand owner to closely coordinate or even integrate any activities which face high levels of uncertainty. The hierarchy here incurs lower transaction costs because information asymmetry is reduced and specific investments in a brand are safeguarded against opportunistic behaviour (Gow & Swinnen, 1998).

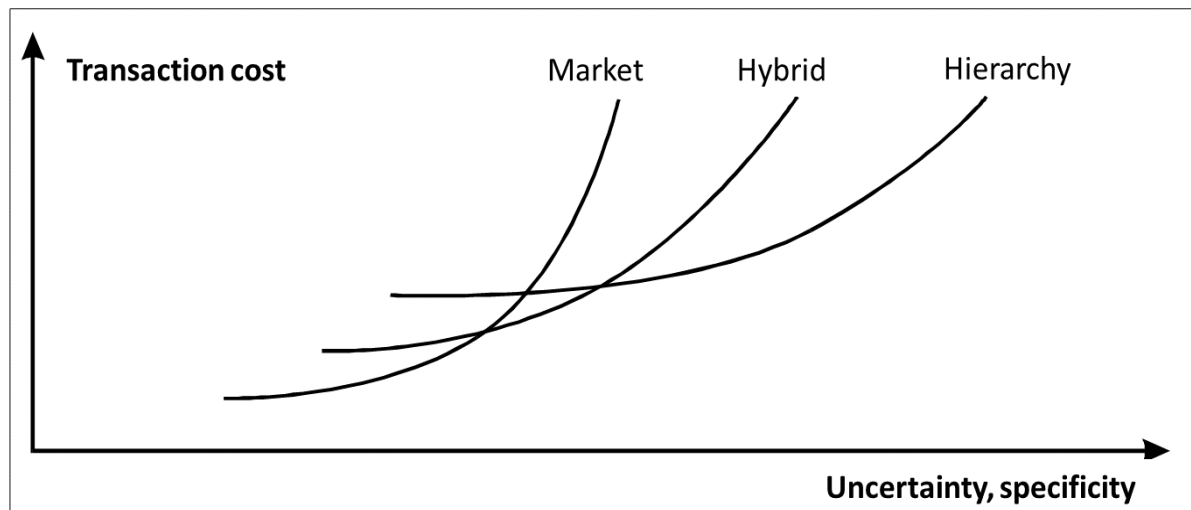


Figure 2.1: Relationship between uncertainty, asset specificity, governance structures, and transaction costs (Williamson, 1991: 284)

2.3.4 Methodologies and key findings of previous research in transaction costs measurement in developed and developing countries

A number of studies have attempted to measure the impact of transaction costs on agricultural markets. However, there is no standard methodology used to measure transaction costs (Royer, 2011). This section will review several of the measures that have attempted to measure transaction costs in the agri-food trade. Roughly, approaches can be classified into qualitative descriptions and quantitative measurements.

Hobbs (1997) conceptualised a method to measure transaction costs incurred in slaughter cattle marketing to identify the factors affecting the choice between liveweight (auction) and deadweight (direct) sales. After classifying transaction costs into three types as shown in the above section (information, negotiation and monitoring costs), she used a Tobit limited dependent variable analysis to estimate the relative importance of those transaction costs. It was the first attempt to collect information about transaction costs in a questionnaire to obtain data on a range of variables.

To measure information costs, Hobbs (1997) collected four main variables: price uncertainty, auction price information costs (measured separately for both marketing channels), direct sale price information costs and product information costs. Negotiation costs are measured for both marketing channels separately, and include transportation costs, transportation efforts,

commission costs, speed of payment, the lack of control over sale orders, risk of non-sale, unequal bargaining power, frequency of auction sales, time spent at the auction, adequate number of buyers and effectiveness of packing plant buyers. Monitoring costs are measured by Hobbs (1997) in terms of shrinkage loss, carcass damage, grade uncertainty, and grade information asymmetry. The result of the study showed that the information costs which had been expected to be high were statistically insignificant due to the presence of strong information sharing systems in the United Kingdom, eliminating price uncertainty. By contrast, negotiation costs and monitoring costs are significant transaction costs that need to be taken into consideration. Gong et al. (2007) built on the work of Hobbs (1997) to study the effect of transaction costs on the decisions of farmers in the beef supply chain in China. The results from their regression analysis showed similar results to Hobbs, namely that negotiation costs and monitoring costs are significant factors affecting farmer decisions.

Royer (2011) measured the magnitude of transaction costs faced by milk producers in their contractual trading with processors in Canada and the United Kingdom. This author used a quantitative approach to quantify transaction costs based on Hobbs's (1997) categorisation. Their study examined two different forms of hybrid governance mechanisms: centralised contracting and decentralised bilateral contracting. Royer (2011) collected data for the study through two methods: interview and survey. The result showed that in the contractual trade, negotiation costs are the lowest transaction costs, and enforcement costs are the highest, whereas there are lower transaction costs in the trade reliant on the marketing board setting. However, the transaction costs arising in both coordination methods are not significant meaning that they have less effect on the competitiveness of the dairy industry. This study indicates the importance of a high level of institutional arrangements in minimizing transaction costs.

Key et al. (2000) elaborated on a model developed by Goetz (1992) to explore the effect of transaction costs on farmer decisions in participation in the corn market in Mexico. They used a structural model to econometrically identify the separate role of two types of variables: fixed and proportional transaction costs. These authors concluded that both types of variables are statistically significant in the estimation of household participation in the market, with proportional costs (transport costs and distance) having more effects on sellers (farmers) than buyers. Their results confirmed that because of high transaction costs, farmers receive lower

profit compared to buyers, putting barriers for smallholders to participate in formal markets. Given that low bargaining power gives farmers low incentives to compete in the market, poor farmers remain stuck in their self-sufficient production.

Renkow et al. (2004) conceptualised a framework to quantify fixed transaction costs faced by maize producing households in Kenya. Using the categorisation proposed by Key et al. (2000) and (Goetz, 1992), and employing a Probit analysis, they found that fixed transaction costs significantly influence the market participation of smallholders, as farmers participate in the market only if the gains from trade exceed fixed transaction costs. Two main factors creating high fixed transaction cost in this case are the distance from farm to markets and their underdeveloped transportation means.

Azam et al. (2012) examined the effects of transaction costs on the market participation of Cambodian rice farmers. These authors also adopted the model introduced by Key et al. (2000) to quantify fixed and proportional transaction costs. It is similar to the aforementioned studies in that the authors highlighted that transaction costs are challenging barriers for smallholders to enter formal markets. The benefits from rice production are mostly obtained by large producers and traders who already have bargaining power in the market. The study also indicates that small-scale farmers face both high fixed and variable (proportional) transaction costs induced by the distance from the market and poor rural infrastructure (road conditions and other physical facilities).

Vakis et al. (2003) mixed Key et al. (2000) and Hobbs (1997) framework to measure the impact of transaction costs on the market choices of Peruvian potato farmers. The authors put the two types of transaction costs (proportional and fixed) classified by Key et al. (2000) into three different stages of transactions (*ex ante*, during the transaction and *ex post*) adopted from Hobbs (1997). The collected data are analysed in two steps. A reduced form conditional Logit market choice model is used in the first step, whereas a semi-structural conditional Logit market choice model is used for the analysis in the second step. The result of this study indicates the significant influence of transaction costs, especially price information and bargaining costs, on market selection made by Peruvian farmers. Vakis et al. (2003) also found that transaction costs are affected by distances of production to market. Farmers in isolated

regions face high costs, and one of the biggest causes for concern is transportation costs when the flow of information does not work well.

Sartorius and Kirsten (2007) attempted to test the influence of trust on government structure (named contract characteristics in their study) by adopting a transaction costs framework in a case study of the Southern African sugarcane and timber industries. They used Williamson’s framework and looked at frequency, asset specificity and uncertainty in different types of contracts: classical contract (informal contract), neo classical contract for specification, neo classical contract for strategic alliance, bilateral relational for formal operation, and unified relational for full vertical integration. This study confirms that the transaction costs are reduced by a high level of trust, and a higher level of trust is built by moving to higher forms of governance structure.

From this review, despite its limitation in the number of studies, it is interesting to note that it indicates a difference in the degree of transaction costs in developed countries and Third World countries. In particular, the studies conducted in developed countries confirm relatively low transaction costs, especially information costs (Hobbs, 1997; Royer, 2011), whereas high transaction costs are faced by smallholders in developing countries (Azam et al., 2012; Gong et al., 2007; Key et al., 2000; Renkow et al., 2004; Vakis et al., 2003).

Table 2.4: Summary of the methods and key findings of previous research on transaction costs measurement

Authors and years	Methods	Key findings
Hobbs (1997)	-Three types of transaction costs: information (ex-ante), negotiation costs (costs of carrying out transactions) and monitoring costs (ex-post) -Using Tobit limited dependent variable analysis -Survey	- Information costs: insignificant - Negotiation costs: significant - Monitoring costs : significant
Key et al. (2000)	-Two types of transaction costs: fixed and variable -Structural model to estimate supply response -Survey	- Fixed transaction costs: significant - Variable transaction costs: significant

Table 2.4 Continued

Vakis et al. (2003)	-Mixed Hobbs' (1997) and Key et al.'s (2000) typologies -Market choice model and equation -Survey	- Information costs: significant ++ - Bargaining costs : significant ++ - Monitoring costs : significant +
Renkow et al. (2004)	-Used Key et al. (2000) typology -Household demand and supply model -Survey	-Fixed transaction costs: significant -Variable transaction costs: NA
Sartorius and Kirsten (2007)	-Used Williamson's framework without each typology to test whether trust significantly influences supply characteristics -Case study approach (qualitative)	-Yes, trust has significant influence on supply characteristics, but it may be No if other factors are considered in the context of developing countries.
Azam et al. (2012)	-Used Key et al. (2000) typology -Heckman type regression model -Survey	-Fixed transaction costs: significant -Variable transaction costs: significant

2.4 The policy analysis matrix

The policy analysis matrix (PAM) was pioneered by Monke and Pearson (1989). A PAM is a computational framework that (a) provides information and analysis to policy makers to measure the competitiveness of agricultural systems at current market prices; (b) estimates social profitability that reflects the opportunity costs of products or inputs used; and (c) measures the effects of policies in creating gaps between the status quo and a more socially optimal situation (Pearson et al., 2003). In this section, the PAM and its use will be explained in general, with a discussion on its usefulness in measuring transaction costs in the next section, following the work of Kydd et al (1997).

The structure of the PAM is illustrated in table 2.5. The first row of the PAM measures profitability (D) for a particular system at private prices (measured at the market prices found in the domestic market) based on revenue (A) minus the costs of tradeable inputs (those traded on world markets such as imported fertilisers) (B) and costs of non-tradeable factors such as labour or services sourced in the domestic market (C). The data in this row include government interventions (both direct and indirect) such as taxes, input subsidies, and so on (Winter-Nelson & Aggrey-Fynn, 2008). The second row measures profitability but at social prices, defined as comparable world prices for tradeable outputs or inputs (Pearson et al.,

2003). Social profit (H) is the result of calculation of social revenue (E) minus the total cost (tradeable inputs (F) and non-tradeable factors (G)).

The values of E, F and, G in the second row can be different from those of A, B, and C (in the first row), depending on policy interventions. The third row in the PAM quantifies the divergence between private and social budgets. All the columns in the third row are the result of the subtraction between those in the first row and those in the second row. The result is that the divergence of revenue (I) in the first column is equal to the private revenue minus social revenue ($I=A-E$); the divergence of tradeable input costs is $J=B-F$; divergences in non-tradeable costs are $K=C-G$; and the divergence in profits is $L=D-H$. If there are no interventions from government in relation to price policies, monetary policy, as well as macroeconomic policies, the value of the divergences will tend to be close to zero. However, if there are imperfections in the market, such as market failures or transaction costs, these divergences would be non-zero.

Table 2.5: Policy analysis matrix

	Revenues	Costs		Profit
		Tradeable Inputs	Non-tradeable Factors	
Private	A	B	C	D
Social	E	F	G	H
Effects of divergences	I	J	K	L

Source: Monke and Pearson (1989)

The PAM can be used to compute several indicators that quantify the severity of policy distortions and compute indicators of comparative advantage. These include the nominal protection coefficient (NPC), real protection coefficient (RPC), effective protection coefficient (EPC), domestic resource costs (DRCs) and net private profitability (NPP). NPC is the ratio of the farm-gate price (private price) and border price (social price) ($NPC=A/E$). The ratio shows the gap between private prices and social prices. NPC is separated into two types: NPC for tradeable outputs (NPCo) and NPC for tradeable inputs (NPCi), where the latter is the ratio of B to F. For outputs, if the value of NPC is less than one ($NPC<1$), the interpretation is that the

production system is taxed by policies, while it is subsidized if NPC is over one ($NPC > 1$); the opposite interpretation holds for the NPC for inputs.

The RPC adjusts the NPC by the ratio of the market exchange rate (e) and the equilibrium exchange rate (e^*), where $RPC = (e/e^*) (NPC)$. This ratio measures the additional influences of the exchange rate on product prices.

The EPC is the ratio of private revenues minus tradeable inputs and social revenues minus socially tradeable inputs [$EPC = (A-B)/(E-F)$]. It indicates the joint effects imposed by policies on both tradeable outputs and tradeable inputs. The interpretation of the EPC ratio value is slightly different from that of the NPC (Pearson et al., 2003). If the EPC value is over 1 ($EPC > 1$), it implies that policy interventions provide incentives for farmers to produce. It might be the result of the implementation of price policies inducing private output prices that are higher than social output prices or the implementation of input subsidy policies to reduce private tradeable input costs. By contrast, if the EPC value is less than 1 ($EPC < 1$), farmers are taxed by policy interventions.

NPP is the ratio of the private revenue minus total private cost [$NPP = A/(B+C)$]. The purpose of this computation is to compare revenue against costs. If the result of the ratio is higher than one ($NPP > 1$), it indicates that there is a financial profitability leading to high incentives for farmers to compete in the market (Adesina & Coulibaly, 1998).

DRC is the ratio of social domestic factors (non-tradeable factors) and social revenues minus tradeable inputs [$DRC = G/(E-F)$]. This calculation measures the comparative advantage of the production system, by addressing whether it is beneficial to promote local production or to import from other countries. If the DRC is less than one, the local production system has comparative advantage meaning that a country saves foreign exchange by producing locally.

A number of researchers have utilised this framework to analyse a range of factors influencing the role of government policies on agricultural production. Nelson and Panggabean (1991) used a PAM to analyse the costs of Indonesian sugar policy. Their results showed that both dry land and irrigated sugar cane cultivation are socially unprofitable, caused by the high opportunity cost of land. This leads to higher input costs compared to cane revenue. However, as the government of Indonesia has instituted price policies that cause the Indonesian

sugarcane price to be higher than the global sugarcane price and input subsidies that result in lower tradeable input costs for sugarcane production, incentives to diversify from other crops to sugarcane are still not an option for Indonesian farmers in Java as the price of sugarcane is lower than that of other crops.

Yao (1997) used this framework to quantify the competitiveness of rice production and other crops in Thailand. PAM results showed that rice has a comparative advantage over soybean and mungbean production as the value of DRC for rice is smaller than that of soybeans and mungbeans. This result is induced by the low non-tradeable factor costs such as the potential of land used in favour of rice, low water costs, and low labour costs found in rice production. However, Yao (1997) highlighted that if the rice price remains in a downward trend in the global market, diversification might lead to more comparative advantage compared to other production systems.

Adesina and Coulibaly (1998) adopted a PAM for the study of the policy and competitiveness of agro-forestry based technologies for maize production in Cameroon. PAM results indicated that maize production under agro-forestry-based systems has a high comparative advantage due to the low costs of both tradeable and non-tradeable inputs. The application of agro-forestry results in high soil fertility through the dominant use of local resources rather than chemicals bought from the market. This implies that agro-forestry techniques are effective to reduce production costs via the utilization of available local resources instead of tradeable inputs. This explains why the DRC value is less than one indicating that adoption of an agro-forestry system for maize production in Cameroon has a comparative advantage.

Fang and Beghin (2000) used a PAM in their study of food self-sufficiency, comparative advantage and agricultural trade in China. Their study showed that labour-intensive crops such as fruits and vegetables have a higher comparative advantage over land-intensive crops (several types of rice). The reason behind this result is that China is a populous country with limited availability of arable land, so labour intensive production systems such as vegetables, tobacco, cotton, and fruits have a comparative advantage over more land-intensive crop systems; i.e., rice and maize.

Mohanty, Fang, and Chaudhary (2002) applied a PAM in their assessment of the competitiveness of Indian cotton production. The PAM analysis indicated that the Indian

cotton production system has a lower comparative advantage in comparison with sugarcane and groundnuts. Without the interventions from the government, cotton producers would not be able to generate profit.

Most recently, Winter-Nelson and Aggrey-Fynn (2008) used a PAM to identify opportunities in the agricultural sector in Ghana. The result of the study showed that both the maize and the rice systems are profitable and contribute to the growth of Ghanaian farmer incomes. Maize production systems have higher levels of profit in comparison with rice production as rice production systems require more inputs such as fertilisers, resulting in higher input costs. Another reason which reduces profits in rice production compared to maize is the downward trend of the global price of rice. With this result, Winter-Nelson and Aggrey-Fynn (2008) encouraged the continuity of the intervention from price policies on rice production even though rice production has lower comparative advantage compared to maize, because rice is one of the dominant products employing a majority of Ghanaian farmers.

This part of the literature review shows that PAM has been widely used, mostly in developing countries, to evaluate a range of factors in a number of agricultural crops. However, none of PAM literature has put this framework into practice relevant to the value chain associated issues, especially transaction costs. This research has identified an essential role of PAM to fill this gap, and the initiation of this usage is discussed in the following sections.

Table 2.6: Summary of previous research using PAM

Authors and years	Main purpose	Key findings
Nelson and Panggabean (1991)	-Analyse the costs of Indonesian sugar policy	-Both dryland and irrigated sugar cane are socially unprofitable (DRC >1).
Yao (1997)	-Quantify the competitiveness of rice production and other crops in Thailand	-DRC of rice < DRC of soybeans and mungbeans suggesting farmers stay focused on rice production.
Adesina and Coulibaly (1998)	-Study of the competitiveness of agro-forestry based technologies for maize production in Cameroon	-DRC <1 suggesting that agro-forestry based technologies for maize production that have comparative advantage be encouraged to carry on.

Table 2.6 Continued

Fang and Beghin (2000)	-Study food self-sufficiency, competitive advantage and agricultural trade in China	-DRC of labour-intensive crops < DRC of land-intensive crops suggesting a considerable focus on labour-intensive crops.
Mohanty et al. (2002)	-Assess the competitiveness of Indian cotton production	-DRC of cotton production > DRC of sugarcane and groundnuts suggesting the diversification.
Winter-Nelson and Aggrey-Fynn (2008)	- Identify opportunities in the agricultural sector in Ghana	-DRC of rice >DRC of maize, but there is encouragement by the author to stay focused on rice production as it plays a significant role in employing the vast majority of Ghanaians. In this case, policy intervention is crucial.

Chapter 3

Research Methodology

As indicated in chapter 2, this study employs two different but complementary frameworks to gain insights into Cambodian farmers' competitiveness in tomato production. First, a standard VCA is adopted that pays special attention to the identification and measurement of transaction costs. Second, based on the results from the VCA, a modified PAM is developed that takes into account transaction costs and governance forms.

3.1 The application of the VCA in this study of competitiveness and transaction costs

The VCA framework conceptualised by Kaplinsky and Morris (2001) is adapted to capture aspects of the tomato value chain. Specific attention is paid to mapping the value chain and analysing the governance structures to assess the types of transaction costs that exist in these value chains.

A stakeholder analysis was conducted at the initial stage of this study. This part of the study captured basic information of the value chain encompassing the number of actors involved in the tomato trade; their location and distances from one actor to others; the infrastructure situation indicating the condition of the road quality which is a possible cause of high transaction costs; means of transportation or product flows; generic activities of the different actors involved in the tomato value chain; gross output values; net output values; physical flows; and information flow showing the communication pattern in the chain (Kaplinsky & Morris, 2001). Adapting the VCA to address the listed information allows the researcher to obtain insight into the potential physical and institutional constraints faced by actors in the tomato value chain. To achieve this, a participatory value chain mapping is essential (Rich et al., 2011).

The second stage of a VCA approach is to analyse the current (and potential) governance structures in different linkages across the value chain. Drawing on the work of Williamson (1979), four important dimensions were used to identify the current governance structure:

contractual patterns, transaction frequency, uncertainty, and level of asset specificity in tomato production investment. Based on these criteria, characteristics, and dimensions of the three main types of governance mechanisms (market-based, hybrid and hierarchy) are identified. In some cases, it is possible that governance mechanisms are not in place in selected tomato value chains. In others, there are different variants of hybrid models in particular. To develop suitable typologies of governance models and their characteristics in terms of the transaction costs faced and incurred in each, the information is drawn from key informants.

This study expands the use of VCA by measuring transaction costs in the governance identification component. The three types of transaction costs classified by Hobbs (1997) are adopted as this framework is suitable for capturing all variables considered by other transaction costs typologies. In the particular governance structure identified based on Williamson, the transaction costs to be quantified are those incurred *ex ante* and *ex post* the transaction decision. The main variables used in this quantification are travel costs including fuel costs and opportunity costs, commission costs and communication costs such as phone cards. In this study, these costs are expected to arise in every transaction from *ex ante* to *ex post*.

However, on reaching this step, the analysis is not yet sufficient to respond to the research objectives. This research has identified another useful approach to improve the quantification of transaction costs. The policy analysis matrix (PAM) can play a critical role in making a complete analysis of competitiveness from the perspective of transaction costs.

3.2 The application of PAM on value chains, smallholder competitiveness, and transaction costs

The PAM framework was initially developed to evaluate public policies (Monke & Pearson, 1989) leading to a wide range of field research in this context (Adesina & Coulibaly, 1998; Fang & Beghin, 2000; Mohanty et al., 2002; Nelson & Panggabean, 1991; Winter-Nelson & Aggrey-Fynn, 2008; Yao, 1997). However, public policy distortions are less important in agriculture nowadays. Nonetheless, the PAM still has some use in looking at other distortions.

Kydd et al. (1997) proposed the use of this approach to analyse transaction costs. They indicated that poor institutions and contractual arrangements are among the issues behind the unequal bargaining power faced by farmers in developing countries. Much of the profits from agricultural commodities are often received by intermediaries or downstream actors, while farmers encounter high costs in their trade relationships. In addition to high input costs (fertilisers, chemicals and capital), high transaction costs resulting from informal institutions are also a considerable challenge and influence competitiveness in developing countries.

Building on the work of Kydd et al. (1997), the PAM is adapted to quantify and integrate the transaction costs that potentially influence the competitiveness of Cambodian smallholders in the tomato value chain. The approach taken here further addresses the role that governance relationships play in affecting competitiveness, incorporating characteristics of different governance modes directly in the PAM. This contributes to the literature on value chains by proposing a new quantitative way of looking at value chain governance. It also adds to the literature on PAMs by demonstrating and quantifying how market structures and institutional considerations influence competitiveness in addition to policy.

The PAM is adapted as illustrated in Table 3.1. As in the original PAM, revenues and costs at private prices are those that currently prevail in the market. Tradeable inputs in this case include fuel, chemical substances (pesticides, herbicides, insecticides, etc.), fertilisers (organic fertilisers and inorganic fertilisers) and other equipment (fixed inputs to be depreciated such as pumping machines, tillers, and others involved in production). Domestic factors or non-tradeable inputs represent the costs of internal factors necessarily used in the production such as land, labour and capital. However, in this PAM, private budgets include various transaction costs. Based on the transaction costs literature reviewed earlier (Hobbs, 1997), farmers face a variety of *ex-ante* costs, costs arising during the transaction, and *ex-post* costs. Because of this, these transaction costs need to be assessed through rigorous field-data collection, and these costs are expected to influence both the price received for output as well as the various input (tradeable and non-tradeable) costs of production. It is hypothesised that the three types of transaction costs (information, negotiation, and monitoring) incur in the transactions of buying the abovementioned tradeable inputs for tomato production and in the costs involved in accessing credit and employing labour. In addition, there are transaction costs associated with the level of physical infrastructure at farm-gates and chain levels that

influence the profitability and competitiveness of farmers. Social budgets, by contrast, do not include transaction costs and are measured in a traditional PAM at social prices.

The adapted PAM further distinguishes between different governance modes that could prevail. While transaction costs create a gap between productions at private prices versus at its social opportunity cost, those divergences might differ depending on the particular type of governance, so that different types of governance might reduce the overall divergences in the system. For instance, using contracts might significantly reduce certain types of transaction costs relative to markets in the provision of inputs or information. It may also raise other types of transaction costs (e.g., negotiating costs, compliance costs). Accordingly, the divergence between private and social prices thus depend on the prospective governance that could be used. This study considers the three main forms of governance from Williamson (1979): spot markets, hybrids (contract farming), and vertical integration.

The adapted PAM is used to measure competitiveness for the different types of governance models, including the use of the PRC, EPC and DRCs as suggested by Kydd et al. (1997). As the focus of the PAM here is not on policy distortions, there are some differences in the interpretation of these results. Two examples of these differences are given below in the context of the EPC and DRC.

Table 3.1: Policy analysis matrix with transaction costs and governance relationships

Governance structures	Revenues	Costs		Profit
		Tradeable Inputs	Non-tradeable Factors	
Private budget				
Private (including TC)	A	B	C	D
Market-based governance	A1	B1	C1	D1
Hybrid governance (e.g., contracts)	A2	B2	C2	D2
Vertical integration	A3	B3	C3	D3
Social budget				
Social	E	F	G	H
Market-based governance	E1	F1	G1	H1
Hybrid governance (e.g., contracts)	E2	F2	G2	H2
Vertical integration	E3	F3	G3	H3
Effects of divergences				
Status quo (including TC)	I=A-E	J=B-F	K=C-G	L=D-H
Market-based governance	I1 = A1-E1	J1=B1-F1	K1=C1-G1	L1=D1-H1
Hybrid governance (e.g., contracts)	I2 = A2-E2	J2=B2-F2	K2=C2-G2	L2=D2-H2
Vertical integration	I3 = A3-E3	J3=B3-F3	K3=C3-G3	L3=D3-H3

Source: Adapted from (Monke & Pearson, 1989) and Kydd et al. (1997)

The EPC is the ratio of private revenues (A) minus private tradeable input costs (B) and the minus of social revenues (E) and social tradeable input costs (F) [$EPC=(A_n-B_n)/(E_n-F_n)$], where n is the number indicating type of governance. In this framework, the ratio measures the influence of transaction costs occurring in both farm-gate price and private tradeable input costs under different governance forms. If there is no policy intervention and if the value of EPC is less than one, it can be interpreted that high transaction costs lead to the divergence between the private budgets and social budgets causing low efficiency in the tomato production system under a specific governance mode. In this situation, alternative governance structures might help to reduce transaction costs. If the EPC value is over one, the current governance structure is efficient, although it is possible other systems might lead to better outcomes. If the EPC value is equal to one, there is no difference between the current structure and higher forms of governance in terms of transaction costs.

Likewise, the domestic resource costs (DRC) measures the comparative advantage of tomato production. In this context, the DRC is the ratio of the non-tradeable input costs divided by the subtraction of output price and tradeable input costs [$DRCs = G_n / (E_n - F_n)$], and this ratio is computed in each governance structure in the social budgets. In different forms of governance, there might be differences in the value of the DRC. If the value of the DRC is less than one, it indicates that tomato production in Cambodia under a given mode of governance has a comparative advantage over the import of vegetables. If DRC is over one, there is no comparative advantage in tomato production in Cambodia. In this situation, this suggests that certain modes of governance may be more or less efficient than relying on imports.

3.3 Research design and data collection

3.3.1 Commodity selection for the study

Tomatoes were selected for the study based on their importance for the Khmer people and their high market value compared to other vegetables grown in Cambodia (Chhean et al., 2004; Genova, Weinberger, Sokhom, Vandy, & Yarith, 2006; McNaughton, 2006). It is also interesting to select tomatoes for the case study as, even though there is high demand for them for daily food consumption and they have a high market value, tomatoes are among those vegetables that have significant imports (Chhean et al., 2004; Nuppun, 2016; SNV, 2014). As the sources of data associated with tomatoes and other vegetables in Cambodia are inadequate and outdated, the researcher has also carried out a quick market observation to confirm that tomatoes are matched to the criteria above.

3.3.2 Study areas

This study focuses on the regions of Cambodia that have a high percentage of small-scale tomato growers. However, there is a lack of secondary data showing the volumes produced by region. Given the focus of the study on market competitiveness, it is important to consider regions based on their distance from the main markets (Phnom Penh capital city) and distance from borders with neighbouring countries (Thailand and Vietnam). Based on these criteria, two provinces among the twenty-five provinces of Cambodia are selected: Battambang province and Kandal province. Battambang borders Thailand, and is 291 km away from Phnom Penh (Phnom Penh Capital Hall, 2017). Kandal, on the other hand, is the closest to the largest

vegetable market (Phnom Penh) at 11 km (Phnom Penh Capital Hall, 2017), and also close to Vietnam (see Figure 3.1).



Figure 3.1: The map of Cambodia (The United Nations, 2004)

3.3.3 Data collection methodology

A mixed method approach combining informant interviews, focus group discussions, case study and quantitative analysis through the use of a PAM is applied in this research.

3.3.3.1 Key informant

Data collection from key informants was through semi-structured interviews using open-ended questions. However, the interview was conducted as a conversation in association with the topic facilitated by the researcher. The key informant interview is an important method used to collect specific information from key people in target areas of the research (Chambers, 1997). For this study, general information regarding the geography of the study zone, production conditions, and target respondents (tomato farmers) is needed. The key informant

approach plays a crucial role in capturing social budgets for PAM analysis. The key informants selected in this case are the Ministry of Agriculture, Forestry and Fisheries (MAFF); provincial departments of agriculture; local authorities (provinces, districts, communes and villages); and NGOs. This method is also important in collecting data from actors in the value system such as vegetable middlemen, retailers, and wholesalers. The detailed number of respondents is shown in Table 3.2.

3.3.3.2 Focus group discussions

According to Hennink (2014), focus group discussions help to identify key characteristics of specific issues through an active, participatory discussion with a predetermined group of people. In comparison with structured interviews whereby questioners take the lead with passive interviewees, a focus group discussion allows researchers to collect in-depth information from the active participation of participants. Because of this, there is now a wide use of this approach across multiple disciplines (Hennink, 2014).

Focus group discussion is the main data collection method in this research. This approach was conducted with specific tomato farmers to collect data required for the VCA and PAM. A snowball approach was appropriate to select respondents. With consultation with local authorities, the researcher scheduled meetings for collecting data, and farmers indicated by key informants were invited to participate in the focus group meeting. The number of focus group meetings conducted depended on the confirmation of data sufficiency for an analysis. The three group meetings per province based on the location (near, middle distance, and far from provincial markets) due to the limitations of time and budget provided sufficient information concerning private budgets (farm-gate prices) relevant to value chain stakeholders, tradeable input costs, non-tradeable input costs, output prices, and transaction costs involved in these aspects. To ensure that the data required for the analysis were sufficient and appropriately collected, data collection manuals consisting of question checklists, facilitation methods, and data templates were designed in advance (see annexes).

3.3.3.3 Case study

Yin (2009, p. 18) defined a case study as an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context. This author points out that this approach

is generalizable to theoretical propositions; however, it cannot be used for the generalization of the populations. The number of cases ranges from a single case to multiple cases. A single case is also accepted, but a larger number of cases (multiple case study) represents replications that allow for theoretical framework development (Ellram, 1996; Lewis-Beck, 2004; Yin, 2009).

In this research, the case study is useful to capture aspects of alternative models of agricultural business which have been introduced in Cambodia to deal with smallholder competitive issues. The cases were selected as a result of a snowball approach with focus groups and key informants. This means that information concerning the cases to be investigated has been provided by tomato farmers, NGOs as well other stakeholders. As shown in Table 3.2, three cases have been selected: 1) the case study of the use of formal contracts between a sponsor and smallholders, 2) the case study of the higher form of institutional arrangement (compared to the current conventional practice) between a sponsor and smallholders depending on informal contracts, and 3) the case study of another business model named by the project as a “partnership approach”.

3.3.3.4 Selection of respondents

There are nine categories of respondents identified for this research: representatives from the Ministry of Agriculture, Forestry and Fishery (MAFF), local authority (commune chiefs), NGO officers or other stakeholders working in the area of the tomato value chain, vegetable importers or wholesalers, input importers or wholesalers, vegetable retailers, input retailers, tomato smallholders and those from relevant projects working in the field of agricultural contract farming. As shown in Table 3.2, the total number of respondents was 146 persons, and the majority of the respondents were tomato smallholders who participated in the focus group discussions. More specifically, there are three focus groups conducted in each province (Battambang and Kandal provinces), and each focus group targeted 15 participants. In relation to other target respondents, the information and data were collected from semi-structure interviews via face-to-face methods or phone interviews flexible to the real situation in the period of data collection.

Table 3.2: The number and categories of respondents in this study

N.	Types of respondents	In Battambang	In Kandal	In Phnom Penh	Total
1	MAFF	1	1	1	3
2	Commune chiefs	3	3	0	6
3	NGOs/ Stakeholders	3	3	3	9
4	Vegetable wholesalers	4	0	4	8
5	Input importers	3	0	3	6
6	Vegetable retailers	5	5	5	15
7	Input retailers	3	3		6
8	Tomato smallholders ²	45	45	0	90
9	Alternative contract farming projects (outside or inside target areas of the study)				3
Total respondents					146

Source: Computations done by the researcher

3.4 Data analysis

This thesis consists of two main types of data: qualitative and quantitative data. The qualitative data are associated with the description of relationship patterns through the classification of governance structures responding to the first main objective. The analysis for this is based on the value chain maps conducted with focus groups and key informants in relation to social budgets.

The quantitative data are mostly associated with the PAM analysis. Data collected from the focus group discussion and key informants were recorded in the templates. It was then entered into Excel worksheets of both private budgets and social budgets quantified through various governance structures.

Additionally, all information used from the secondary data analysis are cited using the APA style as specified in the Lincoln University style manual.

² The number of smallholders is counted from the focus group participants. In this research, three focus group discussions with 15 participants in each group have been conducted in each province (Battambang and Kandal provinces).

3.5 Ethical considerations

According to the guidelines of Lincoln University Human Ethics Committee (HEC), “interviews with professional persons in the areas of their duties and competence and non-interactive observation of these people in the course of everyday life do not come under the scope of HEC review”. This means that there was no requirement for HEC approval for this research which is to be conducted through two main data collection methods: key informant interviews and focus group discussions with selected tomato value chain stakeholders in Cambodia. Nonetheless, participation in this study was voluntary and respondents were free to not answer specific questions or participate in the interview if they chose. The names of respondents were not identified in any part of the research, and the information collected was kept confidential and secure. The researcher requested permission from participants in advance in case voice recordings were necessary, and these were also kept confidential.

3.6 Human and safety considerations

This research was conducted to comply with Lincoln University Health and Safety Protocols. Necessary first aid was prepared and carried each time during field data collection. There was no travelling at night, and every trip by motorbike used a helmet that was compliant with Cambodian traffic laws. All valuable items such as mobile phones and laptops were securely kept. The researcher avoided sensitive discussions related to political issues which could lead to serious arguments during the focus group discussion. All materials produced in the data collection process from focus groups were promptly recorded on Excel worksheets prepared in advance to avoid any losses and to confirm their sufficiency for analysis. The data were regularly and securely backed up using Cloud or other online storage sources.

Chapter 4

Value chain structures and governance: Results and discussion

4.1 Overview

This section illustrates the competitiveness issues faced by Cambodian smallholders as a consequence of the aforementioned analytical framework. The section starts with a description of the general situation of the tomato market and the roles played by smallholders. This is followed by a description of the tomato value chain using the two main tools of value chain analysis: value chain mapping and an assessment of governance mechanisms. From this, the types of transaction costs found in identified governance mechanisms are analysed, based on existing chains and alternative structures that are being proposed. These will be used as a backdrop for the evaluation of alternative value chains by means of the PAM in Chapter 5.

4.2 Seasonality of the tomato value chain and tomato smallholder producers in Cambodia

Based on data collected from focus groups and key informants, tomatoes are seasonal fruits in both the research target provinces: Kandal and Battambang provinces. The favourable months of the year for tomato production are from November to March as the weather during this period is not too wet and not too hot, inducing higher yields compared to off-seasons. It is reported by focus groups that a major problem faced by farmers growing tomatoes out of this period is the high risk of crop damage caused by diseases. As a result, Cambodian-origin tomatoes have a short period in the market. From March to October, tomato farmers engage in crop rotation, changing from growing tomatoes to other types of vegetables such as Chinese kale, cucumbers, egg plants, long beans, lettuces, etc.

Since domestic tomatoes are highly seasonal, the domestic demand for this type of fruit can only be met by importing from other countries at certain times of the year. Based on the information given by vegetable importers, the largest percentage of imported tomatoes available in Cambodia comes from Vietnam, at around 90 percent, followed by tomatoes

imported from Thailand, at around 10 percent. Notably, those imported from Vietnam are year round, while tomatoes imported from Thailand are seasonal as well.

Focus groups have also reported that there are dramatic price fluctuations in the tomato market, which have serious effects on their profitability. High prices for domestic tomatoes are only received by a small percentage of tomato smallholders at the beginning of the harvesting season, while the vast majority of smallholders receive low prices during the peak harvesting season. Indeed, focus groups have reported that when the prices are too low in some production cycles (including two of the past five years), some smallholders decide not to harvest tomatoes and keep them rotting on their farms.

4.2.1 Tomato value chain maps in Battambang and Kandal

This section gives descriptive results of the Cambodian tomato value chain. Figure 4.1 presents the map of the value chain for tomato smallholders engaged in Battambang province, while figure 4.2 shows the map for Kandal province. Owing to their different geographical locations, there are differences between input and output flows in Battambang and Kandal provinces. In both cases, however, it is important to note that nearly all inputs used in domestic tomato production are imported from neighbouring countries including Thailand and Vietnam.

In Battambang province, input wholesalers import inputs directly from Thailand, making up about 30 percent of total wholesale tomatoes in the province, and make purchase orders to other Vietnamese input providers from those Phnom Penh who also have roles as input wholesalers and retailers. There are four input wholesalers who specifically supply a range of agricultural inputs to the main Battambang provincial market, and they supply inputs to three types of buyers: input retailers who sell mixed products in the Battambang provincial town, input wholesalers who also act as input retailers located in district markets, and input retailers in communes.

Input wholesalers in district towns buy all types of inputs from wholesalers in the Battambang provincial town, and they sell to retailers in commune markets which supply between five and 15 villages (from 30-150 families in each village and each household has around five members) in each commune and sell directly to farmers who mostly live near the district town. There are one or two input wholesalers in each district town.

Input retailers in communes sell inputs bought from two main channels: 20 percent from district wholesalers and 80 percent bought directly from wholesalers in the provincial town. Their target buyers are vegetable farmers. Notably, only input retailers whose stores are located far from the provincial town buy inputs from district wholesalers. Otherwise, they buy directly from the wholesalers in the provincial town.

Farmers buy their necessary inputs used in tomato production encompassing seeds, chemical fertilisers, pesticides, trellises, and strings from three types of suppliers: 10 percent of them buy directly from provincial market retailers, 10 percent buy from district retailers, and 80 percent of them buy from local retailers in their commune. The majority of farmers buy inputs from local suppliers who allow farmers to obtain inputs on credit based on their trust-based relationship. The condition used in this on-credit buying is that the input retailers in their commune do not charge the 3 percent interest per month if farmers repay the full amount of money within 30 days. Focus groups reported that most farmers who buy inputs on credit pay off their debts when they receive cash from a completed sale of their tomatoes.

Farmers depend on three sources of finance, including 50 percent from their own savings (own financial capital), 40 percent from microfinance organizations, and another 10 percent from private lenders. In the case of loans borrowed from microfinance organizations, it is compulsory for farmers to have collateral such as land or house titles. The interest rates are applied differently depending on loan sizes, with the maximum interest rate being 18 percent per year which complies with the sub-decree (Prakas) issued by the Cambodian national bank on March 13, 2017. If the loan size is lower than USD 10,000, the maximum interest rate is applied. It was reported that all smallholders participating in the focus group discussion obtain loans in amounts less than USD 10,000. The majority of smallholders borrow around USD 1,500 for a period of up to 10 years, but less than 30 percent of the total loan borrowed is used for tomato production. The rest is used for other seasonal rotational crops throughout the year and household needs. Smallholders face much higher interest rates up to 30 percent per week for loans received from private village lenders. However, the amounts borrowed from private lenders are only for household emergencies and average around USD 300.

There are five important downstream chain actors in Battambang: vegetable collectors, vegetable wholesalers in the provincial town, retailers in provincial town markets, retailers in

district towns and small retailers in communes. In Battambang, the number of collectors varies depending on the distance of farms to the provincial town. The further the distance from town, the fewer the number of collectors. For example, in Thmor Korl, which is about 20 km from the provincial town, there are approximately 15 vegetable collectors, whereas in Moug Reusey district, about 50 km away, the number of vegetable collectors is irregular and few, usually fewer than five. It is also interesting to note that the number of collectors is also related to vegetable prices. When vegetables fetch high prices, the number of collectors increases and vice versa. Noticeably, all collectors not only buy tomatoes, but buy most of the available vegetables in their zone. Collectors transport and sell vegetables collected from farmers to two target buyers: 60 percent to wholesalers in the provincial town and 40 percent to medium-scale retailers (or small-scale wholesalers) in their district town.

None of the wholesalers solely trades tomatoes in Battambang. Fieldwork discussions and observations reveal that they sell at least three types of vegetables in their wholesale stores. Because tomatoes supplied by Cambodian farmers are seasonal, wholesalers trade imported tomatoes throughout the year even in the season when Cambodian tomatoes are available. There are two main wholesale markets in Battambang: Beung Chhurk market where around 10 wholesalers are involved in the tomato trade and Phu Puy market where there are around 15 wholesalers who also trade tomatoes. The quantity of tomatoes purchased per wholesaler fluctuates from 500 kg to 1,500 kg per day depending on the availability and prices of other substitute vegetables. Wholesalers make a low daily purchase order for imported tomatoes and increase the purchase order for other vegetables if there is a chance of gaining better profit. Wholesalers in Battambang became involved in trading tomatoes imported from Vietnam more than those imported from Thailand and more than the local tomatoes due to their year-round availability and quality (shape, colour, less amount of damage, etc.). Thai tomatoes are also seasonal in nature. Wholesalers in Battambang buy Vietnamese imported tomatoes from wholesalers in Phnom Penh and vegetable wholesalers in the provincial town sell tomatoes to two types of buyers: vegetable retailers in markets around the provincial town and medium-scale retailers (small-scale wholesalers) in districts.

It is important to note that all wholesalers in Battambang trade both domestic and imported tomatoes (or other vegetables). Unlike this, in Phnom Penh, some wholesalers do not trade in domestic vegetables because of seasonality, while some are trading both. Those who trade in

both domestic and imported tomatoes are also flexible and check the prices before making any decision to trade or purchase. In the off-season for domestic tomatoes, they check the prices of Thai and Vietnamese tomatoes. If either of these can be supplied at a lower price, the wholesalers increase their purchase orders quickly. The wholesalers in Battambang sometimes do not make purchase orders to Phnom Penh wholesalers for Vietnamese tomatoes if the Thai price is very competitive (equal or lower). But, this situation is rare. Wholesalers in Phnom Penh cannot escape from trading in Vietnamese tomatoes, and some of them are not even involved in other types of tomatoes.

Vegetable retailers in markets in the Battambang provincial town buy all types of vegetables from vegetable wholesalers, and they sell to final consumers who are commonly the people living in the town. The volume of tomatoes bought for retail sale per retail store ranges from 20 kg to 50 kg per day for imported tomatoes. The prices of tomatoes are the equilibrium prices and commonly change every day. From observation, there are the same tomato retail prices from one store to the next in the same market, and there are slight differences in different markets in the provincial town.

Medium-scale retailers in the districts buy tomatoes from two main sources: 40 percent from vegetable collectors and 60 percent from the wholesalers in the provincial town. The majority of tomatoes in their stores are imported products, even in the season when Cambodian tomatoes are available. Based on the information given by retailers, medium-scale retailers have business transactions with every wholesaler in the town, and they buy different types of vegetables from two or three wholesalers, with purchases per vegetable type ranging from 30-50 kg a day. This type of actor sells 40 percent of tomatoes to final consumers living in or near the district town, and 60 percent of tomatoes are distributed to commune retailers or grocery vendors. It is reported that a majority of Cambodian tomatoes available in the medium-scale retail stores is sold directly to final consumers. In this sense, almost 100 percent of tomatoes distributed to commune retailers are imported products so that final consumers in villages rarely consume local tomatoes.

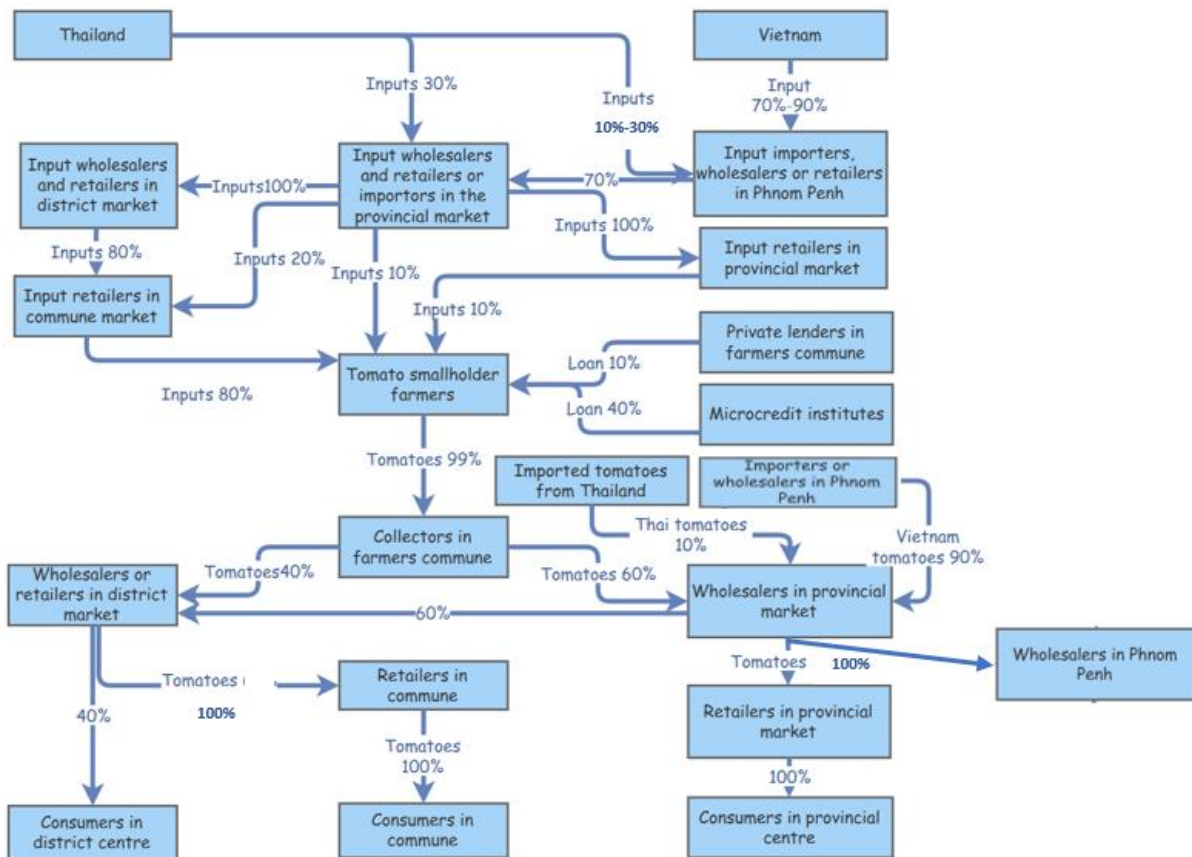


Figure 4.1: Value chain map³ for tomatoes in Battambang Province (based on primary data)

There are some notable similarities and differences between the tomato value chain in Kandal province and Battambang province in both the input and production side (upstream) and output side (downstream) (see Figures 4.1 and 4.2). On the input side, nearly 100 percent of inputs used for tomato production are imported products, with the exception of financial capital. Concerning the output side, domestic tomatoes produced by Kandal and Battambang farmers still need to compete with imported tomatoes. The main differences between the two regions are on how certain chain actors engage in exchange, thus inducing some different flows of inputs and outputs.

There are four main actors on the input side including wholesalers in Phnom Penh, medium-scale retailers in the provincial town (Ta Khmau), input retailers in communes and farmers, the final users. Input wholesalers in Phnom Penh import 70-90 percent of inputs directly from Vietnam and the remaining 10-30 percent from Thailand. These inputs are further distributed

³ The percentages indicating flows are those of products or services receivers, users or buyers. For example, tomato smallholders receive inputs from three sources: 80 percent of those inputs from commune distributors, 10 percent from wholesalers in the provincial town and the rest 10 percent from retailers in the provincial town.

to medium-scale wholesalers in the provincial town and wholesalers in districts, for whom this is the only purchasing channel. Inputs are then resold to medium-scale wholesalers in more distant districts. It is noticeable that most districts in Kandal province are farther from Phnom Penh, the capital city compared to Ta Khmau town. Because of this, 70 percent of medium-scale input wholesalers in districts directly trade inputs with the large-scale wholesalers in Phnom Penh to supply to retailers in communes whose stores are nearest to the tomato producers. A similar story emerges with wholesalers in districts due to the distance to the capital city, with about 30 percent of input retailers in communes maintaining direct trade relationships with the wholesalers in Phnom Penh, whereas 70 percent of them still find it more profitable to receive inputs from medium-scale wholesalers in their own district.

The majority of farmers buy basic inputs such as tomato seeds, chemical fertilisers, pesticides and strings from local suppliers in the commune, at around 80 percent of inputs used in their farm, and the remaining 20 percent of inputs can be directly bought from district markets and the capital city, 10 percent and 10 percent respectively. In relation to financial capital, the processes are similar to those in Battambang, but there is a slightly lower number of loan borrowers. The estimation from focus groups is that 35 percent of smallholders depend on loans for their farming activities, whereby 30 percent of them use loans from microcredit institutes and only 5 percent of them have experience in using loans from local private lenders.

From observation, the output side in the downstream part of the chain in Kandal province is similar to the case in Battambang as well. About 99 percent of domestic tomatoes are commonly collected by local collectors to supply to wholesalers in Phnom Penh capital city. In the short growing season that domestic tomatoes are available in the market, wholesalers in this capital city still import tomatoes from Vietnam and Thailand in the same quantity or slightly lower quantity to supply to the large tomato demand in Cambodia.

There are around 20 wholesalers who are involved in the tomato trade in two main markets in Phnom Penh capital city such as Neak Meas market and Psa Derm Kor market. These wholesalers supply both domestic and imported tomatoes to retailers around Phnom Penh capital city, whereas only imported tomatoes from Vietnam, which are the dominant tomatoes in Cambodian markets are supplied to Battambang and other provinces across the country. Similarly to Battambang, retailers in the main markets have a trading relationship

with nearly all wholesalers to buy different types of vegetables. Excluding other types of vegetables, retailers go to buy and transport tomatoes from wholesale stores. They sell between 10 and 50 kg per day, and transactions are based on market prices which change daily.

Generally, vegetable retailers in district towns buy only imported tomatoes from their district wholesalers to supply commune retailers and sell at retail prices to their local consumers. These actors have less involvement in the domestic tomato value chain.

The information collected from the value chain mapping is vitally important for the analysis at further stages. All actors of the chain are clearly shown; the flows of their communication and products are detected; and important information relevant to each linkage is clearly understood and described.

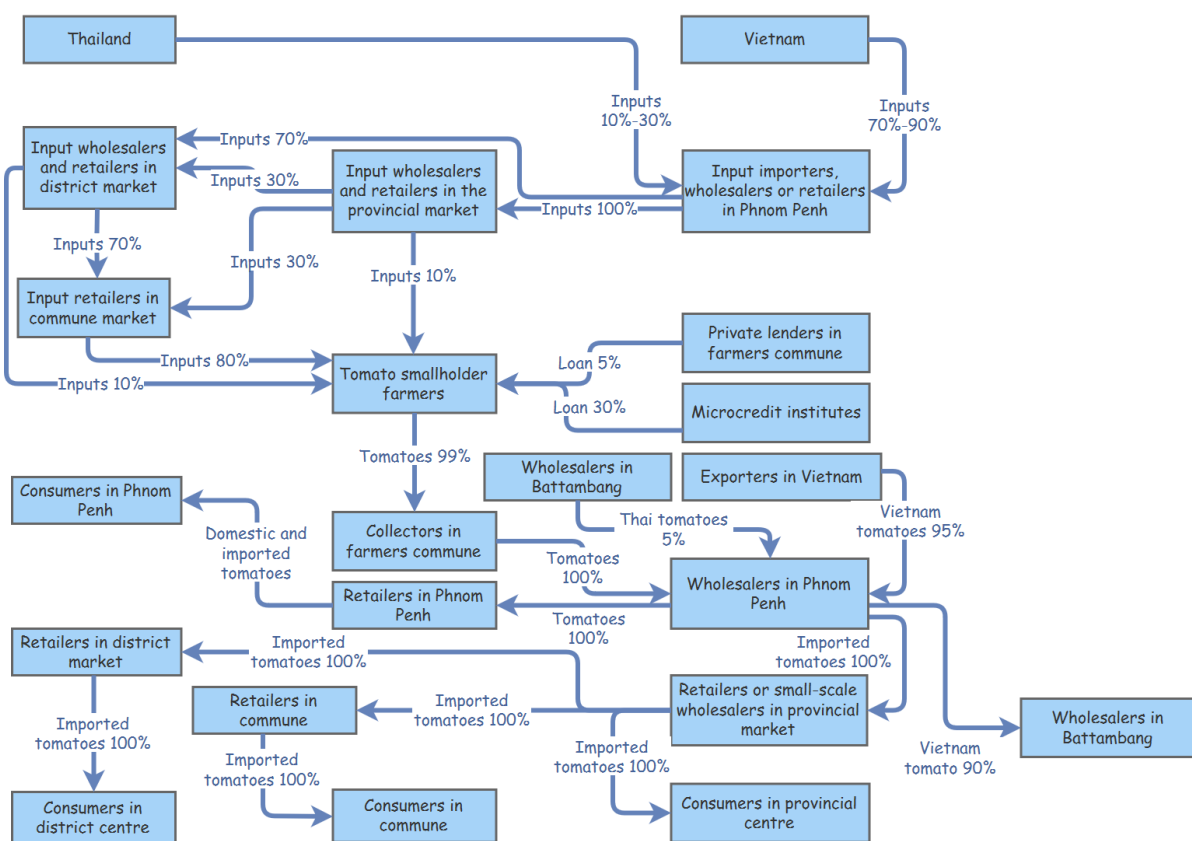


Figure 4.2: Value chain map⁴ for tomatoes in Kandal Province (based on primary data)

⁴ The percentages indicating flows are those of products or services receivers, users or buyers. For example, tomato smallholders receive inputs from three sources: 80 percent of those inputs from commune distributors, 10 percent from district distributors and the rest 10 percent from retailers in provincial town.

Table 4.1 illustrates the summary of activities of all actors in tomato value chains in both Kandal and Battambang provinces. This list of activities indicates that tomato smallholders have the greatest number of linkages with other value chain actors as compared to other actors throughout the value chain. They interact with both actors in the input and output sides of the market.

Table 4.1: Summary of actors' activities of domestic tomato value-chain actors

Actors	Activities
Input wholesalers in provincial towns or in Phnom Penh city	<ol style="list-style-type: none"> 1. Make purchase orders with exporters from neighbouring countries 2. Transport products from exporters 3. Warehousing 4. Transport and deliver products to distributors in districts
Input medium-scale retailers in districts	<ol style="list-style-type: none"> 1. Check input inventory 2. Make purchase orders to wholesalers in Phnom Penh for Kandal province or in Battambang town for Battambang province 3. Warehousing 4. Sell inputs to retailers in communes
Input retailers in communes	<ol style="list-style-type: none"> 1. Travel to buy and transport inputs 2. Warehousing 3. Sell inputs to final consumers
Tomato smallholder farmers	<ol style="list-style-type: none"> 1. Travel to buy inputs from retailers in communes, districts and in the provincial town 2. Plant tomatoes 3. Maintenance until harvesting 4. Search for price 5. Seek collectors by phone call and travel to collectors' houses to discuss prices 6. Harvest tomatoes 7. Grade tomatoes into different quality 8. Pack in 10-kg plastic bags and weigh them
Vegetable collectors	<ol style="list-style-type: none"> 1. Observe the quality and quantity of vegetables 2. Check the market prices with wholesalers 3. Bargain price with farmers 4. Buy and transport tomatoes to wholesalers' store
Vegetable wholesalers in Phnom Penh or in Battambang provincial town	<ol style="list-style-type: none"> 1. Store tomatoes in the wholesale stores 2. Clean and take the damaged tomatoes out of the plastic bags 3. Sell tomatoes at wholesale prices to retailers
Vegetable retailers in Kandal provincial town	<ol style="list-style-type: none"> 1. Travel to buy and transport tomatoes from wholesale stores 2. Store tomatoes in wholesale stores 3. Carry out wholesale and retail

Table 4.1 Continued

Vegetable retailers in districts	1.Travel to buy and transport tomatoes from wholesale stores 2.Store tomatoes in wholesale stores 3.Carry out wholesale and retail
Vegetable retailers in communes	1.Travel to buy and transport tomatoes from wholesale stores 2.Store tomatoes 3.Sell to final consumers

Source: Primary data from focus groups, key informants and observation

4.3 An assessment of current governance mechanisms identified in domestic tomato value chains in Battambang and Kandal provinces

After the specific linkages are identified and shown in the aforementioned value chain maps, the next stage of analysis is to investigate the type of governance structure in each linkage. The observed types of governance forms are summarized in Table 4.2 based on the typology of governance structures from Williamson (1979). This analysis is based on Williamson's three transaction cost dimensions and the other two key aspects: relationship characteristics and opportunism. The overall result of this section indicates that all relationships between actors across the value chain are reliant on the market-based structure of interaction i.e., those mediated by price.

Starting with the relationship between input importers (wholesalers) and provincial distributors, the form of governance here is considered as a market-based structure. This relationship is reliant on what Williamson terms a "classical contract" due to several identified attributes such as verbal agreement for every exchange, the use of market prices which is widely known by both parties and the absence of a third party. The purchase agreement is simply made when the provincial distributors make purchase orders mainly focusing on quantity to fill their inventory stock and ignoring the quality. This type of arrangement mirrors what Gereffi et al. (2005) would call a market-based form of governance, although because of the use of trust-based relationships, there are elements of relational governance in such transactions as well, with such long-term trade relationships maintained without the use of a formal written contract. Both parties play a key role in distributing products, not in manufacturing, so only the location of their warehouse is important for their trade, and they do invest in other types of specific assets. The transaction frequency is recurrent because it can be said that they have regular exchanges, once per month due to the stock inventory of

provincial distributors. As they can secure their margins in such a simple structure, it seems that these two actors are reluctant to behave opportunistically.

There are a number of possible reasons that explain the low uncertainty level in the trade relationship between input importers and provincial distributors. The first reason for this is that both parties face low risk in terms of quality feedbacks by domestic input buyers. In this sense, these actors can simply enjoy their margins while ignoring the poor quality and effectiveness of their products, as the level of quality inspection in Cambodia is very limited. While quality risks are high, these risks do not influence the transaction mechanism as such. Low uncertainty for these actors is further induced by stable prices and low demand fluctuation because around 90 percent of agricultural inputs distributed across Cambodia are imported products (USAID, 2015).

While the linkages from provincial distributors to commune retailers are similar to the aforementioned linkage, the linkage between input commune retailers and farmers is different and important to take into consideration for discussion. The exchange of inputs to farmers is generally carried out in a conventional, market-based way, without any pre-existing agreement or contract. Farmers make decisions to buy inputs when needed without any plan or purchase orders. They have different transactions for different inputs. In particular, farmers go to buy seeds and fertilisers at the beginning of their tomato growing season and travel to buy pesticides if their crops suffer from pests and diseases. The location is important for the transaction as it induces the differences in costs. The farmers face higher costs if they travel to buy inputs from far locations; however, commune retailers are generally local people who own their land and warehouse. This means that the investment in site asset specificity in this case is really low.

What makes the linkage between commune input retailers and farmers different from others on the input side is the appearance of a high level of uncertainty and opportunistic behaviour for farmers, the final users. Unlike other actors, uncertainty in terms of price and quality has strong, negative effects on farmers. The lack of price information and the ignorance of such information provides for the possibility for opportunism by commune retailers. Because of this, farmers pay high prices for inputs with limited chances of bargaining. Another effect is the risk of applying uncertain quality inputs. Farmers pay high prices for inputs, but there is

an absence of a quality guarantee. In particular, it is reported that certain types of tomato seeds bought can yield differently. A high percentage of chemical inputs cannot be trusted in terms of quality. USAID (2015) highlighted that 40 percent of fertilisers used across Cambodia are counterfeit imported products.

On the output side, market-based structures are also seen in the relationship between farmers and vegetable collectors: The output transactions also rely on classical contracts in the Williamsonian sense, inducing prompt decisions in relation to prices, quantity and payment method. In this trade relationship, even though there are no specific assets involved, the location of tomato plantations can lead to transportation costs. This means that location is the only criterion used to measure the cost in terms of asset specificity. The frequency of tomato exchange is irregular. The tomato exchange agreements are carried out up to 15 times per production cycle until all tomatoes are sold out; however, the transaction frequency between the actors in that specific linkage is more than that if the exchanges of other types of vegetables throughout the year are included. It is because smallholders shift tomato production to other rotational crops, and it is highly possible to trade those outputs with the same collectors who buy tomatoes. Farmers are unable to predict future price for their next exchanges until their vegetables are completely sold. During the vegetable harvesting season, farmers need to make quick decisions to sell their vegetables because tomatoes are highly perishable. On-credit sales also lead to high price uncertainty based on the re-negotiation made by collectors as they tend to ask for *ex-post* price deduction to maintain their margin. An even worse situation for farmers can occur as well when collectors reject tomatoes sold to them even though they could be purchased by them at a low price. This happens when the market price of tomatoes is too low to provide a favourable margin for collectors. Therefore, it can be concluded that farmers face very high uncertainty induced by opportunism practised by collectors, reducing the incentives for farmers to invest in the tomato sector in terms of quality, etc.

Market-based structures are found in other linkages of actors in the output side from collectors to retailers as well, but these actors have a better situation as they face a moderate level of uncertainty and opportunism in their trade. The classical contract used in their recurrent transactions seems to be effective in promoting their long-term relationship without the high level of investment in asset specificity. To maintain a long-term relationship, these

actors commit to sharing market risks with each other. However, uncertainty and opportunism are still found in moderate levels for collectors, while actors downstream such as vegetable wholesalers and retailers always enjoy a secured margin resulting from their strong bargaining power. Vegetable collectors still face a situation of achieving low or no margins caused by quick fluctuations of vegetable market prices. In this situation, the verbal agreements that are commonly made the evening before the transaction cannot guarantee the agreed prices. This means that the actual prices given by vegetable wholesalers can be a lot lower than that in the verbal agreement.

According to the governance mechanism described above, the market-based structure has considerable impacts on farmers as a result of high uncertainty levels linked to the high chance of opportunism in both linkages in input and output sides, whereas other actors seem to be able to secure their benefits from the same governance structure.

Table 4.2: Expected governance structures being used by actors in their tomato trade relationship

Linkages	Dimension of governance typology					Expected governance structure
	Observed characteristics of the governance structure	Asset specificity investment	Frequency of transactions	Uncertainty level	Opportunism	
Input side						
Input importers – provincial retailers	-Classical contract ✓ Verbal contract ✓ Market prices ✓ Use invoices of purchase order ✓ No third party ✓ Quantity based ✓ No quality specification ✓ Long-term trade relationship	- Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No	- Recurrent: ✓ Around 48 times per year ✓ Regular purchase order reliant on stock inventory ✓ Forward buying	- Low for both parties: ✓ High quality uncertainty but no checks ✓ Both parties uninformed ✓ Low level of perishability ✓ Low demand fluctuation ✓ Good predictability ✓ Stable prices ✓ Quality does not have effects on their business ✓ High ability to walk away does not have an effect on their business	- Low: ✓ Both parties share incentives to keep a long-term relationship ✓ They set their certain margin	Market-based
Provincial input retailers – District input retailers	-Classical contract -Same as input importers'	- Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No	- Recurrent: ✓ Around 24 times per year ✓ Flexible purchase orders reliant on stock inventory	- Low for both parties: ✓ Same as input importers'	- Low: ✓ Same as input importers'	Market-based

Table 4.2 Continued

District retailers— commune retailers	- Classical contract - Same as input importers'	- Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No	- Recurrent: ✓ Around 18 times per years ✓ Face-to-face transaction ✓ Buyers transport products to their stores	- Low for both parties: ✓ Same as input importers'	- Low: ✓ Same as input importers'	Market-based
Commune retailers – Farmers	- Classical contract ✓ No contracts, even verbal ✓ Equilibrium prices ✓ Can sell on credit reliant on trust-based relationship ✓ Decision based on own experience ✓ No third party	- Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No	- Occasional ✓ Irregular, ad hoc ✓ One transaction for specific products ✓ Face-to-face: farmers go to buy and transport products to their farms (no purchase order)	- High for farmers: ✓ Equilibrium prices depend on negotiation ✓ No quality guarantees for all types of inputs - High for retailers: ✓ Sell on credit without collateral	- High: Information asymmetry ✓ Retail price negotiation ✓ Farmers lack knowledge and price information	Market-based
Output side						
Farmers – Vegetable collectors	- Classical contract ✓ No contracts ✓ Equilibrium prices reliant to market price fluctuation and tomato quality ✓ Can sell on credit based on trust-relationship ✓ No third party	- Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No	- Recurrent: ✓ Around 15 transactions per year, but one transaction for one trade agreement, and start negotiation for another agreement for the next transactions ✓ Face-to-fact: collectors travel to	- High for farmers: ✓ Perishable ✓ Prices fluctuate by transactions ✓ Very low bargaining power (price takers) resulting from the lack of information ✓ Different quality of tomatoes are given different prices	- High: Information asymmetry ✓ Farm-gate price bargaining ✓ Farmers lack price information	Market-based

Table 4.2 Continued

			observe, negotiate and buy	<ul style="list-style-type: none"> ✓ Re-negotiation to reduce unit price occurs very often for the sale on credit ✓ No collectors in vegetable flooding seasons 		
				<p>-Moderate for collectors:</p> <ul style="list-style-type: none"> ✓ Quality cheating 		
Collectors – Wholesalers	<p>- Classical contract</p> <ul style="list-style-type: none"> ✓ Verbal contract via phone call or no contract at all ✓ Market prices ✓ Receive cash during product delivery ✓ No third party ✓ Long-term relationship 	<ul style="list-style-type: none"> - Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No 	<p>- Recurrent:</p> <ul style="list-style-type: none"> ✓ One by one transaction on daily based 	<p>- Moderate for collectors:</p> <ul style="list-style-type: none"> ✓ Prices fluctuate too quickly ✓ Tomato damage ✓ Very low bargaining power (price takers) <p>- Low for wholesalers</p> <ul style="list-style-type: none"> ✓ Price giver 	<p>- Moderate:</p> <ul style="list-style-type: none"> ✓ Market prices, but they negotiate for big margins 	Market-based
Wholesalers – Retailers	<p>- Classical contract</p> <ul style="list-style-type: none"> ✓ Verbal contract ✓ Market prices (wholesale prices) ✓ Can sell on credit ✓ No third party ✓ Long-term relationship 	<ul style="list-style-type: none"> - Site : Yes - Physical : No - Human : No - Brand : No - Dedicated : No - Temporary: No 	<p>- Recurrent</p> <ul style="list-style-type: none"> ✓ Daily ✓ No purchase orders ✓ Buyers come and buy 	<p>Low for both party:</p> <ul style="list-style-type: none"> ✓ Daily transaction 	<p>- Moderate:</p> <ul style="list-style-type: none"> ✓ Market prices, but they negotiate for big margins 	Market-based

Source: An analysis result based on primary data collected from focus groups, key informants and observation

4.4 The types and quantification of transaction costs faced by tomato smallholders in Cambodia

The descriptive results gained from the analysis of value chain mapping and governance structure identification describe areas of possible transaction costs arising in smallholder tomato production. This section attempts to quantify these empirically. Following the transaction cost economic framework, the transaction costs associated with the above governance modes need to be analysed. These are quantified using the three categories suggested by Hobbs (1997): *ex-ante*, during transactions and *ex-post*. Key variables collected for this measurement are in the form of travel costs, commission fees, communication fees (both formal and informal), and losses induced by opportunism practised by another exchange party (partner). It is assumed that smallholders face each of these costs in every stage of their transactions in the whole production cycle from the input output transactions. Data used in this work are the primary data collected from tomato smallholders following their exchange activities listed in the section of the value-chain analysis. These data are denominated per average farm size i.e., 1600m².

Smallholders encounter three types of transaction costs in the tomato production cycle. First, they incur in the tradeable input transactions. In the loose coordination form with the absence of formal agreements between smallholders and input traders, farmers need to observe input prices and select the most reliable input traders. It is assumed that transaction costs in the form of travelling costs, commission fees, and communication costs arise. Additional transaction costs can come in the form of losses resulting from selecting the wrong partners, such as input sellers who tend to behave opportunistically in terms of price as well as input quality. Second, the transaction costs arise in non-tradeable input transactions. Farmers need three important non-tradeable inputs such as financial capital, land, and labour. Farmers face costs for information about their partners including loan lenders, land renters, and labourers, negotiating for favourable service and costs, and renegotiating based on the performance of their partners. Third, transaction costs are incurred in output transactions. Farmers face some costs relative to the search for information on price and reliable vegetable buyers, price negotiation transactions, losses as a result of receiving lower prices than they should have received and the bargaining by buyers seeking additional margins. Costs identified in these transactions are same as those in input transactions that they commonly incur in the form of

communication cost (phone cards used to contact buyers), travel costs (fuel costs used for the travel to seek and negotiate with potential buyers) and other additional costs.

4.4.1 The level of transaction costs on tradeable input transactions

Table 4.3 shows the level of transaction costs arising on tradeable input transactions faced by tomato smallholders. The activities producing the costs are associated with the travel to buy inputs such as fuel costs, opportunity costs of time, and food costs. It is observed that the transaction costs in input transactions are low, only USD 6.66. The average travel cost per trip is USD 0.95 paying for petrol, and there are around seven trips for buying inputs per production cycle. The low level of information search for their input transactions seems to have negative impacts on tomato smallholders. While they do not face high costs on *ex-ante* information or monitoring the performance of sellers, there is uncertainty, particularly in the price and quality of goods they need to use in their production. This results in *ad hoc* decision making. As a result, they have very low bargaining power to negotiate with input sellers in terms of price. This means that smallholders pay high prices for products of uncertain quality, and with no means to prove a lack of quality.

Table 4.3: Transaction costs on tradable inputs

Transaction activities	Period (day)	Frequency per production cycle	Number of people	Unit cost (USD)	Total cost (USD)
Ex-ante: Searching for information about inputs					
Travel	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Checking with local people	0.1	7	2	0.00	0.00
Commission fees	0	0	0	0.00	0.00
Losses	0	0	0	0.00	0.00
During the transaction					
Travel to buy inputs	1	7	1	0.95	6.66
Phone calls	0	0	0	0.00	0.00
Commission fees	0	0	0	0.00	0.00
Losses	0	0	0	0.00	0.00
Ex-post: Renegotiation about inputs					
Travel to renegotiate	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Commission fees	0	0	0	0.00	0.00
Losses	0	0	0	0.00	0.00
Total (USD)					6.66

Source: Primary data collected by researcher

4.4.2 The level of transaction costs on non-tradeable inputs

Transaction costs were found in credit transactions among the three different types of non-tradeable inputs considered in this research. No transaction costs were reported in land cost and labour costs because the majority of smallholders grow tomatoes on their own land and use their household labour. However, it is possible that despite the absence of this information from the interviews, unobserved transaction costs may still exist that are associated with labour or land markets. The opportunity costs for their household labour are already included in the non-tradeable input costs. The volume of transaction costs in the following description is shown in Table 4.4.

Smallholders face high transaction costs when they need capital from microcredit institutes, especially the costs incurred during the transactions. Before getting a loan, they search for the best lenders who can provide them with a loan at the lowest interest and with a convenient repayment schedule. During the focus group discussions, on average, it was observed that they need to contact around two credit officers by phone around five times, with each call costing them USD 1. After making decisions about the lender from whom to borrow a certain amount of money needed for their household and tomato production, there is a long approval process. Even though most of transactions are the responsibilities of credit officers who play a key role in preparing all types of documents, it is found that smallholders still have considerable costs. In particular, they are obliged to pay 1.5 percent of their loan for the processing fee. They also pay informal commission fees to the local authority for acknowledgement of the agreement between them and the microcredit institutes. During the loan process, until they receive the loan requested, smallholders reported that they have to travel twice to visit the lender in person, involving both fuel costs and opportunity costs in terms of their time. The total transaction cost associating with credit transactions faced by tomato smallholders is USD 46.94, making up 14.50 percent of the total non-tradeable input costs faced by smallholders.

Table 4.4: Transaction costs on non-tradable inputs

Transaction activities	Period (day)	Frequency per production cycle	Number of people	Unit cost (USD)	Total cost (USD)
Land					
Ex-ante: Searching for information about land					
Travel	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Checking with local people	0	0	0	0.00	0.00
During the transaction					
Travel to buy inputs	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Ex-post: Renegotiation about inputs					
Travel to renegotiate	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Sub-total costs of land (USD)					0.00
Labour					
Ex-ante: Searching for information about labour					
Travel	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Checking with local people	0	0	0	0.00	0.00
During the transaction					
Travel to buy inputs	0	0	0	0.00	0.00
Phone calls	0	0	0	0.00	0.00
Ex-post: Renegotiation about inputs					
Travel to renegotiate	0	0	0	0.00	0.00
Phone call	0	0	0	0.00	0.00
Sub-total cost of labour (USD)					0.00
Credit					
Ex-ante: Searching for information about loan					
Travel to search for loan	0	0	0	0.00	0.00
Phone calls	-	1	5	1.00	5.00
Checking with local people	0	0	0	0.00	0.00
During the transaction					
Travel to request	1	2	2	7.81	31.22
Phone calls	0	0	0	0.00	0.00
Commission fee	-	2	-	2.86	5.72
Ex-post: Renegotiation about inputs					
Travel to renegotiate	0	0	0	0.00	0.00
Phone calls	0	5	1	1.00	5.00
Sub-total costs of Loan (USD)					46.94
Total non-tradeable inputs					46.94

Source: Primary data

4.4.3 The level of transaction costs on the output side

Smallholders face higher costs in transacting outputs compared to those in tradeable and non-tradeable input transactions. In particular, before their tomato production reaches the harvesting stage, they pay the costs to search for trustworthy buyers who are able to provide the best prices. Before making a tomato trade decision, they check with three collectors who have long-term trade relationships with them. The average cost for the price checking and negotiation is USD 30 per tomato production cycle. To confirm their decision making about the selection of buyers, they also try to check with their neighbours, but this does not induce relevant costs.

Even though they have a long-term trade relationship with collectors, it is observed that smallholders still incur losses caused by the opportunistic behaviour of those collectors. It was already mentioned in the part on the governance mechanism that the price uncertainty is high for smallholders due to the high level of information asymmetry. Based on the calculation shown in Table 4.5, tomato smallholders face costs of USD 7.32 per tomato transaction as a result of price negotiations. It commonly happens that after smallholders have already harvested their tomatoes, collectors inform smallholders that they have very low margins in their transactions with tomato smallholders and reduce the prices offered. As there is an average of 10 transactions made, this results in transaction costs of USD 73.17 per production cycle. This reveals the high bargaining power of collectors and the low bargaining power of smallholders. This loss is the type of transaction cost to be included in the computation in Table 4.5. Noticeably, the computation to find this loss is basically from the amount of additional margin asked by collectors, commonly 100 Riel (USD 0.024) multiplied by the average tomato sale per transaction at 300 kg and multiplied by the average number of transactions that collectors ask for the additional margin which is about 10 times per production cycle.

During the harvesting period, as an agreement between smallholders and collectors is made for every transaction, smallholders need to bargain for high prices very often. This kind of activity does not create travel costs in terms of fuel cost, but results in considerable time spent which can be classified as a form of opportunity cost. The average frequency of this activity is around seven days, so this activity costs USD 37.56 per production cycle. Phone communications are used for these types of buying and selling transactions. Farmers usually

make a call to collectors asking about a meeting time to weigh the tomatoes harvested and packaged and for other information about the verbal agreement surrounding the tomato trading period. The average of this communication cost is around USD 7 per production cycle.

In general, smallholders prefer not to sell their tomatoes on credit. However, they cannot totally escape this as it is influenced by the seasonality of tomato production with the period of their harvesting season being the time of a surplus of tomatoes in the market. In that period, there is also a reduction in the number of collectors because of the narrow opportunity for generating profits from the tomato trade. The decreasing number of collectors reduces the bargaining power for smallholders. Not only do they offer tomatoes to collectors at lower prices in such situations, but they also increase the possibility of offering on-credit sales to motivate collectors to buy the rest of their tomatoes. This situation leads to the appearance of *ex-post* transaction costs in the form of monitoring costs *ex-post* to ensure that payment is eventually made. This cost commonly occurs through communication via phone calls and was estimated at USD 7 per production cycle.

The *ex-post* risk is exacerbated by market pressure during harvest or by opportunism from collectors as well. It is found that tomato smallholders face three rounds of *ex-post* re-negotiation. As the estimated tomatoes sold in one transaction are around 300 kg and the estimated decreased value asked for by collectors from tomato smallholders is USD 0.024 (100 Riel) per kg, the total *ex-post* loss considered as the *ex-post* transaction costs of tomato output transaction is USD 21.95 (see Table 4.5 below).

Table 4.5: Transaction costs reducing smallholder revenues

Transaction activities	Period (day)	Frequency per production cycle	Number of people	Unit cost (USD)	Total cost (USD)
<i>Ex-ante: Searching for information about buyers and prices</i>					
Travel	0	0	0	0.00	0.00
Phone calls	-	10	3	1.00	30.00
Checking with local people	0	7	2	0.00	0.00
During the transaction					
Travel to negotiate	1	7	-	5.37	37.56
Phone calls	-	7	-	1.00	7.00
Loss resulting from price negotiation	-	10	-	7.32	73.17
<i>Ex-post: Renegotiation about inputs</i>					
Travel to renegotiate	-	-	-	-	-
Phone calls	-	7	1	1.00	7.00
<i>Ex-post</i> price deduction	-	3		7.32	21.95
Total (USD)					176.68

Source: Primary data

4.5 Summary

This chapter highlighted the structure of the value chain and the types of governance structures present. The research adds value to standard VCA by also capturing a range of information concerning the effects of transaction costs on the value chain. Tomato smallholders are exposed to a number of challenges in their competitiveness. There is loose coordination in the tomato value chain and market-based governance is applied for all linkages between actors across the chain. The issue of this structure is that here is a high level of information asymmetry and uncertainty. In the input side, input distributors upstream from the importers to commune retailers care the most about price and ignore the quality of inputs. Without any quality guarantee in the situation that smallholders lack knowledge, it is uncertain that smallholders receive the input quality they paid for. They are at high risk of paying high prices for counterfeit products. On the output side, tomato smallholders have low bargaining power. They are price takers who most often accept prices given by their trade partners. This is compounded by competition from imported products. Wholesalers secure their margins in their trade with neighbouring countries as their supply is reliable. They are able to supply year-round tomatoes, while the domestic products are highly seasonal.

Imported tomatoes are also of better quality, have better physical appearance and are more resistant to damage. The irregularity in trade, low commitment, and lack of trustworthiness of the downstream value chain actors also weaken the bargaining power of smallholders. When there is price pressure in the tomato peak season as a result of high competition with both imported and domestic tomatoes, tomato collectors are not willing to trade in domestic tomatoes. A transaction costs perspective helps to quantify the magnitude of these costs. The results show that smallholders in the current governance structures face the highest transaction costs in the output trade, which are about four times higher than costs faced on the input side.

Chapter 5

Application of the policy analysis matrix to assess the competitiveness of the tomato value chain in the context of transaction costs

5.1 Introduction

In this chapter, the policy analysis matrix (PAM) is used to measure smallholder completeness, taking into account the role played by transaction costs. The PAM helps to quantify how far current production practices are from their socially efficient level. While traditionally used to look at the impacts of public policy, the approach here considers the role that various transaction costs and market failures may have in the tomato sector.

This chapter details the computation of the different elements (private revenues and costs, social revenues and costs, and divergences) associated with the policy analysis matrix, concluding with an analysis of the finalized PAM developed from a combination of primary data from participatory sessions with focus groups and secondary data. This analysis serves as the basis for sensitivity analysis of alternative governance structures discussed in Chapter 6.

5.2 Computation of producer revenue in the PAM

The first column of the PAM quantifies revenues in the tomato sector, contrasting private and social prices. Data for private revenues comes directly from focus group discussions with tomato smallholders, reflecting the average farm-gate prices received per kg of tomatoes multiplied by marketed volumes. By contrast, social revenues use social prices which are typically set as the farm-adjusted world price to assess the comparative advantage of Cambodian tomato farmers (Hobbs, 1997; Monke & Pearson, 1989). It is also important to note that according to the findings in Chapter 4, there is a high seasonality in tomato production in Cambodia. In this sense, all private prices used in the computations in this section take the average of the prices during the months that domestic tomatoes are produced.

5.2.1 Tomato price situation throughout the year

Figure 5.1 shows the trend in prices for different high-end vegetable products in Cambodia between 2013 and 2015. The figure clearly indicates the seasonality of the wholesale price of tomatoes. The lowest price⁵ is between January and April, at USD 0.34/kg (1,400 Riel/kg), and the highest price is around October, at USD 0.63 (2,600 Riel) per kg. During the main harvest season from January to April in 2014 and 2015, the wholesale price per kilogram fluctuated from USD 0.34 (1,400 Riel) to USD 0.49 (2,000 Riel).

Table 5.1 presents estimates of the trend of prices and supply of both domestic and imported tomatoes. While imported tomatoes from Thailand and Vietnam are available year-round in the Cambodian wholesale market, the supply of domestic tomatoes is highly seasonal. It was reported by vegetable wholesalers that tomatoes imported from Vietnam are the dominant product throughout the year covering over 90 percent of wholesaler supply, while tomatoes imported from Thailand are found in much lower quantities.

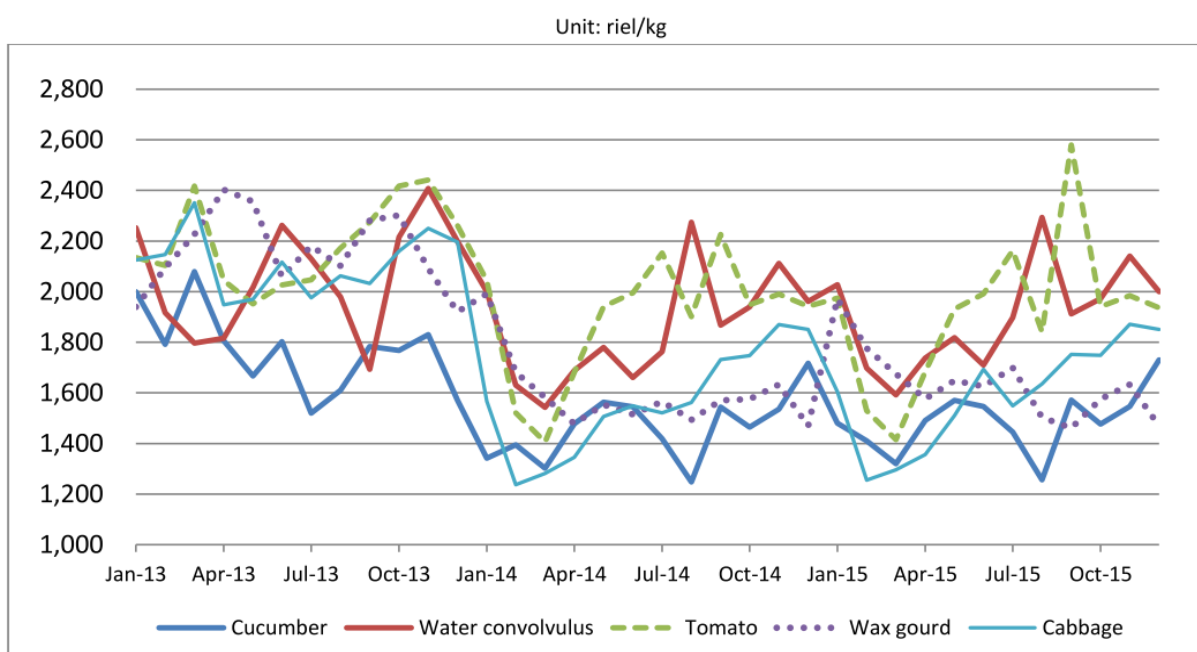


Figure 5.1: Wholesale prices of tomatoes and other high-value vegetables in Cambodia (Nuppun, 2016)

⁵ This is the average lowest price for the wholesale market. This graph does not show price shocks that have occurred twice in five years when the lowest price received by farmers was 300 Riel per kg.

Focus group discussions show that domestic tomato producers receive an average price of USD 0.24 (1,000 Riel) per kg during the peak season from the end of February to the beginning of March. In this period, 55 percent of the total domestic supply of tomatoes of the year is harvested. Because of the high risk of perishability, the maximum price is very close to the average price and there is a high possibility of the occurrence of price shocks which can quickly lower the domestic price to as low as USD 0.07 (300 Riel) per kg. It seems that this situation is caused by the high level of competition between domestic tomatoes supplied at exactly the same time to the wholesale market in which imported tomatoes are dominant. It is important to note that only a small number of tomato smallholders can harvest and achieve the maximum tomato price during the year, USD 0.73 (3,000 Riel) because the period of this price is only around 10 days a year. The price situation is also exacerbated by the competition from the increase in tomatoes imported from Thailand in the season of domestic harvesting.

Table 5.1: Average supply and price of domestic tomatoes and imported tomatoes

	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
Average border price of imported tomatoes (Riel ⁶ /Kg)	1,300	1,200	1,200	1,400	1,800	2,000	1,800	2,000	2,000	1,800	1,600	1,600
Average wholesale prices of imported tomatoes (Riel/Kg)	1,700	1,600	1,600	1,800	2,200	2,400	2,200	2,400	2,400	2,200	2,000	2,000
Average farm-gate price of domestic tomatoes (Riel/Kg)	1,100	1,000	1,000	1,200	1,600						1,400	1,400
Maximum farm-gate price of domestic tomatoes (Riel/Kg)	1,500	1,400	1,100	1,300	2,000						2,000	2,000
Minimum farm-gate price of domestic tomatoes (Riel/Kg)	700	700	300	900	1,200						1,200	1,200

Source: Estimated from focus groups and key informants and Nuppun (2016). Note that the shaded cells refer to the periods in which domestic tomatoes are available in local markets.

⁶ The average market exchange rate: 1USD = 4100 Riel

5.2.2 Social prices of tomatoes in Cambodia

The valuation of social prices is the measurement of comparative advantage or efficiency in the commodity system (Monke & Pearson, 1989). Table 5.2 details the calculation of the social price per kg. The social price of tomatoes is the c.i.f. border price of tomatoes, adjusted for wholesale and farm transportation costs to compare to the domestic farm-gate (private) price. The average border price of imported tomatoes in the main tomato-harvesting season was estimated at USD 0.29 (1,200 Riel) per Kg or USD 292.68 per tonne. After buying from the border, wholesalers transport imported tomatoes to wholesale stores. They face three types of expenses in these transactions: a fee for government agencies (including both formal and informal fees), transportation including labour and fuel, and storage involving store rent and security fees. Wholesalers also have other types of expenses involved with the haulage to the wholesale market, such as communication with buyers, marketing and losses caused by damage. Adding these fees yields a price at the wholesale market in Phnom Penh for imported tomatoes of USD 455.98 per tonne.

Next, the wholesale price needs to be adjusted to the farm-gate by deducting the transportation and handling costs from the wholesale market to the farm. Collectors cover costs associated with the transport of domestic tomatoes from the farm-gate to wholesale stores including labour and fuel. In addition, there are two sets of margins that are incurred for wholesalers and collectors between wholesale markets and the farm gate. This results in an adjusted farm-gate border price (social price) of USD 329.18 per tonne or USD 0.33 (1,349.63 Riel) per kg. Compared to the average domestic price of USD 0.24 (1,000 Riel) per kg, this is USD 0.09 (349.63 Riel) higher than the actual farm-gate price received by domestic tomato smallholders.

Table 5.2: Computation of social prices for tomato production

N.	Activities	Calculated result
1	Border price of tomatoes (USD/tonne of tomato)	292.68
2	Fees to government agencies (USD/tonne of tomato)	33.33
3	Transport to wholesale storage (USD/tonne of tomato)	24.12
4	Storage charge (USD/tonne of tomato)	3.79
5	Adjusted border price =1+2+3+4, (USD/tonne of tomato)	353.93
6	Cost of haulage to share market =a+b+c+d, (USD/tonne of tomato)	102.05
	a. Communication (USD/tonne of tomato)	5.00
	b. Selling and marketing (USD/tonne of tomato)	10.73
	c. Damage losses (USD/tonne of tomato)	30.49
	d. Wholesaler margin (USD/tonne of tomato)	55.83
7	Adjusted wholesale social price =5+6 (USD/tonne of tomato)	455.98
8	Cost from domestic farm-gate to wholesale market =e+f+g+h+i+j, (USD/tonne of tomato)	126.81
	e. Transport from farm-gate to wholesale stores	28.54
	f. Labour	10.73
	g. Communication	10
	h. Margin for wholesalers	36.3
	i. Margin for collectors	23.9
	j. Damage losses (5%)	17.33
9	Adjusted farm-gate social price of tomatoes at farm-gate =7-8, (USD/tonne of tomato)	329.18
10	Average smallholder tomato yield (kg/1600 metre squares)	5,000
11	Market exchange rate 1 US dollar to Khmer Riel (Riel)	4,100
12	Social price of tomatoes in Cambodia at farm-gate (USD per kg)=9/1,000	0.33
13	Social price of tomatoes in Cambodia at farm-gate (Riel per kg) =11 X 12	1,349.63
14	Average domestic farm gate price in the peak harvest season (Riel per kg) (private price)	1,000
15	Difference between private and social prices =14 – 13	- 349.63

Source: Calculation based on price and cost data given by importers and wholesalers

5.3 Tradeable and non-tradeable input costs used in smallholder tomato production vs the border prices

5.3.1 Tradeable input costs in smallholder tomato production

It is expected that the majority of smallholders commonly apply conventional practices in their tomato production. Based on the results from focus groups, key informants and observation, the approximate average land size used for tomato production is 1,600 m². Because of this, all data related to input quantity and costs are calculated based on this estimated average land size. This data is also the average calculated from data given from different types of respondents in two different provinces: Battambang and Kandal.

Table 5.3 illustrates the tradeable input costs used in smallholder tomato production based on focus group data and the comparison between the actual costs faced by smallholders and the estimated social costs in USD. It is important to note that the comparison between private tradeable input costs and social tradeable input costs is carried out by keeping the quantity of inputs used in the same land size. From Table 5.3, it can be clearly seen that all types of private costs faced by tomato smallholders are higher than those based on estimated social prices.

There are seven types of variable tradeable inputs used in current tomato production. These inputs encompass seeds, urea fertilisers, DAP fertilisers, Kali fertilisers, pesticides, and strings. The sum of these tradeable input costs amounts to USD 143.17. Strings that are used for preventing tomato plants from strong winds have the highest costs at USD 36.59 in private prices of variable tradeable input costs, followed by fuel cost and seeds, at USD 28.54 and USD 21.95 respectively. Nevertheless, if the costs of three types of fertilisers are combined, the cost of fertilisers is the highest.

It is also important to have a quick discussion on the unit cost and quantity of each input used in smallholder tomato production. The unit price of seed is seen to be the highest at USD 10.98, almost 10 times higher than that of other inputs. However, only two packages of tomato seeds are sufficient for producing tomatoes on an area of 1,600 m². According to the

counting work carried out by the Cambodia-HARVEST⁷ project, there are about 1,250 tomato seeds per seed package.

The total cost of the private prices of fixed tradeable inputs is about three times lower than that of variable tradeable inputs, at USD 47.50. It is assumed that more than 50 percent of tomato smallholders own three types of fixed tradeable inputs: one tiller for ploughing, one pump for water irrigation, and one spraying machine for chemical-substance application. Tillers and pumps can be commonly used for up to 10 years, and a spraying machine is expected to last 5 years. Not only are these fixed inputs used in tomato production, at around 30 percent of the total use per year, but they are also used for other types of crop production throughout the year, as farmers only plant one crop of tomatoes per year. Owing to the depreciation⁸ and the percentage of the use in tomatoes having to be deducted, the private prices appearing in Table 5.3 of tillers, pumps and spraying machines are relatively low at USD 18, USD 17.50, and USD 12, respectively.

In terms of social prices of tradeable inputs, because the majority of those inputs are imported from the neighbouring countries (Thailand and Vietnam), the social prices of tradeable inputs are simply interpreted as the expected farm-gate prices paid for inputs by producers (tomato smallholders). Most data used for the estimation of these prices have been collected from input importers. The source of this data is expected to be more precise reflecting the real situation of the input value chain since it is commonly understood that there is loose control of input trading. The exchange of tradeable inputs at the borders is generally done in the currency of neighbouring countries (Thai Baht and Vietnam Dong) for variable tradeable inputs, while that used for fixed tradeable inputs is USD. However, all currencies identified for the trade of tradeable inputs are converted into USD in this study.

⁷ The full name of Cambodia-HARVEST is “Helping Addressing Rural Vulnerability and Ecosystem Stability”. Data shown in the analysis has been received from a key informant who was a specialist of the project. It is based on the internal horticultural technical bulletin which is only used for guiding project staff.

⁸ Most fixed inputs owned and used by smallholders are generally not used for only one specific production. Because of this, it is important to know the percentage of the use of those inputs in tomato production per year. Considering this case, the depreciation of fixed inputs is the result of the total cost smallholders paid during buying (excluding transaction costs) divided by the period of total use (e.g. expected 10 years for a tiller) and multiplied by the percentage used in tomato production. The capital recovery method of Monke and Pearson (1989) was not used due to a lack of data.

Three steps were taken in the computation of social prices for tradeable inputs. First, by keeping the same quantity of inputs used in practice by tomato smallholders (collected from focus group discussions), border prices of those inputs were calculated. The border prices of tradeable inputs refer to the prices paid by importers to import those inputs to markets in Cambodia. Second, wholesale prices were computed by adding the costs incurred in transporting products from borders to wholesale stores. Margins obtained by trading actors in this transaction are also included. The result of this step is the expected wholesale prices of tradeable inputs. The last step is the calculation of the social prices at the farm-gate, which were added to the estimated wholesale prices and estimated border prices. The result of this is the social prices of tradeable inputs expected to be paid by farmers. The second part of Table 5.3 is the illustration of estimated social prices of tradeable inputs used in small-scale tomato production in Cambodia.

The differences between the private prices and social prices of tradeable inputs in smallholder tomato production in Table 5.3 show that the total average private price is 34.84 percent higher than the total average social price. The variable input costs have more impact on this difference. The comparison between the total variable input cost of the private price and that of the social price indicates that the percentage of difference is 34.07 percent (a difference of USD 23.80) of private variable input cost. By contrast, the percentage of the different cost of fixed private inputs and fixed social inputs is only 0.76 percent (only a difference of USD 1.61) of fixed tradeable input cost. Interestingly, in the variable input costs, there is a large gap between the unit private price of seed, USD 10.98 per pack and the unit social price of USD 2.8 per pack, whereas the differences between both budgets of other variable input costs such as fertilisers, pesticides, fuel and strings are just less than one dollar per unit. Despite these small unit differences, it creates a significant divergence between total private and total social tradeable input costs due to the tradeable input quantity. In the computation results shown in Table 5.3, the quantity of tradeable inputs is kept to equalize the quantity of those used on tomato smallholders' farms.

Table 5.3: Tradeable input costs and border prices for the average land size of 1600 m²

Types of tradeable inputs	Items	Unit	Unit cost (USD)	Total (USD)		
Private tradeable input costs						
Variable inputs	Seeds	2	10.98	21.95		
	Fertiliser1-Urea	25	0.49	12.20		
	Fertiliser2-DAP	20	0.73	14.63		
	Fertiliser3-Kali	20	0.61	12.20		
	Pesticides	20	0.85	17.07		
	Fuel	30	0.95	28.54		
	Strings	30	1.22	36.59		
Sub-total of tradeable variable inputs in private prices				143.17		
Fixed inputs	Tiller (10-year depreciation)	1	18.00	18.00		
	Pump (10-year depreciation)	1	17.50	17.50		
	Pesticide spraying machine (5 years)	1	12.00	12.00		
Sub-total of tradeable fixed inputs in private prices				47.50		
Total for private tradeable input costs (USD)				190.67		
Social price of tradeable input costs						
Types	Items	Unit	Unit prices (USD)	Border price(USD)	Wholesale prices (USD)	Expected farm-gate price (USD)
Variable inputs	Seeds	2	2.8	5.6	6.44	7.41
	Fertiliser 1-Urea	25	0.29	7.2	8.28	9.52
	Fertiliser2-DAP	20	0.54	10.86	12.49	14.36
	Fertiliser3-Kali	20	0.42	8.4	9.66	11.11
	Pesticides	20	0.75	15	17.25	19.84
	Fuel	30	0.69	20.7	23.81	27.38
	Strings	30	0.75	22.5	25.88	29.76
Sub-total of variable tradeable-input costs in social prices				119.37		
Fixed Inputs	Tiller (10-year depreciation)	1	15	15	17.25	19.84
	Pump (10-year depreciation)	1	12.5	12.5	14.38	16.53
	Pesticide spraying machine (5 years)	1	7.2	7.2	8.28	9.52
Sub-total of fixed tradeable-input costs in social prices				45.89		
Total for border tradeable input costs (USD)				124.96	143.70	165.26
Differences between private prices and social prices						
			Variable input costs	Fixed input costs	Total	
Divergences (USD)			23.80	1.61	25.41	
Percentage of social price (%)			34.07	0.76	34.84	

Source: Calculation based on data collected from focus groups, key informants and observation

Note: The expected farm-gate price in Table 5.3 is the social prices of tradeable inputs expected to be paid by tomato smallholders in Cambodia.

The results shown in Table 5.3 exclude the effects of tradeable input quality on its costs. Based on USAID (2015) and re-reported by Nuppun (2016), around 40 percent of fertilisers which are important type of agricultural tradeable inputs used by Cambodian farmers are counterfeit products which are informally imported from Thailand and Vietnam. The important tradeable inputs mentioned here are the variable tradeable inputs including seeds and chemicals (e.g. fertilisers). Reiterating the discussion in the part on governance mechanism in Chapter 3, there is a lack of input quality control; ignorance of quality across the chain actors; and a lack of knowledge about quality checks resulting in very low bargaining power. This has negative effects on smallholders, as they pay relatively higher prices compared to prices paid by farmers in Vietnam and are likely to obtain lower yields than they would with better inputs (Nuppun, 2016). The relationships between good quality inputs and yields is beyond the scope of this research, but it should be noted that the divergences reported in the PAM later are likely to be an underestimate in light of this issue.

5.3.2 Non-tradeable input costs in smallholder tomato production

Unlike the tradeable inputs, there are no world prices for non-tradeable inputs. Land, labour and capital are considered to be domestic factors (Monke & Pearson, 1989). In this study, the observed domestic factors are those currently deployed in tomato production of smallholders in the total average land size of 1,600 m² in the tomato production season in Cambodia. This section provides the discussion about the three main domestic factors computed and shown in Table 5.4. The result of the estimation illustrates that there is a small divergence between the private prices and social prices of non-tradeable inputs, owing to the amount of capital acquired from microcredit organizations and differences in the interest rate.

The land value used for tomato production is assumed to be the same in both private and social budgets. In this research, land is valued by the estimation of its value in other purposes such as rental or sale. Farmers use their own land plots for growing tomatoes, but if they had rented or bought from others, they would have paid the market price. Land value differs from one region to another, but there is no difference in value across its use in alternative crops. In this case, land prices were based on the average value of land used for cash crops. According to focus groups, 1,600 m² land plots can be rented at the price of USD 121.95 (500,000 Riel.)

In terms of capital assets, it was assumed that tomato smallholders in this case use loans from microcredit institutes. Commonly, farmers request larger loans compared to the total amount required for small-scale tomato production. Focus groups reported that the average loan size they borrow is around USD 2,000, and they pay monthly interest and a calculated monthly percentage of the total loan back to the microcredit institutes. This implies that smallholders do not use the whole amount of the loan for tomato production, but use it for their year-round livelihood activities, e.g., rice, livestock and other crop productions. Based on the calculation of tradeable input costs at private prices, tomato smallholders require only USD 190.67 for a tomato production cycle, so this amount is used for the calculation to find the total interest.

The microcredit sector has just received an intervention from the government of Cambodia via the issue of a sub-decree (called Prokas in Khmer) limiting the maximum interest rate and effective from March 13, 2017 (three months before the field data collection for this study). All microcredit institutes as well as banks are restricted to providing loans with an interest rate of not more than 1.5 percent per month or 18 percent per annum. Based on the focus groups, the interest rates paid to those institutes followed that of Prokas, and there are a few different rates depending on the loan size (already discussed in the VC mapping). This policy distortion produces a divergence between the private and social prices of smallholder financial capital that make microfinance-sourced loans artificially cheaper. The social (free market) interest rate, by contrast, is approximately 1.65 percent per month. However, because the loan size required by tomato smallholders is small, at USD 190.67 under private prices and USD 165.26 under social prices, the difference in interest costs is relatively small, calculated at USD 8.58 in the private budget and USD 14.87 in the social budget per production cycle.

Private labour costs are valued at the prevailing day labour wage, at 22,000 Riel or USD 5.37 per day. Based on the number of activities and days multiplied by this wage, the total labour cost per tomato production cycle is USD 193.17.

Table 5.4: Non-tradeable input costs

Types of non-tradeable inputs	Items	Unit	Unit cost (USD)	Total cost (USD)
Private non-tradeable inputs				
Land (1600m ²)	Opportunity cost of land for tomato production	1	-	121.95
Capital	Interest	3	2.86	8.58
Labour	Manual land clearing	2	5.37	10.73
	Ploughing	2	5.37	10.73
	Weeding	14	5.37	75.12
	Planting	6	5.37	32.20
	Fertiliser application	2	5.37	10.73
	Harvesting	10	5.37	53.66
Total for non-tradeable input costs				323.70
Social prices of non-tradeable inputs				
Land (1600m ²)	Opportunity cost for other crops	1	-	121.95
Capital	Interest	3	4.96	14.87
Labour	Manual land clearing	2	5.37	10.73
	Ploughing	2	5.37	10.73
	Weeding	14	5.37	75.12
	Planting	6	5.37	32.20
	Fertiliser application	2	5.37	10.73
	Harvesting	10	5.37	53.66
Total for non-tradeable input costs				330.00

Source: Calculation based on focus groups key informants and results from the policy analysis matrix

5.4 Competitiveness of smallholders measured in the PAM

In this step of analysis, the full baseline PAM is presented and what makes this adapted PAM different is the inclusion of transaction costs. Transaction costs were quantified by the use of the mixed framework developed by Williamson (1979) and Hobbs (1997) beginning from the two main components of value chain analysis (VCA): value chain mapping and the analysis of governance mechanisms. Transaction costs are composed of three aspects as discussed in section 4.3: the costs incurred in tradeable input transactions, the transaction costs that increase non-tradeable input costs, and the transaction costs that reduce revenues. In the earlier part of this chapter (Chapter 5), all elements of the original PAM are discussed starting from the revenues in both private and social prices followed by those of tradeable inputs and non-tradeable inputs.

Overall, in the PAM matrix shown in Table 5.5, it is clearly seen that there are high transaction costs that reduce smallholder profits by nearly one-third compared to the situation where transaction costs are not incurred. If transaction costs are excluded, smallholder profits are estimated at USD 705.14 per production cycle. However, based on the measured costs and revenues faced by producers, their profit is only USD 474.86 per production cycle. Transaction costs primarily reduce revenues and increase non-tradeable input costs, with each changed by about 15 percent. Their influence on the tradeable input costs faced by producers is relatively low.

If the divergences are compared with private and social budgets, there are large gaps on the output side, amounting to USD 603 per production cycle. At the same time, it is important to note that this divergence on the revenue side is not fully explained by the transaction costs calculated above. Less than 30 percent of the total divergence between private and social revenues comes from observable transaction costs, with the remainder of the divergence (71%) unobserved. Similarly, for tradeable inputs, only 21 percent of the divergence arises from calculated transaction costs, while over 79 percent is unobserved. On the non-tradeable input side, measured (observed) transaction costs explain much more of these divergences, accounting for 85 percent of non-tradeable divergences.

In the absence of government intervention in the sector, the unobservable effects of divergence are assumed in part to be the hidden costs associated with the behaviour of value chain actors. It can be seen by looking back to the value chain mapping and current conventional governance structure that many transactions are poorly coordinated. Seasonality aspects further exacerbate the competitive situation of smallholders. Downstream actors, especially tomato wholesalers, have low trust and commitment to trade the highly seasonal products supplied by domestic smallholders. Instead, they have better trade relationships and better incentives to participate in the value chain of imported commodities, especially commodities from Vietnam. This implies that the downstream actors potentially have a high level of opportunistic behaviour exploiting the incentives from domestic smallholders. This is linked to the high level of information asymmetry downstream of the chain as well. All of these factors weaken the bargaining power of smallholders. The lack of transaction cost data on land and labour markets could further contribute to the high levels of unobserved effects.

As these divergences are assumed to be the negative effects of poor market coordination, it is necessary to consider how alternative governance structures may influence competitiveness and profitability. This will be explored in Chapter 6 when the PAM is adapted to consider these forms.

Table 5.5: The result of the policy analysis matrix showing the influence of transaction costs on tomato smallholder competitiveness (in 1600m²)

	Revenues	Costs		Profit
		Tradeable Inputs	Non-tradeable Factors	
Private budget				
Farm-gate budget without TC (USD)	1,219.51	190.67	323.70	705.14
Transaction costs in private budget (USD)	176.68	6.66	46.94	
Percentage of transaction costs (%)	14.49	3.49	14.50	
Private budget including TC (USD)	1,042.83	197.33	370.64	474.86
Social budget				
Social prices (USD)	1,645.89	165.26	330.00	1,150.64
Effects of divergences				
Divergence between private and social prices (USD)	-603.06	32.07	40.65	-675.78
Unobservable transaction costs	426.38	25.41	6.29	
Percentage of unobservable transaction costs of divergence (%)	70.70	79.24	15.48	

Source: Primary data collected from focus groups and key informants

Chapter 6

Estimation of the effects of alternative governance structures recently introduced in Cambodia on tomato smallholder competitiveness

This chapter provides insight into potential opportunities and strategies for tomato smallholders to improve their competitiveness. Three main types of alternative governance structures are assessed here: the link between farmers and a sponsor with a formal written contract, the link between these actors with informal contracts and links based on a partnership approach. These forms are described below and later quantified using the PAM to assess their desirability and competitiveness compared to current modes of production.

6.1 Alternative Governance Model 1: Relationship based on an informal contract

The first vegetable trade model identified in this research is the relationship between a sponsor and farmers based on an informal contract. This model is based on the case of Anaya farm. Despite the informal contract, the model is different from the conventional market used by the majority of Cambodian farmers and also different from other alternative forms identified in this study. What makes this model important is that farmers in this model receive different incentives compared to those in other models including the current conventional market.

According to Figure 6.1, the sponsor in this model also dominates the transactions from the input to the output sides, and farmers take part only in production activities. The sponsor in this case is the firm acting as an input supplier, a technical assistance provider, and an output trader. Anaya farm has a strong business connection with agricultural input importers as well as input exporters in neighbouring countries such as Vietnam and Thailand. This firm also has expertise in modern agricultural technology that aims to ensure sustainability and generate agricultural income. Unlike the previous model, Anaya farm selects farmers to join its project by introducing modern agricultural technology in a plot of land owned by this firm. This demonstration site is located near to farmer villages so that farmers can see modern practices.

When farmers express an interest in replicating that technology, they are invited to register to become a member of a community called a “farmer community” facilitated and established by the firm. The farmer community has its own internal by-laws and regulations in relation to the performance of members, and to become a member of that community, farmers are required to obtain a written official form certified by their local authority up to commune level. However, the relationship between farmers and the sponsor related to input and output trades is reliant on informal agreement.

The sponsor supplies all types of inputs to farmers to replicate the new crop-planting techniques. In addition to this, the sponsor is responsible for providing all services including installation and maintenance. What makes this model special is that the sponsor is able to supply those inputs on credit without any collateral and without interest. The performance of farmers in this case is monitored by the sponsor’s field staff who work regularly with farmer members. As the sponsor is also the output buyer, the payment for inputs is generally carried out during the output transaction, in which inputs are paid for by deducting input costs from the farmers’ revenues from their vegetables bought by the sponsor.

All production decisions are mainly made by the sponsor. Relying on its demand projection, Anaya farm provides a quota to the community members at the beginning of every production cycle. The quota focuses on the variety of vegetables to be produced and the amount of land to be used. Because of this, a member farmer produces more than one variety in their own land. Under the strict monitoring by field staff, farmers are required to guarantee the supply of solely chemical-free vegetables to receive higher prices compared to those of conventional vegetables.

In association with investment capital, there is an absence of microcredit institutes in this value-chain model as they are replaced by the farmer community which plays a key role in community banking. In particular, all members of this community are obliged to save 20 percent of their revenues from vegetable production with the community bank, and they can request the money back for next production capital. The community is authorized to provide loans to farmers who request them for the expansion of their production. This lending is carried out without the obligation of collateral, but it is compulsory to pay a market interest rate back to the community.

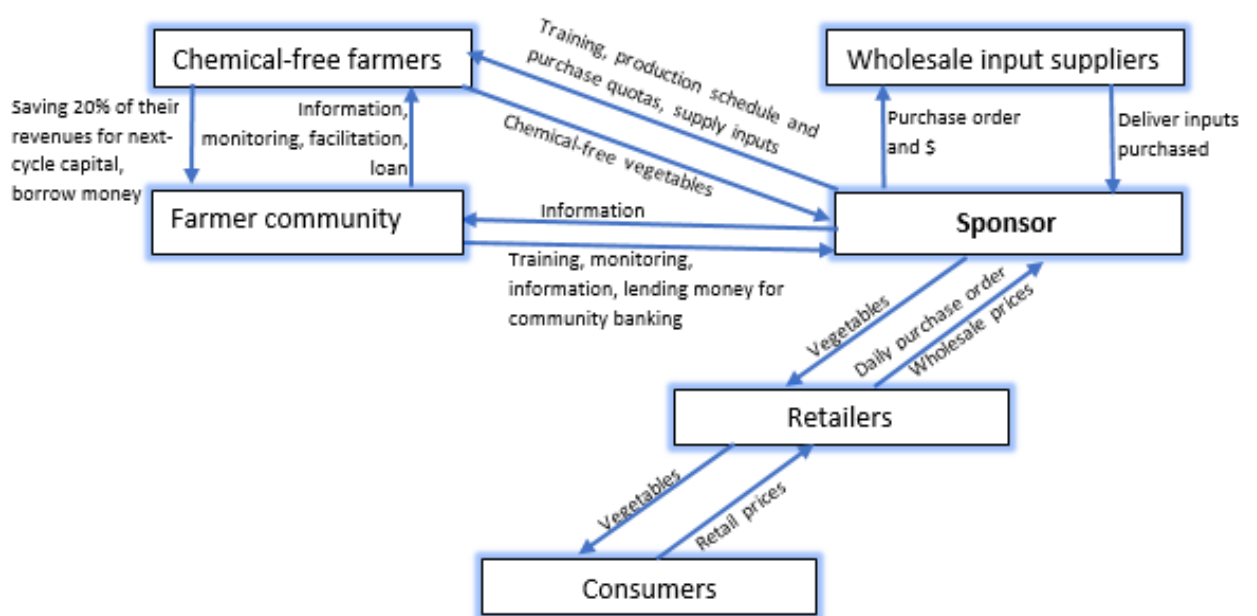


Figure 6.1: Main actors and their roles in the informal contract-based relationship in Cambodia (based on primary data)

6.2 Alternative Governance Model 2: Relationship between smallholders and a sponsor based on formal contracts

This governance form involves the use of formal contracts in transactions between vegetable farmers and a sponsor. This form is based on a vegetable value-chain initiated by a sponsor called “Natural Agricultural Village (NAV)”, which is a small firm playing a key role as the wholesaler distributing a number of chemical-free vegetables in Phnom Penh market as a niche product. The business model adopted by this firm was started in 2009, but it failed and closed in 2012. However, NAV started this model again in 2014 and it is still running at the time of this research. This firm works with a range of vegetable farmers in various provinces, and tomatoes are just one of the vegetable varieties. In Figure 6.2, a value chain map illustrates the transactions and relationships in this model. It indicates that NAV, the sponsor, plays a dominant role influencing all other key actors in the whole value-chain. The sponsor has multiple functions in the chain as a facilitator and technical provider in the input and production side, and as a trader in the output side.

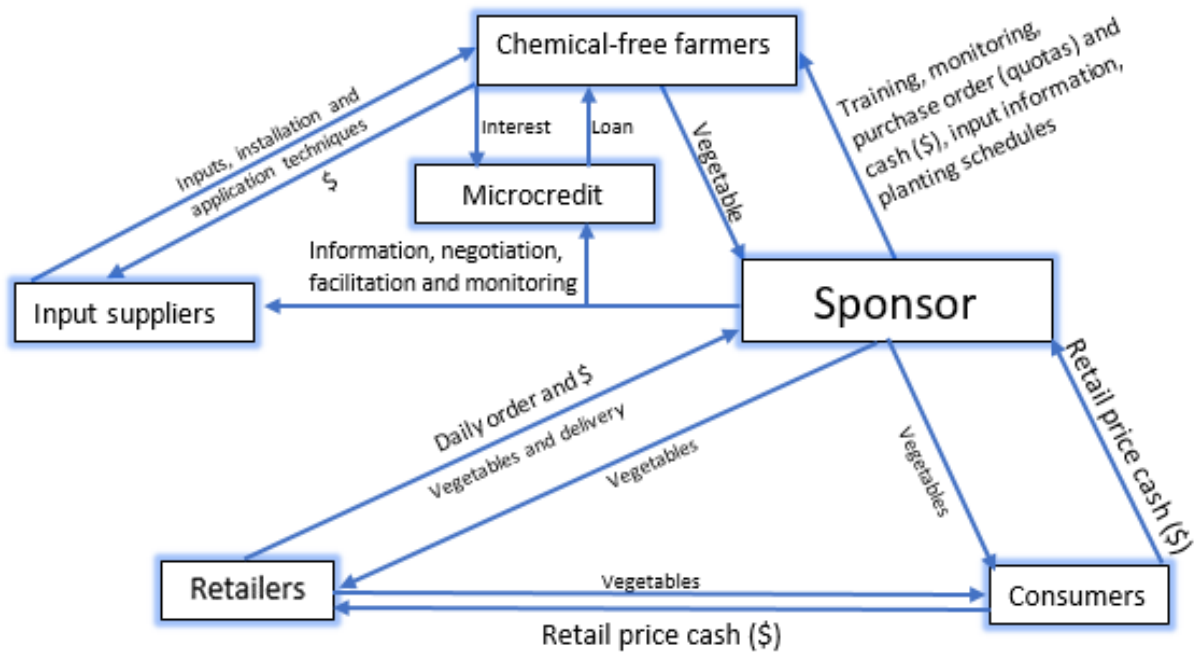


Figure 6.2: Main actors and their roles in the formal contract-based relationship in Cambodia (based on primary data)

Beginning from the input and production sides, the sponsor starts the business project by selecting prospective farmers through a strict screening process based on criteria such as experience, performance, and commitment. Farmers who are selected to be members of this project are those who have been actively involved in projects of NGOs or the government, and commit to joining the project. After selection, the sponsor provides an annual contract which is strictly focused on performance in chemical-free vegetable production and higher prices compared to conventional vegetables. This means that all selected farmers are obliged to guarantee that all vegetables produced and supplied to the sponsor do not use chemical substances. The contract between the sponsor and selected farmers are acknowledged by the local authority in the farmers' village and commune.

At the beginning of every year, the sponsor makes a prediction relative to demand and sets a schedule of rotational crops throughout the year for farmers. The schedule specifies the types of crops, land size and when they should be planted. Because of this condition, a farmer can plant more than two varieties of vegetables per production cycle. To monitor the performance of selected farmers, the sponsor employs field staff who have a range of main duties from providing regular technical assistance in vegetable production to post-harvest coordination. The field staff make a list of necessary inputs to be used, and they engage farmers with

appropriate input suppliers who are able to supply inputs at lower margins in comparison to other input suppliers.

With regard to the method of receiving investment capital, the sponsor facilitates farmers to receive loans from microcredit agencies without any collateral for loans up to USD 850. The loan can be processed in this way due to the formal contract which is considered as the equivalent document for that loan size. However, it is still compulsory for farmers to use their property such as land and house titles for loan requests over USD 850. Notably, the interest rates applied for this case are the same as those outside the project.

The sponsor also takes a lead in output transactions. Based on the agreement stated in the annual contract, the sponsor is responsible for providing a higher price compared to the market price of conventional vegetables and for buying all vegetables produced by contracted farmers. The field staff of the sponsor provide the date and quantity of harvesting to farmers and transport the harvested vegetables to a wholesale store in Phnom Penh capital city before distributing to the retail market. Because of this, there are fewer activities for contracted farmers in output transactions. Their main involvement in this stage is to harvest and pack vegetables in bags provided by the project.

6.3 Alternative Governance Model 3: Partnership approach based on a formal written contract

The third model considered is the partnership approach between a sponsor, Dak Dam cooperative and farmers. Even though the current practice of this model during the period of this research does not involve tomato production, this research extrapolates the potential effects on their model from other products into tomatoes.

The relationship between farmers and the sponsor in this model is highly integrated, as illustrated in Figure 6.3. Farmers play a role as co-investors participating in production activities led by the sponsor. The sponsor makes all decisions from the input to the output transactions, while farmers invest only their certain size of land and enjoy 50 percent of the gross revenues gained from that land size.

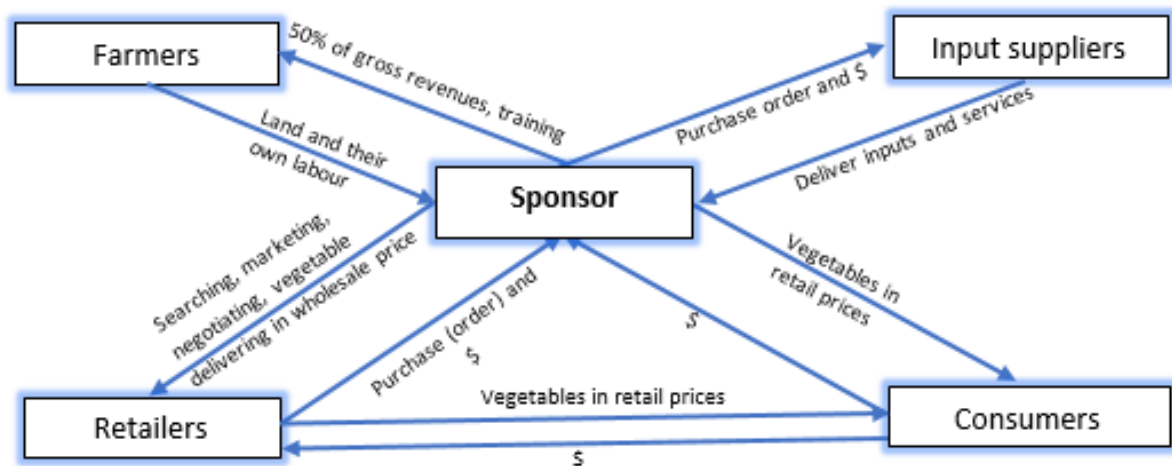


Figure 6.3: Partnership approach recently introduced in Cambodia (based on primary data)

The sponsor in this case is a group of people forming a firm by sharing investment capital put into agricultural production. This firm buys a plot of land to be a demonstration site with a location near to villages in order to attract farmers who are interested in the new agricultural practice to join the project. To be a member of this firm, farmers need to agree with the company to provide their land for the investment project proposed by the firm, and the agreement is based on a written-five-year contract certified by the local authority up to commune level. After this agreement, all activities from production to output trades are the responsibility of the sponsor.

Table 6.1 compares the three business models. The similarity among the three models is the domination of decision making on the entire value-chain by the sponsor, especially in marketing and developing investment plans. It is worth noting that the sponsor influences production and through employing field staff manages production activities. Another similarity among the three alternative models is the use of new technology in crop production. Each model attempts to introduce high-tech inputs such as drip irrigation systems, plastic mulch, green net, etc.

Aside from the decision making and the use of modern technology, there are a range of differences between the alternative models from the input side to the output side. Starting from the input side, only in Model 1 the sponsor acts as the input supplier who directly supplies a range of inputs required by their trade relationship with farmers. This implies that the sponsor, i.e. Anaya farm, gains profits from the input trade, while the other two models, i.e. NAV (Model 2) and Dak Dam cooperative (Model 3), receive no margin from inputs. There

are also differences in the flow of capital investment and its incentives gained by farmers. Farmers in Model 2 receive benefits from the condition of borrowing from microcredit without the requirement of collateral; those in Model 1 enjoy the on-credit input supplies made by the firm; and those in Model 3 invest only household labour.

There are two important differences to be taken into consideration in relation to output in the three alternative models. While Models 1 and 2 adopt a focus strategy which aims to capture only the high-value niche market of vegetables through the chemical-free production, the vegetables produced in Model 3 compete with conventional vegetables. Another difference is that farmers in Models 1 and 2 receive their revenues from sales at niche prices and proportional to the quantity of higher-quality vegetables sold, while those in Model 3 gain a regular 50 percent from the gross revenues as the other 50 percent is the sponsor incentive.

Table 6.1: A comparison of the three alternative business models

Characteristics	Types of alternative governance models		
	Verbal contract (Model 1)	Written contract (Model 2)	Partnership (Model 3)
Contract	-Verbal agreement between vegetable buyers and producers	-Written contract between vegetables buyers and producers -Verbal contracts between farmers and input suppliers	-Written contract between a sponsor and land owners
Involvement of third party	-Farmer community	-Local authority (village and commune)	-Local authority (village and commune)
Contract duration	-Every production cycle	-One-year	-Five-year
Contract specification	<p>Producers</p> <ul style="list-style-type: none"> -Replicate the technology -Use all inputs supplied by the sponsor -Guarantee their farm is chemical-free -Follow crop rotation schedules <p>Sponsor</p> <ul style="list-style-type: none"> -Supplies inputs -Installs all inputs -Guarantees the quality -Provides technical assistance -Buys all chemical-free vegetables 	<p>Producers</p> <ul style="list-style-type: none"> -Follow the annual production schedule (crop rotation) -Guarantee the supply of chemical-free vegetables -Only supply to the sponsor <p>Sponsor</p> <ul style="list-style-type: none"> -Buys 100% of vegetables -Stabilises high prices -Provides technical support 	<p>Land owners (farmers)</p> <ul style="list-style-type: none"> -Provide a certain size of land -Agree with the sponsor's project -Agree to participate in all necessary activities -Receive technical advice from the sponsor -Receive only 50% of total gross revenues <p>Sponsor</p> <ul style="list-style-type: none"> -Responsible for 100% of investment capital -Responsible for production technology, marketing and sale

Table 6.1 Continued

			-Receives 50% of the gross revenues
Ownership of inputs and input flows	<p>Producers</p> <ul style="list-style-type: none"> -Buy inputs from the sponsor -Replicate the new technology <p>Sponsor</p> <ul style="list-style-type: none"> -Supply inputs with lower margins compared to other input suppliers 	<p>Producers</p> <ul style="list-style-type: none"> -Responsible for all expenses occurring in their production <p>Sponsor</p> <ul style="list-style-type: none"> -Provides information, links farmers to input suppliers and facilitation -Provides technical assistance to farmers on input installation and maintenance 	-All inputs used in the agreed land size will be owned legally by the land owners after the contract period
Decision making regarding planting and harvesting times	-Sponsor makes annual production schedules	-Sponsor makes annual production schedules	-Sponsor makes production schedules participated in by land owners
Type of inputs used in vegetable production	<ul style="list-style-type: none"> -Compost fertilisers (bought from the sponsor) -Green net (not compulsory) -Trip irrigation system (compulsory) -Trellises (compulsory) -Strings (compulsory) -Mulch (compulsory) -Organic pesticides (compulsory) 	<ul style="list-style-type: none"> -Compost fertilisers (bought from input suppliers or made by farmers themselves) -Green net (compulsory) -Trellises (compulsory) -Strings (compulsory) -Trip irrigation system (not compulsory) -Grown mulch (leaves or rice straw mulch) (compulsory) 	<ul style="list-style-type: none"> -Chemical fertilisers -Compost fertilisers -Chemical pesticides -Green net -Trip irrigation system -Trellises -Strings -Mulch
Source of financial capital for investment	-Producers' own capital	-Producers' own capital -Microfinance institutes	-Sponsor's investment capital
Intervention of sponsor on financial capital	-Sell inputs on credit	<ul style="list-style-type: none"> -Links producers to microfinance institutes -Provides guarantee to microfinance institutes -Farmers receive loan up to 850 US dollars without collateral 	-Not required
Obligation to deliver and to buy	<p>Sponsor</p> <ul style="list-style-type: none"> -Provides 10-kg plastic bags -Transports from farm-gate <p>Farmers</p> <ul style="list-style-type: none"> -Harvest and put all vegetables in plastic bags (10 Kg) 	<p>Sponsor</p> <ul style="list-style-type: none"> -Provides 10-kg plastic bags -Transports from farm-gate <p>Farmers</p> <ul style="list-style-type: none"> -Harvest and put all vegetables in plastic bags (10 Kg) 	-The sponsor arranges all transactions from harvesting to sale

Table 6.1 Continued

Price arrangement	-Flexible prices according to the market prices of organic products (still high compared to conventional products')	-Listed in the written annual contract (almost double compared to conventional products')	-Market prices of conventional products
-------------------	---	---	---

Source: Primary data collected from focus groups and key informants

6.4 Costs faced and revenues received by smallholders in the three different business models

This section examines the estimated costs and revenues of tomato production under the alternative governance structures and compares these under private and social prices. The results are summarized in Tables 6.2 and 6.3 which provide partial farm budgets at private and social prices, respectively, with a few notable exceptions. Table 6.2 also includes transaction costs in the private budget which are removed from the social budget.

In Tables 6.2 and 6.3, outputs are valued at the new, higher prices that are obtainable under the different governance models. These are assumed to be the same for private and social budgets. Tradeable costs include costs from the previous budget in Chapter 5, plus new inputs associated with improved production practices. These include the use of mulch, drip irrigation, nets, and compost. The prices of these inputs were assumed to be the same for private and social budgets given a lack of information to assume otherwise. In Table 6.2, the private price of seeds was assumed to be the wholesale social price from the previous chapter, accounting for the ability of the governance programs in Models 1 and 2 to obtain bulk-purchased inputs. For the other inputs in Table 6.2, the private prices from Chapter 5 were used to calculate private costs. In Table 6.3, the social price used in all cases was the wholesale price (the border price adjusted by a 15 percent margin). For new inputs, there was no difference between private and social prices. For non-tradeable inputs, private and social prices were assumed to be the same.

The other difference between Tables 6.2 and 6.3 involves the incorporation of transaction costs for these new inputs in the private budget (Table 6.2). In Table 6.3, these transaction costs were assumed to be zero. It is worth noting that the transaction costs faced by smallholders in the three alternative structures are a lot lower compared to the estimated costs of tradeable and non-tradeable inputs and estimated revenues. Interestingly, there are

no transaction costs faced by smallholders identified in Model 3, while Model 1 has the highest transaction costs, but they are still low enough that their influence on profitability is limited.

Table 6.2: Estimation of input costs faced, revenues received by tomato growers and transaction costs in the alternative models at private prices

N.	Types of inputs	Quantity			Unit costs (USD)			Total costs (USD)		
		M1	M2	M3	M1	M2	M3	M1	M2	M3
Variable inputs										
1	Seeds (packages)	2	2	3	3.22	3.22	0.00	6.44	6.44	0.00
2	Compost fertilisers (kg)	960	960	960	0.13	0.08	0.00	128	76.8	0.00
3	Strings	30	30	30	1.22	1.00	0.00	36.59	30.00	0.00
4	Mulch (rice straw)	-	-	-	-	-	-	19.51	19.51	0.00
5	Fuel	30	30	30	0.95	0.95	0.00	28.54	28.54	0.00
Fixed inputs										
6	Tiller (10-year depreciation)	1	1	1	18.00	18.00	18.00	18.00	18.00	18.00
7	Pump (10-year depreciation)	1	1	1	17.50	17.50	17.50	17.50	17.50	17.50
8	Pesticide spraying machine (5 years)	1	1	1	12.00	12.00	12.00	12.00	12.00	12.00
9	Drip irrigation system (2 years)	1	1	1	65.78	71.11	0.00	65.78	71.11	0.00
10	Green net (5 years)	1	1	1	234.67	240.00	0.00	234.67	240.00	0.00
Total tradeable input cost								567.03	519.90	47.50
Non-tradeable inputs										
11	Interest (months)	0	3	0	0.00	7.40	0.00	0.00	22.21	0.00
12	Land value	1	1	1	121.95	121.95	121.95	121.95	121.95	121.95
13	Labour				193.17	193.17	193.17	193.17	193.17	193.17
Total non-tradeable input cost								315.12	337.33	315.12
Transaction costs on tradeable inputs										
14	Ex-ante TC							22.49	10.00	0.00
15	During transaction							0.00	0.00	0.00
16	Ex-post TC							0.00	10.00	0.00
Transaction costs on non-tradeable inputs (credit)										
17	Ex-ante TC							0.00	0.00	0.00
18	During transaction							0.00	47.12	0.00
19	Ex-post TC							0.00	20.00	0.00
Total tradeable input costs including transaction costs								589.52	539.90	47.50
Total non-tradeable input costs including transaction costs								315.12	404.45	315.12
Average expected output										
20	Yield and revenue	4,500	4,500	6,400	0.73	0.73	0.24	3,285	3,285	1,536
Transaction costs in output										
21	Ex-ante TC							5.00	0.00	0.00
22	During transaction							5.00	0.00	0.00
23	Ex-post TC							5.00	20.00	0.00
Total output after transaction costs								3,270	3,265	1,536

Source: Data collected from field interviews. M1 refers to Model 1, M2 to Model 2, and M3 to Model 3 as discussed in the previous section.

Table 6.3: Estimation of input costs faced, revenues received by tomato growers and transaction costs in the alternative models at social prices

N.	Types of inputs	Quantity			Unit costs (USD)			Total costs (USD)		
		M1	M2	M3	M1	M2	M3	M1	M2	M3
Variable inputs										
1	Seeds (packages)	2	2	3	3.22	3.22	0.00	6.44	6.44	0.00
2	Compost fertilisers (kg)	960	960	960	0.13	0.08	0.00	128	76.8	0.00
3	Strings	30	30	30	0.86	0.86	0.00	25.88	25.88	0.00
4	Mulch (rice straw)	-	-	-	-	-	-	19.51	19.51	0.00
5	Fuel	30	30	30	0.79	0.79	0.00	23.81	23.81	0.00
Fixed inputs										
6	Tiller (10-year depreciation)	1	1	1	17.25	17.25	17.25	17.25	17.25	17.25
7	Pump (10-year depreciation)	1	1	1	14.38	14.38	14.38	14.38	14.38	14.38
8	Pesticide spraying machine (5 years)	1	1	1	8.28	8.28	8.28	8.28	8.28	8.28
9	Trip irrigation system (2 years)	1	1	1	65.78	71.11	0.00	65.78	71.11	0.00
10	Green net (5 years)	1	1	1	234.67	240.00	0.00	234.67	240.00	0.00
Total tradeable input cost								543.99	503.45	39.91
Non-tradeable inputs										
11	Interest (months)	0	3	0	0.00	7.40	0.00	0.00	22.21	0.00
12	Land value	1	1	1	121.95	121.95	121.95	121.95	121.95	121.95
13	Labour				193.17	193.17	193.17	193.17	193.17	193.17
Total non-tradeable input cost								315.12	337.33	315.12
Transaction costs on tradeable inputs										
14	Ex-ante TC							0.00	0.00	0.00
15	During transaction							0.00	0.00	0.00
16	Ex-post TC							0.00	0.00	0.00
Transaction costs in non-tradeable inputs (credit)										
17	Ex-ante TC							0.00	0.00	0.00
18	During transaction							0.00	0.00	0.00
19	Ex-post TC							0.00	0.00	0.00
Total tradeable input costs including transaction costs								543.99	503.45	39.91
Total non-tradeable input costs including transaction costs								315.12	337.33	315.12
Average expected output										
20	Yield and revenue	4,500	4,500	6,400	0.73	0.73	0.24	3,285	3,285	1,536
Transaction costs on output										
21	Ex-ante TC							0.00	0.00	0.00
22	During transaction							0.00	0.00	0.00
23	Ex-post TC							0.00	0.00	0.00
Total output after transaction costs								3,285	3,285	1,536

Source: Data collected from field interviews. M1 refers to Model 1, M2 to Model 2, and M3 to Model 3 as discussed in the previous section.

6.5 A comparison of alternative governance structures using the adapted PAM

The adapted PAM based on the budgets presented in Tables 6.2 and 6.3 is summarized in Table 6.4. The PAM highlights significantly improved profitability amongst all alternative governance models and notably less in the way of divergences. Model 1 is the most beneficial structure for smallholders. It achieves high returns from a combination of higher prices from targeting a high value market and lower input costs. Even though production yields are lower because of the focus on the chemical-free market, the production is highly profitable. In one production cycle, tomato smallholders can receive total profits (at private prices) up to USD 2,365.

In Model 2, profits are nearly as high at private prices (USD 2,321), although revenues are slightly lower and costs slightly higher. This model has more in the way of transaction costs (see Tables 6.2 and 6.3) that create wider divergences as compared to this model at social prices. At the same time, there could be benefits relative to Model 1 on the organizational costs of using an informal contract. These were not quantified but would be a good area for future research.

The partnership approach of Model 3 significantly reduces the tradeable production costs faced by smallholders, but the revenue-sharing nature of the program leads to considerably lower revenues compared to the other models. Transaction costs, on the other hand, are considerably lower, with differences between private and social budgets being small. Nonetheless, the profits received by farmers under this model are about one-half of the other two models. Again, there may be additional organizational benefits from this approach that were not quantified.

Table 6.4: Adapted PAM for alternative governance structures

Governance structures	Revenues	Costs		Profit
		Tradeable Inputs	Non-tradeable Factors	
Private				
Baseline (with transaction costs)	1,042.83	197.33	370.64	474.86
Model 1	3,270.00	589.52	315.12	2,365.36
Model 2	3,265.00	539.90	404.45	2,320.65
Model 3	1,536.00	47.50	315.12	1,173.38
Social				
Baseline	1,645.89	165.26	330.00	1,150.64
Model 1	3,285.00	543.99	315.12	2,425.90
Model 2	3,285.00	503.45	337.33	2,444.23
Model 3	1,536.00	39.91	315.12	1,180.98
Effects of divergences				
Baseline	-603.06	32.07	40.64	-675.78
Model 1	-15.00	45.54	-	-60.54
Model 2	-20.00	36.46	67.12	-123.58
Model 3	-	7.60	-	-7.60

Source: Computation based on primary data

The adapted PAM further verifies the improvement in efficiency and comparative advantage associated with the different governance models. In Table 6.5, computations of EPCs and DRCs were made, comparing the baseline and alternative governance models. In all cases, DRCs highlight strong comparative advantage, while the EPC results of the alternative governance models demonstrate less distortions from observable transaction costs.

Table 6.5: EPC and DRC calculations from baseline and adapted PAM

Types of ratios	Ratio results
EPC-Baseline	0.57
EPC- Model 1	0.98
EPC-Model 2	0.98
EPC-Model 3	0.99
DRC-Baseline	0.22
DRC-Model 1	0.11
DRC-Model 2	0.12
DRC-Model 3	0.21

Source: Computation from the adapted PAM matrix (table 6.4)

Chapter 7

Discussion and Conclusions

7.1 Introduction

This research has tried to answer the research question, “Why is Cambodia unable to competitively satisfy domestic demand for tomatoes, and is instead reliant on imported products?” While vegetables have been claimed to give higher profits for farmers than more land-intensive crops such as rice, maize, cassava, etc., this does not seem to be the case in Cambodia. This research hypothesises that one of the most influential factors behind Cambodia’s low competitive advantage is the presence of high transaction costs. Three research objectives were developed to test this hypothesis: (1) to understand the structure and practice of tomato value chains in Cambodia; (2) to quantify the transaction costs that affect the competitiveness of smallholder vegetable farmers; and (3) to examine and quantify the role that alternative governance mechanisms could play in reducing transaction costs.

This thesis reviewed a range of literature encompassing the Cambodian tomato sector and its value chains, a number of key value chain theories, a review of relevant theory on transaction costs and governance, and the use of the policy analysis matrix (PAM) for quantitative analysis. An important contribution of this research has been to build on past research that has tried to quantify different types of transaction costs in the value chain. This research partially draws on the work of Williamson and Hobbs, while also trying to extend the role that PAMs could play in the context of transaction costs, following the earlier work of Kydd et al. (1997). The adapted PAMs generated in this thesis try to better address both transaction costs and the role of different governance measures in reducing the market failures experienced by smallholders, and provide a quantitative evidence base to support policymaking among the public and private sectors alike.

The following sections review some of the key findings and provide some additional guidance for policy, private investment, and future research.

7.2 Research synthesis and conclusions

The first stage of analysis in this study provided a descriptive background of the tomato value chain and governance structure in every linkage across the chain. A full insight into a broad range of problems was detected and a key insight of this research was quantifying the magnitude of transaction costs, and proposing alternative governance mechanisms that reduce them. By doing so, the values of transactions can be precisely illustrated and measured in the types of transactions (information, negotiation and monitoring) faced by farmers. In terms of the tomato value chain in Cambodia, this research indicated that the highest level of transaction costs arose in output transactions, followed by non-tradeable input transactions, whereas the value of those incurred in tradeable transactions were much smaller, at USD 176.68, USD 46.94 and USD 6.66, respectively. The total observable transaction costs faced by tomato smallholders reduced the profits of smallholder farmers by nearly one-third.

The second stage of the analysis in this research attempted to investigate and measure the full range of challenges faced by smallholders. The framework of the policy analysis matrix was helpful in measuring the occurrence of transaction costs in output transactions, in tradeable input transactions and in non-tradeable input transactions. The PAM revealed that both observable transaction costs and unobservable costs create divergences from the socially optimal level of profit. These unobservable costs are much higher on the output and tradeable input sides, representing 71 percent of the total divergence in output transactions and 79 percent of total divergence in tradeable inputs. By contrast, unobservable transaction costs comprise just over 15 percent of the total divergence in non-tradeable inputs. These unobserved costs could come from a variety of market and coordination failures in the value chain and warrant further research to quantify. The adapted PAM result indicates that profits at private prices (which include transactions costs) are substantially lower than optimal profits at social prices, with transactions costs reducing private profits by almost 60 percent.

Computations of domestic resource costs (DRC) indicate that tomato production has a comparative advantage over imports, even at the baseline. However, a variety of market failures impair the ability of smallholders to capitalize on this. Alternative governance patterns could improve competitiveness versus imported products and increase smallholder profit. The adapted PAM used in this study further allowed a quantification across alternative governance

structures with the current structure. The PAM indicated that smallholders have a greater chance to be better off by moving from the current structures to another two higher forms: namely either contracting with an informal contract or through a written contract. These two models provide greater comparative advantage relative to a partnership approach. These governance structures provide better market coordination that could reduce transaction costs and increase profit. However, the ability of smallholders to take advantage of these alternative marketing forms depends on the relative cost of coordination, which could be quite high.

The complete result of this value chain study suggests a few interventions that could be taken. From a policy standpoint, improving the coordination among value chain actors should be a priority. The private sector should be encouraged to develop tighter links with smallholders. The projects of the government as well as NGOs should also focus on market coordination rather than just intervening in new technology. The motivation to integrate Models 1 and 2 is also beneficial. Model 1 takes great input coordination, but it is still at high risk due to the informal contract, and it is the opposite for Model 2. Sponsors working in Model 1 have a role as input traders ensuring input quality, appropriate input-use techniques as well as input prices for their selected farmers. Model 2 focuses attention on the output coordination with the secured output price for farmers through a written contract. The combination of these two models can lead to a higher form of vertical coordination for both the input and output sides. This helps orient both the lead firms, sponsors and producers and farmers to share risks and commit to obtaining long-term incentives. It is also important for the government to consider formalizing horizontal coordination among farmers to increase their bargaining power.

7.3 Limitations and future research

The researcher has identified two potential limitations of this research and these areas are suggested for future research. First, the transaction costs quantified in this study are only those exposed by smallholders, while those arising in the transaction costs of other actors have not yet been included. It is expected that other actors also face transaction costs. Quantifying the total transaction costs value across the chain and comparing those faced by others would bring more insights into promising possible actions in the value chain. Second,

and linked to the first gap, this research has identified the total measurable costs associated with transaction costs, but there remain other unobservable costs that create divergences that are still to be investigated. As the unobservable costs are significantly huge in value, up to 66 percent of the total transaction costs affecting smallholders' tomato productions in Cambodia, future research may play a role in initiating a new framework for detecting them and for explaining how they occur.

List of References

- Adesina, A. A., & Coulibaly, O. N. (1998). Policy and competitiveness of agroforestry-based technologies for maize production in Cameroon: An application of policy analysis matrix. *Agricultural Economics*, 19(1), 1-13.
- Azam, M. S., Imai, K. S., & Gaiha, R. (2012). Agricultural supply response and smallholders market participation: The case of Cambodia. *Discussion Paper Series, RIEB, Kobe University*.
- Birthal, P. S., Joshi, P. K., & Gulati, A. (2005). Vertical coordination in high-value food commodities: Implications for smallholders. *Discussion Paper of International Food Policy Research Institute*, 85.
- CDRI. (2011). *Cambodia food security and agricultural policy: Roundtable proceedings*.
- Chambers, R. (1997). Shortcut and participatory methods for gaining social information for projects. *Sustainable development: social organization, institutional arrangements and rural development*, 6(1997), 177-208.
- Chhean, S., Diep, K., & Moustier, P. (2004). *Vegetable market flows and chain in Phnom Penh: Sustainable Development of Peri-Urban Agriculture in Southeast Asia Project*.
- Coase, R. (1937). *The nature of the firm*
- Cuevas, C. E., & Graham, D. H. (1986). *Rationing agricultural credit in developing countries: The role and determinants of transaction costs for borrowers*. Paper presented at the meeting of the Agriculture in a Turbulent World Economy,
- Dolan, C., & Humphrey, J. (2004). Changing governance patterns in the trade in fresh vegetables between Africa and the United Kingdom. *Environment and Planning A*, 36(3), 491-509.
- Dolan, C., Humphrey, J., & Harris-Pascal, C., &. (1999). *Horticultural commodity chains: The impact of the UK market on the African fresh vegetable industry* Institute of Development Studies.
- Dynamic Alliance Consulting. (2011). *Research on agro-tools market mapping and analysis*.
- Ellram, L. M. (1996). The use of case study method in logistics research. *Journal of Business Logistics*, 17, 93-138.
- Em, H., Yutaka, T., Fukuda, S., & Kai, S. (2007). Spatial connection of vegetable market in Cambodia. *Kyushu University*, 52(2), 465-474.
- Fang, C., & Beghin, J. C. (2000). *Food self-sufficiency, comparative advantage, and agricultural trade: a policy analysis matrix for Chinese agriculture*.
- FAO. (2014). *Socio-economic context and role of agriculture*. Retrieved from <http://www.fao.org/docrep/field/009/i3761e/i3761e.pdf>
- FAO. (2015). *FAO statistical pocketbook: World food and agriculture*
- Genova, C., Weinberger, K., Sokhom, S., Vanndy, M., & Yarith, E. C. (2006). Postharvest loss in the supply chain for vegetables: The case of tomato, yardlong bean, cucumber and Chinese kale in Cambodia. *AVRDC Working Paper*, 16.
- Gereffi, G., & Fernandez-Stark. (2016). *Global value chain analysis: A primer*
- Gereffi, G., Humphrey, J., Kaplinsky, R., & Sturgeon, T. (2001). *Introduction: Globalisation, value chains and development*. Institute of Development Studies (IDS) Bulletin.
- Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, 12(1), 78-104.
- Goetz, S. J. (1992). A selectivity model of household food marketing behaviour in Sub-Saharan Africa. *American Journal of Agricultural Economics*, 74(2), 444-352.
- Gong, W., Parton, K., Cox, R. J., & Zhou, Z. (2007). Transaction costs and cattle farmers' choice of marketing channels in China: A tobit analysis. *Management Research News*, 30(1), 47-56.
- Gow, H. R., & Swinnen, J. F. M. (1998). Up and downstream restructuring, foreign direct investment, and hold-up problems in agricultural transition. *European Review of Agricultural Economics*, 25, 331-350.

- Grover, V., & Malhotra, M. K. (2003). Transaction cost framework in operations and supply chain management research: Theory and measurement. *Journal of Operations Management*, 21, 457-473.
- Gunjal, K., Sheinkman, M., Burja, K., Jeong, J., & Long, Y. (2012). *FAO/WFP crop and food security update mission to Cambodia*: FAO and WFP.
- Heifer International. (2011). *Studying cooperatives in Cambodia*: Heifer International.
- Hem, S. (2012). *Foreign investment in agriculture in Cambodia: A survey of recent trends*. The International Institute for Sustainable Development. Retrieved from https://www.iisd.org/sites/default/files/publications/foreign_investment_ag_cambodia.pdf
- Hennink, M. M. (2014). *Focus group discussion: Understanding qualitative research*. Retrieved from https://books.google.co.nz/books?hl=en&lr=&id=5DLLAgAAQBAJ&oi=fnd&pg=PP1&dq=focus+group+discussions&ots=hlQOAuXcTP&sig=_7DJBhpH4uJ03eZJPkxaqVceS_E#v=onepage&q=focus%20group%20discussions&f=false
- Hobbs, J. E. (1997). Measuring the importance of transaction costs in cattle marketing. *American Agricultural Economics Association*, 79, 1083-1095.
- Humphrey, J., & Schmitz, H. (2000). Governance and upgrading: Linking industrial cluster and global value chain research. *IDS Working Paper*.
- Intal, P. S., Jr., Oum, S., & Simorangkir, M. J. O. (2008). *Agriculture development, trade and regional cooperation in developing east Asia*: Economic Research Institute for ASEAN and East Asia (ERIA).
- Kaplinsky, R. (2000). Globalisation and unequalisation: What can be learned from value-chain analysis? *The Journal of Development Studies*, 37(2), 117-146.
- Kaplinsky, R. (2004). Spreading the gains from globalisation: What can be learned from value-chain analysis? *Problems of Economic Transition*, 47(2), 74-115.
- Kaplinsky, R., & Morris, M. (2001). *A handbook for value chain research*
- Key, N., Sadoulet, E., & De Janvry, A. (2000). Transactions costs and agricultural household supply response. *American Agricultural Economics Association*, 82, 245-259.
- Kusakabe, K. (2006). *On the borders of legality: A review of studies on street vending in Phnom Penh, Cambodia*: International Labour Organization.
- Kydd, J., Pearce, R., & Stockbridge, M. (1997). The economic analysis of commodity systems: Extending the policy analysis matrix to account for environmental effects and transactions costs. *Agricultural System*, 55(2), 323-345.
- Lee, J., Gereffi, G., & Beauvais, J. (2012). Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *PNAS*, 109(31), 1226-1233.
- Lewis-Beck, M., Bryman, A. E., and Liao, T. F. (2004). The Sage encyclopedia of social science research methods. *Thousand Oaks, CA: Sage Publications*, 1.
- McNaughton, R. (2006). *Local vegetables to boost Cambodian diets*. Retrieved from <http://aci.gov.au/files/node/630/Partners%20Dec%2005%20Cambodian%20vegetables.pdf>
- Miller, A. (1998). External analysis. In *Strategic Management* (pp. 70-113)
- Mohanty, S., Fang, C., & Chaudhary, J. (2002). *Assessing the competitiveness of Indian cotton production: a policy analysis matrix approach*.
- Monke, E. A., & Pearson, S. R. (1989). *The policy analysis matrix for agricultural development*
- Narro, C., Roy, D., Okello, J., Avendano, B., Rich, K., & Thorat, A. (2009). Public-private partnerships and collective action in high value fruit and vegetable supply chains. *Food Policy*, 34, 8-15.
- Nelson, G. C., & Panggabean, M. (1991). The costs of Indonesian sugar policy: A policy analysis matrix approach. *American Agricultural Economics Association*, 73(3), 703-712.
- Nuppun. (2016). *The vegetable sector in Cambodia*.
- Palada, M., Bhattarai, S., Roberts, M., Bhattarai, M., Kimsan, R., Kan, S., & Wu, D. (2008). *Increasing on-farm water productivity through affordable microirrigation*. Paper presented at the meeting of the International Forum on Water and Food,
- Pearson, S. R., Gotsch, C., & Balhri, S. (2003). *Applications of the policy analysis matrix in Indonesia*

- Phnom Penh Capital Hall. (2017). *Distances from Phnom Penh to other provinces*. Retrieved 7/05/2017, 2017, from <http://phnompenh.gov.kh/en/phnom-penh-city/distances-from-phnom-penh-to-other-provinces/>
- Pigali, P., Khwaja, Y., & Meijer, M. (2005). *Commercialising small farms: Reducing transaction cost*. Paper presented at the meeting of the The future of small farm,
- Porter, M. E. (1985). The value chain and competitive advantage. In *Competitive advantage* (pp. 33-61). Retrieved from https://books.google.co.nz/books?hl=en&lr=&id=INEI9R4MWawC&oi=fnd&pg=PT54&dq=porter+Value+chain+and+competitive+advantage&ots=XCma2Dp-LF&sig=LDs2U66x2UR-V_bF_H6FgvinpBo#v=onepage&q=porter%20Value%20chain%20and%20competitive%20advantage&f=false
- Reardon, T., Barrett, C. B., Berdegue, J. A., & Swinnen, J. F. M. (2008). Agrifood industry transformation and small farmers in developing countries. *World Development*, 37(11), 1717-1727.
- Reardon, T., & Timmer, C. P. (2007). Transformation of markets for agricultural output in developing countries since 1950: How has thinking changed? In *Handbook of Agricultural Economics* (Vol. 3, pp. 2807-2855)
- Renkow, M., Hallstrom, D. G., & Karangja, D. D. (2004). Rural infrastructure, transaction costs and market participation in Kenya. *Journal of Development Economics*, 73, 349-367.
- Rich, K. M., Ross, R. B., Baker, A. D., & Negassa, A. (2011). Quantifying value chain analysis in the context of livestock system in developing countries. *Food Policy*, 36, 214-222.
- Royal Government of Cambodia. (2011). *National strategic development plan update 2009-2013*.
- Royal Government of Cambodia. (2014). *National strategic development plan 2014-2018*.
- Royer, A. (2011). Transaction costs in milk marketing: A comparison between Canada and Great Britain. *International Association of Agricultural Economics*, 42, 171-182.
- Sartorius, K., & Kirsten, J. (2007). A framework to facilitate institutional arrangements for smallholder supply in developing countries: An agribusiness perspective. *Food Policy*, 32, 640-655.
- SNV. (2014). *Value chain mapping and analysis: Land-based communities in Cambodia*.
- Sok, S., Chap, S., & Chheang, V. (2011). Cambodia's agriculture: Challenges and prospects. *CICP Working Paper*, 37.
- The World Bank. (2011). *Cambodia more efficient government spending for strong and inclusive growth: Integrated fiduciary assessment and public expenditure review (IFARPER)*: The World Bank.
- The World Bank. (2014). *Poverty has fallen, yet many Cambodians are still at risk of slipping back into poverty, new report finds*. Retrieved from <http://www.worldbank.org/en/news/press-release/2014/02/20/poverty-has-fallen-yet-many-cambodians-are-still-at-risk-of-slipping-back-into-poverty>
- The World Bank. (2015). *Cambodian agriculture in transition: Opportunities and risks*.
- Theng, V., & Koy, R. (2011). *Review of agricultural policy and policy research*.
- Trienekens, J. H. (2011). Agricultural value chain in developing countries: A framework for analysis. *International Food and Agribusiness Management Review*, 14(2), 51-82.
- UNDP. (2013). *Industry-agriculture linkages: Implications for rice policy* (Vol. 9)
- USAID. (2015). *An analysis of three commodity value chains in Cambodia: Rice, horticulture and aquaculture*.
- Vakis, R., Sadoulet, E., & De Janvry, A. (2003). Measuring transactions costs from observed behavior: Market choice in Peru. *Department of Agricultural and Resource Economics, UCB, Berkeley*.
- Weinberger, K., & Lumpkin, T. A. (2007). Diversification into horticulture and poverty reduction: A research agenda. *World Development*, 35(8), 1464-1480.
- Wever, M., Wognum, P. M., Trienekens, J. H., & Omta, S. W. F. (2012). Supply chain-wide consequences of transaction risks and their contractual solutions: Towards an extended transaction cost economics framework. *Journal of Supply Chain Management*, 48(1), 73-91.

- Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics*, 22(2), 233-261.
- Williamson, O. E. (1985). *The economic institutions of capitalism*. Free Press: New York.
- Williamson, O. E. (1991). Comparative economic organization: The Analysis of discrete structural alternatives. *Administrative Science Quarterly*, 36(2), 269-296.
- Winter-Nelson, A., & Aggrey-Fynn, E. (2008). Identify opportunity in Ghana's agriculture: Results from a policy analysis matrix. *International Food Policy Research Institute*.
- Yao, S. (1997). Rice production in Thailand seen through a policy analysis matrix. *Food Policy*, 22(6), 547-560.
- Yin, R. K. (2009). *Case study: design and methods (Third ed.)*. Thousand Oaks, CA: Sage Publications

Annexes

Annex 1: Data collection checklist

This checklist is prepared to collect data for the research title, “Measuring smallholder competitiveness in the vegetable value chain in Cambodia: A transaction cost perspective”. This checklist follows the chronological order of expected findings responding to the main research objectives. In each section, four important elements are included: the purpose of each section, the expected respondents, the checklist of data to be collected, methods used to collect data and the responsibility of the data collector team.

1. Tomato value chain mapping

Purpose	The value chain map is to be produced to understand the characteristics of tomato value chains in Cambodia.
Respondents	15 tomato growing farmers and key actors
Questions	<ol style="list-style-type: none"> 1. Who are the actors? 2. Their location? 3. Distance (km) from each actor? 4. Average cost of transportation? 5. Transport means? 6. Activities of each actor? 7. Numbers of each actor? 8. Road condition? 9. Information flow? 10. Monetary flow?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Maps of Cambodia, Battambang and Kandal ✓ Transparent flipcharts with a number of layers ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of all different stages of maps being produced <p>-Facilitation method:</p> <ul style="list-style-type: none"> ✓ Focus group ✓ Key informant: to check with other actors whether the information given by farmers is correct. <p>-Number of facilitators: 2 persons</p> <ul style="list-style-type: none"> ✓ Researchers ✓ One assistant
Activities and responsibility	The activity will start with the introduction of the purpose of value chain mapping introduced by the researcher. Then, show the map and point out the place of meeting. In this stage, the researcher shows some of important locations such as towns (Phnom Penh, Battambang town or Kandal provincial centre). After that, the researcher proposes the first question about the stakeholders, “Who are the input suppliers, middlemen, retailers etc.?” and follows the questions listed above.

1.1 Seasonal calendar of tomatoes

Purpose	This tool is used to get more insight into the activities of farmers in different seasons. This exercise can provide the first ideas about the opportunity cost taken by farmers throughout the different seasons of the year.
Respondents	-Same participants as in the previous section
Questions	<ol style="list-style-type: none"> 1. What is the actual period of the rainy seasons and dry seasons in your areas? 2. What are your main activities of the year? (rice, crops, livestock, labour...) 3. List all main activities 4. If there are some changes in the terms of activities from one season to another, what are the reasons?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts which have the seasonal calendar sheets already prepared ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p> <ul style="list-style-type: none"> ✓ Focus group <p>-Number of facilitators: 2 persons</p> <ul style="list-style-type: none"> ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	<p>The explanation of the sheets of the seasonal calendar (prepared in advance on the flipcharts) is the beginning of the exercise. With the question checklist, list all main activities given by participants in the activity columns. Give 10 marks to every column of the months for each activity for the busiest period, and give 0 marks for those of each activity, if there is no activity or they are not busy at all.</p> <p>The facilitator encourages the discussion by selecting one of the most popular participants to be the facilitator for giving the marks. During the discussion, the facilitator also needs to take notes and ask the follow up question “reasons for giving marks”.</p>

Template of seasonal calendars used in this study

N.	Activities	Months											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Rain?												
2	Dry?												
3	Rice?												
4	Crop 1-what?												
5	Crop 2-what?												
6	Crop 3-what?												
7	Livestock 1-what?												
8	Livestock 2-what?												
9	Livestock 3-what?												
10	Labour 1-what?												
11	Labour 2-what?												
12	Other sources of income?...												
13	Prices of tomatoes (Riel/kg)												
14	Yields of tomatoes												
15	Road conditions												
16												

2. Description of governance structures

2.1 The coordination between input suppliers and farmers

Purpose	-To identify the relationship patterns among tomato chain actors
Respondents	15 tomato farmers for a focus group
Questions	<ol style="list-style-type: none"> 1. What are the inputs used in your tomato production? How do you know the importance of those inputs/ why do you use those inputs? 2. Who and where do you buy them from? Do you buy different inputs from different places or from only one supplier? Why? 3. How many times per production cycle do you buy inputs? Do you buy inputs from the same suppliers you have bought for the previous production cycle or years? If yes or no, why? 4. If you buy from the same suppliers for years, what type of contract do you use? Why? When do you pay (cash and receive the products)? 5. If you have a contract, what is included in the contract (delivery time, quality, quantity, tolerance levels, guarantee, contract duration)? Is it in a written form? 6. Is there the involvement of a third party? If yes, who and what are their roles? 7. Do you make a purchase order before buying or just go and buy? Why? 8. What are the criteria used for making a decision to buy products (quality, price, others)? 9. In the case where you have a contract with your suppliers, what are the differences between your current suppliers and other suppliers? 10. Have you had any problems in terms of changing terms in contracts relative to price, quality or others? How do you deal with them? 11. When is the quality measured? By whom? 12. What are the specific terms used in the agreement in terms of quality?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p> <ul style="list-style-type: none"> ✓ Focus group <p>-Number of facilitators: 2 persons</p> <ul style="list-style-type: none"> ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	The focus group facilitator leads the discussion beginning with specific types of inputs used in tomato production. After this, the facilitator asks questions and encourages diverse answers from the group for every question. During this discussion, the facilitator groups the answers due to the differences and asks for reasons behind the differences. After finishing this section, it is important to make a brief summary to make sure that all the information is correct and well understood.

2.2 The coordination between farmers and buyers

Purpose	-To identify the relationship patterns among tomato chain actors
Respondents	15 tomato farmers for a focus group
Questions	<ol style="list-style-type: none"> 1. How many potential tomato middlemen are there in your area? Who are they? How far away is their location? (Also ask in the mapping session) 2. How do you know them? 3. What are the criteria used to select one of them (price, trust, easy communication, easy delivery, relationship, prompt payment and others)? 4. What type of contract is used in your trade relationship (written or verbal)? What is included in your contract (price, quality, quantity, delivery time tolerance levels and others)? <ol style="list-style-type: none"> 4.1. Who set the price? 4.2. What are specifications involved in quality? Who measures it? When? 4.3. When and how do you know the total volume to be bought? 5. Is there the involvement of a third party? If yes, who and what are their roles? 6. Have you experienced re-negotiation? What is it for? How do you solve that problem? 7. Have you experienced changing your buyers? If yes, what are the reasons? 8. What are the differences between your current buyer and other middlemen?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p> <ul style="list-style-type: none"> ✓ Focus group <p>-Number of facilitators: 2 persons</p> <ul style="list-style-type: none"> ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	Same as section 2.1

3. Production costs for farmers

3.1 Tradeable input costs

Purpose	-To measure the production costs of tomato production
Respondents	Same focus group as in section 2.1
Questions	What are the costs of your inputs per production cycle?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p> <ul style="list-style-type: none"> ✓ Focus group <p>-Number of facilitators: 2 persons</p> <ul style="list-style-type: none"> ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	As the inputs are already listed in the section 1 of the focus group discussion, they are relisted in the template of tradeable input costs on the flipcharts by a research assistant (see the table below). To begin this exercise, the participants are divided into 3 different groups based on production scale. Each group is required to assign one facilitator who is responsible for leading the discussion to find the quantity and unit price of each input utilised in the tomato production. After that, the researcher facilitates making a calculation to find total costs. This stage provides an opportunity to see the different results among the three groups. Next, a representative from each group is requested to do a presentation and answer questions raised by other groups. This leads to understanding the reasons there are differences in the costs of tradeable inputs.

Template used for collecting data of tradeable input costs for this study

N.	Items	Quantity	Unit price (R)	Total (R)
Variable costs				
	Seed			
	Fertiliser1			
	Fertiliser2			
	Fertiliser3			
	Herbicide1			
	Herbicide2			
	Herbicide3			
	Insecticide 1			
	Insecticide 2			
	Insecticide 3			
	Weedicide			
	Water drip system			
	Plastic mulch			
	Trellises			
Fixed cost (farm equipment)				

	Tillers (depreciation...years)			
	Pump (depreciation ...years)			
	Total			

3.2 Non-tradeable input costs

Purpose	-To measure the production costs of tomato production
Respondents	Same focus group as in section 2.1
Questions	What are the costs of your non-tradeable inputs per production cycle? - Land: Owned or rented? How much per production cycle? - Labour: If hired, how much per production cycle? - Credit for capital: How much per production cycle including interest rate?
Method and materials	-Material list: ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output -Facilitation method: ✓ Focus group -Number of facilitators: 2 persons ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	To begin this exercise, the participants are divided into 3 different groups based on production scale. Each group is required to assign one facilitator who is responsible for leading the discussion to find the quantity and unit price of each input utilised in the tomato production. After that, the researcher facilitates making a calculation to find total costs. This stage provides an opportunity to see the different results among the three groups. Next, a representative from each group is requested to do a presentation and answer questions raised by other groups. This leads to understanding the reasons why there are differences in the costs of tradeable inputs.

Template used for collecting data of non-tradeable input costs for this study

N.	Items	Quantity/ Days	Opportunity costs/ interest rate	Unit price (R)	Total (R)
1	Land				
2	Loan				
Labour (non-wage household labour)					
	Manual land clearing				
	Ploughing				
	Harrowing				
	Weeding				
	Planting				
	Fertiliser application				
	Herbicide application				

	Insecticide application				
	Bird scaring				
	Harvesting				
	Packing				
	Cleaning				
	Grading				
	Loading of-loading				
	Transport				
					Total
Labour non-household member (wage)					
	Manual land clearing				
	Ploughing				
	Harrowing				
	Weeding				
	Planting				
	Fertiliser application				
	Herbicide application				
	Insecticide application				
	Bird scaring				
	Harvesting				
	Packing				
	Cleaning				
	Grading				
	Loading of-loading				
	Transport				
					Total

4. Output prices

Purpose	-To measure the production costs of tomato production
Respondents	Same focus group as in section 2.1
Questions	-Price of tomatoes per Kg? Minimum and maximum? -Average total volume (kg) per production cycle? Minimum and maximum? -Average total volume (kg) sold per production cycle? Minimum and maximum?
Method and materials	-Material list: <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output -Facilitation method: <ul style="list-style-type: none"> ✓ Focus group -Number of facilitators: 2 persons <ul style="list-style-type: none"> ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	Same as section 3.2

Template used for collecting the data of the average returns gained from tomato production for this study

Seasons	Average quantity (kg)	Minimum quantity (kg)	Maximum quantity (kg)	Unit price (Riel/Kg)	Total revenue (Riel)
Season 1					
Season 2					
Season 3					
Season 4					

5. The transaction costs incurred in the tomato value chain

5.1 Transaction costs added to tradeable input costs

Purpose	-To measure transaction costs adding to the tomato production
Respondents	Same focus group as in section 2.1
Questions	<p>Information searching costs (before the transaction-ex ante)</p> <ol style="list-style-type: none"> 1. How many days on average do farmers need to search for input suppliers? (opportunity cost) 2. How do they know the input suppliers? (from neighbours/NGOs/others-what?) 3. Is there any travel involved to search for input suppliers? If so, how many trips? What is the cost per trip? How many people join the trip (opportunity cost)? Total costs for transportation? 4. Are there any phone communications? If so, how often do they call or message? What is the average cost per call or message? <p>Negotiation costs added to tradeable inputs</p> <ol style="list-style-type: none"> 5. Do farmers need transport to buy inputs from sellers? If so, what is the average cost per time? How many times per production cycle? 6. How far are the input shops from their home? 7. Do they use different trips for buying different types of inputs? If so, how many times on average? <p>Monitoring costs added to tradeable inputs</p> <ol style="list-style-type: none"> 8. Have they experienced changing the products bought in terms of quality? If so, how? Are there any trips to change? Are there any phone communications? Total costs?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p> <ul style="list-style-type: none"> ✓ Focus group <p>-Number of facilitators: 2 persons</p> <ul style="list-style-type: none"> ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	Same as in section 3.2

Template used to measure transaction costs incurred in farm-gate budgets in the current structure

N.	Type of variables	Period (days)	Opportunity costs (Riel/ days)	How often?	Cost per time?	N. of people	Total
Information searching costs (ex-ante)							
1	Searching for input suppliers						
2	Travel costs						
3	Phone calls						
Negotiation costs added to tradeable inputs (during the transaction of delivery)							
5	Travel costs						
6	Phone calls						
Monitoring costs added to tradeable inputs							
7	Travel costs						
8	Phone calls						
Total							

5.2 Transaction costs added to non-tradeable input costs

Purpose	-To measure transaction costs adding to the tomato production
Respondents	Same focus group as in section 2.1
Questions	<p>Land</p> <ol style="list-style-type: none"> 1. If they rent land for tomato production, how many days do they spend on searching for the appropriate location they want? How often do they change the land and find another? (opportunity cost) 2. Is there any commission for assistants to search for land? If so, how much per production cycle? (commune/village chief signatures) <p>Labour</p> <ol style="list-style-type: none"> 3. How many family members are involved in tomato production (total average working day for each)? (Opportunity cost) 4. If they employ people from outside, where are they from? How do farmers search for them? Phone communication? Travel to negotiate? Any agencies assisting to search for them (commission cost)? Total cost? <p>Credit</p> <ol style="list-style-type: none"> 5. If they use credit for production capital, how do farmers know which credit institute to borrow from (neighbour/ NGOs/ microcredit staff/others)? How many days do they spend on getting credits? 6. Is there any phone communication? What is the average communication cost? 7. Is there any travel? How many times and how far? What is the average cost per trip? (Add opportunity cost) 8. Is there any commission involved in borrowing (village/ commune chief signature)? 9. How do they pay the interest rate? Travel to the microcredit office/bank or via a credit officer?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p>

	<ul style="list-style-type: none"> ✓ Focus group -Number of facilitators: 2 persons ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	Same as in section 3.2

Template used to measure transaction costs in non-tradeable input costs

N.	Type of variables	Period (days)	Opportunity costs (Riel/ days)	How often?	Cost per time?	N. of people	Total
Land							
Information searching costs (ex-ante)							
1.	Searching for land						
2	Travel costs						
3	Phone calls						
Negotiation costs added to tradeable inputs (during the transaction of delivery)							
4	Travel costs						
5	Phone calls						
6	Commission costs						
Monitoring costs (ex-post)							
7	Travel costs						
8	Phone calls						
Sub-total for Land costs							
Labour							
Information searching costs (ex-ante)							
9	Searching for labour						
10	Travel costs						
11	Phone calls						
12	Commission costs						
Negotiation costs (during finding and renting land)							
13	Travel costs						
14	Phone calls						
15	Commission costs						
Monitoring costs (ex-post)							
16	Travel costs						
17	Phone calls						
18	Commission costs						
Sub-total for labour							
Credit							
Information searching costs (ex-ante)							
19	Searching for lenders						
20	Travel costs						
21	Phone calls						
22	Commission costs						
Negotiation costs (during finding and renting land)							

23	Travel costs						
24	Phone calls						
25	Commission costs						
Monitoring costs (ex-post)							
26	Travel costs						
27	Phone calls						
28	Commission costs						
Sub-total for credit costs							
Grand total							

5.3 Transaction cost effects on output prices

Purpose	-To measure transaction costs affecting the returns on tomato production
Respondents	Same focus group as in section 2.1
Questions	<p>Information costs affecting output prices</p> <ol style="list-style-type: none"> 1. Searching for buyers: When to search (before/during planting or during the harvesting period)? How many days in total (opportunity cost)? 2. If they do not plant tomatoes, what do they spend their time on (opportunity cost)? How much can they earn per day? 3. Is there any travel to search for buyers? If so, how many trips? What is the cost per trip? How many people join the trip (opportunity cost)? Total costs for transportation? 4. Are there any phone communications? If so, how often do they call or message? What is the average cost per call or message? <p>Negotiation costs (during the transactions)</p> <ol style="list-style-type: none"> 5. Do farmers transport their tomatoes to the buyers' places? If so, what is the average cost per transportation (fuel)? How many people are involved in transporting and how long (opportunity cost)? Total transportation costs including opportunity cost? 6. Do you buy food which is not normal for your daily life? If so, what is the average cost? 7. Are there any commission costs incurred during transportation (police check points)? If so, how much per transportation? 8. Are there any phone communications during transportation? If so, what is the average cost for that? 9. What is the quality maintenance equipment needed for transportation? How much in total per transportation involving all buying costs (transportation, communication....., opportunity cost)? <p>Monitoring costs (After the transaction)</p> <ol style="list-style-type: none"> 10. Do farmers get paid after the product is delivered? If so, how many days? 11. What are the payment methods? 12. Is there any travel to deal with this? What is the average cost for fuel and phone calls? 13. Are there any re-negotiations in terms of price? How are these dealt with?
Method and materials	<p>-Material list:</p> <ul style="list-style-type: none"> ✓ Flipcharts ✓ Permanent pens/ markers ✓ Voice recorders ✓ Camera: to take photos of the output <p>-Facilitation method:</p>

	<ul style="list-style-type: none"> ✓ Focus group -Number of facilitators: 2 persons ✓ Researchers (facilitator) ✓ One assistant (assisting with the materials and recording)
Activities and responsibility	Same as in section 3.2

Template used for quantifying transaction costs affecting the returns from tomato production

N.	Type of variables	Period (days)	Opportunity costs (Riel/days)	How many times?	Cost per time?	N. of people	Total
Information searching costs (ex-ante)							
1.	Searching for input buyers						
2	Travel costs						
3	Phone calls						
Negotiation costs added to tradeable inputs (during the transaction of delivery)							
5	Travel costs						
6	Phone calls						
7	Commission						
Monitoring costs added to tradeable inputs							
8	Travel costs						
9	Phone calls						
10	Commission						
Total							

Annex 2: Semi-structured interview for key informants

This is a section prepared to find the social budgets of the tomato trade in Cambodia. While the data of previous sections are mostly collected from value chain actors, especially farmers, this checklist is for the semi-structured interview to be conducted with non-value chain actors such as NGOs, government officers (Ministry of Agriculture and Ministry of Commerce) and vegetable importers. It is noticeable that most of the questions in this section are similar to those listed in section 2-5 as this section plays an important role in capturing different effects of the current governance and the alternative forms.

6. Social budgets of the tomato value chain

6.1 Current market (Social budget)

Purpose	-To find a social budget (social output costs and tradeable input costs)				
Respondents	-Importers				
Methodology	-Semi-structured interview with the checklist below -Facilitator: Researcher				
Activities	Market exchange rate	Equilibrium exchange rate	Import parity per ton	Unit cost	Total cost per kg
Output price					
Insurance					
Import duty					
Fees to gov't agency					
Stevedoring					
Transport to storage					
Fumigation					
Agent's charge					
Total import cost					
Tradeable inputs					
N.	Items	Quantity	Unit price (R)	Total (R)	
Variable costs					
1	Seed				
2	Fertiliser1				
3	Fertiliser2				
4	Fertiliser3				
5	Herbicide1				
6	Herbicide2				
	Herbicide3				
	Insecticide 1				
	Insecticide 2				
	Insecticide 3				
	Weedicide				
	Water drip system				
	Plastic mulch				
	Trellises				

Fixed cost (farm equipment)				
	Tillers (depreciation 15y)			
	Pump (depreciation			
Total				

6.2 Better market (border price)

6.2.1 Tradeable input costs

Purpose	-To find the global costs of tradeable inputs to compare with the real costs faced by Cambodian farmers.
Respondents	NGOs, government officers, importers and secondary data
Questions	<ol style="list-style-type: none"> 1. What are the inputs used in tomato production? 2. What are the border prices on average? Minimum and Maximum? 3. Are they changed by seasons? If so, what are the prices for tradeable inputs by seasons? Minimum and maximum? 4. For the imported products, what are the average transportation costs per kg from the border to the market? Maximum and minimum? 5. Are there any commission costs? How much? 6. In Cambodia, all agricultural input products are imported without any tariff barriers. Is it true for inputs used for tomato production? If not, what do they cost in terms of tariffs and tax? 7. What are the labour costs involved in the imported inputs? 8. What are the costs for storage? 9. What are the average prices of tradeable inputs in the current Cambodian markets? Min and Max? Are they changed by seasons? What?
Materials and method	<p>Material:</p> <ul style="list-style-type: none"> ✓ Question checklist ✓ Voice recorders ✓ Data templates <p>Collection method:</p> <ul style="list-style-type: none"> ✓ Semi-structured interview: personal discussion <p>Number of facilitators required:</p> <ul style="list-style-type: none"> ✓ Researcher only
Activities and responsibility	This interview will take place anywhere agreed or suggested by the respondents, and it is also according to the information from the secondary data. Before conducting the interview, the interviewer introduces the purposes of the interview and gives interviewees the right to skip or stop talking about sensitive issues. During the interview, the interviewer just leads the discussion based on the key points drafted in the question checklists.

6.2.2 Output prices

Purpose	-To find the global output prices to compare with the real prices received by Cambodian farmers.
Respondents	NGOs, government officers, importers and secondary data
Questions	<ol style="list-style-type: none"> 1. What are the border prices of tomatoes on average (in Vietnam and Thailand)? Minimum and Maximum? 2. Are they changed by seasons? If so, what are the price inputs by seasons? Minimum and maximum? 3. What are the average transportation costs per kg from the border to the market? Maximum and minimum? 4. Are there any commission costs? How much? 5. What are the cost values in relation to tariffs and tax? 6. What are the labour costs involved in the imported inputs? 7. What are the costs for storage? 8. What are the average prices of tradeable inputs in the current Cambodian markets? Min and Max? Are they changed by seasons? What? 9. What is the currency used for the imported inputs? What is the value converted into local currency (Riel)?
Materials and method	<p>Material:</p> <ul style="list-style-type: none"> ✓ Question checklist ✓ Voice recorders ✓ Data templates <p>Collection method:</p> <ul style="list-style-type: none"> ✓ Semi-structured interview: personal discussion <p>Number of facilitator required:</p> <ul style="list-style-type: none"> ✓ Researcher only
Activities and responsibility	This interview will take place anywhere agreed or suggested by the respondents. Before conducting the interview, the interviewer introduces the purposes of the interview and gives the interviewees the right to skip or stop talking about sensitive issues. During the interview, the interviewer just leads the discussion based on the key points drafted in the question checklists.

Data template used for border budget recording in this study

Revenue (R) per kg					
Seasons	Average border prices in foreign currency	Max	Min	Market exchange rate (Thai and Vietnam)	Revenue in local currency
Season1					
Season2					
Season3					
Season4					
Tomato imported costs (R) per kg					
Items	Average cost value in foreign currency	Max	Min	Market exchange rate (Thai and Vietnam)	Costs in local currency (R)
Season 1					
Transport cost					
Labour					
Storage					
Commission					
Tax					
Season 2					
Transport cost					
Labour					
Storage					
Commission					
Tax					
Season 3					
Transport cost					
Labour					
Storage					
Commission					
Tax					
Season 4					
Transport cost					
Labour					
Storage					
Commission					
Tax					

6.3 Social costs in relation to different governance structure perspective

This section is prepared to measure the social costs in different governance structures following the contract farming models. With the purpose of comparing the performance of these models, all have the same questions. The target respondents for these questions are NGO experts, Ministry officers and other sponsors who have experienced implementing any of the models.

Structures	Questions
Centralized model (vertical coordination)	<p>Tradeable inputs</p> <ol style="list-style-type: none"> 1. When farmers are vertically coordinated, what are tradeable inputs used in tomato production? Are they different from those outside the coordination? 2. What are the average cost values of those inputs? Min and max? 3. Where do farmers buy them from? How far away? How often do they buy? What is the travel cost per trip? 4. Do they need to spend time searching for input suppliers? If yes, how many days? Is there any travel related to the search for input suppliers? How many times? What is the cost value per time? 5. If they need to search for input suppliers, do they communicate via phone call? What is the average cost value per time? 6. Are there any problems after buying inputs? If yes, what? How do they solve them? What are the costs involved in dealing with that problem? <p>Non-tradeable inputs</p> <p>✓ Land</p> <ol style="list-style-type: none"> 7. How big is the size of land required? 8. Do farmers rent the land for their tomato production? Are there any searching costs, commission and travel costs? <p>✓ Labour</p> <ol style="list-style-type: none"> 9. To reach the supply quota given by the contracted buyer (sponsor), how many people are required for the tomato production? 10. How many of them are hired? How much do farmers pay for each? 11. Do farmers face transaction costs related to searching, commission and travel? (See the questions in section 5) 12. Do you receive training from your contractors? What is it about? How long and how often do you join the training? 13. Do you need to train your labour? If yes, how many days do you spend on it? <p>✓ Credit</p> <ol style="list-style-type: none"> 12. If they use credit for production capital, how do farmers know which credit institute to borrow from (neighbour/ NGOs/ microcredit staff/others)? How many days do they spend on getting credits? 13. Is there any phone communication? What is the average communication cost to get it done? <ol style="list-style-type: none"> 14. Is there any travel? How many times and how far? What is the average cost per trip? (Add opportunity cost) 15. Is there any commission involved in borrowing (village/ commune chief signature)? 16. How do they pay interest rates? Travel to the microcredit office/bank or via a credit officer? <p>Outputs</p> <p>✓ Information costs affecting output prices</p> <ol style="list-style-type: none"> 17. Searching for buyers: When to search (before/during planting or during harvesting period)? How many days in total (opportunity cost)?

	<p>18. If they do not plant tomatoes, what do they spent their time on (opportunity cost)? How much can they earn per day?</p> <p>19. Is there any travel to search for buyers? If so, how many trips? What is the cost per trip? How many people join the trip (opportunity cost)? Total costs for transportation?</p> <p>20. Are there any phone communications? If so, how often do they call or message? What is the average cost per call or message?</p> <p>✓ Negotiation costs (during the transactions)</p> <p>21. Do farmers transport their tomatoes to the buyers' places? If so, what is the average cost per transportation (fuel)? How many people are involved in transporting and for how long (opportunity cost)? Total transportation costs including opportunity cost?</p> <p>22. Do you buy food which is not normal for your daily life? If so, what is the average cost?</p> <p>23. Are there any commission costs incurred during transportation (police check points)? If so, how much per transportation?</p> <p>24. Are there any phone communications during transportation? If so, what is the average cost for that?</p> <p>-What is the quality maintenance equipment needed for transportation? How much in total per transportation involving all buying costs (transportation, communication....., opportunity cost)?</p> <p>✓ Monitoring costs (After the transaction)</p> <p>25. Do farmers get paid after the product is delivered? If so, how many days?</p> <p>26. What are the payment methods?</p> <p>27. Is there any travel to deal with this? What is the average cost for fuel and phone calls?</p> <p>28. Are there any re-negotiations in terms of price? How are they dealt with?</p>
	<p>Transaction costs</p> <p>1. Follow the questions in the transaction cost section in the private budget</p> <p>2. In the higher governance structure, do farmers need to have document keeping skills? If yes, what? How much time do they spend on the training?</p> <p>3. List of alternative jobs and wages per day</p> <p>Additional information</p> <p>1. Is there yield uncertainty in different governances? Why?</p> <p>2. Are there any problems for farmers in relation to asset specificity investment?</p> <p>3. Do farmers face any writing issues due to low education? How do they solve them?</p>
Nucleus model	Same questions
Multipartite model (joint-venture)	Same questions
Informal model	Same questions
Intermediary	Same questions

Template used to measure the social budgets in different governance structures in this research

Type of governance structure:.....									
Output prices									
N.	Price in the contract (R/kg)	Transaction costs						Total price after transaction costs subtraction (R/kg)	
		Type of costs	Period (days)	Opportunity costs (Rield/days)	How often?	Cost per time?	N. of people		Total TC
		Information searching costs							
1		Searching for buyers							
2		Travel costs							
3		Phone calls							
		Negotiation costs (during the transaction of delivery)							
4		Travel costs							
5		Phone calls							
6		Commission costs							
		Monitoring costs (ex-post)							
7		Travel costs							
8		Phone calls							
9		Commission costs							
Sub-total TC									
Grand total price after transaction costs subtracted (R/kg)									
Tradeable input costs									
N.	Type of inputs	Quantity	Unit price	Total cost (R/kg)	Description of product quality standard				
10									
11									
12									
13									
14									

Sub-total tradeable input costs									
Transaction costs added to tradeable input costs									
N.	Type of variables	Period (days)	Opportunity costs (Rield/days)	How often?	Cost per time?	N. of people	Total	Additional information	
Information searching costs (ex-ante)									
	Searching for input suppliers								
	Travel costs								
	Phone calls								
Negotiation costs (during the transaction of delivery)									
	Travel costs								
	Phone calls								
Monitoring costs (ex-post)									
	Travel costs								
	Phone calls								
Total tradeable input costs with TC									
Non-tradeable input costs									
N.	Type of inputs	Quantity	Unit price	Total cost (R/kg)	Additional information				
10									
11									
12									
13									
14									
Sub-total non-tradeable input costs									
N.	Type of variables	Period (days)	Opportunity costs (Rield/days)	How often?	Cost per time?	N. of people	Total	Additional information	

Land							
Information searching costs (ex-ante)							
	Searching for land						
	Travel costs						
	Phone calls						
	Commission						
Negotiation costs (during the transaction of delivery)							
	Travel costs						
	Phone calls						
	Commission						
Monitoring costs							
	Travel costs						
	Phone calls						
	Commission						
Labour							
Information searching costs (ex-ante)							
	Searching for labour						
	Travel costs						
	Phone calls						
	Commission						
Negotiation costs (during the transaction of delivery)							
	Travel costs						
	Phone calls						
	Commission						
Monitoring costs							
	Travel costs						
	Phone calls						
	Commission						
Credit							
Information searching costs (ex-ante)							

	Searching for lenders							
	Travel costs							
	Phone calls							
	Commission							
Negotiation costs (during the transaction of delivery)								
	Travel costs							
	Phone calls							
	Commission							
Monitoring costs								
	Travel costs							
	Phone calls							
	Commission							
Sub-total transaction costs added to non-tradeable input costs								
Total non-tradeable input costs with transactions								

7. The analysis of competitiveness through transaction cost quantifying in the PAM approach

	Revenues	Costs		Profit
		Tradeable Inputs	Non-tradeable Factors	
Private (without TC)				
Private (including TC)				
Social				
Market-based governance (Informal contract farming)				
Multipartite model (joint venture)				
Nucleus model				
Vertical coordination (centralized model)				
Effects of divergences				
Market-based governance (Informal contract farming)				
Multipartite model (joint venture)				
Nucleus model				
Vertical coordination (centralized model)				

Annex 3: Focus group agenda

Period	Activities	Outputs
05 minutes (8:30am-8:45am)	Introduce and explain the purpose of the topic	
90 minutes (8:45am-10:15am)	Start drawing the links between actors in the layer. Stack with additional information listed in the checklists	-Value chain maps with key information <ul style="list-style-type: none"> ○ Actors (who?) ○ Value added activities (what?) ○ Distance (where?) ○ Infrastructure condition ○ Communication ○ Monetary flow ○ Information flow ○ Physical flow ○ Product flow ○ Transportation method ○ General constraints
10 minutes	Coffee and snack	
60 minutes (10:25am-11:25am)	Identify relationship method used in each of the links based on the maps	-Current governance structure identified by the Williamson criteria: <ul style="list-style-type: none"> ○ Contract (verbal/written?-third party?) ○ Frequency (recurrent/occasional/once?) ○ Level of asset specificity required ○ The circumstances of opportunism/uncertainty ○ (see the question checklists)
15 minutes (11:25am-11:35am)	Verify the seasonal calendars produced by FAO	-Production cycle calendar <ul style="list-style-type: none"> ○ Price fluctuation ○ Yield fluctuation ○ Demand fluctuation ○ Additional reasons
90 minutes	Lunch break	
30 minutes (13:05pm-13:35pm)	-List down the tradeable inputs required in tomato production -Discuss the costs	- Tradeable input costs (fixed costs and variable costs) - Reasons to use those inputs - Efficiency of those inputs in tomato production
30 minutes (13:35pm-14:05pm)	-Discuss transaction costs incurred in input transactions	- Information about types of inputs to be used? How? - Information about potential buyers? How? - Information about price? - Price negotiation? - Negotiation about quality guarantee? - Learn how to use? - Farmers go to buy?
10 minutes	Coffee and snack	
30 minutes (14:15pm-14:45pm)	-Discuss non-tradeable factors: land, credit (interest rate), required labour	- Cost of land for production (rental) - Cost burden caused by interest rates (loan) - Labour costs (wage) - Additional information

<p>30 minutes (14:45pm- 15:15pm)</p>	<p>-Discuss transaction costs involved in domestic factors</p>	<ul style="list-style-type: none"> - Search for land (how many days? travel (fuel/meal/number of people), commission for renting contract? - Negotiation for rental fee (phone card, middlemen commission, renting acknowledgement fee) - Loan application (how many days? travel? processing fee? commission for local authority: village/commune) - Loan receiving (travel? commission fee?) - Interest payment (travel?) - Application for paying off (travel? processing fee? commission fee?) - Searching for labour (travel? phone?) - Monitoring labour (how many days? travel? how many people?)
<p>30 minutes (15:15pm- 15:45pm)</p>	<p>-Discuss transaction costs incurred in selling outputs</p>	<ul style="list-style-type: none"> - Searching for price, buyers, demand or quality (phone, travel, commission?) - Price negotiation (phone, travel, commission?) - Quality monitoring (travel, labour wage, how many people and days?)