Agri-food System Transformation:

A Case Study of the Effects on Cambodian Pig Value Chain Actors

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Abstract

Agri-food system transformation has rapidly spread from developed countries to developing countries in Asia including Cambodia. It is often argued that the transformation presents both economic opportunities and challenges for smallholder enterprises of agri-food value chains. Pig production is a very important livestock sub-sector in Cambodia via both the provision of protein for the general population and critical employment and income stream not only for rural households but also all actors along the value chains. The main aim of this research is to examine the effects of agri-food transformation on pig value chain actors in Cambodia. The findings of this study are useful for all Cambodian pig value chain stakeholders include concerned government authorities, development partners (NGOs), research institutes, private investment sector, as well as the value chain actors.

A qualitative approach was employed in this study. Data was collected through secondary source and primary source via face-to-face interviews with respondents from the government, industry as well as pig value chain actors from the study province, Kampong Speu. The findings of the study identified the restructuring patterns and a number of key opportunities and challenges faced by the various actors along the chain. Provided the effects of the transformation, it is projected that in short to long term, those smallholder chain actors along the pig value chains in Cambodia will increasingly be replaced due to the competition with larger players, and their inability to comply with the changing market requirements.

Due to their constraints and important role in the development of rural agricultural community, this study pointed out that Cambodian smallholder pig producers are the most affected chain actors and need immediate supporting interventions from the relevant stakeholders. The study concluded that better governmental regulative, technical and financial policies and pig producers' vertical (market arrangements with buyers) and horizontal (collective action) coordination are essential in tackling the challenges facing Cambodian smallholder pig producers under this transformational market environment.

Key words: Agri-food system transformation, Cambodian pig value chains, smallholders, vertical coordination, horizontal coordination

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List of Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
CIA	Central Intelligence Agency
DAHP	Department of Animal Health and Production
FDI	Foreign Direct Investment
HIC	Heifer International Cambodia
GDP	Gross Domestic Product
MAFF	Ministry of Agriculture, Fisheries and Forestry
MoE	Ministry of Environment
NIS	National Institute of Statistics
NGO	Non-Government Organisation
PDA	Provincial Department of Agriculture, Fisheries and Forestry
USD	United States Dollars
WTO	World Trade Organisation

Chapter 1: Introduction

1.1 Background of the research

Agri-food system transformation has occurred since the 20 century in the United States and Western Europe. The diffusion of the transformation rapidly spread to developing countries in Asia, Latin America and Africa over the past five decades (Reardon & Timmer, 2012). Particularly in Asia, Reardon and Timmer (2014) claimed that the diffusion of the agri-food system revolution has been taking place as a series of waves of transformation, starting in more advanced East Asian countries, such as Japan and South Korea in the 1960s-1980s, and has recently spread to developing countries, like Bangladesh and Cambodia.

The transformations have been observed in all segments (down, mid and upstream) of agri-food value chains in the form of structural, institutional and technological changes in the food system (Pimbert et al., 2001). It is often argued that the transformation presents both economic opportunities and challenges for smallholder enterprises of agri-food value chains (Baloyi, 2010; Maspaitella, Garnevska, Siddique, & Shadbolt, 2017; Rankin et al., 2016).

1.2 Problem statement

The above mentioned agri-food system transformation is a global phenomenon, as it occurs in a diffusional fashion across developing regions and countries in different agricultural commodities. Recently it appears that transformation is emerging in Cambodian pig value chains. Pig production is a significant component of Cambodian agriculture, as it offers employment and cash income to rural households. In 2013, around one million farmers were directly or indirectly employed in pig value chain in Cambodia (HIC, 2013). Pig production is crucially important, as it provides an important source of meat protein as pork is the most preferred meat for Cambodian consumers. Furthermore, pig production also contributes to the development of other rural crop sectors such as rice, corn and cassava production, because these crops are inevitably used as pig feed (Deka, Grace, Lapar, & Lindahl, 2014). Therefore, it is important for all stakeholders, both from public and private sector, to understand this value chain transformational phenomenon and its effects on different actors. As a result,

appropriate interventions and development strategies can be provided to support those most vulnerable actors in the value chain, within this dynamically changing environment.

1.3 Research question and objectives

Research question:

What are the effects of agri-food system transformation on pig value chain actors in Cambodia?

Research objectives:

1. To map out the Cambodian pig value chain and its chain actors' activities
2. To examine the transformation factors and restructuring patterns of Cambodian pig value chains
3. To identify the opportunities and challenges faced by chain actors
4. To make recommendations for the Cambodian pig value chain stakeholders' intervention policy formulation

1.4 The importance and contribution of the research

Although the transformation of agri-food value chains is not a new research topic in the developed world, it is still a new research topic in developing countries. As Reardon and Timmer (2012) stated, the steps of conceptualising and empirically researching this topic in still in an infant stage. Furthermore, most previous studies on agri-food value chain transformation in developing countries usually focused on staple grains such as rice, or tomatoes and other vegetables. Very few studies have investigated the transformation of meat value chains.

It appears that this study is one of the first studies aimed at examining the effects of transformation of the agri-food system in Cambodia, particularly in pig value chains. Previous research studies about the Cambodian pig industry were conducted mainly to investigate producers' constraints with the focus placed on technical aspects (Huynh, Aarnink, Drucker, & Verstegen, 2007; Samkol, Borin, & Sovann, 2006; Tornimbene & Drew, 2012; Wallberg, 2011). This study, however, will investigate the dynamics within Cambodian pig value chains from the transformational and holistic agri-food system point of view. This study is, hence, of crucial importance to help the stakeholders understand the changing phenomenon of pig value chains in Cambodia. It provides the information

concerning the extent to which the pig system has evolved and what is to be expected next, by comparing lessons from what has happened in other developing countries. This current research also offers solutions to smallholders in regard to how they should improve themselves and participate in a changing and competitive market.

1.5 Limitations of the study

Due to time and financial constraints, this research was conducted in only one specificpig value chain setting in Cambodia. Additionally, a relatively small number of respondents from the value chains and related institutions were interviewed. For instance, some information in regard to the procurement system of modern retail was provided by the suppliers, rather than the modern retailers as these retailer respondents considered the information confidential for their own organisation and refused to be interviewed. Furthermore, due to the scarcity of academic research studies about Cambodian pig value chain, the available related reports from secondary data source may not be reliable. The finding of this research, therefore, is limited in providing more generalised effects of agri-food system transformation on pig value chain actors in Cambodia as whole.

1.6 Thesis outline

The present thesis is organized into seven chapters. The first chapter is the introductory chapter, which includes brief background information about the research study, the problem statement, research question and objectives, the significance of the study and its limitations. Chapter two provides background information about the study country, Cambodia. Specifically, this second chapter presents relevant information in regard to the country's geographical location, socio-economic development and trade policies, agriculture and particularly the pig market supply and demand situation. Chapter three reviews relevant concepts and theories from literature related to agricultural value chain and the transformations of agri-food value chains in developing countries. Based on this literature review, a conceptual framework for the study is developed in this chapter. The fourth chapter presents the research methodology: comprising research design, respondent and area selection, data collection and analysis methods. Chapter five provides the findings and analysis of the data collected. Chapter six discusses the findings and provides recommendations, followed by the final chapter, which summarises and concludes the thesis with the provision of further research suggestions.

Chapter 2: Study Country Background

Introduction

This chapter provides relevant background information about Cambodia and sets the context for this study. This chapter is divided into seven sections. It starts with a brief description of the geographical location of the study country. Sections two and three provide socio-economic related information, which is relevant to the background information the research topic. Section four and five draw attention to Cambodian agriculture, livestock sub-sector and the pig industry in particular. Section six presents information regarding Cambodian general consumer market and modern food retail situation. Last section summarises the key points of this chapter.

2.1 Geographic location and topography

The official name of Cambodia is The Kingdom of Cambodia. Cambodia has a total territory area of 181,035 sq km (176,515 sq km of land and 4,520 sq km of water) and is situated on the mainland part of Southeast Asia. The country is located between latitudes 10° and 15° North and longitude102° and 108° East (MoE, 2009). Cambodia's neighbouring countries include Thailand (817 km) to the northwest, Laos (555 km) to the north and Vietnam (1,158) to the south-east. The south-west of Cambodia faces the Gulf of Thailand (CIA, n.d) (see Figure 2.1).

Figure 2-1: Country map of Cambodia

Source: Google Maps (2017)

According to the government's National Institute of Statistics, Cambodia is divided into four main topographical regions; Tonle Sap Lake Zone (8 provinces), Plains Zone (7 provinces), Plateau and Mountainous Zone (6 provinces), and Coastal Zone (4 provinces) (NIS, 2015b).

Cambodia has a tropical climate with two major seasons: the rainy season runs from May to November and the dry season runs from December to April (CIA, n.d). One dominant feature of the Cambodian landscape includes the large Tonle Sap (Great Lake), which is the largest freshwater lake in south-east Asia. This lake is 2,600 km² in the dry season but increases to 13,000 km² during the rainy season. Other significant features include the Bassac River and the Mekong River (the country's longest river-486 km), which runs across the country from the north to the south (MoE, 2009). Phnom Penh, the capital and largest city, is located on the banks of Tonle Sap and the Mekong River in southern-central of Cambodia.

2.2 Population and urbanisation

According to the Cambodia Socio-Economic Survey 2015 report, the population of the country in 2015 was 15.4 million, 7.8 million of which were women (51%). Among the total population of 15.4 million, the total working age population (15-64 years) was reported to be 10.1 million (NIS, 2016). About 14% of the total population live below the national poverty line (ADB, 2015).

The majority of Cambodians still live in rural areas. However, there has been a steady increase in urbanisation in recent years. Table 2.1 provides population and urbanisation growth from 11.43 million in 1998, to 15.4 million by 2015. During that period, the urban population grew from 1.79 million (15.7%) to 3.51 million (22.8 %) in 2015. Phnom Penh alone has a population of 2 million (NIS, 2016). Reported factors causing the increase in urbanisation include: increasing employment opportunities in industrial and service sectors, such as garment manufacturing, construction and tourism in urban areas; and the migration of people from rural areas in seek higher education in major cities. For example, the labour force engaged in the industry sector accounted for only 15.9 % in 2009, but rose to 24.3 % of the total labour force in 2014 (MAFF, 2017).

Table 2-1: Population growth and urbanisation

Population (million)	1998	2004	2008	2009	2013	2014	2015
Cambodia	11.43	12.65	13.39	13.72	14.67	15.18	15.4
Urban	1.79	2.38	2.61	2.64	3.14	3.41	3.51
Urban %	15.7%	18.8%	19.5%	19.2%	21.4%	22.5%	22.8%

Source: NIS (2016)

2.3 Cambodian economy

2.3.1 GDP growth

The Cambodian economic growth rate is one of the highest among Asian countries with an average of 7.6% over the last two decades (World Bank, 2017). Following this strong economic growth, with a country GDP of USD 20 billion (2016) and per capita GDP of USD 1,269, Cambodia has attained the status of a lower middle-income country. The progress of the economy was projected to remain strong at 6.8 % and 6.9% in 2017 and 2018, respectively. This growth was contributed by the growth of garment exports, construction and the tourism industry. Figure 2.2 illustrates the strong growth of Cambodian GDP per capita, from USD 323 in 1994 to USD 1,269 in 2016.

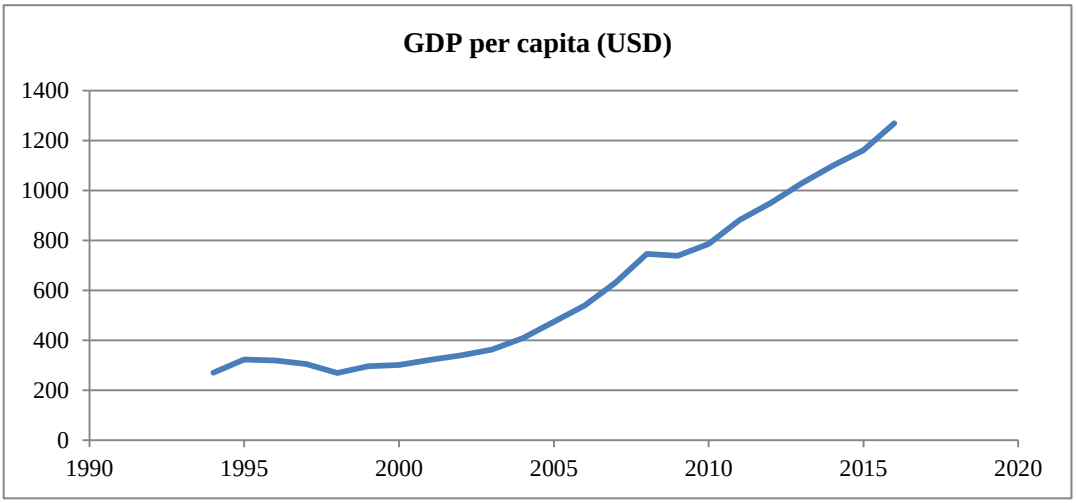


Figure 2-2: Cambodia GDP per capita from 1994-2016

Source: World Bank (2017)

As depicted in table 2.2, key sectors that contribute to Cambodia's national GDP include agriculture (28.2%), industry (29.4%), and services (42.3%). The most significant

contribution to the economy is the export of garment and footwear products, which account for 72% of total exports.

Table 2-2: Economic indicators 2016

Indicator	Metric
GDP	USD 20.017 billion
GDP per capita	USD 1,269
GDP growth	7%
GDP contributing sector	Agriculture (26.3%) Industry (31.3%) Services (42.4%)
Labour force by sector	Agriculture (45.3%) Industry (24.3%) Services (30.4%)
Trade Balance	USD -3.21 billion
Total Imports	USD 11.73 billion
Total Export	USD 8.52 billion
Garment and footwear exports	USD 6.28 billion
Rice exports	538,396 tons
Tourist arrivals	4.77 million
FDI inflow	USD 1.802 billion

Source: MAFF (2017)

2.3.2 Income disparity

Despite the national average GDP per capita, disposable income disparity varies considerably between different regions of Cambodia (NIS, 2016). For example, the monthly per capita disposable income in Phnom Penh is twice as high as the per capita disposable income for those in rural areas. Table 2.3 shows the monthly disposable income disparity between the population living in the capital city, urban and rural areas.

Table 2-3: Per capita disposable income disparity

Per capita disposable income disparity (2015, in USD)	
National	92.5
Phnom Penh	162.5
Urban	131
Rural	76.5

Source: NIS (2016)

2.3.3 Trade and investment policy

After the Paris Peace Agreement was signed in 1991 by all Cambodian warring parties, and the first post conflict national election, supervised by United Nations transitional rule, was held in 1993, the Cambodian economy has been extremely open with very few restrictions on trade and capital inflows. This economic openness is a result of the policy framework established during the United Nation rule and it has continued due to the Cambodian leadership's embrace of open trade and investment policies (Hill & Menon, 2014). The trade and investment open policies were further underpinned by Cambodia's membership to the Association of Southeast Asian Nations (ASEAN) and the World Trade Organization (WTO), in 1999 and 2004, respectively (Hill & Menon, 2013).

2.4 Cambodian agriculture

Agriculture is one of Cambodia's main economic contributors, providing 26.3% to Cambodian national GDP in 2016 (see above Table 2.2). However, from 2012 to 2016, the contribution of the Cambodian agriculture sector to the national GDP had declined from 35.6% in 2012 to 26.3% in 2016. The decline had been caused by the development of other two key sectors, industry and service (MAFF, 2017). As shown in Figure 2.3, while services sector had slightly increased over the period, the share of industry sector in national GDP had noticeably increased, spurred by garment and footwear exports.

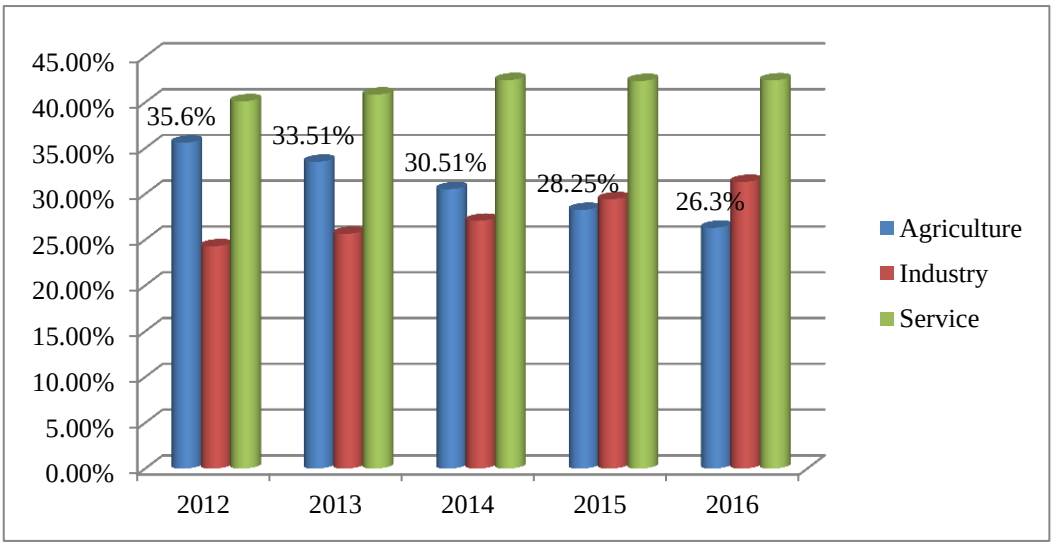


Figure 2-3: Agriculture share in national GDP

Source: MAFF (2017)

As shown in Figure 2.4, despite the decline of the agricultural share within the national GDP, the agricultural gross value added (GVA) had doubled over the last decade, increasing from 10,406 billion Cambodian Riels (USD 1= 4,000 Riels) in 2007 to 20,101 billion Cambodian Riels in 2016.

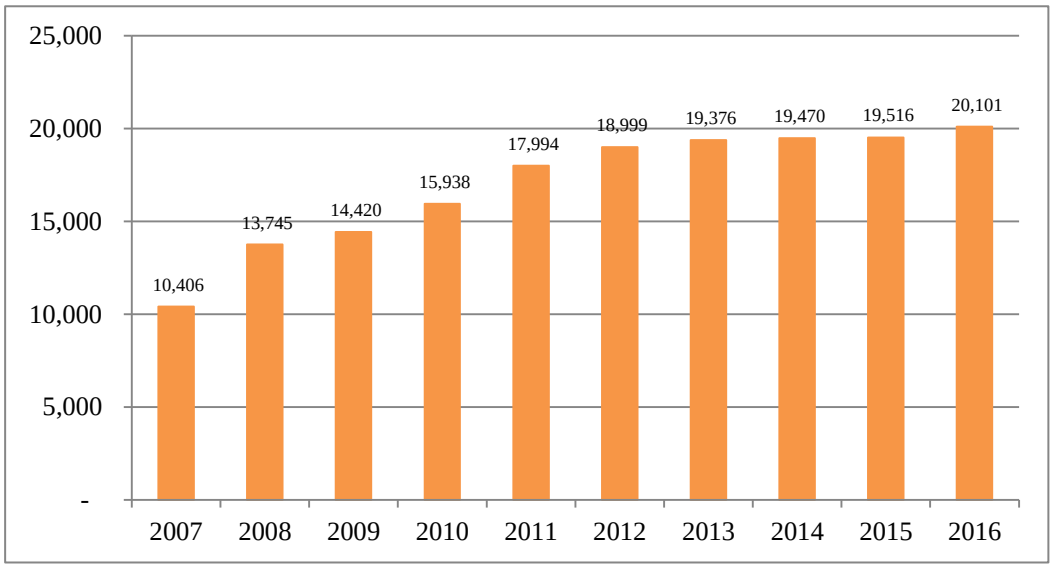


Figure 2-4: Agricultural Gross Value Added (in billion Riels)

Source: MAFF (2017)

2.4.1 Sub-sectors composition of Cambodian agriculture

There are four main sub-sectors contributing to Cambodian agriculture, namely crop production, livestock production, fisheries and forestry. In 2016, among these sub-sectors, crop production was the main sub-sector accounting for 62.39% of the contribution to agriculture, while fisheries, livestock production and forestry contributed 24.26%, 11.96% and 7.19%, respectively (MAFF, 2017). The changes in the agriculture contribution of these sub-sectors from 2012 to 2016 are shown in Figure 2.5.

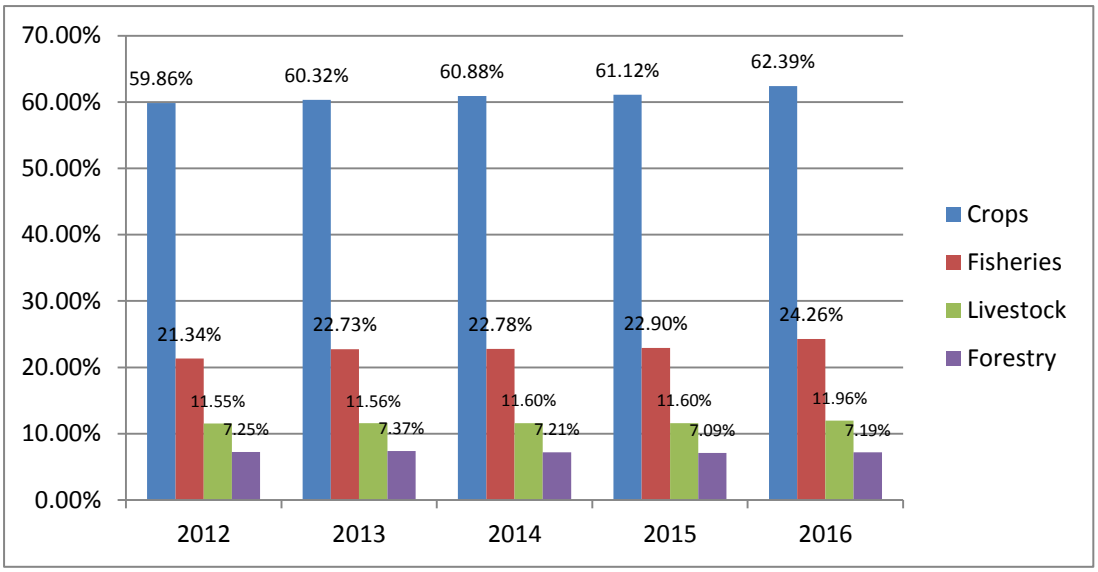


Figure 2-5: Cambodian agricultural sub-sectors 2012-2016

Source: MAFF (2017)

Within the crop production sub-sector, rice is the main crop, while other subsidiary and industrial crops include corn, cassava, sweat potato, vegetables, soy bean, sugar cane and tobacco.

2.4.2 Livestock sub-sector

Most rural Cambodian households are involved with livestock related activities (HIC, 2013). Livestock production is, therefore, crucial to the Cambodian economy, as it provides rural employment, food security, and is a source of meat protein. As a consequence, it results in the reduction of income disparity between rural and urban households (MAFF, 2017). Meanwhile, this sub-sector also has great potential for growth, due to the increasing meat consumption following population growth and urbanisation (DAHP, 2015).

There are two main types of livestock production in Cambodia. These are the family production system and the commercial production system. Recently there has been a shift within the family production system from subsistence to commercialised production, especially in the pig industry (MAFF, 2017). According to the same report, the total number of livestock including cattle, bovines, pigs, poultry, horses, sheep, goats and elephants increased from 29,617,354 head in 2012 to 42,183,394 head in 2016 (see Table 2.4).

Table 2-4: Total number of livestock production 2012-2016

Production system	Livestock type	2012	2013	2014	2015	2016
Family production system	Cattle	3,372,212	3,425,952	3,053,481	2,903,420	2,897,126
	Bovine	656,938	619,114	541,827	506,165	523,320
	Pig	1,952,321	2,067,975	2,360,823	2,357,839	2,371,283
	Poultry	19,374,139	21,429,519	25,630,027	26,688,675	28,402,486
	Horse	12,394	10,850	9,161	7,637	5,610
	Sheep	174	100	238	378	400
	Goat	11,995	15,831	18,256	23,321	22,719
	Elephant	64	64	63	64	63
Sub Total		25,380,237	27,569,405	31,613,876	32,487,499	34,223,007
Commercial production system	Cattle	4,593	4,882	6,446	13,289	23,188
	Bovine	37	52	32	63	194
	Pig	256,290	370,204	374,894	416,525	599,341
	Poultry	3,974,291	6,194,898	5,953,630	7,830,398	7,331,275
	Horse	137	47	47	41	64
	Sheep	41	15	15	31	67
	Goat	1,728	5,187	4,988	5,547	6,258
Sub Total		4,237,117	6,575,285	6,340,052	8,265,894	7,960,387
Total		*29,617,354*	*34,144,690*	*37,953,928*	*40,753,393*	*42,183,394*

Source: MAFF (2017)

2.5 Cambodian pig industry

The pig industry is a significant component of the livestock sub-sector in Cambodia, as it directly and indirectly involves around one million stakeholders and provides both a source of protein and an income for rural households (DAHP, 2015; HIC, 2013). The pig industry is not only important for pig producers, but is also beneficial for those farmers who grow corn, cassava, soy bean and other agricultural products that serve as input materials for pig production (HIC, 2013). Currently, both the family production and commercial production systems contribute to pig production in Cambodia. In 2016, the total production of pigs was 2,970,624 head, out of which 2,371,283 pigs were produced by the family production system, while 599,341 pigs were produced by commercial producers (MAFF, 2017) (see Table 2.5).

Table 2-5: Total number of pig production 2012-2016

Total pig production 2012-2016					
Year	2012	2013	2014	2015	2016
Family	1,952,321	2,067,975	2,360,823	2,357,839	2,371,283
Commercial	256,290	370,204	374,894	416,525	599,341
Total	2,208,611	2,438,179	2,735,717	2,774,364	2,970,624

Source: HIC (2013); MAFF (2017)

As shown in Table 2.5, over the period from 2012 to 2016, the total pig production in Cambodia had increased slightly. However, there was a significant increase in pig production from commercial system with a 40% growth in 2016. As a result, as shown in Figure 2.6, the share of commercial production system in total pig production rose from 15% in 2015 to 20% in 2016. This increased figure indicates increasing significant contribution of commercial production system in Cambodian pig production.

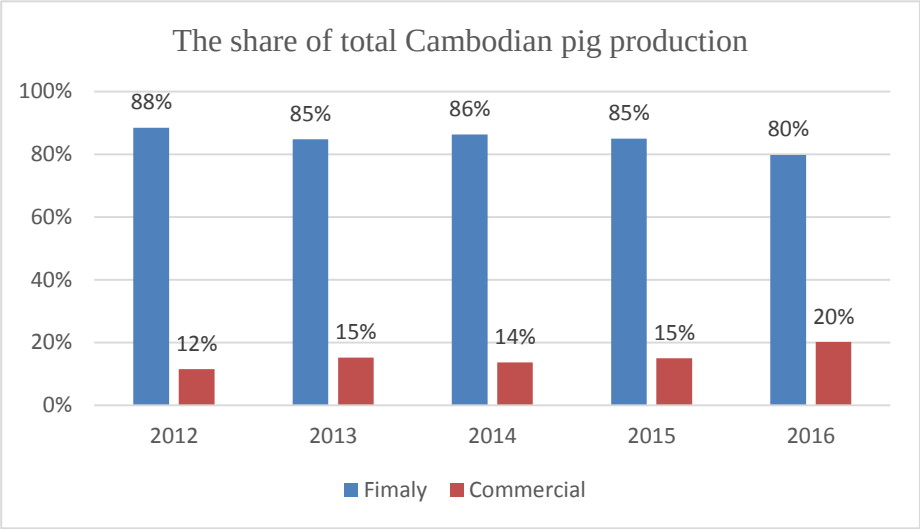


Figure 2-6: Pig production system from 2012-2016

Source: MAFF (2017)

2.5.1 Pork consumption

The total meat demand in Cambodia in 2016 was 289,094 tons. Pork accounted for more than half (64%) - equivalent to 183,497 tons. In contrast, beef and poultry accounted for 81,204 tons and 24,213 tons, respectively (see Table 2.6). The Figure illustrates that pork is the most important source of meat protein for Cambodian consumers.

Table 2-6: Total meat demand in Cambodia in 2016

Meat demand in Cambodia in 2016		
Meat	*Tons*	*%*
Pork	183,497	64%
Beef	81,204	28%
Poultry	24,213	8%
Total	288,914	100%

Source: MAFF (2017)

Compared with their two larger neighbours, Thailand and Vietnam, Cambodians have the lowest per capita pork consumption. However, as illustrated from Table 2.7, per capita pork

consumption per annum in Cambodia increased from 6 kg in 2002 to 9.29 kg in 2011(HIC, 2013), and further increased to 12.23 kg in 2016 (MAFF, 2017).

Table 2-7: Cambodian per capita pork consumption

Cambodian per capita pork consumption per annum			
Year	2002	2011	2016
Demand (kg)	6	9.29	12.23

Source: HIC (2013); MAFF (2017)

Furthermore, Sullivan (2007) claimed that there had been a huge pork consumption disparity between consumers in the capital of Phnom Penh and those of the nation average. The per capita consumption in the capital was estimated to be twice as much of the country average.

2.5.2 Pork supply and demand

Cambodian pork demand in 2011 was 157,555 tons. This increased to 162,743 tons in 2012 (HIC, 2013), and 183,487 tons in 2016, which is equivalent to 3.67 million head of pigs (MAFF, 2017). As shown in Table 2.8, the national demand for pork has had a steady increase over the period of 2011 to 2016.

Table 2-8: Total pig demand in Cambodia from 2011-2016

Total annual pig demand						
Year	2011	2012	2013	2014	2015	2016
Demand (head)	3,151,094	3,254,865	3,358,636	3,462,407	3,566,178	3,669,949

Source: HIC (2013); MAFF (2017)

Domestic production has not produced enough to respond to the market need especially with an annual increase in pork demand. MAFF (2017) reported that Cambodia produced only 2,970,624 head of pigs in 2016, although this was increased from 2,208, 611 head in 2012.

Table 2-9: Total annual pig production from 2012-2016

Total annual pig production					
Year	2012	2013	2014	2015	2016
Demand (head)	2,208,611	2,438,079	2,735,717	2,774,364	2,970,624

Source: HIC (2013); MAFF (2017)

As indicated in Table 2.9 above, there had also been a steady increase in pig production over a period between 2011 and 2016, but the increase hadn't grown for Cambodia to be self-sufficient. As a result, pork and live pigs have been imported from two neighbouring countries, Thailand and Vietnam, since 2002 in order to fulfil the domestic demand (Ernst, 2009; Sak & Thong, 2008; Wallberg, 2011). According to Ernst (2009), there was unregulated/unofficial importation of pigs from Thailand and Vietnam at around 1,000 head daily across the borders. This unregulated import figure was as much as half of the actual total import.

2.6 Cambodian consumer market

As a result of trade and investment liberalisation policies, Foreign Direct Investment (FDI) have been flowing into the country, including into its agribusiness firms and modern retail companies (Hill & Menon, 2013). Consequently, similar to other developing countries in the region, agri-food products in Cambodia are being sold through both traditional and modern markets. Traditional markets remain the dominant channel.

Thanh (2015) reported that Cambodian consumers spend about half of their disposable income on food items including rice, salt, sugar, meat, vegetable oil, and sauces. (see Figure 2.7). According to the survey conducted by the Cambodian National Institute of Statistics, it was found that fish, meat (beef, pork and poultry), and eggs were consumed 3 times, 2.23 times, and 1.31 times, respectively, per week. However, consumers in Phnom Penh (the capital city) consume fish and meat more frequently than people living in rural areas (NIS, 2015a).

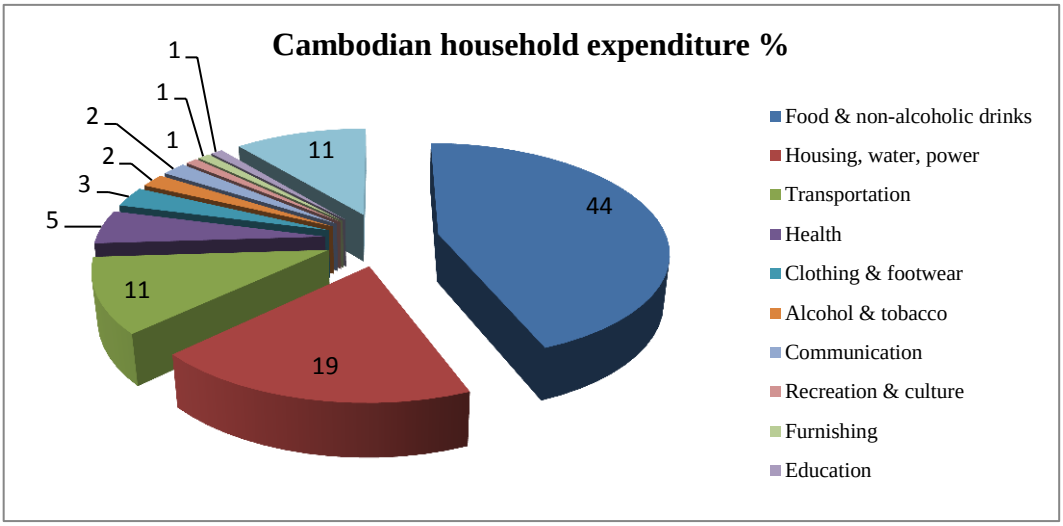


Figure 2-7: Cambodian household expenditures

Source: NIS (2015a)

2.6.1 The emergence of modern food retail

There is no study reporting the exact percentage of modern food retail as compared to the country's overall food retail (modern & traditional), but C. McCarthy and Jaffe (2016) stated that most Cambodians are still going to traditional markets to do most of their shopping. Table 2.10 compares the level of modern food retail penetration in Cambodia and other Asean countries.

Table 2-10: Modern grocery retail penetration (2014)

Penetration of modern food retail in Cambodia and some Asian countries	
Singapore	71%
Thailand	45%
Malaysian	43%
Philippines	28%
Indonesia	16%
Cambodia	Below 10%

Source: Yeo, Sim, Artispong, Yoong, and Lioe (2015)

However, due to the economic growth, urbanisation and the arrival of western tourists as well as a large number of expatriates, there has been a changing trend towards western style fast food chains and modern food retail chains. For example, in 2013, shopping mall investment

accounted for 11.8 percent of total FDI, and most shopping malls include at least one large modern supermarket (Thanh, 2015). Consequently, the shopping habit of Cambodians is also changing with the increasing availability of modern trade outlets, especially in the capital of Phnom Penh and major cities, such as Battambang, Siem Riep, Sihanouk Ville, Kampong Cham and Prey Veng.

2.7 Chapter summary

This chapter presents general background information about Cambodia as well as the country's relevant agricultural and socio-economic information which is highly relevant to the research topic. The relevant major key points of this chapter are summarised in the Table 2.12.

Table 2-11: The summary of relevant information

Relevant country information	
Indicator	**Description**
Location	Southeast Asia
Population	15 .4 million, growing urban population
GDP	Average 7.6 % growth (past 20 years), high rural-urban income disparity
Trade and investment government policy	Open
GDP contributing sectors	Agriculture (26.3%) Industry (31.3%) Services (42.4%)
Composition of agriculture sub-sector	Crops (62.39%), fisheries (24.26%), livestock (11.96%), forestry (7.19%)
Pork consumption, supply and demand	Increasing pork demand, higher urban per capita consumption, insufficient domestic pig supply, high level of imports
Food retail market	Household disposable income (50% on food expenditure), traditional market dominant, rapid growth of modern retail in the capital and major cities

Chapter 3: Literature Review

Introduction

This chapter reviews literature pertaining to the framework of agri-food transformation and its effects on food values chain and the chain participants. The chapter is divided into six sections. Section one to section four present definitions, theoretical approaches and key concepts of value chain and agricultural value chain analysis for developing countries. Section five highlights the determining factors and effects of agri-food system transformation on agri-food value chains with the emphasis on smallholders. The last section summarises the chapter and provides the developed conceptual framework for the study.

3.1 Value chain concept

3.1.1 Definition of value chain

The concept of a value chain was first used to examine the unfair distribution of value retained from the development of non-fuel primary commodities between transnational corporations and developing producer countries (Girvan, 1987). Other terms including supply chain, commodity chain, production chain and activities chain are sometimes used interchangeably to refer to value chain (Sturgeon, 2001). The definitions of value chain have been defined by different scholars. Porter (1985) defined value chain as a collection of a firm's activities that are performed to design, produce, market and support its product. Value chain is a way of understanding people's and firms' interactions with markets. In a value chain, primary actors perform a set of different functions such as input supply, production, processing, storage, wholesaling, retail and consumption (Mitchell, Keane, & Coles, 2009).

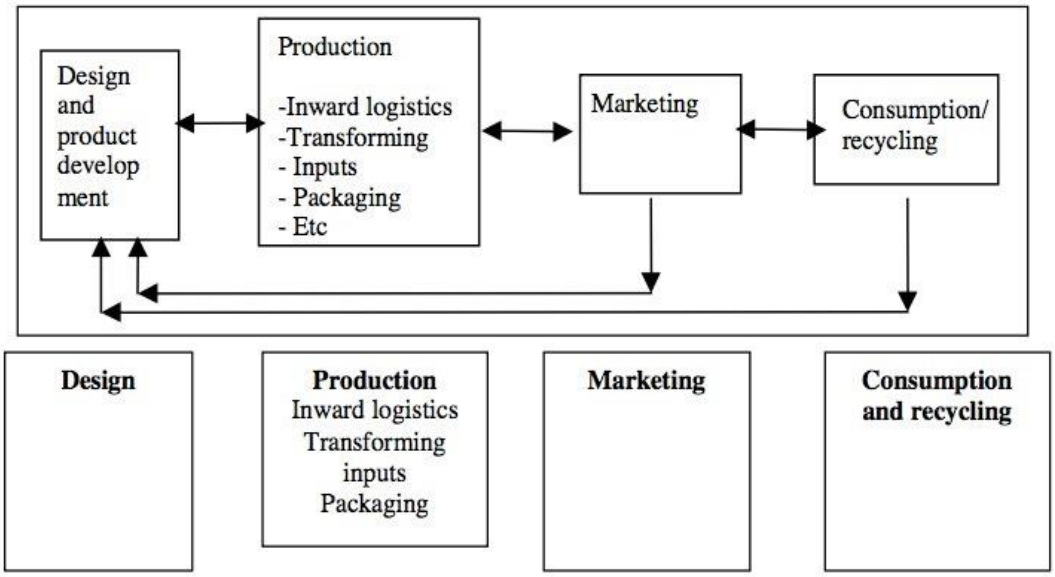


Figure 3-1: A simple value chain

Source: Kaplinsky and Morris (2001)

In the simple value chain depicted in Figure 3.1, there are four main value added links, with each link having a set of specific activities to be performed by chain actors. For example, within the production chain there are specific functions and value added activities such as inward logistics, transforming inputs and packaging (Kaplinsky & Morris, 2001).

3.1.2 Value chain approach in agriculture

A large number of studies have applied a value chain approach to agricultural commodities (Anandajayasekeram & Gebremedhin, 2009; Grunert et al., 2005; Lee, Gereffi, & Beauvais, 2012; Lindgreen et al., 2008; Stirling, 2013; Trienekens, 2011). An agricultural value chain, as defined by Higgins et al. (2010), is typically "mapped as a linear sequence of activities from primary production through to the consumer and waste management" (p. 965). Adding more elements of network to the generic definition of value chain focuses more on the vertical relationships (Anandajayasekeram & Gebremedhin, 2009; Barnes, 2004; Higgins et al., 2010; Humphrey, Oetero, Trade, & Development, 2000), Trienekens (2011), however, extends the VC concept by defining it as a network of both vertically and horizontally related companies, who jointly work to provide a product for a market. Value chain in an agricultural context, thus, focuses not only on the transformation and movements of the products and services, but also the vertical and horizontal relationships between chain actors.

3.1.3 Agricultural value chain system

Due to different market demand and requirements, such as quality, safety and market differentiation, Trienekens (2011) asserts that there are three main sub-systems of agricultural value chains in developing countries. The characteristics of the three feed sub-systems are summarised in Table 3.1.

The A system is characterised by local low-income chains, generally representing long chains intermediated by traders who connect small and traditional (family) producers to the local markets. However, system A may have the opportunity to connect to further middle income markets. Despite a high production volume, very little value is generated by System A. This type of value chain is very common in emerging economies, where agricultural production is smallholder-based (Ruben, Van Boekel, van Tilburg, & Trienekens, 2007).

Table 3-1: Agri-food value chain system

Types of agri-food value chain system			
Characteristics	**A**	**B**	**C**
Producers	Small-traditional	Small-traditional, Small-medium	Small-medium, Large
Market	Local, low-income	Local/national, medium-high income, supermarkets	Export market
Chain length	Long	Medium	Short
Governance arrangement	Spot market	Collective, contract	Integrated
Value generation	Low	Medium	High

Source: Trienekens (2011)

System B is aimed at delivering to local middle, high-income and emerging supermarkets in developing countries. Major suppliers of this system/chain are small traditional and medium-size producers organised under collective action organisations or contracting arrangements. Compared to System A, producers in System B produce a relatively smaller volume but

generate a larger value. System B producers' products are based on food quality and safety required by national and sometimes international requirements (Ruben et al., 2007). System C is characterised by mostly small-medium and large farms normally owned by foreign investment companies. They focus on export markets, where quality and safety are tightly controlled by the importing retailer requirements (Trienekens, 2011).

3.1.4 Agricultural value chain analysis

The main purpose of agricultural value chain analysis is to identify the inefficiencies and seek for solutions to improve the performance of the chain. Chain performance analysis should emphasise not only the current chain performance but also the future performance (Kaplinsky, 2000). The agricultural value chain analysis approach focuses on the chain governance structure and the power relations that determine the benefits shared among chain actors at each level (Anandajayasekeram & Gebremedhin, 2009). Herr and Muzira (2009) identified four steps used in agricultural value chain analysis:

1. Mapping out the value chain, which allows researchers to assess the characteristics of chain actors and the flow of products from upstream to downstream
2. Analysing the benefits shared among chain actors, which enables researchers to determine the benefit winner and how benefits should be better distributed
3. Identifying value chain upgrading options (quality/product improvement, network, governance)
4. Choosing governance structures that could improve capabilities, benefit distribution distortion, and increase the value added for chain actors.

3.1.5 Value added and distribution of value added

Value added refers to the value addition created by different chain actors throughout different stages of the value chain. Value added could come in many forms such as quality improvement, cost reduction, increase in delivery time and innovativeness, all of which depend on the willingness of final consumers to pay the price (Trienekens, 2011). Value added is seen as the contribution of each link to the market value (Kogut, 1985). Since value chain is the combination of many value added links, production is, therefore, considered a value added. Opportunities for a value chain actor to add value depends on a number of factors, namely market characteristics, technological capabilities of the actor and availability of market information on process and product requirements (Kaplinsky, 2000). The

distribution of value added among chain participants is strongly associated with the types of governance form of the chain. Other factors, including the chain actor's power, bargaining position, information asymmetry and production technology used, are viewed to determine how the value added is shared among chain members.

3.2 Theoretical approaches to value chains

The theories of value chains have been intensively reflected on, and undergone many different definitions and analytical approaches in the past decades (Lazzarini, Chaddad, & Cook, 2001). The main theories can be grouped into four streams with different perspectives on inter-firm relationships. These four main theories are: Global value chain (GVC), Supply Chain Management, New Institutional Economics, and Network approach (Trienekens, 2011).

Table 3-2: Theoretical approaches to value chain

VC theoretical approach	Key perspectives	Author(s)
Global value chain (GVC)	Multi-national value chain relationships, lead firms, local participants' employment and poverty alleviation	Gereffi (1994); Nadvi (2004)
Supply Chain Management	The management of value chain operations, focuses on quality and distribution process improvement	M. Cooper, Lambert, and Pagh (1997)
New Institutional Economics	Choices of governance structure of vertical inter-company relationships	Williamson (1999)
Network approach	Vertical and horizontal coordination of chain actors	Uzzi (1997)

As summarised in Table 3.2, the Global value chain approach looks at the relationships between multi-national companies, which include lead firms and participating firms in the international value chains (Gereffi, 1994). The Global value chain has an impact on GVC local actors' employment and poverty reduction (Nadvi, 2004). The Supply chain

management approach investigates the management of operations within the value chain. This approach focuses on process and quality improvement as well as optimisation of the distribution process (M. Cooper et al., 1997). The New Institutional Economics approach investigates the governance choices of inter-company relationships (Williamson, 1999). The Network approach investigates both vertical and horizontal relationships of value chain actors (Uzzi, 1997).

However, due to the relevance of this study context where pig production is for domestic consumption only (no exports), only literature related to the two theoretical approaches of Transaction Cost Economics (a New Institutional Economics approach) and Network approach are reviewed in this study. These approaches are shaded in Table 3.2. These two VC theories are reviewed in further detail in the sections below.

3.2.1 Transaction Cost Economics (New Institutional Economics approach)

A value chain can be viewed as the organisation of transaction costs between chain actors (Trienekens, 2011). A transaction is the process of an exchange of products, information and money inside a supply chain management (Jraisat, 2010). Within transaction cost theory, transaction cost explains the costs of doing business transactions (e.g. coordination, screening, contracting deals, opportunistic risks and information sharing), which could be high or low under different conditions (Ruben et al., 2007; Williamson, 2008). The Transaction Cost Economics theory claims that the choice of governance structures, whether spot market, contracts or integration, is determined by the comparison of the net effect on transaction cost (Stephen Martinez, 2002).

From the Transaction Cost perspective, it is argued that transactions occurring between firms are governed under the conditions of bounded rationality and opportunism of the involved chain actors (Williamson, 1999). Bounded rationality refers to the limitation of human cognitive ability to process information, due to the lack of relevant information (Ouma, Ochieng, Dione, & Pezo, 2017). Opportunism refers to the possibility of actors in a supply chain relationship acting opportunistically for their own interests (Williamson, 1975; Grover & Malhotra, 2003, as cited in Jraisat, 2010). When bounded rationality and opportunism situations exist, the transaction cost for concerned chain actors to monitor and avoid the risks increases (Williamson, 2000). Under these situations, actors in supply chains seek closer chain relationships (Fink, Edelman, Hatten, & James, 2006). Some key elements of

transactions are identified as asset specificity, uncertainty and frequency of transaction (Williamson, 1999).

Asset specificity

Asset specificity refers to both physical and human assets that are invested in a particular business partner and whose redeployment entails considerable costs in switching (Williamson, 1999). The level of transaction costs depends on the extent of the asset specificity invested to carry out the transactions. Any chain actors who invest any specific assets in other chain partners will choose a governance form, such as contract, that protects them from opportunism by the partners (Stephen Martinez, 2002).

Uncertainty

Uncertainties arise when members in a partnership are unable to predict their partner's behaviour or the possible changes in the external environment (Kwon & Suh, 2004), such as a change in technology, market demand or quality standards (Bijman & Wollni, 2009) that are caused by information asymmetry problems (Jraisat, 2010). Uncertainties are the cause of contractual disturbance and could result in extra costs between parties (Williamson, 2008). According to Kwon and Suh (2004), the unpredictable behaviour of a chain member tends to decrease the level of trust of the trading partner. The Transaction Cost Economic theory suggests that as uncertainties increase, the concerned chain actors tend to adopt coordination mechanisms and governance forms to increasingly control and, therefore, avoid the risk of the unknown.

Frequency of transaction

Frequency refers to the regularity of business transactions taking place between firms. This level of frequency determines whether the firm should contract the asset specificity or internalise the investment (Bourlakis & Bourlakis, 2005, as cited in Jraisat, 2010). According to Wu (2008), frequent and intense business interactions will lead to effective work routines and exchange of complementary business information and knowledge.

3.2.2 Network approach

In order to compete successfully in a changing market environment, networks are used between firms to replace traditional market systems (Möller & Halinen, 1999). The term network and relationships between companies are sometimes used interchangeably (Jraisat,

2010). The definitions of concepts related to inter-company networks and relationships can be summarised in Table 3.3.

Table 3-3: Definitions of network related concepts

Related concepts	Definition	Author(s)
Network	A focal firm's connection with other firms to obtain information and resources	Wu (2008)
Social Network Approach	A company's vertical and horizontal relationships to seek for input and services support	Trienekens (2011)
Relationship	The commitment and information exchange between firms as to develop long-term collaboration	Wilson (1995)
Relationship	A connection between buyers and suppliers as they share product information and issues	Benton and Maloni (2005)
Relationship	Inter-firms' connection based on trust, commitment, communication, power, satisfaction and cooperation	Uzzi (1997); Dash, Bruning, and Guin (2007)

Wu (2008) explains that a network is a focal firm's connection with other firms and other service providers in order to obtain timely access to information and other resources. Relevant for developing country value chain research, the Social Network approach is defined as a company being embedded in a complex of both horizontal and vertical relationships while seeking for the support of inputs and services (Trienekens, 2011). Wilson (1995) defines a relationship as the commitment and information exchange between firms in order to develop their long-term relationship. A relationship, as described by Benton and Maloni (2005), is a strong connection between suppliers and buyers as they share product information and issues, and this leads to improved firm performance. Uzzi (1997) claims that relationships are not built only upon economic considerations, but also based on trust and power, which impact the structure and duration of the relationships. Most research has looked

at relationship components such as trust, commitment, communication, power, satisfaction and cooperation (Dash et al., 2007).

A number of scholars have identified the importance of networks and relationships in doing business. Table 3.4 summarises some key findings from previous studies on network theory.

Table 3-4: Previous research related to network theory

Related concepts	Key findings	Author(s)
Social network, social capital Social Capital theory	Social network leads to favourable exchange terms, transaction cost reduction. Higher level of social capital leads to fairer benefit distribution	Robison, Siles, and Schmid (2002)
Trust, relationship	High level of trust and relationship is crucial for horizontal coordination	(Coleman, 1990)
Trust	Trust in inter-firm relationship increases possibility of involved partners to act fairly and responsibly	Chen, Yen, Rajkumar, and Tomochko (2011); Zaheer, McEvily, and Perrone (1998); Gereffi, Humphrey, and Sturgeon (2005); Trienekens (2011)
Power, bargaining position	Power and bargaining position are very important in an inter-company network as they can influence governance structures and the determine the distribution of value added	Dahl (1957) as cited in Chen et al. (2011); Wannyih Wu, Chiag, Wu, and Tu (2004); Uzzi (1997)

Robison et al. (2002) argued that building social networks and organisations through social capital can promote favourable exchange terms, reduction of transaction cost, and a wider range of options for coping with risks. According to Social Capital theory, it is suggested that as social capital increases within networks of transacting partners, the disparity of benefits decreases and the average level of benefit distribution increases. Furthermore, it is asserted

that in communities with strong social structures, a high level of trust and the intensity of relationships play a crucial role in horizontal collaboration. Coleman (1990) asserted that the embeddedness of smallholders, therefore, strengthens their bargaining position. In an inter-firm relationship context, trust increases the possibility of of involved parties to fulfil obligations, negotiate fairly and not to act opportunistically (Chen et al., 2011; Zaheer et al., 1998). Trienekens (2011) affirms that trust may play a key role in building up both vertical and horizontal relationships. Furthermore, trust also reduces opportunistic behaviour of chain actors and keeps the transaction cost low (Gereffi et al., 2005; Lindgreen et al., 2008; Ruben et al., 2007; Trienekens, 2011). Additionally, Uzzi (1997) maintains that trust has a key impact on the structure and duration of the relationships of chain actors. Dahl (1957), as cited in Wu et al., (2004), defines power as the ability of one individual or group of people to get another individual or group to do something in their favour. From an inter-firm relationship context, the firm with more power can influence other actors' activities in the supply chain (Wu et al., 2004). Power and bargaining position are very important, as they can determine the distribution of value added among various actors in the value chain (Trienekens, 2011). Power also influences the governance structures of inter-company relationships (Uzzi, 1997). Furthermore, (Robison et al., 2002) stated the ability of power to influence others depends on the physical resources and social capital is available.

3.3 Vertical coordination

In order to respond to the changes in market demand and requirements, the need for vertical coordination has become crucially important for agri-food value chain actors (Pingali, 2007; Reardon, Barrett, Berdegué, & Swinnen, 2009). A vertical coordination, according to (Stephen Martinez, 2002), is a "synchronization of successive stages of production and marketing, with respect to quantity, quality and timing of product flows" (p. 2). Vertical coordination can come in different levels, between two extreme spectrums of control: spot market exchange on one end and full hierarchy or vertical integration on the other (Jordaan, Grové, & Backeberg, 2014; Stephen Martinez, 2002; Swinnen & Maertens, 2007).

While Mighell and Jones (1963) suggested four levels of vertical coordination structures, Denolf, Trienekens, van der Vorst, and Omta (2015) suggested that there are governance structures along the coordination spectrums. Raynaud, Sauvee, and Valceschini (2005), also pointed out that between the two ends of the vertical coordination, there are five different levels of governance structure. In line with Raynaud et al. (2005), Peterson, Wysocki, and Harsh (2001) proposed and developed a strategic framework of vertical coordination, which

also consists of five levels of governance structure. This framework is known as the vertical coordination continuum.

3.3.1 Vertical governance structure

Governance structures are defined as how transaction is organised within the rules and regulations set by concerned value chain actors(Jordaan et al., 2014). Governance structures consist of five different levels (see Figure 3.2), which include Spot/Cash Market, Specification Contract, Relational-based Alliance, Equity-based Alliance, and Vertical Coordination. In essence, most scholars agree that governance structures range from spot market to integration/hierarchy with hybrid forms (contracts) of governance along the spectrum (Trienekens, 2011).

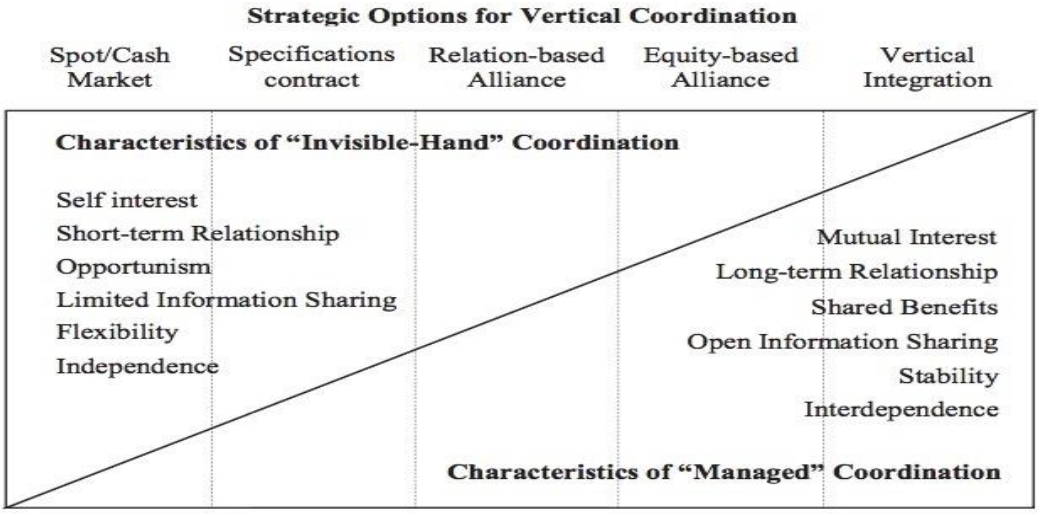


Figure 3-2: Vertical coordination continuum

Source: Peterson et al. (2001)

Depending on the methods of vertical coordination, the degree of control that integrators or contractors have shifts along the coordination continuum from Open Market to Vertical Integration.

In regard to governance structure control, Stephen Martinez (2002) contended that there are four specific methods of vertical coordination that determine different levels of control by integrators or contractors. These methods are Open Production, Market-specific Contract (marketing contract), Resource-providing contract (production contract) and Vertical integration (see Figure 3.3).

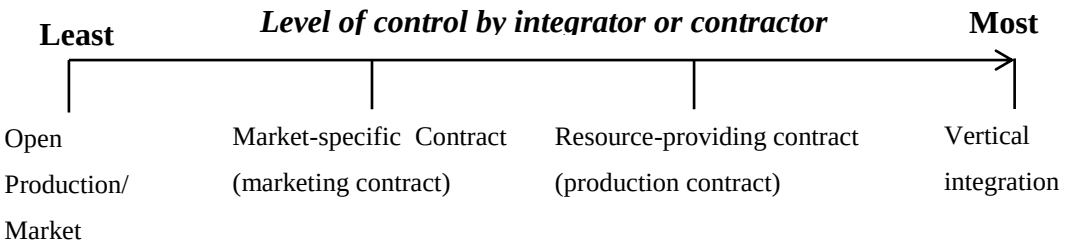


Figure 3-3: Vertical coordination control spectrum

Source: Mighell and Jones (1963)

In Open production/market transaction, the producers have no prior selling commitment to any buyers before completing the production (Stephen Martinez, 2002). A buyer purchases a commodity from a farmer at a market price determined at the time of that purchase (Steve Martinez & Reed, 1996). Thus, the level of control in Open market transaction is low (Peterson et al., 2001).

In Marketing-specific Contract/Marketing Contract, there is some prior commitment for farmers to sell goods to contractors with a pre-determined delivery schedule, product characteristics and pricing method.

In Resource-providing/Production Contract, both contractors and farmers provide significant inputs for the production process. While contractors provide and retain the ownership of production inputs, farmers are required to provide labour, farming facilities and the production site. Contractors engage in many of the producer's decision making and production outputs belong to the contractor (Stephen Martinez, 2002).

Vertical integration gives a single firm the control over two or more successive stages of the vertical coordination (King, 1992; Stephen Martinez, 2002; Mighell & Jones, 1963). In vertically integrated firms, the management directives dictate the transfer of resources across stages of the coordination continuum (Stephen Martinez, 2002). A firm can either integrate upstream or downstream. When the integration is coordinated upstream, it is called backward integration while downstream coordination is known as forward integration (Harrigan, 1985).

3.4 Horizontal coordination

Most chain related analysis studies, such as supply chain analysis (Christopher, 1999; Simchi-Levi, Simchi-Levi, & Kaminsky, 1999) and value chain analysis (Porter, 1985), place

the emphasis on the independence of firms that are vertically related. On the contrary, a concept of netchain analysis, which was developed by Lazzarini et al. (2001), focuses on networks that comprise horizontal relationships between firms from industries of the same level.

The new concept of netchain analysis argued that it is important, not only to evaluate transactions between buyers and sellers of different vertical layers, but also how actors of the same layers interact between themselves to promote and exchange knowledge (Dyer & Nobeoka, 2000; Stuart, Deckert, McCutcheon, & Kunst, 1998). Extending on this new concept, Trienekens (2011) redefined value chain as a network inclusive of both vertical and horizontal relationships between actors.

Ouma, Dione, Lule, Roesel, and Pezo (2014) stated that while vertical relationships exist between actors who perform different value chain activities, horizontally related relationships exist among actors who carry out the same function in the value chain. Figure 3.4 shows both vertical and horizontal relationships between firms in the same and different levels of the value chain. While the vertical dimension reflects the relationships between actors in different value chain stages (for example, between suppliers and traders or processors and retailers), the horizontal dimension reveals the relationships among suppliers or processors themselves.

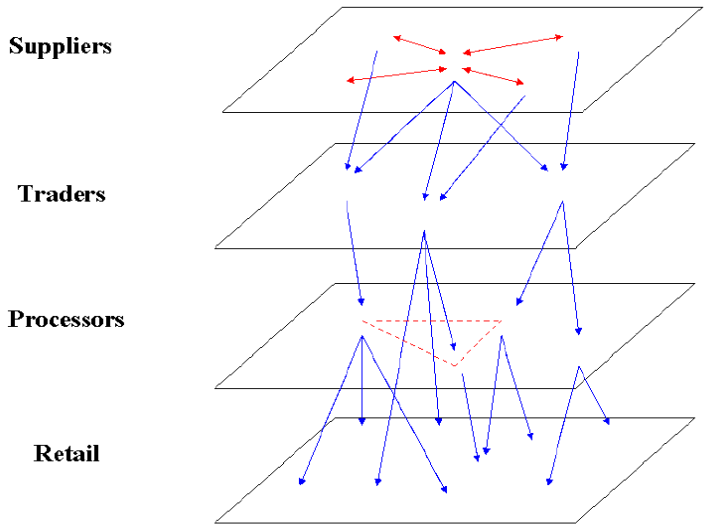


Figure 3-4: A generic netchain

Source: Lazzarini et al. (2001)

The vertical relationships between actors in different levels may follow through each step of the value chain links from suppliers to traders to processors to retailers or may skip certain links. As illustrated in Figure 3.4, however, the trader level relationships may skip the processing stage and directly link to retail. Meanwhile, the horizontal relationships between actors in the same level may occur in various forms, including farmer cooperatives or price agreement between traders (Trienekens, 2011).

3.4.1 Collective action

Collective action comes under horizontal coordination between actors of the same level. In the context of small-scale agriculture development, collective action is defined as the involvement of a group of people who share the same interest and are willing to work together to achieve the shared goal (Meinzen-Dick, DiGregorio, & McCarthy, 2004). Collective action emerges when smallholder farmers are faced with challenges that cannot be solved as individuals and the challenges can only be tackled by activities undertaken as a group. It is demonstrated by a certain level of interconnectedness, motivation and capacity (McCarthy, 2004).

The benefits of collective action

Collective action organisations can come in many forms, based on the purpose and activities of the organisation. Farmer cooperatives, associations, federations and firms are good examples of collective action organisations (Bijman & Wollni, 2009; Saarelainen & Soevers, 2011).

Due to market imperfections, smallholder farmers are usually prevented from participating in high value markets (Hellin, Lundy, & Meijer, 2009). In order to avoid being excluded and for new market development, producer organisations as a form of collection action have been viewed as the development strategy for smallholder farmers (André Louw, Vermeulen, Kirsten, & Madevu 1, 2007; Patrick, 2004; Shepherd, 2007). Research has revealed that collective action organisations help smallholder farmers to overcome market imperfection challenges. Results include reducing transaction costs and improving farmers access to input and credit markets (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009; Narayanan & Gulati, 2002; Trienekens, 2011). Through collective action organisations, smallholder farmers can also increase their bargaining power for better trade terms when negotiating with buyers (Markelova & Mwangi, 2010; Trienekens, 2011). Additionally, collective action also helps smallholders to share skills and access new production technology, which helps them to meet

basic market requirements in terms of quantity, quality and frequency of supply (Kaganzi et al., 2009).

There are a number of factors determining the success and failure of the establishment and development of collective action organisations. Some key contributing factors to successful collective action organisations are summarised in Table 3.5.

Table 3-5: Collective action organisation success factors

Success factors of collective action organisations		
Factor	Description of factor	Author(s)
Group characteristics	Group size and homogeneity, group member social relationships, commitment to working in group	Banaszak (2008); Faure (2004); Fulton (2004); Saarelainen and Soevers (2011)
Leadership	Leadership with influence, trustworthiness, business skills and good networks	Garnevska, Liu, and Shadbolt (2011); Kruijssen, Keizer, and Giuliani (2009); Markelova et al. (2009)
Economic	Increase in finances and profit distribution to members	Fulton (2004)
Political and legal	Supporting government policies	Liu (2010)
Member capacity	Members have knowledge and skills about related industry	Garnevska et al. (2011)

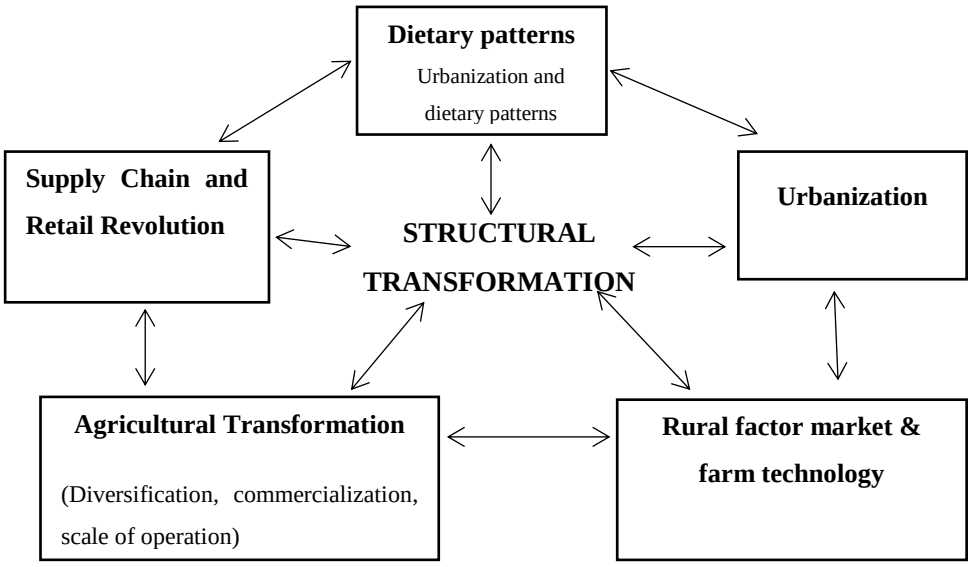
3.5 The transformation of the agri-food system

The transformation of the agri-food system has been occurring since the 20th century, initially in the United States and Western Europe. Over the past five decades, the diffusion of the food system transformation has rapidly spread to developing countries in Asia, Latin

America and Africa (Reardon & Timmer, 2007, 2012). Globalization, economic development and the use of new technologies are rapidly changing consumer behaviour and impact how both farming and agribusiness are conducted (Baloyi, 2010; Esterhuizen, 2006).

For developing countries, Reardon and Timmer (2014) suggested that the overall transformation of the agri-food system is influenced by five key transformational components; urbanization; dietary pattern; supply chain and retail revolution; agricultural transformation; and integrated factor markets, as seen in Figure 3.5. These five components are linked in mutually causal ways. The transformation of the system, therefore, is of an integrated rather than independent change.

Figure 3-5: Five key components of the agri-food system transformation



Source: Reardon and Timmer (2014)

The five transformations can be grouped into three sets: downstream (urbanisation and dietary pattern), midstream (the rural-urban food system transformation), and upstream (transformation of rural factor markets and farm technology) (Reardon & Timmer, 2014). The scholars claimed that the changes in any segment happen in tandem with and impact the changes in other segments of the whole agri-food system. As illustrated in Figure 3.6, transformation can start at any segment (upstream, midstream or downstream) and affect the other segments in the whole system.

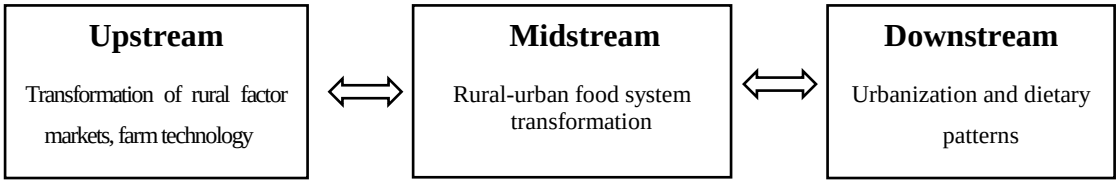


Figure 3-6: The interlink of agri-food system

Source: Reardon and Timmer (2012)

3.5.1 The effects of government policies on the agri-food system

As shown in Table 3.6, the transformation of the agri-food system in Asia has been facilitated by the direct and indirect government intervention policies. Government direct interventions in the market were seen as a fundamental restructuring policy driver, in the early stages of transformation during the 1950-1970s. These interventions included input and credit support, resulting in the provision of public wholesale markets, retail and export supporting state mechanisms.

Table 3-6: Government policy and agri-food system transformation

Government policy	Effects on agri-food system	Author(s)
Direct input and credit support	Increased farm productivity; the provision of public wholesale market, export marketing board and retail facilities (China and India)	Reardon (2015); Reardon and Huang (2008)
Privatisation of public agricultural parastatals and trade liberalisation	Inflows of FDI and private investments into the agri-food system (up, mid and downstream) (Thailand)	Rashid, Gulati, and Cummings (2008); Reardon and Huang (2008)

Later, after the government withdrew direct interventions, there were encouraging government policies supporting the privatisation of agricultural parastatals and the liberalisation of agricultural trade, especially after the 1990s (Rashid et al., 2008). Consequently, the opening policy has brought in FDI, which helps transform the agri-food system. For example, in 1991, there was a major policy reform in the Indian diary sector

where the government liberalised trade and domestic markets allowing FDI to invest in the Indian dairy processing and retail sectors.

3.5.2 The effects of the socio-economic development process on the agri-food system

In addition to government policy-driven factors, previous studies have also identified socio-economic related factors that affect the transformation of the agri-food system in Asia. These factors include population growth (Tschirley, Reardon, Dolislager, & Snyder, 2015), urbanisation (Rao et al., 2011), income growth and diversification of dietary patterns (Timmer & Dawe, 2010), and the growth of modern retail (Reardon & Berdegué, 2002; Reardon, Timmer, & Minten, 2012). These factors are inter-related. For example, increasing population and urbanisation in Asia have led to a higher demand for food in general and particularly for high value food, such as animal protein and dairy products (changing dietary patterns) in urban areas. The summary of these factors is seen in Table 3.7.

Table 3-7: Socio-economic factors and agri-food transformation

Contributing factor	Effects	Author(s)
Population growth	Population growth leads to higher demand for food	(Tschirley et al., 2015); Sharma et al. (2013a)
Urbanisation	Asian urban population is expected to grow from 45% (2011) to 56% (2030) which puts pressure on demand for high value food for urban population	Reardon and Timmer (2014)
Income growth and diversification of dietary patterns	Higher income leads to diversification of consumption pattern, a shift from staple/grain intake to more animal food consumption	(Timmer & Dawe, 2010); Pingali (2007); Reardon and Berdegué (2002)
The growth of modern retail	The emergence of modern retail changes supply procurement system - a shift from tradition market relation to contract relation via dedicated wholesalers and preferred supplier systems	Reardon and Berdegué (2002); Reardon et al. (2012)

3.5.3 Market transformation and the effects on food system restructuring patterns

The two sections above have set out the factors that lead to the transformation at the downstream (retail) segment in particular, where the demand both changes and impacts other segments of the whole food system. The following section reviews what effects these changes at the market segment have on farm production and the food supply chain system. The restructuring patterns are focused in terms of changes in structure, market relations and the use of technology in all segments of agri-food system.

Pingali (2007) asserted that the main source of food, especially those high value foods such as fruits, dairy and meat, for urban market depends on domestic farm supply. The transformations occurring upstream, therefore, drive the changes in how food supply chains are organised from rural to urban areas, as well as the changes in farm production systems. From international experiences, some scholars have observed some dramatic changes in how the food supply chain is organised and also how farms are operated in response to these changes (Baloyi, 2010; Pingali, 2007; Reardon et al., 2014). These key changes are summarised in Table 3.8.

Table 3-8: Restructuring patterns of farm operations and market relations

Traditional	Modern (transformed)
Farm Structure	
Self-sufficient production system	Commercialised production system
Operating individually	Operating co-operatively
Small players dominant	Small players decreased, large players consolidated
Value chain market arrangement	
Traditional chains	Modern value chains
Low value market	High value market
Long chains	Short chains
No standard or public standard	Private standard quality and safety
Spot market relation	Vertical coordination
Farm technology use	
Non-purchased input	Purchased/commercial input use
Manure, by-products, residues	Chemical, fertilizer, commercial feeds
Traditional animal housing and poor quality breeding	Modern technology animal housing and breeding

Source: Baloyi (2010); Pingali (2007); Lem, Bjørndal, and Lappo (2014); Reardon et al. (2014); Reardon and Timmer (2007)

For example, in the case of changes in livestock and poultry production, the study by Pingali (2007) in China revealed that farms have specialised and increased scale of production. Studies conducted in Brazil, India, Thailand and the Philippines also show that advanced technology used in breeding and feeding contributed to the success of the transformation of livestock and poultry production (Pingali, 2007).

3.5.4 Opportunities for smallholders to participate in modern retail markets

Empirical studies from the 1980s show that agri-food industry transformations downstream (retail segment) present both opportunities and challenges for smallholders (Maspaitella et al., 2017; Rankin et al., 2016). On the positive side, it has been proven that there is an improvement in farmers' income when they participate in high value markets (Irianto, 2009). It has also been argued that horizontal coordination and vertically integrated food supply

chain linking all chain actors from farm to fork have become essential for responding to the changing requirements of the transformed market (Pingali, 2007).

A success story from Thailand shows that in response to the growing demand from modern retail, smallholder farmers had opportunities to integrate into the fresh food value chain, through contract farming with buyers and via informal farmers' associations (Van, Willems, & Boselie, 2002). Another study with smallholder vegetable farmers in Madagascar revealed that with the provision of resource-based contracts provided by the contractors, smallholders inclusively participated in the export market chain. Thus, the study concluded that the inclusion of smallholders in the value chain improves their household income. The implication of the study is that coordination with buyers through contracts is, therefore, an opportunity for smallholder farmers to participate in high value market chains. A similar case using contracts also improved the opportunities for smallholders in India to participate in modern fresh food market chain (Pingali, 2007). A study conducted by Deshingkar, Kulkarni, Rao, and Rao (2003) showed that apart from the support from government sponsored schemes, horticulture smallholders had opportunities to sell to large food retailers through contractual arrangement with buyers and by resource-sharing among themselves. Another study in India on the impact of the growing modern food retail on smallholders found modern retailers tend to reorganise the supply chains based on some forms of coordination (Trebbin, 2014). The study revealed that farmer organisations and producer companies play an important role in empowering the smallholders' position and links them to supermarket buyers. The opportunities for smallholders to participate in a transformed market via different types of vertical and horizontal coordination are summarised in Table 3.9.

Table 3-9: Previous research on vertical and horizontal coordination of smallholders

Types of coordination	Key findings	Author(s)
Horizontal coordination and vertical integration	Effective response of producers to the requirements of the changing markets	Pingali (2007)
Contract farming through informal farmers' associations	Farmers able to integrate into high value fresh food chains in Thailand	Van et al. (2002)
Resourced-based contract farming	Madagascan farmers improved household income via participating in European export market chain	Pingali (2007)
Contract farming, farmers' resource-sharing strategy	Farmers able to supply large food retail in India	Deshingkar et al. (2003)
Farmer organisation and producer company	Indian farmers' position empowered and able to link to supermarket buyers	Trebbin (2014)
Contract farming, smallholder company	Increased smallholder participation and governance in modern agri-food value chains	Mungandi, Conforte, and Shadbolt (2012)

In essence, the transformation upstream present opportunities for smallholder farmers to participate in high value markets through the use of certain forms of vertical and horizontal coordination arrangements.

3.5.5 Challenges for smallholders to participate in modern retail markets

Baloyi (2010) claimed that despite the opportunities, there are still risks of smallholder farmers being excluded from participating in the transformed market. It is contended by Pingali (2007) that in order to supply modern markets, small farm production systems need to be commercialised to survive. On the other hand, Reardon and Berdegué (2002) asserted that agricultural commercialisation and the transformation of food systems have led the food

industry to be increasingly dominated by large agribusiness firms. Smallholder producers could, therefore, be excluded from the market.

A number of constraints faced by smallholders in developing countries have been identified by various scholars. These include poor market access (Grunert et al., 2005), poor production endowment (Porter, 1990), high transaction costs (Makhura, 2002), asymmetry of information or lack of market information (Biénabe, Coronel, Le Coq, & Liagre, 2004), poor quality of inputs (Baloyi, 2010), inconsistency of production (Andre Louw, Madevu, Jordaan, & Vermeulen, 2004), lack of bargaining power (Biénabe et al., 2004), poor technological skills (Baloyi, 2010), and limited access to credit and input services (Heijden, 2010; Khaile, 2012; Meer, 2006). In general, these smallholders' challenges can be grouped into two broad categories of constraints – production related constraints and trade related constraints – as summarised in Table 3.10:

Table 3-10: The summary of constraints facing smallholders

Production-related constraints	Trade-related constraints
• Poor production endowment • Poor quality of inputs • Inconsistency of production • Poor technical skills • Lack of access to credit and input services	• Poor market access • High transaction costs • Asymmetry of information or lack of market information • Lack of economy of scale • Lack of bargaining power

3.6 Research conceptual framework

The first part of this chapter reviewed relevant theories and approaches related to value chain and its application to agricultural commodities, which is the main focus of this research study. The second part of the chapter presented the review of literature on the transformation of the agri-food system, which serves as the background context influencing how agricultural value chains are affected.

The transformation of the agri-food system in Asia is driven by two broad sets of factors: policy factors and market demand factors. The socio-economic development process which include population growth, urbanisation, income growth, changing dietary patterns and

growing modern retail are demand-driven factors of the transformation on one hand, and the liberalisation and privatisation government policy serves as the policy driven factors on the other.

With the changes occurring market downstream, the demand focuses not only on the increase in quantity, but also on the higher quality and safety aspects of food. This presents economic opportunities for value chain actors. In order to participate in the changing market, chain actors must improve and upgrade their farming and operation techniques at their respective segments, so as to comply with the new requirements. Due to their constraints, small-scale chain actors are usually in a disadvantaged position under this changing market environment, despite the opportunities. Consequently, the agri-food system transformation presents not only opportunities but also challenges and impacts how producers and food supply chain actors respond to the market.

Contextually, looking from the lens of the overall agri-food system transformation, the general hypothesis of this research is that the transformation has effects on pig value chain actors in Cambodia and the three specific hypothesises are as follows:

- The transformation will have an effect on the restructuring patterns of pig value chains in Cambodia
- The transformation presents both economic opportunities and challenges for Cambodian pig value chain actors
- Constrained small-scale actors will be pushed out of their business

In summary, it is hypothesised that under market transformation, pig value chains in Cambodia will be affected in terms of structure, market relations and technology used at each and between segments of the value chains. While the transformation downstream, with the growth of modern retail and higher value markets, presents economic opportunities, there are also many challenges facing smallholders who need to comply with the new market requirements. The conceptual framework for this study is, therefore, developed as illustrated in Figure 3.7:

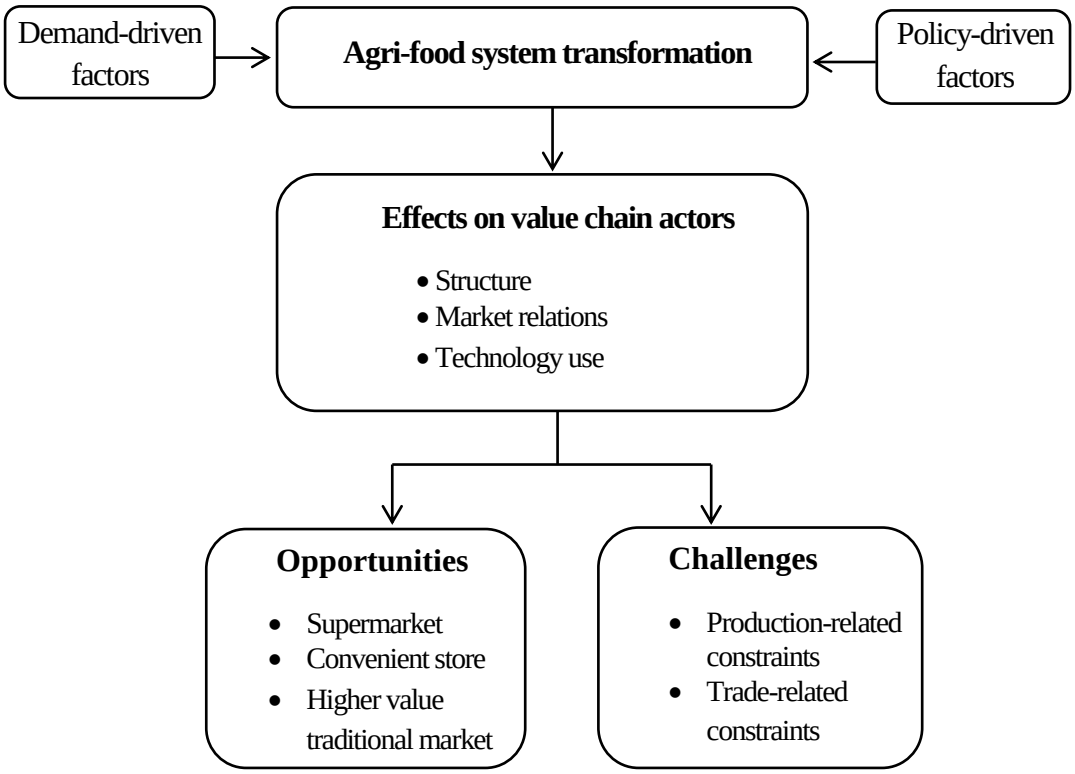


Figure 3-7: The developed research conceptual framework

Chapter 4: Research Methodology

4.1 Research question and objectives

The overall aim of this study is to examine how the transformation of agri-food system affects pig value chain actors in Cambodia. To achieve this aim, the study had the following research question and objectives:

Research question:

What are the effects of agri-food system transformation on pig value chain actors in Cambodia?

Research objectives:

1. To map out the Cambodian pig value chain and its chain actors' activities
2. To examine the transformation factors and restructuring patterns of Cambodian pig value chains
3. To identify the opportunities and challenges faced by chain actors
4. To make recommendations for the Cambodian pig value chain stakeholders' intervention policy formulation

4.2 Ontological and epistemological perspectives

An ontological perspective is concerned with the nature of social reality on which a theory is based. Ontological claims are assumptions about social reality that exist and how they interact with each other. There are two main ontological views: 'objectivism' and 'constructivism'. While ontological objectivism views social phenomena and their meanings as existing independent of social factors, ontological constructivism, on the other hand, views social phenomena and their meanings as constructed by social actors (Bryman & Bell, 2011).

An epistemological perspective is concerned with what should be accepted as valid knowledge - how one should seek to discover knowledge about the world (Blaikie, 2009). There are two contrasting epistemological positions: 'positivism' and 'interpretivism'. Positivism views phenomena as valid knowledge only if they are measurable and observable. This view reflects the independent and objective position. Positivism paradigms tend to align well with an ontological objectivist view. On the other hand, interpretivism sees reality as

constantly changing as it interacts with the phenomenon being examined (Bryman & Bell, 2011).

Based on the overall aim and objectives described for this study, it is hypothesised that the restructuring patterns, opportunities and challenges of pig value chains and chain actors in Cambodia are associated with, and the results of, the overall transformation of the agri-food system. Accordingly, the researcher will take on ontological constructionist and epistemological interpretivist perspectives to approach this study and believes that the structures and behaviours within Cambodia's pig value chains are constantly changing, as a result of the changing socio-economic environment of the country.

4.3 Research design

Research design structures the research and outlines the investigation plan leading to answers to the research questions and objectives. The design, therefore, is often based on research questions (Blumberg, Cooper, & Schindler, 2008). This research is one of the first studies undertaken to examine the effects of agri-food system transformation in Cambodia, particularly in pig value chains. The study is, thus, conducted in the form of an exploratory study.

4.4 Research methods

There are two types of research methods: quantitative and qualitative. The quantitative method is used to test if a relationship between a theory and phenomena can be found from the data findings, based on numerical interpretations (Bryman & Bell, 2007). The qualitative method, on the other hand, usually places emphasis on words rather than quantification for data collection and analysis (Ghauri & Grønhaug, 2005). The qualitative approach aligns with both interpretivism and constructivism perspectives, as this type of research requires researchers to engage more with social actors in order to understand their views of the social reality (Bryman & Bell, 2007). Furthermore, Blumberg et al. (2008) stated that the accomplishment of exploratory study's objectives rely heavily on the qualitative method.

In order to obtain answers responding to the research question and objectives, the qualitative method has, therefore, been selected. This method enables the researcher to closely engage with the chosen pig value chain actors and gain a deeper understanding of their perceptions regarding the transformational opportunities and challenges they face in the value chain. The qualitative research method also offers flexibility, allowing the researcher to obtain

knowledge of what is going on and understand the nature of the problem. This occurs through interviews and observations of actors in the business relationships under investigation (Jraisat, 2010).

4.5 Study area selection

Kompong Speu Province, was selected as the target study area. There are several reasons why Kampong Speu was chosen as the research target province. First, the province produces the country's highest number of pigs on commercial farms (MAFF, 2017). Out of 575 commercial pig farms in Cambodia, 191 commercial farms are located in this province. Furthermore, this province is also the hub of Cambodia's pig commercial feed mills, and an important pig supply source for the capital and other major cities. Additionally, this province also produces the fifth highest number of pigs by small-scale producers, which makes it one of the most significant pig producing provinces in Cambodia.

Therefore, it can be argued that Kampong Speu province is experiencing the most transformation of pig value chain in Cambodia, which makes it crucial for the research to be conducted there.

4.6 Data collection methods

Data sources refer to the carriers of the information needed for research studies (Ghauri & Grønhaug, 2005). There are two types of data sources: primary and secondary data. Primary data are the original data the researchers need to collect in person, while secondary data are the available information collected by others to serve other purposes (Kumar & Phrommathed, 2005). There are different means as regards to how primary data can be collected. These means include observations, questionnaires and interviews (Blackmon & Maylor, 2005).

In previous studies examining the effects of agri-food system transformation, both primary and secondary data were used and primary data was gathered through interviews (Reardon & Huang, 2008). Kumar and Phrommathed (2005) stated that interviews can be a useful approach for collecting complex and in-depth information, as it allows interviewers to flexibly interact with respondents in person so as to gain better understanding and observations.

Accordingly, this study used both primary and secondary data sources. Primary data collection was conducted at the target province through face-to-face interviews with 22 pig

value chain stakeholders, using semi-structured interview questionnaires and follow-up phone calls when further clarification and information was needed. Berg (2007) stated that the semi-structured interview offers the researcher flexibility in asking questions. This type of interview technique also enables the researcher to clarify information during the interview (Boeije, 2009). Semi-structured interview questionnaires were pre-tested with three pig value chain actors before the actual interviews were conducted. The purpose of the pre-tested interviews was to see the relevance and sequencing of the interview questions. Ruane (2005) stated that interview pre-testing activities allow the researcher to access the validity and reliability of the questions in relation to the research objectives. As a result, some content and sequence of the interview questions were revised.

Secondary data were collected from sources such as journals, concerned ministry and department reports, NGO project reports, livestock magazines, online newspapers and company websites (see Figure 4.1).

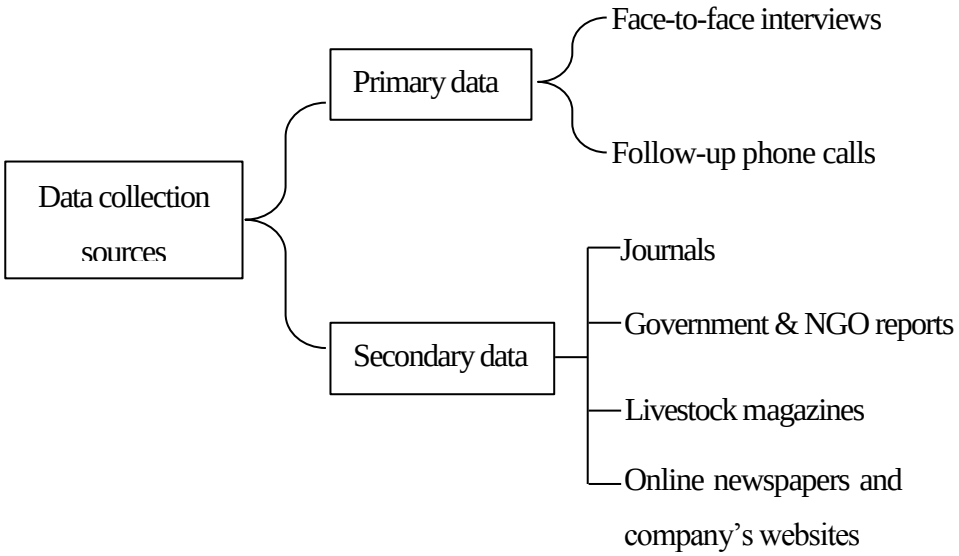


Figure 4-1: Sources of data collection

4.7 Study respondent sample

A sample of a study is selected to represent the population of the study, when the population study is too large to be undertaken through a census/interviews (David & Sutton, 2011). This study uses the snowball sampling method. According to Griffiths, Gossop, Powis, and Strang (1993), snowball sampling is a useful technique when a population is very hard to identify. This sampling technique allows the researcher to identify other potential respondents through contact with one appropriate key respondent (Atkinson & Flint, 2001).

During the field study, the researcher made contact with one key respondent who is knowledgeable about pig value chains in Cambodia, and from there the next potential respondents were introduced.

In order to achieve the objectives of this study, the key respondents for the study sample included:

- two representatives from large commercial feed and pig companies
- two respondents who operate medium-size farms,
- two respondents from contract farming,
- six respondents representing small-scale producers
- two pig trading respondents
- two pig processors
- four wholesalers/retailers
- one respondent from a farmer group
- one government official

The detail of the respondents can be found in the appendix 1.

4.8 Data analysis

Data analysis is the process of breaking the gathered data into bits, then connecting the bits together (Dey, 2003). In this study, the researcher analysed the collected data using the Qualitative Data Analysis (QDA) technique introduced by Dey (1993). This technique involved three stages which include describing, classifying and connecting. Figure 4.2 illustrates the three important steps in qualitative data analysis process.

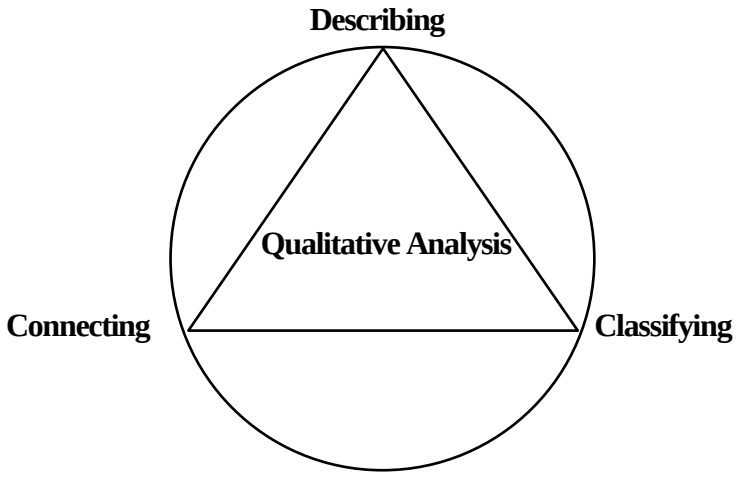


Figure 4-2: Qualitative analysis process

Source: Dey (2003)

Describing involves the transcription of the important aspects of the phenomena from the audiotaped interviews into written form (Gray, n.d.). The next process of the analysis is classifying, which involves the organising of the transcribed data into different categories or themes (Creswell, 2009). The last step is the connection process, where researchers identify the associations between different themes and connect them into meaningful relationships (Gray, n.d.). These processes were repeated several times until the researcher captured a deeper and clearer understanding of the key information needed to respond to the research questions and objectives.

4.9 Ethical considerations

Ethics are those norms and expected behaviours that guide the moral choices in our interactions with others. In doing research, the purpose of ethical consideration is to ensure that those involved in the research activities are not physically or mentally harmed, discomforted, embarrassed or suffer any loss of privacy (D. Cooper & Schindler, 2003).

The researcher, therefore, considered and followed all ethical principles and requirements, in order to ensure that risks and harm to the research participants including the researcher are absent or minimised. For this academic research to be approved and undertaken, it had to go through the risk assessment of Massey University Human Ethic Committee (MUHEC) (MUHEC, 2015).

It was the researcher's responsibility to clearly explain to all involved participants the benefits of the research. The researcher also explained how the participants would be protected and their right to decline to participate. Subsequently, the participants' informed consent to take part in the research activities was obtained.

4.10 Critical review of the chosen research methodology

In order to achieve the aim and objectives of this proposed study, it is critical for the researcher to have a deep understanding of the selected respondents' perceptions in regard to the structural changing patterns, opportunities and challenges caused by the transformation process of the pig value chains in Cambodia. Therefore, the use of the selected research design and methods are most appropriate for undertaking this study.

It was assumed that many of selected participants, especially smallholder farmers, might have limited education and a low level of understanding of the industry, so the use of semi-structured interviews provides the researcher with flexibility in facilitating data collection and interactions with the interviewees. This interview method also offers the respondents more

freedom to express themselves so that a deeper understanding of their views in regard to the subjects under investigation can be drawn out.

Chapter 5: Results

Introduction

This chapter presents the results from the data collected in the research target province of Kampong Speu, Cambodia. This chapter is divided into six sections. Section one addresses the first objective of the research which to map out pig value chains in Cambodia and describes the functions and activities of chain actors. Section two presents the distribution of margins, which illustrates how unfairly benefits are shared by different actors across the value chains. Chapter three and four examine the factors that lead to the transformation and the restructuring patterns of Cambodian pig value chains. These two sections provide the results for addressing the second objective. Section five and six identify the opportunities and challenges faced by Cambodian pig value chain actors, addressing the third of objective of the research. Final section provides the summary and analysis of the chapter.

5.1 Cambodian pig value chain and chain actors' activities

Pig value chains in Cambodia include input supplies and services, production, trading, processing, wholesale, retail and consumption. At each stage of the value chain, value added activities are carried out by different chain actors. Some actors, however, may perform more functions than others. For example, as shown in a generic Cambodia pig value chain in Figure 5.1, trading, processing, wholesale and retail can sometimes be performed by the same chain actor.

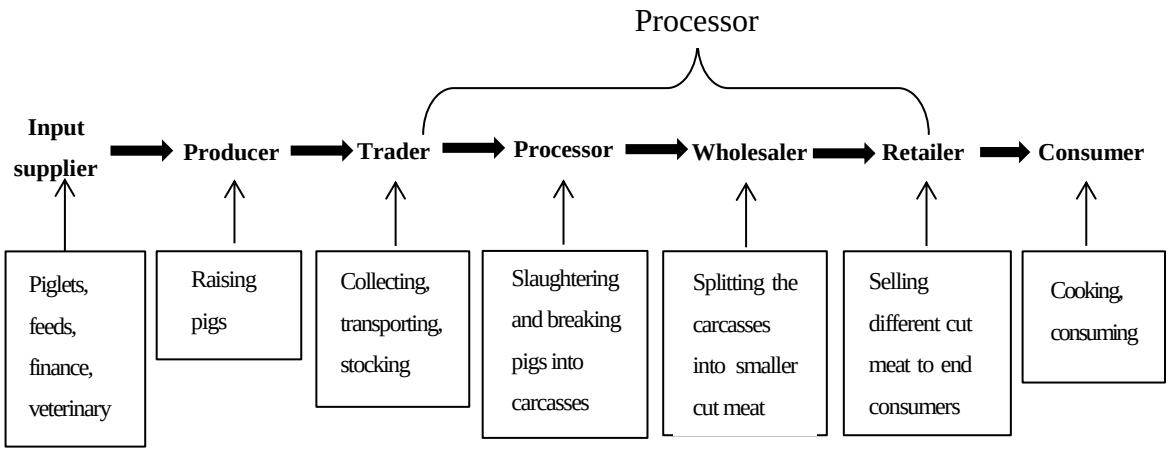


Figure 5-1: A generic Cambodian pig value chain

Input supplies and services refer to purchase of piglets and feed, as well as financial and veterinary services. Production refers the activities of raising pigs from weaners to finishers. Trading is the activity of collecting pigs from producers and selling them to other buyers (processors). Processing is the activity of slaughtering pigs, followed by dividing them into carcasses and different organ parts. Wholesale activities include the purchase of carcasses from slaughterhouses (processor) and splitting them into smaller parts, for example lean meat, ribs and legs. Retail is the selling of different pork cuts to the end consumers.

5.1.1 Input supplies and services

Cambodia's commercial animal feed market is dominated by foreign owned commercial feed companies with imports from neighboring countries. Those large commercial pig feed companies include CP Cambodia, Green Feed, Betagro, Agri-Master, New Hope and other small feed mills. Currently there are 13 commercial animal feed mills that are producing and distributing feed, which leads to a decrease in imports.

The biggest suppliers of piglets are commercial pig companies. Easily the largest piglet producers among them are CP Cambodia and M's Pig ACMC Cambodia who keep 50,000 sows and 10,000 sows respectively.

> *After only 7 years, our company has 10,000 sows which could produce about 100,000 piglets. On the other hand, the other company keeps about 50,000 sows which are equivalent to about 500,000 piglets (LSF 01).*

Access to the credit market in Cambodia is not easy and usually with high interest rates.

> *Accessing the financial market is difficult because we have high interest rates of 8-9% per year. Also, we can only take the loan for a short term of 4 years only (LSF 02).*

Veterinary services are provided by either private commercial pig and feed companies, veterinary service providers or government veterinary staff.

5.1.2 Producers

Producer classifications

Cambodian pig production comprises pig producers with different farm sizes and characteristics, ranging from small scale farmers raising five pigs to large commercial companies with 100,000 head of fatteners.

According to the report from (MAFF, 2017), there are two main production systems in Cambodia: the family production system and the commercial production system. The family production system refers to the raising of a small number of pigs by Cambodian households as a traditional way of life, with limited animal feed, technical and veterinary service inputs. In contrast, commercial production is a production system where there is an investment in production technology and the input services (Provincial Animal Health and Production Office Chief, personal communication).

During the time of this study, backyard or family pig raisers keeping fewer than five pigs had almost disappeared, due to constraints. One of the processors who used to buy pigs from smallholders acknowledged that:

> *Smallholders who raise 2 or 3 pigs are no longer raising pigs because they do not make profits. Even those farmers who raise 10 pigs also started to quit the business (BTC 02).*

On the other hand, based on the new Law on Animal Health and Production announced in 2016 by the General Department of Animal Health and Production, MAFF, all pig producers are now considered commercial producers and are classified into the three groups of small, medium and large-scale farms (MAFF, 2016). However, the details of the classifications regarding the characteristics and herd size of each category are still being discussed within the General Department of Animal Health and Production (MAFF Vet Official, personal communication, 2017).

For this study, pig producers are classified into these three categories of small, medium and large-scale producers, depending on the herd size and characteristics. Each category is based on the information gathered (see Table 5.1).

Table 5-1: The classification of pig producers

Producer Classification		
Type	Herd size (head)	Characteristics
Small scale	1-100	- Own rice mill and/or winery - Secondary income - "Pig bank" savings - Tradition - Use by-products as feed supplement - Keep breeders - Limited access to market - Lack of management skills
Medium scale	101-5,000	- Main income - Have farm staff - Use of concentrated feed - More market options
Large scale	over 5,000	- Intensive production and superior farming technology - Commercial input suppliers - Run contract farms

Small-scale producers

Small scale producers in this study are defined as farmers who raise from one to 100 pigs with basic production inputs. Among the six producers under this producer category who were interviewed, the smallest scale farmer had five pigs, while the highest number was 70 pigs. The first observed characteristic of small-scale producers was, in many cases, they operate other businesses such as running a rice mill, rice winery, growing other crops or raising other animals. Figure 5.2 illustrates how small-scale producers keep their pigs - either in single and multiple pens. Since they also raise other animals, their pigs are sometimes kept with other animals such as chickens.

Figure 5-2: Single pen and multiple pen pig keeping

Most of the smallholders interviewed raised their pigs as a secondary income and as a way of saving the money through "Pig bank" savings. They then sell the pigs when they need the money to build their house, send their children to school or for festive activities. Raising pigs is also a traditional way of life, which has been passed down through many generations. In villages, sometimes one of these pigs gets slaughtered for consumption during traditional and festive celebrations.

Generally, farmers purchase pig feed and mix it with by-products from their rice mill or winery to feed the animals as a feed supplement. Occasionally, they get veterinary services from local service providers. Buying piglets from commercial pig companies can be costly. Some small-scale producers, therefore, keep one sow (usually low-quality breeding sows) to produce piglets.

> *My main business is making rice wine. It is a part of the reason I raise pigs because I can make use of the by-products to feed the pigs. … These by-products save me about half the expense of feed (SFF 01).*

Due to their small number of animals and harvest seasonality (only two seasons per year), small-scale farmers usually sell their pigs to pig traders or processors at the nearby district or provincial town and receive low prices. Occasionally, they are able to sell the animals to traders in the capital city when the supply of pigs from medium, large farms and imported pigs are scarce.

Because of our small supply volume, we can only supply local buyers. So, it is important for us to stay loyal with our buyers so that they may give us high prices (SSF 01).

Sometimes we can sell to slaughterhouses in Phnom Penh, especially when the pig supply is scarce and the number of imported pigs is very low (SSF 02).

Another common characteristic of small-scale farmers is that they have poor farm management skills. For example, they do not know how to calculate their basic income and expenses for their farm operation.

I never calculate the cost of production. It is too big a headache to think about the cost, because we are not earning much money from this business (SSF 05).

I don't really know how to calculate my cost of production. I just know that we need to buy some inputs such as feed and piglets. I never record the cost. Then at the end of season, our pigs are sold to buyers and we receive some money (SSF 03).

Medium-scale producers

Medium-scale producers are usually larger in scale and with better investments in farming technology and input services compared to small-scale farmers. During the data collection, two medium-scale producers of 200 pigs and 700 pigs were interviewed. Unlike small-scale producers, medium-scale farmers raise their animals as the primary source of income.

I have 20 years of pig raising experience. I started raising pigs as secondary job as my major income was from poultry production. But then I invested more and made the pig business my main income (MSF 01).

Medium-scale farmers keep their own parent stock of both sows and boars to produce piglets for their farms. Medium-scale producers usually hire a few staff to help manage their farm. Another significant characteristic of medium sized producers is that they buy raw materials and produce their own pig feed, so they can have better control of the quality and reduce their expenditure on feed purchased from commercial companies (see a feed production warehouse where medium-scale producers keep feed raw materials in Figure 5.3).

Figure 5-3: A pig feed raw material warehouse of a medium-scale farm

Due to the larger herd size and a more consistent supply to buyers, medium-scale farmers have more market access, either selling their pigs to traders within the province or to traders in the capital city, or both depending on the demand.

> *Our main buyers are from both the province and Phnom Penh. In the province, I sell to the provincial town, Chbar Mon. But mostly I sell in the province (MSF 01).*

Contract farmers/producers

Normally a contract farm is required to have at least 550 pigs in one piggery. Based on this herd size, contract farms are categorized as medium-scale farms, and hence are discussed in this section.

Currently, the two main big commercial companies who operate contract farming with contract farmers are Charoen Pokphand (CP) Cambodia and M's Pig ACMC Cambodia Co Ltd. There are certain requirements and processes for the establishment of contract farming between farmers and the companies. First, the representative from the contract offering company will go to inspect the location of the prospective contract farm to see if it is suitable for setting up piggeries accommodating at least 550 pigs. Then, the proposed location must be of a certain distance from residential areas, and it must have access to both water and

power supplies. Farmers are also required to supply their own farm labour. Next, after meeting these requirements, the companies will make the assessment and start negotiating contract terms and conditions with farmers. The contract period could range from one year to ten years, depending on the company, with the possibility of renewal. Once the contract is agreed upon by both parties, the contract farmers will set up the piggery, water and power access, as explained by one contract farmer interviewed:

> *We must first own a piece land which is in a suitable area for setting up piggeries or farms approved by the company. We must construct the piggeries by ourselves at our own cost and supply farm labour and a power generator. They also require us to dig a pond on our land so that water can be supplied to the farm (CTF 01).*

The common type of pig contract farming in Cambodia is a resource-providing contract. Based on the conditions of this contract, the contracting company supplies all the input services, which include piglets, pig feed, and veterinary services to the contract farms at the company's costs. The contract farmers' job is to raise the animals following the farm management standards set by the company. A veterinary staff member is sent by the company to monitor the management of the farm daily. Contract farmers do not own the pigs and the company will sell the pigs to the market when they reach marketable size. The main market for pigs supplied from contract farms is in the capital city and major cities, while only a small quantity is supplied in the target province.

The farm income contract farmers receive is based on the Feed Conversion Ratio (FCR) of the pigs and other good farm management practice factors. FCR refers to the amount of food that a pig eats that converts into pig weight growth. The average FCR is 2.44, which means for a pig to gain one kilogram of weight it requires 2.44 kilograms of animal feed. Maintaining the FCR rate, as set by the company, is determined by how well contracting farmers and their farm staff manage and take care of the pigs.

Large-scale producers

There is a small number of large-scale farms in Cambodia, which include CP Cambodia, M's Pig ACMC Cambodia Co Ltd, BVB, Betagro and Kandol Dam Farm. These large-scale farms are usually owned and operated by commercial feed companies. Large-scale farms or commercial farms are categorised by highly intensive production systems and the use of superior farming technology. As seen in Figure 5.4, pigs are kept in closed houses with good

temperature control. This kind of modern pig housing facilities can only be observed in large commercial farms.

> *At first Lok Ok Hna [referring to the owner of the company] was invited by USAID to the US to see pig farms there and he was interested […] At that time we had not much knowledge about pigs, but there was a huge market demand. We observed local pig breeds are not so good so he [the owner] decided to import those high-quality breeds and technology from the UK to Cambodia to improve our pig industry (LSF 01).*

Figure 5-4: Modern pig housing

In addition to operating their own pig farms, these two big companies also run contract farming in provinces across the countries. Recently, Kandol Dam Farm (Hok Hieng) has also started to offer some contract farming to farmers.

5.1.3 Traders

The main activities of traders are collecting, transporting and stocking pigs. When buying pigs, traders transport the animals from farm gate to their animal stockyard or slaughterhouse at their own risk and costs. Traders use their small trucks and sometimes even motorbikes, depending on the number of pigs they are collecting. A trader could buy from 10 to 20 pigs at a time, so they use a small truck to collect the pigs. A common type of truck used by a trader is illustrated in Figure 5.5. This medium-size truck could load from 10 to 20 head of live pigs.

Figure 5-5: A trader owned medium-sized truck

To supply the capital, Phnom Penh, live pigs are transported by traders to slaughterhouses or their stockyard, where the animals get slaughtered or redistributed to processors. As seen from Figure 5.6, when a customer from the capital buys a higher number of pigs per shipment, the delivery of animals is usually arranged by a commercial pig company with an extra transport fee.

Figure 5-6: A company-owned pig-transporting truck

Normally, bigger traders have their own pig stockyard to keep pigs they have collected from farms. The slaughterhouse also provides temporary stockyards for the animals. As shown in Figure 5.7, pigs are temporarily kept in stockyards at a slaughterhouse, waiting to be slaughtered or transferred to other slaughterhouses.

Figure 5-7: A pig stockyard at a slaughterhouse in the capital city

5.1.4 Processors

The main function of a processor is to slaughter pigs and break them into carcasses and organ parts. There are two types of slaughterhouses in Cambodia: type "A" and type "B". This type classification is based on the number of pigs the slaughterhouse handles each day. Any slaughterhouse that slaughters more than 100 head of pigs per day is categorised under slaughterhouse type "A", while a "B" type slaughterhouse slaughters less than 100 animals daily.

A pig slaughterhouse in Cambodia may be owned by the municipality or private processors who use or rent out slaughter space to other processors. There are currently 12 type "B" slaughterhouses in the target province; three of these are owned by private processors while the rest are owned by the provincial municipality. Processors who rent the space could either supply their own labour to slaughter the animals or use the slaughterhouse butchering services. Any pig processors who want to operate and own a slaughterhouse must submit their application to MAFF's General Department of Animal Health and Production, and finally the application is decided by the Provincial Department of Agriculture, Fisheries and Forestry.

> *To be able to operate a type A slaughterhouse, the applicant [prospective owner] must register for an operation certificate from the ministry. The registration process starts from a lower level to the ministry level. The lower type of registration is approved by the provincial departments of agriculture, but also needs to be acknowledged by the ministry (OFC 01).*

In general, apart from the modern slaughterhouses privately owned by large commercial companies, the traditional slaughterhouses in Cambodia, especially those in the provincial and district level are of low quality with low safety and hygiene conditions. Unfortunately, there were no photos taken during the pig slaughtering process because normally it takes place at two or three o'clock in the morning and a visit during a process requires approval from authorities. The photo seen in Figure 5.8 was taken one day during the data collection period at the municipality owned slaughterhouse (type B) in Chbar Mon District, the provincial town of the target province. Pigs are slaughtered and dressed on the slaughterhouse floor. After the slaughter, the carcasses and other pork products are then delivered to a wet market in the provincial town and districts where wholesale and retail activities take place.

Figure 5-8: A traditional slaughterhouse type "B"

5.1.5 Wholesalers

Wholesalers generally buy pig carcasses from the slaughterhouse (processors) and split them up into smaller cut pieces, which they sell to small retailers in villages or smaller wet markets. However, it is not uncommon for a wholesaler to also be a retailer.

5.1.6 Retailers

In both the research target area and across the country, pork is sold predominantly through traditional wet markets. As shown in Figure 5.9, pork cuts are laid out or hung at meat shops as an undifferentiated commodity product, usually with poor hygiene and food safety conditions.

Figure 5-9: A traditional retail shop in Somrong Tong District

However, in the capital and other major cities, the sale of pork can be found in supermarkets as well as the emerging and rapidly growing organic convenience stores. As illustrated in Figure 5.10, it is not uncommon to find different pork products being displayed on the supermarket cold shelf after being packaged, branded and priced.

Figure 5-10: Pork shelf of a supermarket in the capital

5.1.7 Other supporting value chain actors

Cambodian Pig Raisers Association (CPRA)

The primary role of the Cambodian Pig Raisers Association is to work with small-scale producers and supply them with good quality piglets, find markets and provide veterinary services. The main funding sources for CPRA were mainly from the former chairman and international development partners, such as USAID. Recognition by the government and concerned development donors meant CPRA had a relatively strong voice. They were listened to when they made complaints and reported their members' challenges during meetings with the government and the development partners.

Despite the important role CPRA plays in helping pig producers, the association is now almost non-operational due to several factors including the loss of its powerful former chairman, the dysfunction of internal management, conflict of interest and the lack of trust amongst the management team, and decreasing participation from its member producers.

> *Back then it [the association] was progressive because we had both power and money. But now we have neither money nor power after the passing of the chairman. … There is no progress because they employed our Cambodian people who are not skilled at this work.*

There is also nepotism and conflicts with the organization. … Our members are decreasing due to the loss of their business (FAH 01).

5.2 Margins shared by value chain actors

There are five main functions of value added activities across the value chain, which include pig production, trading (collecting/transporting/stocking), processing (slaughtering/splitting organ parts), wholesaling (splitting carcasses into different parts) and retailing. Different levels of margin (or loss) are shared based on the cost of production/transaction/ operation and the price received from their buyers.

5.2.1 Margin distributed by value chain actors

The results from the interviews regarding the income and expenses of value chain actors revealed that producers were experiencing losses from their operation. Value added activities, expenses, income and net profit/loss of the chain actors are summarised in Table 5.2.

Table 5-2: Value added activities and margin shared by chain actors

Chain actor	Value added activity	USD per kg		
		Expense	**Income**	**Net profit (Loss)**
Producer	Raising pigs	1.89	1.70	-0.19
Trader	Collecting, transporting, trading	1.78	1.83	0.05
Processor	Slaughtering, splitting parts/organs, transporting	1.87	2.06	0.19
Wholesaler	Cutting the carcass into meat parts	2.45	2.68	0.23
Retailer	Selling to end consumers	2.72	3.25	0.53

As Table 5.2 shows, at the market price current at the time of interviews, the producers were losing about USD 0.19 per kg. The average expense of a producer is around $1.89 to grow a kg of live pig, while they could get only $1.70 per kg when selling to buyers. Smallholders were experiencing further loss due to their higher production costs and the lower price received as opposed to bigger operators. Traders could earn about $0.05 per kg by collecting and transporting pigs from farms and selling them to processors. This amount of net profit per kg is earned for just one day of work. In the province, a trader could collect 10-15 head of 100 kg pig and earn $50 to $75 per day.

More value is added by processors through the slaughtering of animals into carcasses and splitting the organ parts. Some pig organs, such as heart and stomach, are of high value. The average profit of $0.19 per kg earned by processors is calculated based on the sale of the carcass and organs of a pig. A wholesaler could earn around $16 from the sale of a carcass and its organs.

Wholesalers could buy one or two carcasses and organs from processors then split the carcass into cut meat. An average weight of a carcass is 70 kilograms. For one carcass and the organs, a wholesaler could earn around $20.

From the wholesalers, retailers only buy a smaller quantity of meat cut off a carcass. They then further cut the meat into smaller pieces and sell these to the end consumers. Retailers receive the highest margin of $0.53 compared to other chain members. A retailer could buy half a carcass of 25 kg from a wholesaler and earn $13 in a morning of business.

As illustrated in Figure 5.11 and also from Table 5.2, the closer the pig/pork moves to consumers, the higher the margin received at each stage. The distribution of profit margins is shared unequally among chain actors, with the producers earning the least or making a loss in the study findings.

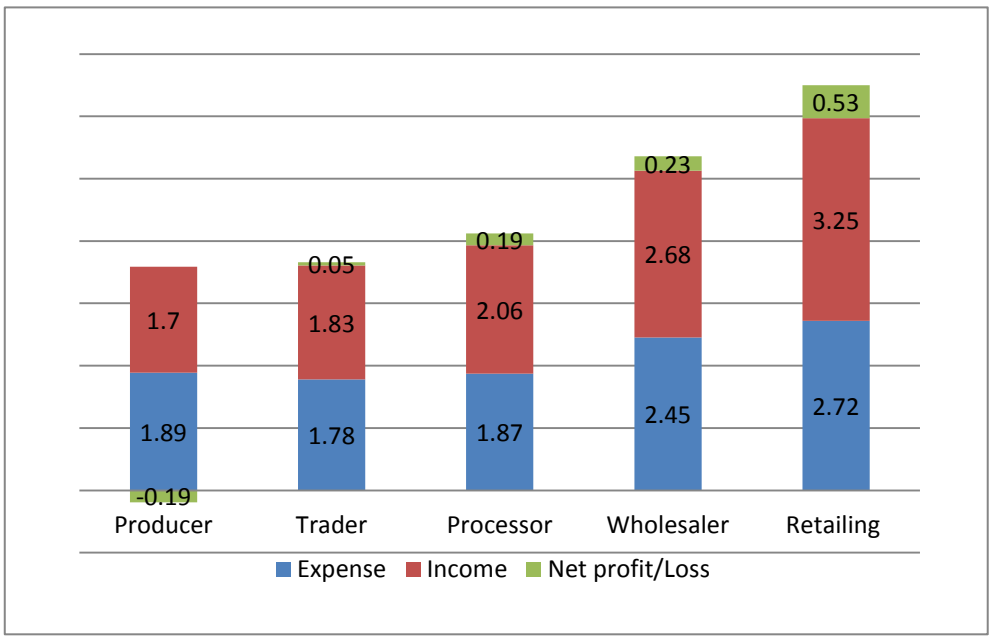


Figure 5-11: Margin distribution along value chains

The low price received by producers, especially for small-scale producers, indicates their weak negotiation power with buyers. At the same time, all producers are also pressured by the price of imported live pigs that serve as the alternative source of pig supply for the buyers.

5.2.2 Price received by traditional and modern retailers in the capital

The retail prices received by traditional retailers in Phnom Penh are higher than that of the province. For example, a kilogram of lean meat costs $4.20 in the capital compared to $3.75 in the province.

> *Its normal that in our capital we need to charge higher price because you need to consider our cost like higher rent for our meat shop and other operation cost (WRL 04).*

Meanwhile, modern retailers charge $6.50 for a kilogram of lean meat. The difference in retail price between the provincial and city retailers and modern retailers reflects more value added activities and costs incurred in transporting, splitting and packaging the products, so as to capture higher value customers in the capital. At the same time, the retail price differences also indicate that urban areas offer higher value markets resulting in a higher price received by urban retailers from both wet and modern markets.

5.3 Factors driving Cambodian pig value chain transformation

There seems to be two sets of external environment factors leading to the dynamics within the pig value chains (downstream, midstream and upstream) in Cambodia. These two external factors include demand-driven factors, and policy and competition-driven factors.

On the market factor side, demand appears to have been driven by the increase of population and income growth, and urbanisation leading to the increase in pork consumption in urban areas. One interviewee from large commercial pig company expressed his market perception, indicating those drivers as the main market drivers.

> *You know in the last 10 years, the structure of our economy has changed. Younger people do not want to do farming in the countryside anymore. There are garment factories in the city which offer higher pay compared to income they receive from doing farming….First thing people change when they have more money is to eat more meat*

> *and better food…Not only our population growth, but their income also increase especially those who move to the cities (LSF 01).*

Beside those factors above, although was not mentioned very much by the interviewees, the emergence of modern retail outlets as presented earlier in the value chain section has had an impact on the transformation of value chain downstream segment. Consequently, the changes in requirements of modern retailers in regard to quality and safety aspects will impact on farm and supply chain segment.

On the other hand, FDI plays a big role in changing the structure of Cambodian pig farm sector. The inflow of FDI into Cambodian agribusiness sector is a result of the government liberalisation policies. One government official from the provincial department of agriculture, fisheries and forestry pointed out that the government's liberalisation policy allowed FDI to come in and transform the production sector.

> *As you know, due to the encouragement from our government open policy, from the early 90s, foreign companies like CP came to invest in feed and livestock production in our country and changed the industry landscape. Later on we also see some Chinese company started to build their feed factories and recently started their pig farms (PDA official, personal communication, 2017).*

Furthermore, the government priviatisation policy allows the proliferation of domestic small and medium investment in processing and retail (modern) sector.

Despite the increase in domestic pig production, the findings seemed to indicate that large volume of pig supply still depend on the importation from neighboring countries. Many interviewees pointed out the imports had impacted tremendously on domestic price resulting consequences for local pig producers. So it is reasonable to argue that the imports also play a crucial role in transforming pig value chains in Cambodia particularly the competition at farm sector.

5.4 Cambodian pig value chain restructuring patterns

This section presents the results related to the changes in structures, market relations, and technology use in different segments of Cambodian pig value chains.

5.4.1 Structure

Across the pig value chains in Cambodia, the level of changes in structure at each segment of the value chains varied, with little dynamics observed in downstream (retail) and midstream (processing) while more dynamics occurring upstream (production). For example, pork retail was estimated to be over 90% still dominated by traditional wet market. Meanwhile, modern retailers have emerged especially rapidly recently in the form of hypermarket and supermarket. Most interestingly, another type of modern retail outlets also emerged in the format of organic convenience store. This kind of convenience stores is mushrooming in the capital and major cities.

> *Normally 90-95% of buyers go to traditional wet markets to do their grocery shopping, such as buying vegetables, meat and fish. Only about 5-10% of shoppers go to modern markets. But I think this number is growing quickly as you can see every day in the capital. It's like each day there is a new supermarket opening (OFC 01).*

Similarly, at the processing sector, small and medium processors proliferate and dominate the segment countrywide with the emerging of few modern processors penetrating the capital and major city markets. The most significant dynamics occurring, however, is at the farm segment. Not only large commercial pig companies have expanded production through company-owned and contract farming arrangements, but most of those large players are planning on expanding in the coming years.

> *Our plan in 2018 is to double the number of sows, from 10,000 head to 20,000 head. The biggest company now have 45,000 heads. So we need to invest to catch up with them (LSF 01).*

On the other hand, smallholder producers who cannot compete have disappeared and those who can survive their business have scaled up their farm operation.

5.4.2 Market relations

Spot market and informal contracting

A spot market relationship was widely observed throughout the whole traditional value chains, from input suppliers to retailers. Due to the frequency of business transactions and personal relationship, some chain actors seemed to have some sort of informal contracting arrangements (verbal agreements) with their counterparts mainly based on trust. However, as expressed by many interviewees, this kind of contracting arrangements can be very risky for them.

> *I can say I trust my buyers. After we have business with them for a while, we know their credit whether it is good or bad. Some buyers we trust are good and some others are bad. For example, if they offered a price for our pigs, they won't change, and they would come to collect the pigs as promised [even if the price might go down]. But some buyers are difficult. They agreed to buy from us at a price but when the price goes down, they turn off their phone or never pick up our calls again (MSF 02).*

Formal contract arrangements

At production segment, there has been an increase in contract farming arrangements between input suppliers (mostly the large commercial feed and pig companies) and farmers. This type of contracting is written and signed in papers by concerned parties. The contract farmers interviewed expressed there had been a trend to favour contracting farming over operating their own farm. The reason for the growth in contract farming is because contract farmers believed that contract farming provided them with both better revenue and low market risks.

> *Operating contract farms gives us fewer risks compared to raising our own pigs, because there is better farm management support from the company. For example, the company sends their vet staff to check our farm every day …We don't have to worry about the market because the animals belong to the company, so we don't have any market risks (CTF 01).*

The emergence of contracting arrangements can also be observed at the processing and retail link. Unlike traditional retailers, who source their pork supply from traditional processors,

modern retailers in the capital and major cities source their pork and pork products from large commercial processing companies. The pork is supplied to modern retailers in the form of a carcass, where it is further butchered into different parts, packaged and branded.

Vertical integration

It appeared that the rapid growth of pig value chain integration is the result of the integration of commercial pig feed companies. These commercial companies started as animal feed producers then moved up the value chain to operating pig farms. Most recently, some commercial companies have started to further integrate the value chain into the midstream processing sector, in order to respond to the demand of the growing modern and higher value markets in the urban areas. One of the commercial companies in the sample started their first private slaughterhouse in 2012. Through the upgrading of the slaughtering facilities, this privately-owned slaughterhouse transformed the way pigs are slaughtered, by getting the carcass hooked up off the floor while slaughtering. Later in 2013, the company began cutting the carcasses into different meat parts and sold them to not only the wet markets but also to supermarkets, hotels and restaurants because of the perceived hygienic slaughtering process. While the main parts of the cut meat go to retailers, other parts of the carcass go to their sausage plants to be processed into hotdogs and sausages. Some of these companies even started thinking of expanding their operation into the modern retail segment.

> *Our slaughterhouse has addressed one of the main issues of an unhygienic slaughtering process where pigs are slaughtered on the floor without proper equipment. We managed to get the animals off the floor when slaughtering and the carcasses are hooked up when being split apart. We have also started cutting carcasses into parts. This has opened up new potential for us to sell meat to not only the market but also to restaurants and hotels. Parts like ham, belly and loins receive better prices when we sell in parts … We also plan to focus on retailing. For a start, we plan to send pork and pork products to our meat shops where they are sold on ice (LSF 02).*

As shown in Figure 5.12, most transactions between traditional value chain actors are carried out based on spot market or informal agreements based on personal relationship and trust. Formal contracts occurred between contract farmers and commercial pig companies at the production segment and between modern retailers and processors at retail segment. Few

commercial feed and pigs companies have integrated the value chain from input suppliers to processors and wholesalers.

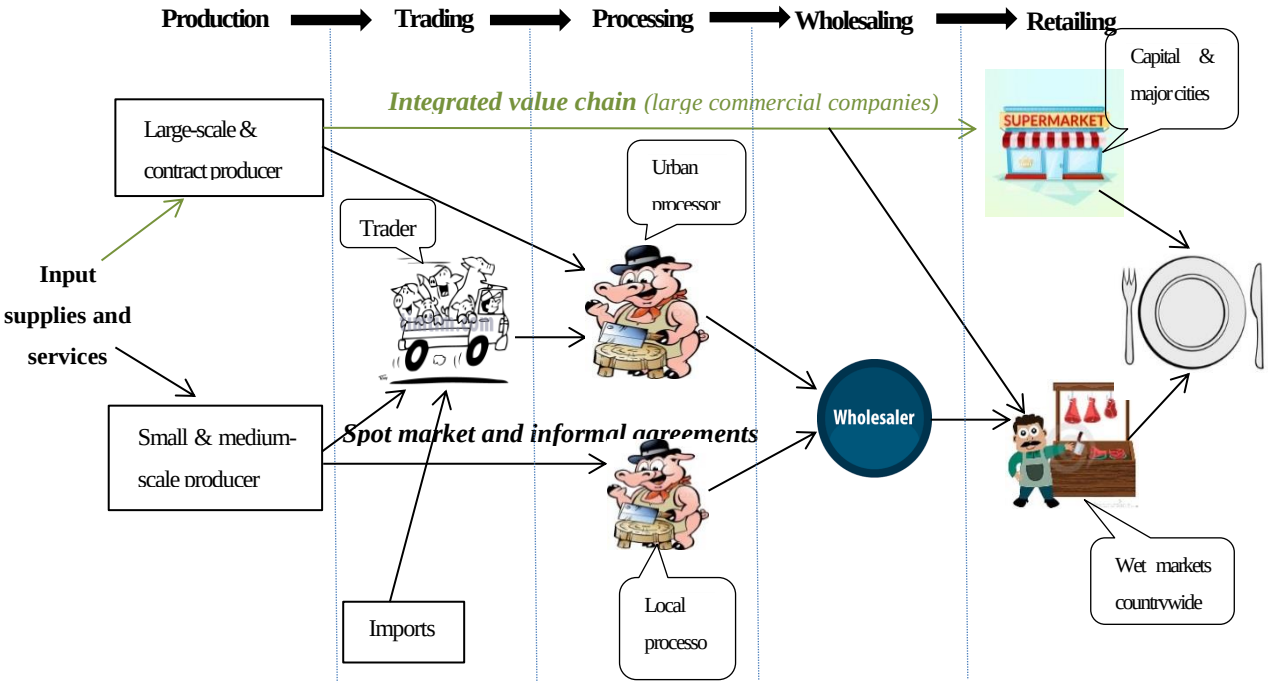


Figure 5-12: Pig value chains based on data collected

5.4.3 Technology use

Across the value chains, except those few emerging modern ones, the changes in technology use in most segments are minimal as practices are still largely traditional. For example, at the traditional retail and processing level, pigs are still being slaughtered and sold in open space and with minimum modern and hygienic facilities. The most significant changes, however, were observed in production segment. Pig farms have invested in modern pig housing facilities and started bringing in high quality breeds and pig feed. This kind of new production system, however, is applicable with medium to large-scale farms only as they require investments.

> *In order to compete, we need economy of scale which means more investment but low per unit production cost. To have a modern production system we need to put at least 600 head of pigs in one house using modern air system….This kind of system can only be applied to medium to large size farms as it needs investment capital of USD 50,000 per modern pig housing (FAH 01).*

5.5 Opportunities for value chain actors

During the data collection, it was observed that most of the interviewees, especially smallholder actors including smallholder farmers and processors, had little awareness of the opportunities for potential market growth or for growth in the pig industry as a whole. For example, most of smallholder producers and traditional processors interviewed had never been to a supermarket in the city before and they had very little knowledge about modern retail, as seen in this statement by a smallholder processor:

> *There is no supermarket in this province. I only heard about it in Phnom Penh and there has been a rumour about a supermarket opening soon in our province, but I have never been to a supermarket myself (BTC 02).*

Only those few key interviewees from large commercial farms and farmer association seemed to realize the potential and expressed a positive outlook for market growth and referred to the effects of the economy and population as driving factors:

> *Our economy is growing fast, so people will demand more meat. Our growing population will demand more quality meat. So, the opportunity is that the pig industry in Cambodia soon, maybe in the next 5 years… I think the situation will be like Thailand and Vietnam or China, where only big commercial farms can survive because they have more capital to invest. …Normal small family scale [farms] will not be sustainable because they need to buy piglets, feed and veterinary services from other companies. They need to have high technical skills and investment capital (LSF 01).*

The general manager from another commercial pig company also showed his optimistic view about future industry growth. However, he projected that, following the market growth, there will be fierce competition between the big players in the industry.

> *The market is growing. …I want to increase the number of my sows from 2,000 head to 3 or 4,000 head. But now we have to wait for big players to react because they also want to expand their business from feed production to animal (pig) production (LSF 02).*

It was also noted that due to urbanisation, the demand for higher quality and safer pork will also grow, especially in the cities. However, it was acknowledged that there was still a

limited number of big processors who are responding to those demands. The farm manager interviewed, thus, pointed out the growth opportunities for the modern processing sector.

> *Personally, I am interested in the processing sector, you know, where we act as a consolidated processor. When we have a big demand, we will have power to require farms to produce high quality pigs. Our markets (the demand for high quality and safe pork) in urban areas now are still very fragmented. There is no one big guy (processor) who coordinates these markets (LSF 01).*

5.6 Challenges of value chain actors

In general, there are several challenges faced by different actors in the value chain, including cost of production, infrastructure and market prices. However, the intensity of impact seems to differ for different value chain segments and actors.

5.6.1 Challenges facing producers

The results from this study revealed that the most vulnerable chain actors are small-scale producers who face more challenges than other chain actors. The following sections discuss the challenges raised by producers.

Market price

Among all the main challenges mentioned, all the 10 producers interviewed (excluding contract farmers, but including the representatives from the commercial companies and the medium-scale farmers), expressed their concerns over the decreasing price of live pigs. During the period of data collection, the price that producers received for their pigs was below the cost of production.

Generally, small-scale farmers receive about 800 to 1,000 Cambodian Riels per kg (USD 0.2 to USD 0.25/kg) lower than what a commercial farm receives from buyers. Small-scale farmers receive a lower price due to the lower quality of their pigs. Some of them claimed that buyers usually criticize the fat level of their pigs and mark the price down.

> *When we mix commercial pig feed with our by-products, the meat quality of our pigs is not as good as 100% commercial feed, because the pigs will grow more fat. … So, the price we receive is very low (SSF 05).*

During the time of this study, the price that small farmers received for live pigs ranged from 6,400 to 7,000 Cambodian Riels per kg (USD 1.6 – 1.75), depending on the actual quality perceived by buyers. Meanwhile, commercial companies received 7,000 Riels (USD 1.75).

The fluctuation of market price is also affected by the quantity of live pigs being imported into the country at cheaper prices. Most producers believed that the main reason for the decreasing market price is due to the competition from imports of live pigs from the neighboring countries of Vietnam and Thailand.

> *The daily domestic demand for pigs is around 7,000 head. We can only domestically supply about 4,000 to 5,000 head. So, we import about 2,000 head of pigs every day from Vietnam and Thailand. They are already experiencing production surplus where, for example, Thailand achieves 28 piglets/sow/year as compared to 18 piglets/sow/year in Vietnam. So, if Vietnam could improve their productivity, there will be more supply to our domestic market, which will further threaten our domestic producers (LSF 02).*

Importing pigs is a sensitive issue, as it is related to who the traders are. According to some respondents interviewed, the importers are those who are powerful in the country. Some respondents expressed their hopelessness of how to resolve this issue of imported pigs.

> *I have been raising pigs, since the 90s until the present, all by myself without any support from the concerned authorities with the market. It is very difficult for stallholders to do business because the importers import pigs to force us out of business. Those powerful businesspeople have all the connections to import and compete with us. No one cares to intervene and help (MSF 01).*

Cost of production

The cost of production for small-scale producers is around 8,000 Riels (USD 2) compared to only 6,800 Riels (USD 1.7) for commercial companies. At this price, small producers are losing about 1,000 to 1,200 Riels per kg (USD 0.25 – 0.3). Medium and large-scale producers are either losing or just break-even.

> *It costs USD 1.7 as a commercial company to produce 1 kg of pig. Today, the selling price of live pigs is also USD 1.7. As for the small farmers, it costs them USD 2 to produce 1 kg of pigs…. Small farmers are losing even more compared to us as q commercial company….They cannot even sell at USD 1.6. So, let's say they can make it at USD 1.6, it is still 10 cents per kg lower than our price. … So, they are losing further USD 10 per 100kg head of pig, compared to commercial companies (CMF 01).*

The high cost of production is linked with high input prices, especially the price of animal feed. Although many small-scale producers use agricultural by-products as a feed supplement, they still need to buy commercial feed to mix with them.

Pig diseases

Another challenge identified by the respondents was pig diseases. Six respondents including large, medium and small-scale farmers all expressed their fears of pig deceases, which could increase the mortality rate and negatively affect their farm income.

> *Another concerning challenge is pig disease. When it strikes, we will lose our profit. Once it does, the loss could equal to our one year of revenues. Disease strikes mean that about 30-40% of our pigs will die. (CMF 01)*

Pig disease was mentioned as a concern, particularly for small-scale producers. Among the 6 small-scale farmers interviewed, four farmers mentioned pig diseases as their challenge. This is due to the lack of technical pig farming skills and limited access to veterinary services resulting in losses of their farm revenue.

> *Our concern is the disease of the pigs. Sometimes, among the five pigs we raise, only four survive to finishers. If this happens, we will have more problems (SFM 04).*

High interest rate of credit market

The lack of financial support to expand their production was specifically mentioned by the two respondents who were from commercial companies operating large-scale farms. The credit conditions offered by credit institutions in Cambodia make it difficult for producers to get loans and grow their business.

> *Another challenge for our business is finance. We have a high interest rate of 8-9% and a short term of 4 years for our credit. So, this limits our incentives to invest more in our operation. If we had lower interest, we would invest more in our business and grow faster (CMF 02).*

It is important for small-scale producers to be able to access credit to increase their production. The head of Cambodian Pig Raiser Association mentioned that the lack of investment capital limits small-scale farmers from modernising their production system to compete with larger players.

> *Now we talk about economies of scale, which means more investment is needed, if we want the lower per unit cost of production and the pigs to grow faster. But given their farm size at the moment, it is difficult to explain to them about the new system. Why? Because the system is too modern and even if they understand, they have no money to invest in the system (FAH 01).*

Lack of trust between chain actors

Across the value chain, personal relationships are perceived as very important because chain actors believed it helps them share information and support each other. However, at the production level, most of producers expressed that they have little trust for buyers when it comes to the weighing of the animals, payments and the opportunistic behaviour of buyers. The trust issue occurs especially in transactions between small-scale producers and traders and processors.

> *I consider those buyers as friends. … Although we are close, I never trust them. I am always cautious because they are buyers. They have many tricks to cheat us. … I never sell my pigs to them on credit. I only sell my pigs when I have a third party to guarantee the payment. The closer you are the easier it is to get cheated (SMF 02).*

Lack and inaccuracy of market information

Information sharing is perceived as crucially important by chain actors, especially at the producer level. The main type of information they enquire about and share with each other is market price. Producers said that they were able to easily get the information of market price

from input suppliers, buyers, retailers and the other producers. The common mode used to search and share information is through telephone conversations with other counterparts.

> *Market information is very important because our business depends on the market. So, it is important that we understand the actual price of our products. After we get the real market price then we can make a decision to sell our pig. We can get information from our buyers, retailers and also from our producers. It is easy we just make a phone call, then we can know everything (SSF 01).*

Despite having plenty of information sources, the accuracy and reliability of the market price information they receive is very limited, due to the lack of trust between chain players. Some small-scale producers were reluctant to believe the actual market price buyers told them was true, as there was a conflict of interest involved between buyers and sellers. Normally, small-scale producers would double check with different sources before they decide to sell their pigs at any suggested price.

> *The price information I receive from buyers is not always true. It is a kind of conflict of interest. For example, if I was a buyer, I would want to buy things at the cheapest price. But still it depends on the negotiation if we want to sell or not (SSF 05).*
>
> *I normally ask the price from different buyers to see if they tell me the same answer. After checking around I will decide to whom I will sell my pigs to (SSF 04).*

5.6.2 Challenges facing traders

Traders, however, express little concern about the fluctuation of the market price. They have more options of supply sources. They can either buy pigs from domestic producers (large, medium and small-scale farms) or live pig importers from the neighbouring countries. However, they mentioned two challenges: the decreasing number of smallholder pig producers; and the extra unofficial fees they need to pay for pig transport.

> *In the near future, I am afraid I won't be able to buy pigs from our Cambodian smallholders because some of them have already stopped raising their animals…. Another problem is every time we transport pigs, we need to pay tax to the government at 3,000 Cambodian Riel (USD 0.75) to the concerned officer. But officially we should only pay 1,000 Riels (USD 0.25) (TRD 01).*

5.6.3 Challenges facing processors

Like pig traders, the processors, who buy pigs from small-scale farmers, were also worried about the sustainability of their suppliers. Because smallholder producers are quitting their business this results in the discontinuity of the pig supply for processors.

> *There are some concerns, such as there will be a shortage of pig supply from small-scale farmers. I do not want the price to be cheaper because it will force them out of business. They [small-scale farmers] have been complaining about the increasing price of animal feed and the decreasing price of live pigs. In the future I am afraid I can no longer get supply from them (BTC 01).*

While they are not aware of the emergence of modern processors, some traditional processors interviewed were worried about the increasing number of processors at district and commune level. They said that more processors mean more competition for them.

> *Now there are slaughterhouses at every district and even some communes have processors. It is difficult for us to buy pigs from producers as now other processors are competing to buy the pigs. Also, some wholesalers and retailers from the communes and villages no longer come to buy carcasses from us because they can get supplies from their local processors (BTC02).*

5.6.4 Challenges facing retailers

The retailers interviewed were the least concerned when asked about their challenges. The only issue raised by some retailers was the high price of live pigs. Retailers did not want the price to increase because it could affect the price of the carcass. Higher carcass price means a lower margin for them, as they will still receive the same price from their customers. There is high competition in the retail segment, so if retailers increase their price, customers will switch to other retailers or choose other protein meat-substitutes.

> *For us [retailers] we don't have any much concern. But if the price of live pigs is higher, it is difficult for us to make profit. It is not easy for us to increase the retail price because if we do the customers will stop buying from us (WRL 02).*

5.7 Chapter summary

5.7.1 Factors leading to the transformation of pig value chains in Cambodia

The findings of this study indicated that the major determining factors that lead to the transformations of the pig value chain in Cambodia include: increasing market demand driven by population and income growth; urbanisation; the consumption patterns of urban consumers; and the emergence of modern retail. The demand for higher quality and quantity, therefore, is mostly from the capital and urban areas, where consumers are paying higher prices. On the other hand, it can be seen that there is free competition within value chain segments from both domestic and international players indicating the liberalisation and privatisation of government policies. Significantly, many chain actors interviewed emphasised the import of live pigs as being the main driver for pushing domestic prices down, resulting in many smallholders being pushed out and medium and large-scale producers scaling up to help their business survive. The determining factors can be divided into two categories: demand-driven factors; and policy and competition factors, as summarised in Figure 5.12.

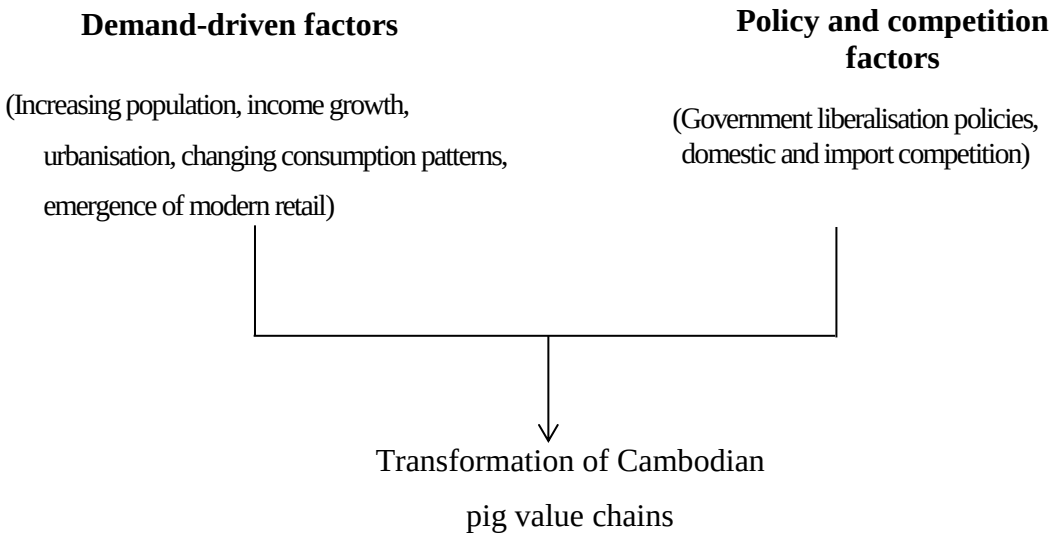


Figure 5-13: Transformation factors of pig value chains in Cambodia

5.7.2 Cambodian pig value chain restructuring patterns, opportunities and challenges

The process of the transformation has effects on pig value chain actors in Cambodia resulting in changes observed across different segments of the value chains. The restructuring patterns

are considered in terms of the changes in structure, market relations (governance structures) and technology use. These observed changes are summarised in Table 5.3.

Table 5-3: The restructuring patterns of Cambodian pig value chains

Cambodian pig value chain restructuring patterns			
	Downstream	**Midstream**	**Upstream**
Structure	Emergence (5-10%) of modern retail in the capital and major cities	Proliferation of small and medium processors, the emergence of modern processors	Farms are scaled up and commercialised while smallholders disappearing
Market relations	The use of contract relations by modern retailers with commercial processors	Emergence of vertical integration of commercial pig companies into the processing sector	Increase in contract farming,
Technology	Cold chain, packing and branding	Increasing investments in modern slaughtering facilities	More use of commercial feed, modern housing facilities and high quality breeds used

The effects on different segments of the pig value chain in Cambodia present both opportunities and challenges for all chain actors. For instance, the growing number of modern retailers and the use of contract relationships indicate economic and technological opportunities for all value chain actors along the value chain stream. As the results showed, selling to modern retailers and higher value markets in the capital and major cities offer producers and processors higher prices. However, the findings of this study also showed an unequal share of margin distribution and that not all chain actors are able to capture these opportunities, due to their own constraints. Instead, these changes along the value chains could be challenges for them to participate in those high value market channels.

As illustrated in Table 5.3 in the retail sector, modern retail has emerged and is rapidly growing in major cities spurred by both domestic players and inflows of FDI in the sector. As a result, these modern retailers require a modern procurement system - contract based governance structure (market relation) - with processors who can comply with high quality and safety requirements. The findings showed that those who supply supermarkets are large commercial pig companies who integrate into the modern processing segment. These modern processors in turn demand high quality processing inputs (live pigs) that only large commercial farms can supply. Consequently, smallholder producers are not in the position to supply modern processors and retailers. Therefore, despite growing high value market

opportunities, these changes in the requirements for higher quality and technological use in pig production, as well as their other challenges, coupled with the competition from international players (imports) are actually increasing constraints for smallholder producers. These restructuring patterns, opportunities and challenges of each segment of the value chains will be discussed in detail in the following chapter.

Chapter 6: Discussion

Introduction

This chapter is divided into three sections. Section one discusses three key categories of factors which led to the transformation of pig value chains in Cambodia. The restructuring patterns, opportunities and challenges of pig value chain actors are discussed in section two. Final section summarises the main points of the chapter.

6.1 Factors affecting the transformation of Cambodian pig value chains

Before discussing the effects on the value chains, it is important to discuss what factors led to the transformation of Cambodian pig value chains. The study findings indicated that three categories of factors affect the transformation of pig value chains in Cambodia. The first category of factors comprises factors that are driven by market demand. The second category of factors includes factors linked to the government's open market and privatisation policies, while the third category of factors is associated with competition.

6.1.1 Demand-driven factors

Factors shaping the transformation of the Cambodian pig industry include population growth, urbanisation, economic growth and the changing consumption patterns. These factors have particularly impacted the downstream segment of the value chain in Cambodia, where consumer demand has increased for both higher quantity and better quality, especially for consumers in urban areas. Due to the changes in socio-economic patterns, there has been a change in urban consumers who now favour more lean pork. In previous studies, these factors have been well highlighted as the factors affecting the transformation of agri-food systems in developing countries (Mendez, Du, & Popkin, 2004; Pingali, 2007; Reardon, 2015; Reardon et al., 2009; Reardon & Berdegué, 2002; Reardon & Huang, 2008; Reardon & Timmer, 2014; Sharma et al., 2013b; Tschirley et al., 2015). For example, Pingali (2007) and Timmer and Dawe (2010) claimed that income growth and urbanisation trigger the shift of dietary patterns from consuming staple food to higher value foods, including meat, with enhanced concerns about food quality and safety. A study undertaken in China found that, over the past two decades, there was a decline of cereal and grain intake accompanied by a dramatic increase in animal food consumption for both rural and urban populations (Mendez et al., 2004).

6.1.2 Policy-driven factors

Cambodian economic policy has been decidedly open to domestic and foreign investments. Since signing the Paris Peace Agreement in 1991, this open policy has led to significant changes of the agribusiness sector with the inflows of FDI. Furthermore, starting from 2007, the government of Cambodia started to privatise slaughterhouses. From the literature review, it can be seen that government direct and indirect interventions play an important role in agri-food system transformation (Reardon, 2015; Reardon et al., 2009; Reardon & Timmer, 2014). In a multi-country case study conducted to determine which factors transform the food industry in developing countries, Reardon and Huang (2008) found that the transformation in most of the countries studied, like China and India, was initiated by the government's public investment, followed by investments from private enterprises encouraged by government privatisation policies.

6.1.3 Competition factor (domestic and import)

As Reardon and Timmer (2014) argued, in Asian countries the main source of food is supplied by the rural areas for urban areas and food imports only account for 5% of food demand. Given the small proportion of food being imported, it implies that the competition takes place mainly between domestic producers, regardless of whether domestic production is being operated by local producers or foreign-owned operations (Rashid et al., 2008; Reardon & Huang, 2008). This seems to be contrary to what was found from the present study. In the Cambodian pig industry context, the competition is between small, medium and large domestic operators and the competition between all domestic producers and imports (both legal and illegal). So, trade liberalisation in this case has two side effects. On the one hand it helps to close the demand gap that cannot be fulfilled by the domestic supply, while on the other hand it negatively impact domestic producers.

Meanwhile, maybe the trade liberalisation policy should not be blamed. Perhaps it is the unregulated/unofficial oversupply of imported live pigs that puts the price pressure on domestic producers, especially smallholders. In this case, it may reflect the relevant authority's poor control of smuggling pigs across borders. The study from Hill and Menon (2014) claimed that Cambodia's international borders are very porous, with large unrecorded trade flows from the two larger neighbours, Vietnam and Thailand. Regardless, the findings of this study highlight that the competition from the pig imported, among other factors, plays a most crucial role in shaping the transformation of the pig value chain in Cambodia.

There are both positive and negative implications from pig importation. On the bright side, the competitive imports could help push the transformation of pig value chains in Cambodia to move forward at a faster rate, because domestic producers need to improve both their production techniques and quality to compete in the market. On the other hand, the imports are obviously a threat to the vulnerable domestic producers, who are financially and technologically incapable of competing with and adapting to these changes. Another implication of this import factor is the reflection of different degrees of transformation among developing countries where, without appropriate supporting interventions, small domestic producers will inevitably be pushed out of their business.

6.2 The restructuring patterns, opportunities and challenges for value chain actors

The above sections have discussed the factors leading to the transformation of pig value chains in Cambodia. The transformation presented both opportunities and challenges for different players in the pig value chains. The following sections will discuss the effects of the transformation on the restructuring patterns of Cambodian pig value chains, as well as the opportunities and challenges faced by chain actors. The restructuring patterns discussed in this section refer to the changes in structure, market relations (the arrangements of governance structures) and technology used by each segment of the value chains during the transformation process.

6.2.1 Restructuring patterns, opportunities and challenges of the upstream (production) segment

Structure: Farms scaling up, smallholders disappearing

Cambodian pig production is still mainly governed by small-scale producers, who together accounted for 80% of the total national output in 2016, down from 88% in 2012. However, the first significant finding from the study is that farm size seems to have increased. In their report, Huynh et al. (2007) stated that Cambodian smallholder pig farmers generally raise between 2 to 4 pigs. Another study undertaken by Tornimbene and Drew (2012) on the character of Cambodian pig production systems defined Cambodian pig smallholders as farmers who raise less than 6 pigs. This is contrary to the study findings. During the data collection, it was hard to find pig farmers who raise fewer than 5 pigs. The disappearance of smaller small-scale pig producers in Cambodia is in agreement with the finding of a study on dairy farm restructuring in Poland, which stressed that during the transformation period, the share of the smallest farms (with less than 9 cows) had dropped from 86% in 2000 to only

68% in 2005 (Reardon & Huang, 2008). The reason for scaling up their farm size is to minimise transaction costs.

Another significant restructuring pattern is the commercialisation of pig production, which is also linked to farms being scaled up. The commercialisation of pig production in Cambodia is a result of the government's livestock development policy, which encourages smallholders through the development of a commercial production scheme (DAHP, 2015). Following economic growth, Pingali (2007) claimed that the patterns of agricultural transformation concerning smallholders has the tendency to move from a self-sufficient production system to scale up to some level of commercialisation for the farmer's survival. For example, from the same study it was found that livestock production in China moved from a side-line household activity to commercialised livestock production.

Another finding found in the present study was the increasing use of commercial pig feeds. Despite some smallholders still using by-products from their rice mill and rice winery for feeding their pigs, as a part of an integrated farming system strategy, some producers have switched to using commercial pig feed as the latter offer higher pig growth performance. About two decades ago, Pingali (1997) was doubtful about the future of the integrated crop-livestock farming system, as he claimed that the system may be infeasible when livestock production is becoming more commercialised, requiring higher production quality and quantity. It is, therefore, questionable as to how much longer this integrated crop-pig production system in Cambodia can be sustained as the agri-food system further transforms.

Market relations (contract farming) and the use of modern farming technology

Additionally, the study also found that there has been an increase in contract farming operated by commercial pig companies. Through resource-providing contract farming, contract farmers are supplied with financial and input services, modern pig housing facilities and high-quality breeds and feed, which offer high production yields. As a result of his study of livestock production in Brazil, India and Thailand, Pingali (2007) claimed that advanced technology in breeding and feeding are the critical success factors in poultry and pig production around the world.

Opportunities

Previous studies have claimed that agri-food transformation in Asia is going to continue to transform in the future, with the late comers transforming at an even faster rate(Reardon et

al., 2012). In Cambodia, all types of modern retail including hypermarkets, supermarkets and organic convenience stores are rapidly growing in the capital and major cities. Furthermore, prices received for pork sold even at traditional markets in the capital are higher, which presents economic opportunities for pig producers to supply these higher value market channels.

Additionally, Cambodia has abundant feedstock resources, such as corn, cassava and rice bran, which are critically important for the pig feed industry. Fuller, Tuan, and Wailes (2002) stated that the development of livestock production to meet the increasing market demand for animal protein is not possible without a sufficient supply of livestock feedstuffs. Therefore, the transformation of the pig value chain in Cambodia also provides opportunities to add value to other agricultural raw materials used in the pig feed industry, and in turn helps develop the rural agricultural community as a whole.

Challenges

Despite the above-mentioned opportunities, Cambodian domestic pig producers face competition with cheaper and higher quality imported pigs. Limited by their nature of being small scale, smallholders face more challenges than do the medium and large scale producers. Accordingly, it is reasonable to project that at some point, in the near future, given smallholders' constraints are not addressed and resolved, smallholders will eventually be pushed out. The section below, therefore, is dedicated to discussing constraints of smallholder pig producers.

Production related constraints

The constraints smallholders face related to production are mostly caused by the lack of access to input market and technical skills. Those constraints include poor quality piglets and pig feed, pig diseases and the high cost of commercial feeds. As a result, pigs produced by smallholders are of low quality and usually receive lower prices from buyers. Biénabe et al. (2004) and Porter (1990) contended that in order to produce a product to serve a market, producers need land, skill and financial resources. Limited access to those resources will result in them not successfully supplying the right quality and quantity for market demand.

Lack of market information and market access

Blandon, Henson, and Cranfield (2009) asserted that access to market information about market requirements is very important for smallholders to participate in high value market

chains. The majority of smallholders were not aware of the existence of high value markets, such as modern retail in urban areas. Trienekens (2011) argued that the ability of smallholders to access a market depends on their market knowledge, product quality and technological capabilities. Without knowing the existence of modern retail, where they could receive higher prices, smallholders would not know what their constraints are to access those market channels.

Lack of bargaining power

As the result of poor quality pigs and the need to sell their pigs, smallholders usually have less power and accept the prices given by buyers. Also, due to inconsistency of quality and quantity of supply, smallholders are usually the price takers from the negotiation. The poor bargaining power of smallholders is the result of their limited market information and the perishability of their products (Moustier, 1998, as cited in Biénabe et al., 2004). Regarding bargaining power, Trienekens (2011) stated that the bargaining power position of actors could influence the distribution of value capture of the value chain. This statement is in agreement with the findings from the study where smallholders received the least margins compared to other chain actors.

Lack of trust

Due to bad experiences of being cheated by some buyers, smallholders are hesitant to sell to new buyers, so they usually stick to the same customers and sell only to local markets. Andre Louw, Jordaan, Ndanga, and Kirsten (2008) identified the lack of trust between producers and buyers as a constraint stopping smallholders participating in high value markets. In this regard, sticking to the same buyers prevents smallholders from connecting to potential new market options. As explained by Robison et al. (2002), the lack of social capital, which includes trust between economic agents in developing countries, leads to less ability to trade and exchange between them.

Inaccessibility of credit market

Difficulties in getting access to a financial market and high interest rates were identified by pig smallholders interviewed as constraints which prevented them from expanding their farm business. Access to a credit market is a constraining factor for value chain upgrading, frequently faced by firms in developing countries (Giuliani, Pietrobelli, & Rabellotti, 2005).

Regulative void

Both regulated and unregulated imports of live pigs have put a tremendous price pressure on smallholders. The limited government regulative support or the absence of it was identified by Trienekens (2011) as one of the constraints for market upgrading for smallholders .

6.2.2 Restructuring patterns, opportunities and challenges of the midstream (processing) segment

Structure: Proliferation of small and medium processors, emerging modern processing

This study revealed an increasing number of district and town pig processors following the government privatisation policy, allowing the use of private and government owned slaughterhouses. Various authors including Reardon et al. (2009) and Pingali (2007) claimed that the restructuring process in the processing sector could be represented by "U-curve". As Figure 6.1 illustrates, the development process can be divided into three phases, where the first phase of the industry is dominated by the public/state sector, the second phase is the fragmentation or de-concentration of the industry as a set of small-scale firms proliferate and are encouraged by the government privatisation policy, and the final phase is the re-concentration of the industry by large foreign or local investment firms (Wilkinson, 2008).

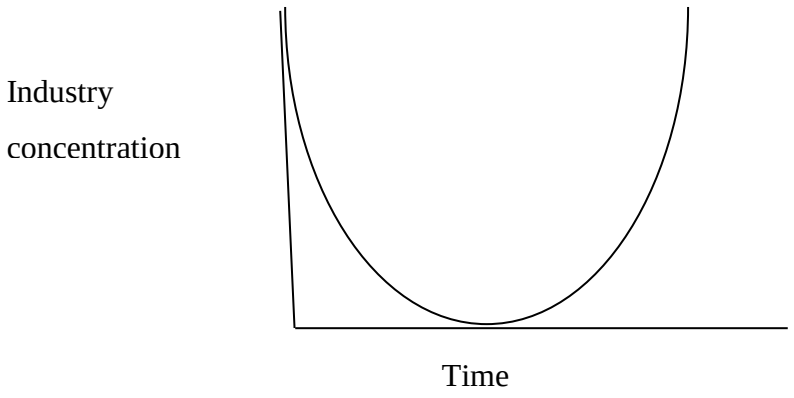


Figure 6-1: Development phases of the processing sector

Accordingly, the proliferation of small and medium district and town pig processors in Cambodia is occurring in what Reardon et al. (2009) called the second phase of the processing sector restructuring in developing countries, where small-scale firms proliferate. At the same time, there has also been an emergence of modern processing, operated by large commercial companies who invest in private slaughterhouses. Empirically, this is similar to what was found in a study on the restructuring of the Zambian beef sub-sector (Reardon & Huang, 2008). In that study, Reardon and Huang observed large commercial beef and chicken

companies vertically integrating into the processing sector to compete with the traditional chains during the 1990s/2000s transformation. So, the development of the Cambodian pig processing sector seems to be going through the same phase patterns and has arrived at stage two with the emergence of stage three. Following the same patterns, growth in consolidation by large modern processors in the sector should be expected next.

Market relations (chain shortened, market integration) and modern slaughterhouses

The results of this study revealed that some small processors had scaled up their operation by investing in logistics (trucks) and pig stockyards, which has led to the direct sale of pigs from farmers to processors, eliminating the role of middlemen. As a result, pig value chains are shortened. Reardon (2015) suggested that when the operation of wholesalers or processors got larger in scale, they began to buy directly from producers through improved logistics. This phenomenon also seems to be in line with what was found in the study of beef wholesale restructuring in Zambia investigated by Reardon and Huang (2008), which suggested that a means of transportation for moving the animals plays a role in farmer-processor direct transactions. Alongside the proliferation of traditional small-scale district and town processors, some large feed and pig companies have expanded and integrated their business from feed production to pig production and finally to pig processing. This expansion has created modern pig integrated value chains operated by large commercial companies (both domestically and foreign-owned). Compared to traditional slaughterhouses, these modern processors have invested in relatively modern and hygienic slaughtering facilities addressing some meat quality and safety issues.

Opportunities

As the downstream market transforms through the increase of modern retail and consumers' growing concerns and preference for meat quality and safety, there will also be a growing demand for private food quality safety standards from supermarkets, as well as mass consumers in general. It, thus, provides opportunities for midstream processing enterprises to invest and upgrade their processing facilities in order to meet the demands from the market. In order to invest in modern slaughtering facilities, high investment capital and technology are required resulting in future investment opportunities for those from private sector.

Challenges

The general challenge for the midstream segment is the poor conditions and facilities of traditional slaughterhouses. These slaughterhouses currently can only supply traditional wet markets, where there is low or no public food standard. With the increasing demand for higher food quality and safety requirements from modern retailers and higher value markets in the capital and urban areas, traditional processors could face competition from large modern processors. Previous studies have pointed out the risks of small processors being forced out of their operations. For example, a study by Reardon et al. (2014) on the revolution of rice value chains in Asian countries found similar challenges facing small rice millers. It was found that over time small rice mills had disappeared, because they could not keep up with the scale and the investment in equipment needed to compete with larger mills. It makes sense that pig processing facilities are capital intensive and only large commercial firms are financially capable of investing in a modern slaughterhouse. Sharma et al. (2013a), however, claimed that depending on the progress of the country's economy, smallholder processors could still have a role to play as traditional retailers tend to source from small-scale processors.

Another challenge for traditional processors is the sustainability of pig supply in the future. The study findings revealed that traditional processors depend on small-scale producers for their pig supply. A previous study suggest the exclusion and demise of smallholders during market transformation (Biénabe et al., 2004). So, with a disappearance of smallholder pig producers, traditional processors could be forced out of their processing business, too.

6.2.3 Restructuring patterns, opportunities and challenges of the downstream (retail) segment

Structure: Traditional market dominant, emerging modern retail

Although Cambodian food retail is still over 90% dominated by traditional wet markets, where pork is sold as undifferentiated meat products, it is common to find packaged and branded pork being sold as fresh produce in the meat section at modern food retail shops in the capital and many major cities. In the early 1990s, modern food retail in Latin America, Central Europe, South Africa and some countries in Southeast Asia also started at a 5-10% share of total food sales (Reardon et al., 2012). In 2014, some Asean countries had relatively higher degree of modern for retail penetration. For example, the share of modern food retail in Singapore, Thailand, Malaysia, Philippines and Indonesia accounted for 71%, 45%, 43%,

28% and 16% respectively (Yeo et al., 2015). Compared to those developing countries in the region, the emergence of Cambodian modern food retail (below 10%) is at an early stage.

The low share of modern retail in Cambodia is linked to the level of income and urbanisation. It is also potentially influenced by with the traditional Cambodian way of life of going to wet markets for grocery shopping. Grocery shopping in modern retail shops with many varieties of products to choose from is still an unfamiliar experience to many Cambodian shoppers. However, the trend of going shopping at modern retail outlets, such as hypermarkets and supermarkets has changed, especially with the young generation of Cambodians and families living in the capital and other urban areas.

Market relations (governance structure): Requirement based contract

With the emergence of modern retail in Cambodia, there has been a shift in market relations between pork suppliers and supermarkets from a spot market to a contract relationship; from sourcing pork from import suppliers to sourcing from domestic large commercial suppliers. The shift of supermarkets from sourcing imported pig and pork products to domestic suppliers is due to the improvement of domestic producers in respect of better pig quality. The trend to shift from a public standard to private standards imposed by modern retail is highlighted in many previous studies which discussed the rise of supermarkets (Berdegué, Balsevich, Flores, & Reardon, 2005; Lee et al., 2012; Reardon et al., 2009). As mentioned by Berdegué et al. (2005), when public food safety and quality standards are either poor or absent, supermarket chains tend to impose private food standards on their suppliers to differentiate themselves and compete with traditional chains. The use of contracts by modern retailers as opposed to spot market relations used by traditional retailers was referred to as a "modernized procurement system" (Reardon et al., 2009). The change of the procurement system to commercial processing suppliers is also highlighted in the study by Sharma et al. (2013a), who claim that modern retailers tends to source their supply from large processors for reasons of food quality and safety and to reduce transaction costs.

Opportunities

The significant progress of Cambodia's economy, combined with its population growth, rising urbanisation and the arrival of foreign tourists and expatriates provide a huge potential for future growth in the modern food retail industry (supermarkets, fast food chains, hotels, restaurants and other modern food services). As claimed by Reardon et al. (2009), the degree of the transformation of food retail from traditional to modern food retail is linked to the level

of rising income and urbanisation of the country. Although the share of modern food retail in Cambodia currently is still low, the modern retail industry in Cambodia provides a huge space for growth in the future, given the high economic growth rate. Thus, there are opportunities for retail actors to upgrade their facilities in regard to safety and food quality. This is important because more affluent urban consumers are increasingly in favour of high quality meat and are more concerned about the safety of their food. At the same time, the growth potential for modern retail in Cambodia is also a signal for investment opportunities for those from the private sector.

Challenges

The challenge facing traditional pork retailers is in regard to competition from the rising modern retail. There are concerns about safety and food quality, due to the nature of traditional wet market conditions. However, some literature suggested that fresh produce traditional retail could stay competitive in the industry for some time yet (Reardon & Berdegué, 2002). In their study, conducted in Latin America, concerning the rise of supermarkets and the related challenges and opportunities, the scholars suggested two relevant reasons for traditional retail, especially small traditional shops, to stay competitive. Firstly, small traditional shops can easily be located at any corner within urban areas, as opposed to large modern retail. Secondly, traditional retailers normally charge lower prices due to the lower operational costs. Furthermore, Sharma et al. (2013b) stated that traditional markets could be resilient and coexist for a significant period of time with the modern retail as a result of spill-over effects from the restructured modern retail.

The reasons suggested in the above study seem to reflect the confidence of the pork retailers interviewed who expressed very little concern when asked about their future challenges. In any case, it appears that traditional pork retailers in Cambodia will stay in business at least for short to medium term. However, as additional consumers are expected to be more concerned about quality and safety issues, traditional pork retailers may need to improve their practices and facilities to compete even among traditional chains.

6.3 Chapter summary

This chapter discusses the factors that lead to the transformation of Cambodian pig value chains, restructuring patterns of each segment as well as opportunities and challenges for chain actors. The discussion can be summarised in Figure 6.2

Figure 6-2: The summary of the discussion chapter

Demand-driven factors
(Population growth, urbanization, income growth, dietary pattern, modern retail)

Policy-driven and competition factors
(Liberalisation policies, competition among domestic players and imports)

The transformations of Cambodian pig value chain

Transformations & effects on	Upstream (Production)		Midstream (Processing)		Downstream (Retail)	
Restructuring patterns	**Structure:** Small-scale farms disappearing, farms scaled up and commercialised **Market arrangement:** increase in contract farming (contracted by large-scale farmers and commercial feed companies) **Technology:** more use of commercial feeds, modern housing facilities and high quality breeds used by large commercial farms		**Structure:** Proliferation of small and medium processors, increasing direct farmers-processor contact, the emergence of modern processors **Market arrangement:** Emergence of vertical (forward) integration of commercial pig companies into processing sector, **Technology:** increasing investments in modern slaughtering facilities by large commercial companies		**Structure:** Emergence (5-10%) of modern retail in the capital and major cities **Market arrangement:** use of private standards and contract relations between modern retails and commercial pig suppliers/processors **Technology:** Cold chain, packing and branding	
Opportunities	Poverty alleviation and higher income by participating in growing higher value markets, development of raw material sector and rural development as a whole		Increasing market demand quality and safe food, opportunities for private sector to invest in modern processing		Increasing demand for quantity and quality, opportunities for retail actors to upgrade and private sector to invest in modern retail	
Challenges	*Future Impact* Immediate *****	Production related constraints, market information and market access, lack of bargaining power, lack of trust, lack access to credit markets, regulative void	*Future Impact* Short to medium term ***	Poor and unhygienic traditional slaughtering facilities, high capital needed for modern slaughterhouse investments, risk of losing pig supply from smallholders	*Future Impact* Mid to Long term **	Poor conditions of traditional markets in respect to food quality and safety

Note: the number of * represents the level of impact timeframe in the future

As depicted in the summary from Figure 6.2, different degrees of restructuring are occurring along all segments of Cambodian pig value chains, which present both opportunities and challenges for chain actors in a short to long term. It appears that the retail segment is the least impacted by the transformations at this stage, due to their dominance and the possibility of them staying in traditional retail for the medium to long term. Processors, on the other hand, could be facing competition with the emergence of more powerful modern processors in the short to medium term.

Meanwhile at the production level, some smallholders have already disappeared, while others are ready to give up their pig farming as the result of their constraints and the effects of the structural transformation. Unlike smallholders in other restructuring developing countries, who are unable to comply with the changing demand of modern retailers, at this stage Cambodian pig smallholders largely suffer from competition from both large domestic producers and especially the importation from neighbouring countries.

Smallholders' constraints and immediate solutions to their challenges, therefore, need to be addressed. They need not only to improve their current challenges to compete with larger domestic and international players, but also to be well prepared to successfully participate in the more transformed market in the future. The implications and recommendations for smallholder producers as well as other value chain stakeholders will be provided in the next (last) chapter.

Chapter 7: Conclusion

Introduction

This chapter summarises the key findings of the study and provides recommendations, which address the research objectives and hypothesises. The chapter is divided into four sections. Section one summarises the study findings. Section two provides the implications of the study for different Cambodian pig value chain stakeholders. Section three outlines the study limitations and the final section gives suggestions for further research.

7.1 Summary of the study findings

Factors leading to the transformation of Cambodian pig value chains

The transformation of Cambodian pig value chains is just emerging as a result of the socio-economic development of the country, which has led to an increase in meat demand, especially from urban areas. Specifically, increased population, income growth and urbanisation are also the determining factors of the transformation of the pig value chain downstream (market demand). Additionally, the transformation has also been influenced by the government's liberalisation and privatisation policies, which encourage investments from domestic and foreign agribusiness firms in different segments of the pig value chain in Cambodia. Among those factors, however, this study identified the importation of live pigs as the major factor transforming the pig value chain in Cambodia, particularly the production sector.

Value chain restructuring patterns

Some restructuring patterns of the Cambodian pig value chains, in regard to the changes in structure, market relations and technology use were found at different segments of the value chains. At the retail segment, while the majority of pork is still predominantly sold through traditional wet markets, pork is also sold through emerging modern retail in the country's capital and major cities, at a share of between 5 and 10% of total pork retail. With the emergence of modern retail, there has been a shift to using contract market arrangements to meet supermarket pork quality standards, as opposed to spot market arrangement of traditional pork value chains.

The transformation at midstream, where pig trading, processing and wholesaling are taking place, was also observed. There has been a proliferation of small and medium pig processors in the provincial districts and towns, as a result of government slaughterhouse privatization. Also recently, a few modern processors have emerged, who invested in modern slaughtering facilities. These modern processors are also the commercial pig and feed companies who have integrated into the processing sector. Meanwhile, the disappearance of village middlemen was observed as direct transactions between producers and local processors are becoming more common with increasing processors' investments in logistics and the pig stockyard.

The transformation of the Cambodian pig production segment is the most noticeable one. It was observed that farms have become largely commercialised with farm size being scaled up, while small-scale farms are disappearing. There was an increase in contract farming and with large commercial farms contracted to and operated by large commercial feed and pig companies. Technology-wise, more producers have shifted to investing in modern pig housing and use more commercial feed and high-quality breeds.

Opportunities and challenges

With the increasing demand for higher quantity, quality and safety of pork meat in Cambodia, especially from urban consumers, the transformation at the retail segment offers opportunities for the processing and retailing actors to improve their processing and retailing facilities, to comply with the changing demand in regards to meat quality and safety. For producers especially smallholders, higher quantity and quality demands could mean a higher income, poverty alleviation and the development of rural community.

However, this study suggested that not all value chain actors are able to take advantage of the transformations, as adapting to the changes in market relations and new technology use requires knowledge, skills and investments, which are challenges for these actors. Among value chain actors, the most susceptible players are smallholder producers, due to their constraints that prevent them from connecting to higher value markets in urban areas. Beside their internal challenges, smallholder pig producers are also constrained by competition, especially from international players.

7.2 Implications of the study

7.2.1 Implications for policy makers (Government and NGOs)

The findings of this study indicate a need for the relevant authorities and development partners to address and respond to the challenges faced by Cambodian pig value chain actors, especially smallholder producers. The recommendations are made as follows:

- **Prevention of border smuggling:** It is important that illegal imports of live pigs from the neighbouring countries be strictly monitored and prevented by the relevant government authorities. Preventing the unregulated imports and dumping from neighbouring countries will help reduce excessive supply and stabilise the market price of domestic live pigs.

- **Development and dissemination of market information:** The relevant government authorities and international development partners should gather all the related information about different market channels and their requirements and circulate the information to smallholders and all relevant supporting value chain actors. Only when smallholders and other stakeholders realise the existence of higher value market channels will they know whether or not they can participate and decide how to cope with their challenges in order to participate in those higher value markets.

- **Technical support:** Provision of training on farm management, extension services and veterinary and medical services is crucial for smallholders to improve their farm management skills and production techniques.

- **Financial support:** In response to the financially related constraints faced by pig producers, the government and/or development partners could establish a specialised bank/credit institution with low interest rates specifically to provide credit to smallholders and their producer groups who have proper business expansion plan. Direct financial subsidies can also be provided to encourage producers to stay on their farm.

- **Food safety certification:** Food safety issues were observed across the pig value chains with a higher degree in traditional chains. It is recommended that there should be more promotion of food safety awareness, not only to consumers but also to all chain actors and stakeholders. This promotion could be achieved through the provision of a food safety certificate to those value chain actors who have qualified for their good safe food practices. In order to build consumer trust and confidence in the certificate, the

government authorities should collaborate with international organisations, as they are experts and well recognised in the field.

7.2.2 Implications for business opportunities

This study indicates that the transformation of Cambodian pig value chains is at an early stage and the market is still largely undeveloped along all segments of the value chain. However, the literature review suggests that the transformation process of late comer countries is usually faster than earlier adopting countries (Reardon et al., 2012). Furthermore, the socio-economic indicators of Cambodia suggest a continuity of transformation in the future. Thus, there are implications for business opportunities for international and domestic agribusiness companies wishing to invest in feed and pig production as well as modern processing and retail sector.

- **Feed and pig production sector:** Currently there is still a shortage of feed and pig supplies from domestic producers. So, there is space for growth in the input and production segments. However, it is recommended that study be undertaken to compare the cost of local production to compare with the cost of importing.

- **Modern processing sector:** Although wet markets still dominate food retail in Cambodia, Reardon et al. (2009) and empirical evidence from regional market development (Yeo et al., 2015) suggest the association between urbanisation, income growth and the rise of modern retail industry. It is expected that the rise of modern retail in Cambodia will continue to grow, which will increase the demand for high quality and safe pork. Furthermore, there seems to also be an increasing concern for food quality and safety from urban consumers who usually go to the wet market to buy pork. So, it is a good opportunity for agribusiness firms to be one of the first to invest in the modern pork processing sector and supply higher quality, safer pork to both traditional and modern retail outlets.

- **Modern retail sector:** Some Cambodian shoppers, especially older generation, are more reluctant to try the new lifestyle of shopping for meat in a modern retail outlet. Although they may have a higher disposable income, they are still more comfortable and familiar with the layout and feel of the traditional market. A recommendation for the retail business sector is to set up a modern retail outlet where it provides not only the safe and clean environment all modern retail outlets do, but also the feel and experience of the tradition

market. For example, maintaining the direct transaction between the seller and shoppers while buying their meat.

Another recommendation for the pork retail industry is to introduce new pork dishes and cooking. Some Cambodian consumers are more conservative and might not have enough experience when it comes to consuming pork through different cooking styles. For example, Pork Satay (fermented pork grilled using bamboo skewers) is a popular pork snack food and main course dish in Thailand, but Cambodian consumers are more familiar with Beef Satay. The promotion of this new pork cooking style through special events, in collaboration with large producer and food service companies, could draw consumer interest, resulting in more pork consumption.

The last recommendation is for modern pork retail actors (even for traditional ones) to brand their pork. Most Cambodian consumers are brand-loyal. The purpose of branding is to differentiate their product from others. Product branding and differentiating is a strategy which should create more value for the product, resulting in consumers being more willing to pay higher prices.

7.2.3 Implications for producers

This study indicated that some of the constraints that Cambodian pig smallholders face are mainly linked to their small scale, which results in high production costs, low bargaining power, lack of market information and market access. In order to address these challenges and create scale economies, the following solutions are recommended:

- **Horizontal coordination improvement:** Improving their horizontal coordination means that pig producers coordinate with other producers to form a collective action organisation in the form of a farmer organisation or cooperative. Through the organised farmer group, Cambodian pig smallholders could create scale economies, which could improve their bargaining power and access to both input and output markets. Producers could also coordinate to form a group aimed at achieving specific purposes, such as improved production or joint marketing. Such types of arrangement enable them to have stronger negotiation power with other value chain actors.

  Trust was identified as a challenge within pig producer organisation. So it is recommended that horizontal coordination be improved through trust enhancement. Trust between members in a producer group could be enhanced by involving the members in the decision

making process. A shared vision and transparent management of the organisation could also enhance trust.

- **Vertical coordination improvement:** Improving horizontal coordination may not be enough because producers need to reach out to both suppliers and buyers. In order to sustain their input supplies and output market, pig producer groups should establish a contracting arrangement with suppliers and buyers. Contracting arrangements could prevent producers from market risks and opportunistic behaviour of buyers. Cost-wise, improved vertical coordination with suppliers could also beneficial. For example, with the larger volume of input demand for pig feed and veterinary services and supplies, a pig producer group should be able to negotiate a favourable price, resulting in cheaper production costs. Similarly, with improved quantity and quality with producer groups, they would have better negotiation terms with buyers.

- **Private-private partnership:** Additionally, with the emergence of modern slaughterhouses, organised farmer groups could form partnership with modern processors. Private to private partnership with processors could also be another strategy for smallholders (through producer groups) in order to secure their output market.

- **Vertical Integration:** Another recommendation for smallholders (through organised producer groups) is to integrate processing and, thus, link their products directly to both traditional and modern retail markets.

7.3 Study limitations

Given time and financial constraints, and the scope of the research target area, which was limited to only one study target province, the findings of the study may only be applicable to the transformation occurring in Kampon Speu province and may not be able to be generalised for the actual transformation of the pig value chain in Cambodia as whole. Furthermore, the number of informants interviewed was rather small, and due to company confidentiality concerns, some primary data information was gathered from second-hand informant. For example, because modern retailers did not allow any interviews, the relevant information was provided by their suppliers which, as a result, could be biased and/or not accurate.

7.4 Future research recommendations

This research is one of the first exploratory studies aimed at exploring and describing the transformation of Cambodian pig value chains and the effects on restructuring patterns,

opportunities and challenges of chain actors. It would be interesting for future research to repeat this research, and so examine how the transformation process of Cambodian pig value chains will have developed in a few years' time. However, noting one of the limitations of the present research, further research should aim to cover a larger study area and number of respondents in the sample.

Another interesting future research suggestion is to use the research conceptual framework developed in this study to investigate the transformation of other commodity value chains, particularly horticulture commodities.

Other suggested future research questions are as follows:

1. What determines the possibility of pig producers participating in different pork market channels?
2. What are the effects of the agri-food system transformation on pig smallholders' benefits (both financial and technological)?
3. What is the role of producer groups in helping pig smallholders participate in high value markets?

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Appendices

Appendix 1: Respondent information

Informant Code					
No.	**Code**	**Date interviewed**	**Role**	**Organisation**	**Herd size**
Large-scale producer					
1	LSF 01	3/02/2017	Farm Manager	M's Pig ACMC (Cambodia) Co., Ltd	100,000
2	LSF 02	23/12/2016	General Manager	Hok Hieng Co., Ltd	20,000
	Contract Farm				
3	CTF 01	25/01/2017	Farm assistant	CP (Cambodia) contract farm	1,100
4	CTF 02	25/01/2017	Farm operator	CP (Cambodia) contract farm	1,100
Medium-scale producer					
5	MSF 01	24/01/2017	Farm owner	Producer	700
6	MSF 02	12/01/2017	Farm owner	Producer	200
Small-scale producer					
7	SSF 01	24/01/2017	Farm owner	Producer	70
8	SSF 02	17/01/2017	Farm owner	Producer	50
9	SSF 03	17/01/2017	Farm owner	Producer	22
10	SSF 04	23/01/2017	Farm owner	Producer	20
11	SSF 05	23/01/2017	Farm owner	Producer	11
12	SSF 06	23/01/2017	Farm owner	Producer	5
Trader					
13	TRD 01	6/02/2017	Trader	Based in the capital	50
14	TRD 02	1/02/2017	Trader	Based in the province	15
Processor					
15	BTC 01	25/01/2017	Butcher	Based in study province	3
16	BTC 02	1/02/2017	Butcher	Based in study province	2
Wholesaler/retailer					
17	WRL 01	25/01/2017	Wholesaler/retailer	Based in study province	2
18	WRL 02	25/01/2017	Wholesaler/retailer	Based in study province	2
19	WRL 03	6/02/2017	Wholesaler/retailer	Based in the capital	4
20	WRL 04	6/02/2017	Wholesaler/retailer	Based in the capital	4
Official and Farmer Association					
21	OFC 01	6/02/2017	Veterinary chief	MAFF	
22	FAH 01	19/12/2016	Chairman	Cambodian Pig Raisers Association	

Appendix 2: Interview questions for producers

Interview Question: Producers

Interview date: / /

I. Participant general information

1. Name:_____ Contact detail:_____

2. Age:_____

3. Education
   - ☐ *Primary school*
   - ☐ *Secondary school*
   - ☐ *High school*
   - ☐ *University*

4. Gender
   - ☐ *Male*
   - ☐ *Female*

5. What is your primary source of income? Secondary?
   - ☐ *Rice production*
   - ☐ *Crop production*
   - ☐ *Livestock production*
   - ☐ *Pig production*
   - ☐ *Other*

II. Farm characteristics

6. Why do you choose to raise pigs?
   - ☐ *Economic purposes*
   - ☐ *Traditional way of life*
   - ☐ *Maximize the use of agricultural by-products and kitchen wastes*
   - ☐ *Others*
7. How many pigs are raised in your farm? Increased or decrease?
8. How many staff do you employ to work in your farm?
9. Do you own your land for raising your pigs?
10. What kind of farming technology is used in your farm?
11. What are the costs incur and the prices you receive from your buyers.

III. Market relations

12. Who are your suppliers and buyers? Why them?
13. What types of market relations (spot/contract?) are arranged between you and your suppliers and buyers? Why?
14. How long have you had this business relationship for?
15. How often do you have business transactions? How big is each transaction?
16. Do you trust your buyer in your business transactions (contract, credits...) with them? Please explain why or why not?

IV. Market information sharing

17. Do you think market information is important for your business? Why and why not?
18. What kind of information is most important to your business? Please explain.
19. What information sharing means are used?
20. Does your buyer share market information with you? Why or why not? Please explain.
21. Do you think your business network/transactions with your buyer have any influence on information sharing? Why? Please give examples.
22. What else do you think could have an influence on information sharing between you and the buyer?

V. Market access

23. Which market are you selling your pigs/pork to? Please explain why is it important? How big is your market share in that market?
24. Have you had any better access to different markets and buyers for your pigs/pork? Please explain why.
25. Do you know anything about modern/super market chain?
26. Do you want to sell to those markets? Why or why not?
27. Do you think the share of market information could influence your market access? Please explain.
28. What else could influence your access to market?

VI. Business performance

29. Do you think market information could help you to receive higher price for your pigs/pork? Please explain how?
30. Do you think market information could influence your business revenue/farm income? Please explain.

VII. Opportunities and challenges

31. What is your future development plan/opportunities for your business?
32. What are the challenges for achieving your development plan?
33. What keeps you worried the most every night about your business?

Appendix 3: Interview questions for large commercial pig companies

Interview Question: Commercial companies

Interview date: / /

I. Participant general information

1. Name:_____ Contact detail:_____

2. Age:_____

3. Education
   - ☐ *Primary school*
   - ☐ *Secondary school*
   - ☐ *High school*
   - ☐ *University*

4. Gender
   - ☐ *Male*
   - ☐ *Female*

5. Name of company_____
6. Position in the company_____

II. Industry information

7. What do you think of the current situation of pig industry in our country?
8. What are the factors that influence the pig industry in Cambodia?

III. Farm characteristics

9. How many head of pigs does your company keep? Increased or decrease?
10. How many staff does your company have?
11. What kind of farming technology is used in your company's farms?
12. What are the costs incur and the prices you receive from your buyers?
13. Does your company run any other businesses beside operating pig farms?

IV. Market relations

14. Who are your suppliers and buyers? Why them?

15. What types of market relations (spot/contract?) are arranged between you and your suppliers and buyers? Why?
16. How long have you had this business relationship for?
17. How often do you have business transactions? How big is each transaction?
18. Do you trust your buyer in your business transactions (contract, credits...) with them? Please explain why or why not?

V. Market information sharing

19. Do you think market information is important for your business? Why and why not?
20. What kind of information is most important to your business? Please explain.
21. What kind of information sharing means/modes is used?
22. Does your buyer share market information with you? Why or why not? Please explain.
23. What kind of information do they share? Please give specific examples.
24. Do you think your business network/transactions with your buyer have any influence on information sharing? Why? Please give examples.
25. What else do you think could have an influence on information sharing between you and the buyer?

VI. Market access

26. Which market are you selling your pigs to? Please explain why is it important? How big is your market share in that market?
27. Have you had any better access to different markets and buyers for your pigs/pork? Please explain why.
28. Do you know anything about modern/super market chain?
29. Do you want to sell to those market channels? Why or why not?
30. Do you think the share of market information could influence your market access? Please explain.
31. What else could influence your access to market?

VII. Business performance

32. Do you think market information could help you to receive higher price for your pigs/pork? Please explain how?
33. Do you think market information could influence your business revenue/farm income? Please explain.

VIII. Opportunities and challenges

34. What are your future development plans/opportunities for your business?
35. What are the challenges for achieving your development plan?
36. What keeps you worried the most every night about your business?

Appendix 4: Interview questions for traders/processors/wholesalers/retailers

Interview Question: traders/processors/wholesalers/retailers

Interview date: / /

I. Participant general information

1. Name:_____ Contact detail:_____

2. Age:_____

3. Education
   - ☐ *Primary school*
   - ☐ *Secondary school*
   - ☐ *High school*
   - ☐ *University*

4. Gender
   - ☐ *Male*
   - ☐ *Female*

5. What is your primary source of income? Secondary?

II. Business characteristics

6. Why do you choose to do your respective business (trading/processing…)
   - ☐ *Economic purposes*
   - ☐ *Traditional way of life*
   - ☐ *Others*
7. How many head of pigs do you handle daily? Increased or decrease?
8. How many staff do you employ to work in your farm?
9. What kind of farming technology is used in your business (trading, processing..)
10. What are the costs incur and the prices you receive from your buyers.

III. Market relations

11. Who are your suppliers and buyers? Why them?
12. What types of market relations (spot/contract?) are arranged between you and your suppliers and buyers? Why?
13. How long have you had this business relationship for?
14. How often do you have business transactions? How big is each transaction?
15. Do you trust your buyer in your business transactions (contract, credits...) with them? Please explain why or why not?

IV. Market information sharing

16. Do you think market information is important for your business? Why and why not?
17. What kind of information is most important to your business? Please explain.
18. What kind of information sharing means is used?
19. Does your buyer share market information with you? Why or why not? Please explain.
20. What kind of information do they share? Please give specific examples.
21. Do you think your business network/transactions with your buyer have any influence on information sharing? Why? Please give examples.
22. What else do you think could have an influence on information sharing between you and the buyer?

V. Market access

23. Which market are you selling your pigs/pork to? Please explain why is it important? How big is your market share in that market?
24. Have you had any better access to different markets and buyers for your pigs/pork? Please explain why.
25. Do you know anything about modern/super market chain?
26. Do you want to sell to those market channels? Why or why not?
27. Do you think the share of market information could influence your market access? Please explain.
28. What else could influence your access to market?

VI. Business performance

29. Do you think market information could help you to receive higher price for your pigs/pork? Please explain how?
30. Do you think market information could influence your business revenue/farm income? Please explain.

VII. Opportunities and challenges

31. What are your future development plans/opportunities for your business?
32. What are the challenges for achieving your development plan?
33. What keeps you worried the most every night about your business?

Appendix 5: Interview questions for government officials and producer groups

Interview Question: Government officials and producer groups

Interview date: / /

I. Participant general information

1. Name:_____ Contact detail:_____

2. Age:_____

3. Education
   - ☐ *Primary school*
   - ☐ *Secondary school*
   - ☐ *High school*
   - ☐ *University*

4. Gender
   - ☐ *Male*
   - ☐ *Female*

5. Name of organisation_____
6. Position in the organisation_____

II. Industry information

7. What do you think of the current situation of pig industry in our country?
8. What are the factors that influence the pig industry in Cambodia? Please explain in details?

III. The role of organisation in Cambodian pig value chains

9. What are the roles that your organisation plays in the pig value chains in Cambodia
10. Who are the main supporter of your organisation

V. Market information sharing

11. Do you think market information is important for pig value chain actors? Why and why not?
12. What kind of information is most important to them? Why?
13. Who should be providing those important information to value chain actors?

VI. Market access

14. What are your opinion regarding modern retail such as supper markets?

15. Do you think producers and other chain actors should sell to modern markets?

VIII. Opportunities and challenges

16. What do you see as future development or opportunities for pig industry in Cambodia?
17. What are the challenges for pig value chain actors in achieving those opportunities?

Appendix 6: Ethics approval

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Date: 29 November 2016

Dear Rithy Thai

Re: Ethics Notification - **4000017049 - Information Sharing in Cambodian Pork Value Chain**

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

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

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

If situations subsequently occur which cause you to reconsider your ethical analysis, please go to http://rims.massey.ac.nz and register the changes in order that they be assessed as safe to proceed.

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

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

If you have any concerns about the conduct of this research that you want to raise with someone other than the researcher(s), please contact Dr Brian Finch, Director - Ethics, telephone 06 3569099 ext 86015, email humanethics@massey.ac.nz. "

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

Yours sincerely

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

Human Ethics Low Risk notification

Dr Brian Finch
Chair. Human Ethics Chairs' Committee and Director (Research Ethics)

Appendix 7: Research information sheet

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

Market Information Sharing in Cambodian Pork Value Chain

Dear Sir/Madam,

Cambodia is an agriculture-based country having about 80% of population employed directly and indirectly in rice, crop and livestock production. Pig industry in particular is important sector which employs and provides cash income and important source of meat protein to Cambodian rural households.

This proposed research is crucially important for pig farmers and other stakeholders to understand more in depth about the challenges facing Cambodian pig industry especially in regards to information sharing among chain members.

Your participation in this research interview is very important for us to achieve the objectives of this research. Please be assured that all the necessary steps will be taken to maintain data security and your anonymity. Our data management and confidentiality processes and procedures have been approved by Massey University's Human Ethics Committee.

Thank you and best regards,

Rithy Thai (Postgraduate researcher), 85A Lombard Street, Palmerston North, New Zealand, riththai@yahoo.com, +64 22 4656788

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

Professor Paul Childerhouse (Supervisor), Massey University, New Zealand, P.H.J.Childerhouse@massey.ac.nz, +64(06) 356 9099 ext. 83757

Appendix 8: Participant Consent Form

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

PARTICIPANT CONSENT FORM

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

I agree/do not agree to the interview being audio taped.

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

Signature _____ Date _____

Full name-printed_____

Appendix 9: Translated research information sheet

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

ការចែករំលែកពត៌មានស្តីពីធីផ្សារក្នុងខ្សែសង្វាក់ផលិតកម្មជ្រូកនៅប្រទេសកម្ពុជា

ជូនចំពោះលោក លោកស្រី

កម្ពុជាជាប្រទេសពឹងផ្អែកលើវិស័យកសិកម្ម ដែលមានប្រជាជនប្រមាណ ៨០% បំពេីការងារក្នុងវិស័យកសិកម្មស្រូវ ដំណាំ និងការចិញ្ចឹមសត្វ។ វិស័យជ្រូកដោយឡែកគឺជាវិស័យដ៏សំខាន់មួយផងដែរដែលបានផ្តល់ការងារ ចំណូល និងជាប្រភពអាហារប្រូតេអ៊ីនសំរាប់ប្រជាជនកម្ពុជា។

ការសិក្សាស្រាវជ្រាវនេះមានអត្ថប្រយោជន៍សំរាប់កសិករចិញ្ចឹមជ្រូក និងភាគីពាក់ព័ន្ធទាំងអស់ក្នុងការស្វែងយល់អំពីបញ្ហាប្រឈមទាំងឡាយ ជាពិសេសការទទួលបាននូវពត៌មានទាក់ទងនិងទីផ្សារ។ ការចូលរួមរបស់អស់លោក លោកស្រីក្នុងការផ្តល់បទសម្ភាសនេះនឹងផ្តល់សារៈសំខាន់យ៉ាងខ្លាំងសំរាប់ការស្រាវជ្រាវរបស់យើងខ្ញុំ។ សូមជ្រាបថា រាល់ពត៌មានទាំងឡាយដែលទទួលបានពីបទសម្ភាសនេះនឹងត្រូវរក្សាជាការសម្ងាត់ និងសុវត្ថិភាពបំផុត។ ការគ្រប់គ្រង និងនីតិវិធីនៃការរក្សាការសម្ងាត់របស់ទិន្នន័យត្រូវបានពិនិត្យនិងនអនុម័តដោយគណៈកម្មាធិការ Human Ethics នៃសាកលវិទ្យាល័យ Massey (ប្រទេសណូវែស្សឡង់) មុនពេលយើងខ្ញុំបានមកសុំធ្វើបទសម្ភាសនេះ។

សូមអរគុណ!

សំរាប់ពត៌មានបន្ថែម សូមធ្វើការទំនាក់ទំនងអ្នកស្រាវជ្រាវដូចមានជូនភ្ជាប់ខាងក្រោម:

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Appendix 10: Translated Participant Consent Form

MASSEY UNIVERSITY
COLLEGE OF SCIENCES
TE WĀHANGA PŪTAIAO

Market Information Sharing in Cambodian Pork Value Chain

ការចែករំលែកពត៌មានទីផ្សារក្នុងខ្សែសង្វាក់ផលិតកម្មជ្រូកនៅប្រទេសកម្ពុជា

PARTICIPANT CONSENT FORM

ការអនុញ្ញាតិផ្តល់បទសម្ភាស

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

ខ្ញុំបានអាន និងទទួលពត៌មានស្តីពីការសិក្សាស្រាវជ្រាវដូចមានក្នុងលិខិតជូនភ្ជាប់។ខ្ញុំបានទទួលការពន្យល់នូវរាល់សំនួរដែលខ្ញុំបានសួរ នឹងអាចបន្តសួរសំនួរផ្សេងៗទៀតក្នុងកំឡុងពេលផ្តល់បទសម្ភាស។

I agree/do not agree to the interview being audio taped.

ខ្ញុំយល់ព្រម/ មិនយល់ព្រមអោយមានការថតសំលេងក្នុងពេលសម្ភាស។

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

ខ្ញុំយល់ព្រមផ្តល់បទសម្ភាសសំរាប់ការសិក្សាស្រាវជ្រាវនេះតាមលក្ខ័ន្ឌដែលបានជំរាបជូនក្នុងលិខិតជូនភ្ជាប់។

Sinature/ហត្ថលេខា _____ Date/ការបរិច្ឆេទ 03. Feb. 2017

Name/ឈ្មោះ: Bun Sideun

Te Kunenga ki Pūrehuroa

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