

Chapter 3

Lao PDR's fruit production for export- a case study of watermelon in Luangnamtha Province

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Abstract

Lao farmers in the rural and border areas in the Northern region begin to grow short cycle crops, such as watermelon, in response to a greater demand for food in the neighboring Chinese market. Contract farming promotes know-how transfer and protects farmers from market and weather condition risks. Despite having other alternative economic opportunities, watermelon growing is a good source for post-rainfed rice season income. Further government supports are needed to address challenges faced by watermelon farmers.

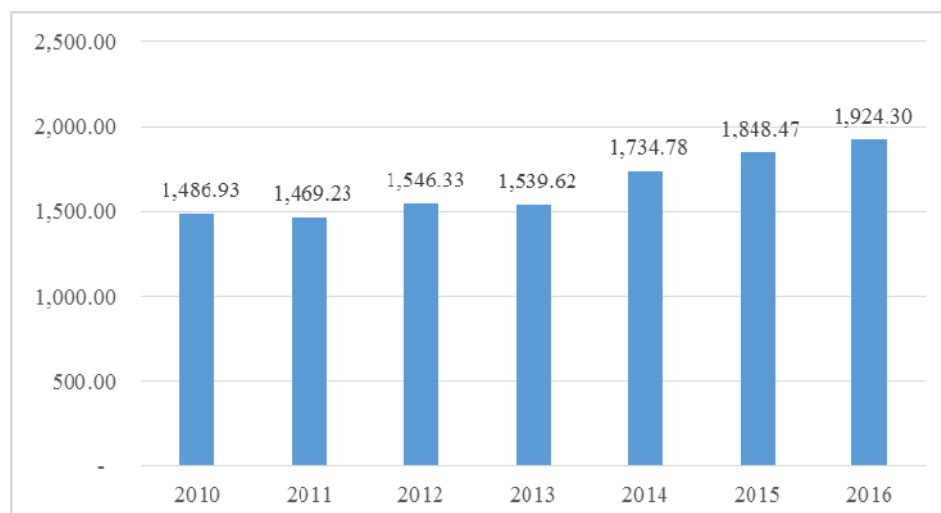
Keywords: Watermelon Supply Chain, Lao PDR, Contract Farming.

1. Introduction

The agricultural sector has always been the backbone of Lao economy. Traditionally, crops were grown for household consumption with any the excess sold in the local market. The concept of commercial production was introduced in the late 1980s by initiation of the national economic reform known as the New Economic Mechanism (NEM). Under this reform, the government aimed to transform the economy from a centrally plan system to a more market oriented structure. The Commercial Production Promotion Program, one of the priority programs under the NEM, had the objective of upgrading the traditional way of production, by promoting production for the market rather than self-consumption, and gradually integrating the production with regional and global markets. This program has contributed to the expansion of agricultural production across the country (Figure 1), and agricultural produce has become a major export from Laos (Table 1).

¹ All opinions and errors in this study are those of the author and do not reflect the view of Lao PDR's Ministry of Planning and Investment. The author wishes to thank Khammerng Bannalath for her excellent research support in leading the field survey and the report's preparation.

Figure 1: Plantation area in Laos (unit: '000s ha)



Source: Ministry of Agriculture and Forestry (2015, 2016)

Note: This data covers 32 agricultural products

Table 1: Lao PDR's major exports (% of total exports)

Export items	2010	2011	2012	2013	2014	2015	2016
Mining	26.37	36.19	29.41	30.03	32.58	32.17	27.39
Copper	19.74	20.29	21.22	23.68	27.22	27.41	23.83
Electricity	4.77	9.54	15.6	18.23	14.44	12.71	22.57
Other agricultural and forestry products	7.13	4.43	6.86	7.38	4.12	5.56	10.01
Garments	7.21	6.41	5.71	4.83	5.11	4.41	3.04
Gold	5.54	3.26	4.68	4.75	3.56	3.73	2.81
Coffee	1.1	1.98	3.57	0.61	1.77	1.44	1.45
Wood Products	1.58	2.38	4.07	4.43	3.39	2.34	0.55

Source: Bank of Lao PDR, 2017

However, the pace of commercialization has been slow and the agro-processing industry remains small. Especially, the opportunities for exporting agricultural produce have been concentrated across only a few commodities, which are usually exported through the border trade. Border trade has long been important for the agricultural sector in Laos, because it helps to integrate remote rural areas with the market, improves the livelihood of the rural people, promotes commercial production, and encourages the transfer of know-

how (Khonethapane, Insisiesienmay and Nolintha, 2006). In recent years, a short cycle crop, such as watermelon, has become a popular agricultural commodity for farmers in the northern region after the rice season for export to China. For instance, the export of fruit has increased significantly from 77 million USD in 2010 to over 220 million USD in 2016, and more than 80 percent of fruit exports are for the neighboring Chinese market (Table 2). Such expansion may benefit from the policy of the Chinese government to promote selected agricultural commodities from Laos, such as maize, dried cassava, banana, watermelon, and rice. The emergence of horticulture presents an interesting opportunity for Laos, which has a strong potential to upgrade the agricultural sector. Several studies point out that horticulture has the potential to accelerate the role of agriculture in the national economy, and horticulture could benefit small scale farmers (Pratap et al, 2008 and Birthal and Joshi, 2007).

Table 2: Export of fruit from Laos

	Laos' total export of fruit	Laos' export of fruit to China	% of fruit export to total exports	% of fruit export to overall exports to China	Share of China in the total of fruit exports from Laos
2010	\$76,918,617	\$62,237,444	4	27.9	80.9
2011	\$17,778,668	\$12,366,322	0.9	11.7	69.6
2012	\$22,735,956	\$14,835,552	1.4	13.8	65.3
2013	\$81,180,947	\$71,796,469	2.7	19.6	88.4
2014	\$51,092,915	\$43,380,400	2	6.2	84.9
2015	\$91,372,017	\$70,841,508	3.1	6.8	77.5
2016	\$227,316,898	\$196,317,762	7.3	17.4	86.4

Source: Data from the UN COMTRADE database

Note: Fruit export is HS08

Against this background, this chapter aims to study the watermelon production and export in Luangnamtha Province, in order to answer the following research questions. Firstly, what are the determinants of farmers' participation in the watermelon export supply chain? Secondly, for those farmers participating in the supply chain, what are their alternative economic opportunities in terms of market and crop? Thirdly, are farmers better off by joining the fresh fruit export supply chain?

This study mainly employs descriptive analysis to examine the status of fruit crop production in Luangnamtha as a major export to China. Data collection used a combination of key informants' interviews, farmers' and buyers' surveys. The field survey and key informants' interviews were conducted in mid-January 2018. Key informants included relevant government authorities, such as representatives from the Department of Agriculture and Forestry, the Department of Industry and Commerce, Agriculture and Forestry District Offices and Industry and Commerce District Offices. The field survey covered 8 watermelon farmers, 8 beans farmers, 13 farmers growing vegetables or other crops for the domestic market, village heads, and traders. The farmers' survey covered 4 villages, of which 2 villages are in Sing District and the other 2 villages are located in Long District. Each district included farmers growing fruit for China and others growing various crops for the domestic market. The villages were randomly selected from a pool of suggested villages by the Agriculture Authority of the Sing and Long districts. The sampled villages were Namai, Silimoon, Houakhoua Song, and Nongkham. Farming households were then randomly selected from each sampled village. Finally, 6 traders or trading companies were also surveyed. However, the sampled traders were not randomly selected due to the fact that the number of companies, brokers, or collectors dealing with fruit export to China was limited.

2. Recent Economic Development in the Role of the Agricultural Sector in Luangnamtha

Figure 1: Map of Laos showing the location of Luangnamtha



Luangnamtha Province is located in the northwest of Laos. The province is bordered by China (Yunnan Province) to the north, Myanmar to the west, Bokeo Province to the south, and Oudomxay Province to the east. Luangnamtha Province covers an area 9,325 square kilometers, of which 85% of the area is mountainous. The province consisted of 4 districts with 365 villages and 33,433 households in 2015. Luangnamtha is the capital district of the province, the Sing and Long districts are important agriculture production areas in the province. The villages are quite small and mainly located along the main roads. Luangnamtha's population in 2015 totaled 185,436 people, with a density of 19 people per km². The population comprised 17 ethnic groups, the 25% Akha ethnic group, Khmu (24%), Lao (12%), Lu (11%), Hmong (6%), and others (22%).

Luangnamtha's economy has grown robustly at an average rate of 8.64% per year from 2011 to 2017. The GDP per capita has increased from USD 815 in 2011 to USD 1,820 in 2017. Unlike the change in the economic structure at the country level, the agricultural sector remains the largest sector of Luangnamtha's economy, accounting 49.73% of GDP in 2017, followed by the service sector (29.7%) and the industrial sector (21.1%). More than 70% of the population are engaged in agricultural production. In the past, a large percentage of villages grew upland and lowland rain fed paddy for consumption. Nowadays, many farmers grow several agricultural crops for export to China. Strong

demand by the Chinese market presents an important opportunity and an important driver for the expansion of commercial agricultural production in the province, especially rubber, sugar cane, cassava, water melon, banana, maize, and pumpkin.

Table 3: GDP growth and the economic structure of Luangnamtha.

	2011	2012	2013	2014	2015	2016	2017
GDP growth (%)	8.2	8.4	8.8	8.9	8.9	9	8.1
GDP per capita (USD)	815	868	1,103	1,244	1,454	1,790	1,820
Share of GDP (%)							
Agriculture	56.58	54.89	54.72	51.61	50.01	50.4	49.73
Industry	19.28	20.33	18.48	22.42	22.91	19.1	21.1
Services	24.14	24.78	26.8	25.97	27.08	30.5	29.17

Source: Department of Planning and Investment, 2017

Luangnamtha is one of the main agricultural production hubs in the northern region. The total cultivated area was 27,581 ha in 2017. In 2017, 59% of the total cultivated area was used for growing rice, vegetables (19.8%), and industrial crops (17.8%). Sugar cane and cassava have become popular crops for farmers. The area for sugar cane plantations has increased by about 11.2% from 2,169 ha in 2011 to 3,095 ha in 2017. The area for cassava cultivation has increased fourfold from 556 ha to 1,984 ha. Major production in 2017 included 138.2 thousand tons of sugar cane, 58 thousand tons of cassava, 57.2 thousand tons of banana, 15.8 thousand tons of water melon, and 9 thousand tons of maize. Most agricultural products are exported to China. However, there is a declining trend in the production area of several dry season crops. For example, the maize plantation area has been reduced from 6,692 ha in 2011 to 2,269 ha in 2017, banana from 9,692 ha to 2,814 ha, and water melon from a peak of 1,305 ha in 2015 to 572 ha in 2017. The following sub-section describes the important characteristics of selected major crops in Luangnamtha.

Table 4: Major agriculture production in Luangnamtha

No.	Commodity	2011	2012	2013	2014	2015	2016	2017
1	Rice	16,932	16,755	22,992	18,680	17,114	16,539	15,510
2	Maize	6,968	3,515	4,448	4,483	2,659	2,973	2,269

3	Banana	9,692	1,670	1,737	1,146	5,728	2,513	2,814
4	Sugar cane	2,169	2,225	3,755	2,455	3,902	2,352	3,095
5	Cassava	556	751	1,453	2,014	2,214	1,576	1,984
6	Watermelon	650	905	1,165	1,195	1,305	1,305	572
7	Beans	204	395	485	294	480	505	488

Source: Department of Planning and Investment, 2017

2.1 Watermelon

The plantation area increased significantly in 2015 and 2016, before declining recently. Watermelon has become a key export item in Luangnamtha Province, especially in the Long and Sing districts. Watermelon is popular with the farmers because it provides a higher value compared with more traditional crops such as rice and vegetables. In 2017, the area cultivated for watermelon covered 1.8% of the total cultivated area, and the production achieved 4.5% of total production. Table 5 shows the planted area, production, and yield of watermelon in Luangnamtha. The average yield of watermelon production in this area is 24 tons per ha. During 2010 to 2017, the highest yield was 28 tons per ha, and the lowest was 15 tons per ha. The price has ranged from 1,250 to 2,000 kip per kg. If the plantation is not affected by unsuitable rainfall, farmers receive a higher price for the crop. However, farmers could make a loss in a season with very heavy rainfall. For instance, the rainfall was very heavy in 2012, and several farmers suffered major losses in their investment. Despite being a promising commodity, the plantation area for watermelon has declined recently. There could be many reasons for this decline, including the increasing cost of exporting watermelon and the higher risk from the adverse impact of unsuitable weather conditions.

Table 5: Plantation area, production, and yield of watermelon in Luangnamtha

	2010	2011	2012	2013	2014	2015	2016	2017
Cultivated area (ha)	785	650	905	1,165	1,195	1,305	1,305	572
Production (Ton)	18,745	15,180	13,185	24,360	33,175	33,975	33,975	15,820
Yield (ton/ha)	23.88	23.35	14.57	20.91	27.76	26.03	26.03	27.7

Source: Department of Planning and Investment, 2017

2.2 Banana

Luangnamtha is one of the biggest banana producers in Laos. The plantation area was 2,814 ha in 2017. The expansion of banana plantations has been fueled by rapid investment from China. Most bananas are exported to China. The investment structure follows the “1+4” model of contract farming, whereby the local farmers provide the land and the other important components are provided by the investors. Basically, the farmers lease their land to the investors. The life cycle of banana in Luangnamtha is for six years. During its life cycle, the highest production is in the second year, then the yield declines slowly during the following years. On average, from 2011 to 2017, the yield for banana production was 30 tons per ha. The price for banana varies from 1,250 kip/kg to 8,750 kip/kg. The banana plantation area has declined because there have been several emerging issues related to banana plantations in Luangnamtha. The government decided to ban new land concessions for banana plantations due to a concern about the long-term negative impact of heavy chemical usage on the environment and the health of the farmers. From the field survey for this study, it was reported that banana plantations use a lot of chemicals for the production. This could have a long-term negative impact on the quality of the soil and the water, as well as affect the health of local farmers and villagers. The future for the banana plantations will depend on the outcome of the Government’s assessment regarding the above mentioned environmental and health concerns.

Table 6: Plantation area, production, and yield of banana in Luangnamtha

	2011	2012	2013	2014	2015	2016	2017
Plantation area (ha)	9,692	1,670	1,737	1,146	5,728	2,513	2,814
Production (ton)	293,474	44,782	58,886	36,537	163,455	112,550	57,190
Yield (ton/ha)	30.28	26.82	33.90	31.88	28.54	44.79	20.32

Source: Department of Planning and Investment, 2017

2.3 Sugarcane

Sugarcane is another promising crop grown in Luangnamtha, especially in the Long and Sing districts for a long period of time. The plantation area increased from 2,169 ha in 2011 to 3,095 in 2017. Most sugarcane is exported to the neighboring district in China, where the

sugarcane processing factory is located nearby. Specifically, a Chinese agricultural promotion company has engaged with the district's Agriculture Office to contract a farming agreement for sugarcane cultivation. Most of the investment follows the “2+3” model of contract farming, which is perceived as a good arrangement for Laos. In this model, the local farmers provide the labor and land and the investor provides the capital, inputs (technology, seeds) and the market. The life cycle of sugarcane is for three years. After planting, the sugarcane can be harvested one year later. After harvesting in the first and second year, normally, the farmers will burn the field to clear the old leaves and maintain the baby sugarcane until the next harvest season. The yield of sugarcane is about 50 tons per ha. The price of sugarcane is between 350,000 kip to 400,000 kip per ton. Compared to other crops, sugarcane is a less risky crop with a stable market and price. From the field visit for this study, it was reported that many farmers who grow watermelon will grow sugarcane in the future if the weather conditions changes in such a way that has an adverse impact on watermelon production.

Table 7: Plantation area, production, and yield of sugarcane in Luangnamtha

	2011	2012	2013	2014	2015	2016	2017
Plantation area (ha)	2,169	2,225	3,755	2,455	3,902	2,352	3,095
Production (ton)	128,940	93,262	177,700	110,475	171,586	110,930	138,170
Yield (ton/ha)	59.45	41.92	47.32	45.00	43.97	47.16	44.64

Source: Department of Planning and Investment, 2017

2.4 Rice

Rice is mainly grown for household consumption in Luangnamtha Province. Rice is mostly the rainfed lowland system (59%), followed by the upland system (39%) and a small amount of paddy from the irrigated system (2%). This is mainly due to the mountainous topography of the province. Upland slash and burn rice practices have declined significantly in accordance to the national policy on cease swidden farming. The life cycle of rainfed lowland rice including seeding is six months from June to November. After harvesting the rainfed rice, the farmers could decide to grow dry season crops for 3 to 4 months. Opportunities include irrigated rice in areas with an irrigation system, fruit, bean, and other vegetables. Due to a small diversification from rice to other crops, the planted area for rice has decreased slightly. Total rice planted area has decreased from 16,932 ha in

2011 to 15,510 ha in 2017, and the production decreased from 64,010 tons in 2011 to 51,638 tons in 2017. The average yield is 3.49 ton/ha, which is lower than the regional and national average.

Table 8: Plantation area, production, and yield of rice in Luangnamtha

Year	2011	2012	2013	2014	2015	2016	2017
Area							
Lowland rainfed paddy	11,573	11,592	11,297	11,565	9,823	9,585	8,880
Dry season paddy	700	519	540	225	169	144	282
Upland rainfed paddy	4,659	4,644	11,155	6,890	7,122	6,810	6,348
Total	16,932	16,755	22,992	18,680	17,114	16,539	15,510
Production (ton)							
Lowland rainfed paddy	52,100	50,845	50,220	51,680	43,500	43,500	38,315
Dry season paddy	3,140	2,330	2,420	999	820	670	1,115
Upland rainfed paddy	8,770	8,820	21,980	13,790	13,271	12,500	12,208
Total	64,010	61,995	74,620	66,469	57,591	56,670	51,638
Yield (ton/ha)							
Lowland rainfed paddy	4.50	4.39	4.45	4.47	4.43	4.54	4.31
Dry season paddy	4.49	4.49	4.48	4.44	4.85	4.65	3.95
Upland rainfed paddy	1.88	1.90	1.97	2.00	1.86	1.84	1.92
Total	3.78	3.70	3.25	3.56	3.37	3.43	3.33

Source: Ministry of Agriculture and Forestry, 2015 and 2016.

2.5 Pumpkin and bean

Other short cycle vegetables, such as bean and pumpkin, have become an important source of income for farmers in Luangnamtha. The market demand from China is an important factor in this area. Contract farming by the 2+3 model is reported for bean cultivation. Local farmers provide the labor and land and the Chinese traders provide other important inputs and the market. Unlike other crops, the price of the bean is pre-determined before the farmers decide to grow the crop. Price is the most important factor in the farmers' decision. It was reported that bean plantation seems to have a lower risk of being impacted from

changes in the weather conditions. For instance, several farmers who have been growing beans since 2009, stated that they have never made a loss from growing beans due to the weather conditions. Moreover, the life cycle of the bean crop is from December to February, which is relatively short. Therefore, if the market is available, growing beans is a good additional flow of income for the farmers' family.

In addition to beans, other popular crops for the Chinese market include pumpkin. The contract farming model of 1+4 is often used for pumpkin cultivation. Local farmers provide the land by leasing their land to the Chinese investors, and the other important components are provided by the investors. The life cycle of pumpkin is four months from December to March. Growing pumpkin seems to provide less return because farmers only receive land rent, and they do not participate in other growing activities.

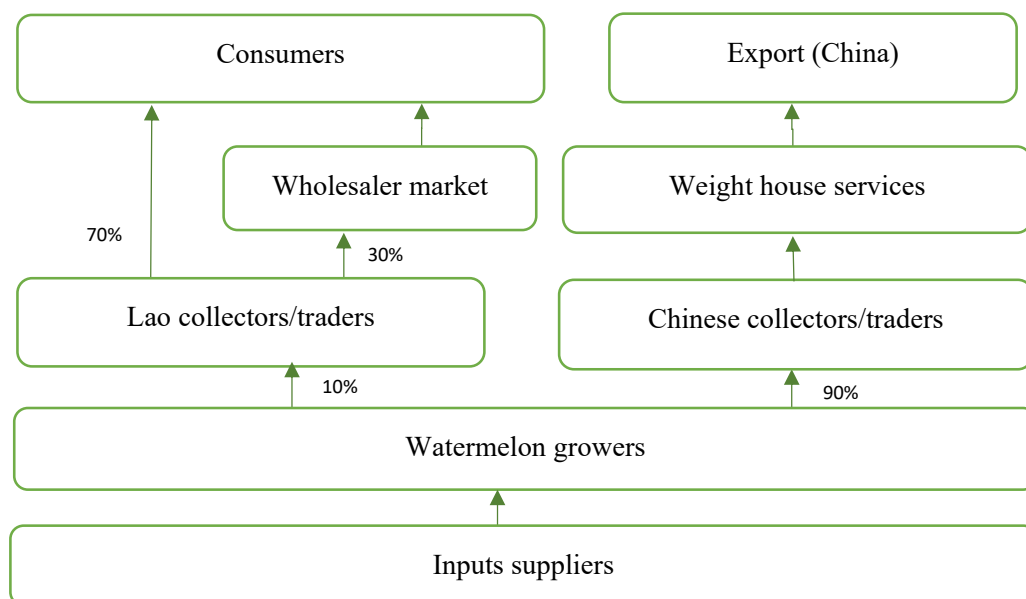
3. The Status of the Watermelon Supply Chain

Watermelon was selected as the case study to examine this horticulture production opportunity for the northern region in Laos. Watermelon is mostly grown in the Sing and Long districts of Luangnamtha, located near the Panghai border checkpoint, which is one of the main gateways for agricultural exports to China. The supply of watermelon from the Long and Sing districts can be divided into three channels (Figure 2). The first channel, is the main route by which the supply chain runs through key stakeholders, such as the inputs provider, farmers, Chinese collectors/traders and into the China market. The second channel, is the supply chain for the domestic market, running through several agents, such as the inputs provider, farmers, Lao collectors/traders, local retail markets, to the local consumer. The third channel is similar to the second channel with the difference is that the Lao collectors/traders sell directly to the consumer.

In terms of market share, according to our field survey, the first channel covers about 90% of total production. After the fruit is packed into boxes, it is transported to be weighed at the weighing station service. Watermelon from Luangnamtha is expected to arrive in the Chinese market in late March to early April. Farmers perceive that the demand for watermelon by the Chinese market seems unlimited. However, this is due to the fact that current production in Luangnamtha is very small compared to the size of the Chinese market. Farmers are more concerned about the risks from the weather conditions which can lead to lower quality and lower prices. The quantity of fruit for the second and third channels depends very much on the quality of the watermelon. After selling the Class 1

fruit to the collectors for the China market, the remainder is sold to the domestic buyers who mostly sell the fruit directly to the domestic consumers and fruit retailers. The rest of this section describes each stakeholder in the watermelon supply chain in more detail.

Figure 2: Current watermelon supply chain structure



Source: key informants' interviews and the author's observation.

3.1 Input suppliers

Most inputs for watermelon cultivation in the studied area are provided by the Chinese traders located in Luangnamtha. Main inputs include seed, fertilizer, pesticide, packing boxes, and plastic sheeting. These inputs are mainly sourced from China. Input suppliers could be classified into two groups, such as independent suppliers and those under contract farming arrangements. Independent input suppliers sell inputs directly to the farmers, and these suppliers are not obliged to purchase the watermelon from the farmers. On the other hand, a contract farming supplier usually follows the 2+3 model, whereby the farmer provides the land and labor and the Chinese counterpart provides inputs, techniques, and the market. Thus, the inputs suppliers under a contract farm arrangement, as in this case, are also the collectors/traders. In order to identify the farmers for contract farming, the Chinese traders usually contact the village head in order to learn more about the condition of the land, local infrastructure conditions, in particular road access, and very importantly, the farmers' behavior and experience. When a Chinese trader identifies a suitable village,

he makes an agreement with the village head, who is tasked with encouraging the villagers to grow watermelon for that particular trader. The village head then writes a simple note for the Chinese trader confirming the number of farmers willing to join the contract farming arrangement. No formal contract is written between the Chinese input provider and the village head, or between the Chinese input provider and the farmers. However, after the traders and farmers get to know each other better, the role of the village head becomes less significant. The terms of such a contract are very simple and informal. Under such contract farming arrangement, the input providers monitor the farmers until harvest time, and the revenue from selling the watermelon is shared equally between the input providers and the farmers. If the quality of the watermelon does not meet the standard the input providers do not purchase the product and the cost of the inputs is waived.

3.2 Collectors

Compared to other crops, the watermelon supply chain consists of fewer domestic middlemen. In our study area, the Chinese collectors/traders take approximately 90% of the total production, while the remaining 10% is handled by Lao middlemen. Chinese collectors include Chinese inputs suppliers and independent Chinese traders. Chinese collectors who are also the inputs suppliers usually monitor the farmers from planting seeds until the harvest.

Price is determined using the spot price in Chinese Yuan based on the Chinese market just before the harvest. When the watermelons are almost ready to harvest, the Chinese collector normally sorts the watermelons and evaluates the price based on the quality. Price is determined depending on the price in the Chinese market. Collectors together with the farmers classify the watermelon product into two classes. The Class 1 watermelon must weigh at least 3 kg, have a beautiful symmetrical shape and a smooth skin without any scratches or marks caused by insects. Class 2 watermelons weigh less than 3kg. The Chinese collectors only purchase Class 1 fruit, hence the farmers sell Class 2 fruit to local collectors at a lower price. In 2017, Class 1 watermelon achieved 1,250 kip per kg, and Class 2 achieved only 300 kip per kg. It was reported that price fluctuation is normally low, provided that the cultivation technique is strictly followed, and there is no adverse impact from the weather.

During the field trip, it was learnt that participation in contract farming has become less important in terms of market access. Independent Chinese traders who are not the inputs suppliers are willing to purchase watermelon with similar prices and conditions. As with the contract farming collectors, the independent Chinese collectors also visit the

farms and determine the prices just before the harvest. Finally, the Lao collectors usually purchase the lower quality fruit to sell in the domestic market within the province as well as other provinces. The cost of labor during the harvest is the responsibility of the collectors.

Most collectors are willing to purchase a variety of agricultural products in addition to watermelon. Traders often deal with all agricultural products and some are involved in other services business. Thus, the watermelon trade is considered as a supplementary business. Most agricultural traders in the area studied partner with relatives and friends. This kind of kinship relationship is quite a common characteristic of the border trade in several regions across the country, and it is an important condition for the early stage of contract farming arrangements (Leebouapao et al, 2004 and Nolintha, 2005).

3.3 Weight measurement station

The weight measurement service is part of the supply chain for fruit exports to China. There are several weighing stations in the Long and Sing districts. Normally, the trucks used to transport watermelon to China are measured twice. The first time is with the truck empty and the second time after loading. The difference in the weight of truck is then estimated to be the volume of watermelon on the truck. Under the contract farming arrangement, the weighing station fee is paid by the Chinese traders, whereas the farmers pay in the case of the non-contract farming arrangement. The fee is 150 Chinese Yuan or 187.500 kip per each 22-wheeler truck. Unlike contract farming or the border trade in some other areas, the weight measurement service is independent from the Chinese traders and the farmers, and is located onshore, hence the farmers are assured for a fair weight calculation for the product.

3.4 Farmers

Farmers are the most important stakeholder in the watermelon supply chain. In order to better understand the farmers, this sub-section of the study briefly compares the characteristics of watermelon farmers with farmers that grow other crops for the domestic market. The general household characteristics of watermelon farmers are quite similar between the two groups (Table 9). However, when comparing the asset and finance information (Table 10), there are some interesting differences. Watermelon farmers tend to have a smaller land size and some farmers have to rent land from others for their production. For instance, watermelon farmers have an average land area of 1.4 ha, and the other group has an average area of 3.45 ha. Also, 43% of watermelon farming households rent land from others. Therefore, land size seems not to be a constraint for the watermelon farmers in

the area studied, because the farmers can rent land from others to grow their crop. In addition, a higher percentage of watermelon farmers have bank accounts.

Table 9: Characteristic of households

	Male household head	Age of the household head	Schooling of the household head (years)	Number of household members	Number of working household members
Watermelon	99%	45	5.4	6.25	3.4
Others	100%	50	5.7	5.4	3.6

Source: Field survey.

Note: The data should only be considered as indicative due to the small sample size.

Table 10: Household information on land and finances (% of the households unless noted otherwise)

	Total land (ha)	Renting land	Leasing land	Having a bank account
Watermelon	1.4	43%	37%	25%
Others	3.4	23%	38%	7%

Source: Field survey.

Note: The data should only be considered as indicative due to small sample size.

Farmers report that contract farming is important at the initial stage of watermelon cultivation, as they learn the techniques to grow and maintain the fruit, including the use of suitable fertilizers and pesticides. They lack of know-how and capital. The domestic market is limited and access to the Chinese market is not easy. Thus, it is very important that in the beginning the farmers participate some form of contact farming arrangement.

However, at present there are more independent than contract farmers. According to the key informants' interviews, it is estimated that about 60% of the farmers are now independent farmers, and 40% work under some kind of contract farming arrangement (Figure 3). Independent farmers can also receive a higher income than the contract farmers (Table 11). The maximum net income of independent watermelon farmers is also higher.

Table 11: Comparison of the net income of households engaging in CFF and households not engaging in CFF.

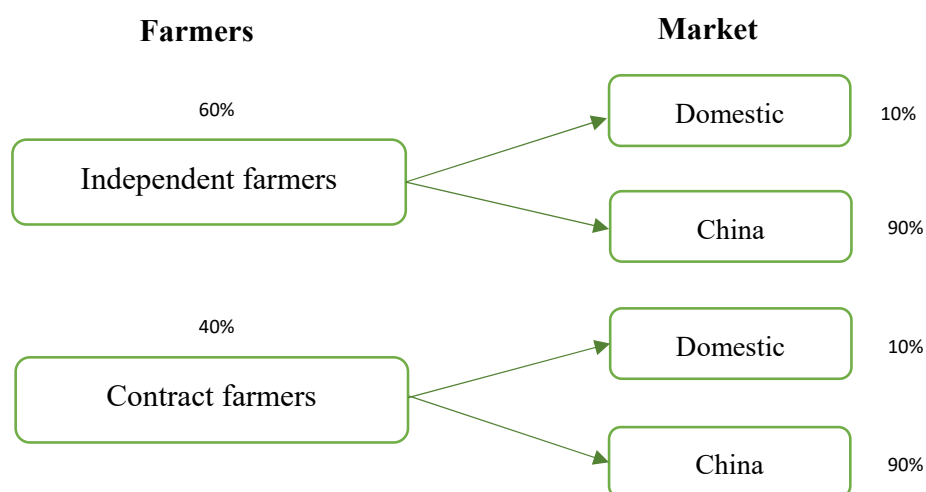
	Do not engage in contract farming	Engage in contract farming
Maximum per	25,000,000	10,000,000

household per year		
Average per household per year	11,000,000	6,300,000

Source: Field survey

There are several reasons why many farmers decide to cease contract farming. First and foremost, the farmers think that the condition of dividing the return by half is not fair. This implies that farmers who accumulate sufficient know-how and capital would be better off by growing their watermelon independently from the contract farming arrangement. However, there are more risks when growing without a contract farming arrangement. Bad weather can lead to a farmer suffering big loss because the cost of production is very high. After some experience, many farmers have the capacity to grow watermelon at an acceptable quality without the need for technical support. In addition, even without a contract farming arrangement, there are independent Chinese traders willing to buy watermelon, and the demand seems to be very large. Importantly, if the quality of the watermelon is low, the Chinese contractors reject to buy the watermelon anyway. However, there are some farmers who decide to stay with contract farming because of a lack of capital and know-how, risk avoidance, and market condition instability.

Figure 3: Independent and contract farmers



Source: Interviews with key informants and the author's observation

Watermelon plantations are usually planned in the lowland paddy area after the rainfed rice harvest season. They are planted during the short cycle from the end of

December to the end of March. Growing watermelon cannot continue in same area after three years because the soil has to recover for another three years before it can be used to plant watermelon again. Based on interviews with the key informants, there are eight activities in the cycle (Table 12). After harvesting the rainfed rice, farmers sow the watermelon seed at the same time as clearing the land. Next, farmers plough the land. Normally farmers use a tractor to plough the land twice. During the second ploughing, the farmers usually apply fertilizer to prime the land. Then, fifteen days after sowing the seed, it is the time for planting. In order to get the best quality of watermelon, one and a half months after the planting day, the farmers need to select the strongest watermelons and cut out the weak fruit. The planting and sorting activities required hired labor. In order to develop strong seedlings, the plantation process is needed to put seedling in the prepared land as soon as possible after drawing them from bedding; this process requires many people. At the sorting stage, the household members alone could not handle this task in time so, again, many workers are needed. The use of pesticides depends on the farmers’ observation. If they notice the spread of insects, the farmers will use suitable pesticides. Farmers can apply pesticide from seven days after planting until the harvest month. Therefore, the use of pesticides for watermelon cultivation needs vigilant monitoring by the relevant agency to provide safety guidance and also to avoid any serious environmental impact as in the case with the banana plantations.

Table 12: Watermelon life cycle

No.	Activity/Month	December	January	February	March
1	Clearing				
2	Ploughing				
3	Seeding				
4	Planting				
5	Applying fertilizer				
6	Pesticide spraying				
7	Sorting				
8	Harvesting				

Source: Interviews with key informants

3.5 Observable challenges in the watermelon supply chain

The study observed several challenges faced by watermelon farmers which require attention by the policy makers.

- Watermelon farmers face high risks from adverse weather conditions. Some farmers therefore have to rely on contract farming as a source of protection. Contract farming is an informal arrangement, lacking any solid and legal protection for the farmers.
- Fruit production including watermelon has been declining. One major reason is the increase in fees at the Panghai border checkpoint. It is reported that the total fee² to export watermelon has increased from 2500 Yuan per 22-wheeler truck in 2014 to 5,200 Yuan recently.
- Labor cost in the Sing and Long districts is higher than the general rate in the province.
- Although watermelon is included in the list of promoted agricultural commodities from Laos to China, the export of watermelon is only formal on the Lao side but informal on the Chinese side. The export of watermelon has to go through the local checkpoint rather than the international checkpoint. It is reported that such difficulties with the export procedure also apply to other promoted crops.
- Infrastructure and road access is difficult. This limits the choice of markets for perishable agricultural product like watermelon and other high value crops.
- There is a growing concern over the use of chemicals in fruit production for export.

4. Benefits from Watermelon Production and Other Alternatives

In order to justify the benefit of watermelon plantation for the farmers, it is important to compare the economic benefit of watermelon with other alternatives. When comparing the net income between watermelon farming households and households that grow other crops for the domestic market, it is inconclusive (Table 13). Watermelon farming households could achieve a higher maximum net income, but the minimum could also be much lower. There are significant variations in net income levels across watermelon farming households. This situation reflects the higher risk nature of watermelon growing, especially in relation to variable weather conditions. Based on interviews with some experienced watermelon farmers, they could suffer a loss every three to four years. Thus, technology that could

² Farmers report that the problem of the higher export fee is related to the grant of export rights to a few selected trading companies. These trading companies pay a lump sum to the government and in return they collect fees from the farmers and traders.

protect watermelon farmers from unpredictable weather condition is essential to minimize such risk. In addition, the situation of asset ownership is very similar between watermelon farming households and farmers that grow other crops for the domestic market (Table 14). This implies that their livelihood conditions are similar. Another benefit for households engaged in the watermelon supply chain is acquiring new knowledge about horticulture. The farmers stated that the techniques employed by watermelon plantations are more sophisticated than their traditional agricultural know-how. They could apply such new knowledge to other high value added crops.

Table 13: Comparison of the net income of households between watermelon farmers and households that grow other crops.

	Farmers growing fruit for export	Farmer growing other crops for the domestic market
Minimum	600,000 Kip	5,000,000 Kip
Maximum	25,000,000 Kip	20,000,000 Kip

Sources: Households' interviews and calculated by the author.

Noted: (1) Net income in the total income of a household after all expenses, but without considering the cost of household labor, and the income includes other sources of household income. (2) The observation sample was small, hence use the data with caution.

Table 14: Comparison of the assets of households between farmers growing fruit for export and farmers growing other crops for the domestic market.

	Wooden house	Brick wall house	Truck	Tractor	Motorcycle	TV	Fridge	Telephone
% of farmers growing fruit for exports	50%	50%	25%	100%	100%	100%	99%	100%
% of farmers not growing fruit for export	38%	62%	32%	92%	100%	100%	100%	100%
Average number of units owned by farmers growing fruit	-	-	0.3	1	2	1	1	4
Average number of units owned by farmers not growing fruit	-	-	0.75	1	2	1	1	3

Source: Field survey

4.1 Alternative economic opportunities

Although watermelon growing can be high risk the return is also high. Tables 15 and 16 show examples of cost and income details of watermelon and irrigated rice farmers. Watermelon farmers can receive a net income as much as four times higher than that by the irrigated rice farmers. However, watermelon farmers require to have more capital because the total production cost for watermelon is double the cost for rice production. Seeds and fertilizers make up more than 60% of the watermelon production costs, and the cost to hire labor is also high. Therefore, watermelon growing can provide a higher return but it is a capital intensive agricultural crop.

Table 15: Example of the cost and income details for watermelon cultivation

Activity/items	For 1 Ha (Lao Kip)
Soil Preparation (hiring labor and fuel for the tractor)	3,812,500
Seed	4,375,000
Planting (hiring labor)	280,000
Fertilizer	3,750,000
Herbicide, pesticide, and other chemicals	250,000
Selecting fruit (hiring labor to cut out weak fruit)	420,000
Weighing services	200,000
Total cost	13,087,500
Total revenue	31,250,000
Net income	18,162,500

Source: Field survey

Note: Interview with one farmer in Namai village, Sing District, Luangnamtha Province, on 16 January, 2018. This household has 2 household workers.

Table 16: Example of the costs and income details for of irrigated rice cultivation

Activity/items	For 1 Ha (Lao Kip)
Soil Preparation (fuel for the tractor)	900,000
Seed	100,000
Planting	1,800,000
Fertilizer	840,000
Pesticide and other chemicals	100,000
Harvest (hiring labor)	1,500,000
Packing materials and transport	500,000
Total cost	5,740,000
Total revenue	9,900,000
Net income	4,160,000

Source: Field survey

Note: Interview with one farmer in Silimoon village, Sing District, Luangnamtha Province, on 16 January, 2018. This household has 2 household workers.

Other alternatives in the area studied include leasing land, working on rubber plantations, growing vegetables for the domestic market, or growing sugarcane and cassava. To see the opportunity cost for farmers who grow watermelon for export to China, the revenue from these alternatives can be compared. Table 17 provides examples of the revenue from these alternatives. Still, watermelon production yield the highest revenue, followed by working on the farm and leasing land. According to our key informants' interviews, there is a labor shortage in the agricultural sector in the Sing and Long districts. Therefore, some workers are imported from another province, such as Xiengkhouang near the Vietnamese border. The cost of labor could be as high as 70,000 kip per day per person, which is higher than in other parts of the province. However, the demand for labor for agricultural work is dependent on the demand by the agricultural sector linked to the Chinese market. Alternatively, the farmers can grow vegetables for the domestic market that provides a more predictable income, but is subject to geographical factors and the poor quality of roads, so the domestic market's income potential is rather limited. Finally, farmers can lease their land to others, but land market is rather unstable. The land rental fee could be high if there is a strong demand from Chinese investors. In most cases, the average land rental fee for local farmers is only 3.5 to 4 million kip per ha, which is similar to the revenue from irrigated rice growing.

Table 17: Comparison of revenues from different activities.

No.	Activities	Revenue (kip)
1	Water melon farm (for a household with 2 working people with their own land of 1 ha. Require around 40 full working days. 90-day cycle)	18,000,000
2	Growing irrigated rice (for a household with 2 working people with their own land of 1 ha. Require around 45 full working days. 90-day cycle)	4,160,000
3	Lease land to others (1 ha)	3,500,000
4	Working for others (2 people, 90 days, 70,000 kip per day)	12,600,000

Source: Interview by the author.

Noted: Revenue for rice and watermelon production does not include the cost of own labor.

5. Conclusions

Despite the fact that the structure of the Lao economy has gradually transformed towards a more services provision and industrial basis, agriculture remains a promising sector. In order to strengthen its role, there is a need to diversify the agricultural sector through promoting more value-added agriculture such as horticulture. Lao farmers in the rural and border areas are beginning to grow several short cycle fruit and vegetable crops for the Chinese market using more sophisticated farming techniques. The study found that the demand in China seems to be the major determinant for Lao farmers to enter the watermelon supply chain. On the supply side, the lack of capital and know-how encourages farmers to participate in contract farming, especially at the initial stage. Watermelon plantations in the area studied were perceived as a high risk and high return activity. Contract farmers are protected from market and weather condition risks, but the return is significantly lower than that achieved by independent farmers. Many watermelon farmers have decided to invest and grow watermelon independently from any contract farming arrangement. There are several alternative economic opportunities for Lao farmers in the study area, such as growing rice, rubber, sugarcane, leasing out land, and working as labor. However, watermelon growing is the best source for post-rainfed rice season income.

The study supports the existing studies regarding the role of horticulture and the benefits of horticulture-led growth for small scale farmers. The value added from watermelon is higher compared to traditional grains like rice and maize. Watermelon production also applies new and more sophisticated agricultural techniques. Transfer of know-how from the Chinese traders to local farmers is observed. In addition, many watermelon farmers own a small area of land. The return on the land is relatively high for watermelon plantations, hence some farmers rent land from others to plant their crop.

Watermelon farmers could benefit more if the government helps by regulating the conditions for contract farming arrangements, investing in improving the infrastructure (such as roads), investing in research and development of affordable indoor farming techniques to reduce the impact due to unsuitable weather conditions. The use of chemicals in agricultural production needs to be monitored and controlled more effectively. More effort is needed to decrease the time and cost of exporting agricultural products, and the policy of lump-sum payment of export fees from agricultural products needs to be further reviewed. More discussion is needed to strengthen the implementation of the list of promoted agricultural products from Laos for the Chinese market, and to consider expanding the list in the future to include a greater variety of promising agricultural commodities.

References

- Bank of Lao PDR, 2017, *Lao PDR's Trade Statistics*, Bank of Lao PDR, Vientiane
- Birthal, P.S, Joshi, P.K., Chauhan, S. & Singh, H., 2008, "Can horticulture revitalize agricultural growth?", *Indian Journal of Agriculture Economics*, Vol.63, No.3, pp.310-321.
- Birthal, P.S. and Joshi, P.K., 2007, "Institutional Innovations for Improving Smallholder Participation in High-value Agriculture: A Case of Fruit and Vegetable Growers' Associations", *Quarterly Journal of International Agriculture*, Vol. 46, No.1, pp. 49-68.
- Department of Planning and Investment, 2017, *Luangnamtha's Provincial Statistics*, Department of Planning and Investment, Luangnamtha.
- Leebouapao, L., Souksavath, P., Sone, P., Darachanthara, S. & Nolintha, V. (2005), "Lao PDR's cross border economy", in *The Cross Border Economies of Cambodia, Laos, Thailand and Vietnam*, CDRI, Phnom Penh.
- Ministry of Agriculture and Forestry, 2015, *40 years of Agricultural Statistics*, Lao PDR's Ministry of Agriculture and Forestry, Vientiane.
- Ministry of Agriculture and Forestry, 2016, *Agricultural Statistics for 2016*, Lao PDR's Ministry of Agriculture and Forestry, Vientiane.
- Nolintha, V. (2005), "Cross-border trade and its impact on the livelihood of people in the border areas", *NERI Economic Review*, Issue 1/2005, Vientiane.
- Sirivanh, K., Insisienmay, S. & Nolintha, V. (2006), *Impact of the border trade on local livelihoods: Lao-Chinese border trade in Luangnamtha and Oudomxay provinces*, Technical Background Paper for the Third National Human Development Report for Lao PDR, UNDP, Vientiane.