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## **Value Chain Analysis of Cassava in Lao PDR**

Phonepaseuth Souvannavong

Postgraduate student, Centre for Global Food and Resources, University of Adelaide

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### **Abstract**

Cassava is a major crop that contributes significantly to the Lao economy and its citizens. The production of cassava in Laos has increased due to the increase in demand from global markets, particularly from near neighbours. Laos has become one of the top five global cassava exporters. However, the Lao cassava industry is facing several constraints and challenges in production, processing and exporting. In this paper, the global market conditions are described, the performance of the cassava value chain is analysed, and suggestions to improve this industry are provided. The main recommendations are the creation of cassava associations, the establishment of national cassava strategic plans, an increase in R&D investment, a strengthening of the extension services, and an increase in investment in infrastructure.

**Keywords:** Lao PDR, cassava, export value chains

### **Introduction**

Agriculture plays a major role in the social economic development of the Lao People's Democratic Republic (Lao PDR or Laos). The agricultural sector contributed about 17.7 per cent to the gross domestic product in 2018, while the contributions of the industrial and services sectors were 35.5 and 46.8 per cent respectively. About 70 per cent of the Lao population live in rural areas and 78 per cent of all employment is in agriculture (Ministry of Planning and Investment [MPI], 2019). The government of Laos has prioritised the agricultural sector to ensure national food security and nutrition, and to enhance commercialisation, with a focus on clean, safety and sustainability (Ministry of Agriculture and Forestry [MAF], 2015). According to the agricultural commercialisation plan, MAF has regulated nine commercial priority crops, including rice, coffee, tobacco, sugarcane, maize, job's-tears, cassava, vegetable and bananas, to promote commercial agriculture through the country (MAF, 2011). Over the past ten years, commercial production of those crops has been gradually increasing.

The production of cassava in Laos has rapidly increased from nearly 20,000 hectares to more than 100,000 hectares during the current decade (MAF, 2017b, 2020), due to the increase in global demand and the promotion of agricultural commercialisation by the Lao government. Laos has become a major global cassava exporter in terms of export value (Tridge, n.d.b). Better understanding the performance of all stakeholders in the cassava value chain of Laos will help the industry to better understand the economic and social contribution of the crop, and also help to identify sources of improved efficiency and sustainability, and address the inclusiveness of development.

In this paper global cassava markets and the Lao cassava situation are analysed, the cassava value chain is mapped and the performance of all actors in the chain are evaluated. The main constraints and challenges are identified and some proposed interventions for cassava sustainable development in Laos are examined.

### Cassava Market Analysis

Cassava originated in South America, and it is currently widely grown in tropical rainfall areas, particularly in developing countries. It is widely utilised for direct human consumption, as an animal feed and as an input into several industries globally (Cock, 1985). Additionally, cassava starch is not only used for consumption, but also as a substitute for other starchy raw materials such as maize or sweet potatoes, in food industries, including bakery, confectioneries, canned fruits, and glucose (Grace, 1977; Newby, 2017). In the regions where it is grown, cassava is considered as a crop for food security, poverty reduction and contribution to rural development (Food and Agriculture Organisation [FAO], 2018).

The main producers of cassava are in Africa, Asia and South America, and the top five world cassava producers are Nigeria, Thailand, Brazil, Indonesia and Ghana (Ebewore & Isiorhovoja, 2019). Thailand is the top cassava exporter in the world, generating US\$632 million of export value in 2020. Costa Rica, Vietnam, Cambodia and Laos are the other top five exporters of cassava (see Table 1). According to cassava export values between 2015 and 2020, Thailand and Vietnam are declining in importance, while Cambodia and Laos are increasing.

**Table 1. Top ten global cassava exporters by export value (US\$ million), 2015-2020**

	2015	2016	2017	2018	2019	2020
Thailand	1,591.79	1,126.06	1,085.04	896.53	531.56	631.86
Costa Rica	72.00	79.12	88.71	89.16	99.74	109.26
Vietnam	398.55	256.22	285.36	150.80	81.57	98.65
Cambodia	22.21	21.27	17.79	230.04	190.30	34.77
Laos	27.83	62.20	87.23	75.93	90.33	24.37
Netherlands	7.86	7.44	10.90	11.42	11.49	10.30
Honduras	1.30	1.94	1.56	0.64	0.06	4.08
Portugal	0.07	0.18	3.41	3.50	3.26	3.79
India	1.99	2.72	2.92	1.76	2.86	2.88
Indonesia	2.69	7.20	2.80	2.27	4.21	2.72

Source: Tridge (n.d.a)

Thailand, Vietnam, Cambodia, Laos and Indonesia are the main exporters from the South-East Asia Nations (ASEAN) community in the top ten of global exporters, which covered about 62 per cent of total cassava export value (about US\$ 2.11 billion) in 2019 (Observatory of Economic Complexity, n.d.a). The cassava area and production in the main ASEAN countries are shown in Table 2 below.

The production of cassava in the ASEAN region has risen because of the extreme increase in China's demand. The cassava cultivation area in ASEAN was more than 3.5 million hectares annually, and the utilisation of its starch also significantly increased in the last ten years compared to other flours made from potatoes, maize and wheat (Newby et al., 2019).

China is the largest importer of cassava, accounting for more than US\$ 1.1 billion or about 46.6 per cent of total global cassava value of imports in 2019 (Observatory of Economic Complexity, n.d.a).

**Table 2. Cassava areas and production in main ASEAN countries, 2016-2018**

	Area ('000 ha)			Production ('000 tonnes)		
	2016	2017	2018	2016	2017	2018
Thailand	1,427	1,284	1,345	30,558	27,875	29,975
Indonesia	823	773	793	20,261	19,054	19,341
Vietnam	569	532	513	10,910	10,268	9,847
Cambodia	684	614	652	14,820	13,817	13,750
Laos	76	71	101	2,410	2,277	3,324
Myanmar	37	35	31	433	405	377
Philippines	230	235	228	2,755	2,807	2,723
<b>Total</b>	<b>3,846</b>	<b>3,544</b>	<b>3,663</b>	<b>82,147</b>	<b>76,503</b>	<b>79,337</b>

Source: ACIAR (2020), MAF (2020)

Table 3 illustrates that China imported more than two billion US\$ of cassava in 2015, although imports decreased to about US\$ 780 million in 2020. The United States is the second-largest importer with only about US\$ 91 million of cassava imports (Tridge, n.d.b).

**Table 3. Top ten global cassava importers by import value (US\$ million), 2015-2020**

	2015	2016	2017	2018	2019	2020
China	2,119.64	1,395.23	1,450.02	1,135.38	644.80	783.16
US	65.64	76.38	76.54	81.41	96.27	91.45
Spain	8.42	10.16	9.78	11.75	14.22	17.31
Netherlands	10.08	9.17	9.55	10.28	12.46	12.43
Canada	3.73	3.89	4.31	4.53	5.61	5.90
Portugal	0.65	0.90	4.20	4.36	5.14	5.02
UK	5.10	4.52	4.48	4.48	5.08	4.98
France	5.31	5.32	6.78	8.21	9.36	4.02
Australia	1.33	1.45	1.76	1.29	1.93	2.22
Belgium	1.00	1.28	0.58	0.47	1.87	1.72

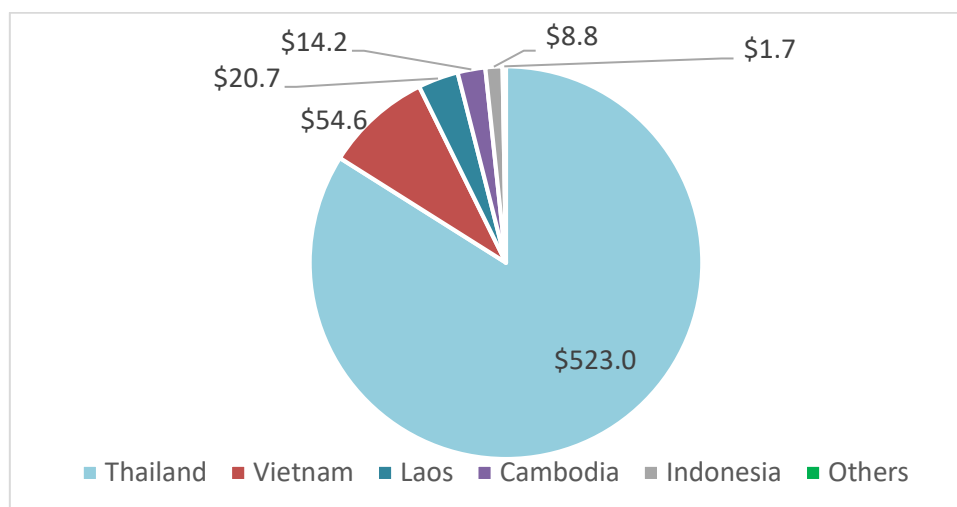
Source: Tridge (n.d.b)

Some 99 per cent of China's cassava imports come from the ASEAN countries, especially Thailand, Vietnam, Laos, Cambodia and Indonesia. In 2019, China imported cassava worth US\$ 523 million from Thailand, which accounted for around 84 per cent of its total import value of cassava. Smaller amounts were imported in 2019 from Vietnam (8.8 per cent), and Laos, Cambodia and Indonesia (all less than five per cent) (See more details in Figure 1).

### Cassava production in Laos and its export markets

Cassava areas and production in Laos have been steadily increasing due to the increase in global demand and Lao's government support policy for agricultural commercialisation. Figure 2 depicts that cassava production areas and production have increased from about 20,000 hectares with about 0.5 million tonnes in 2010 to 101,200 hectares with more than 3.3 million tonnes in 2019, a five-fold increase in area and a six-fold expansion for production, during the decade. The average cassava yield increased from about 25.1 to 32.8 tonne per hectare from 2010 to 2019 (MAF, 2017a, 2020). As mentioned, the main reason for this dramatic increase in Laos production has been the rising demand from global and regional markets, particularly from China, Thailand and Vietnam (Newby, 2017).

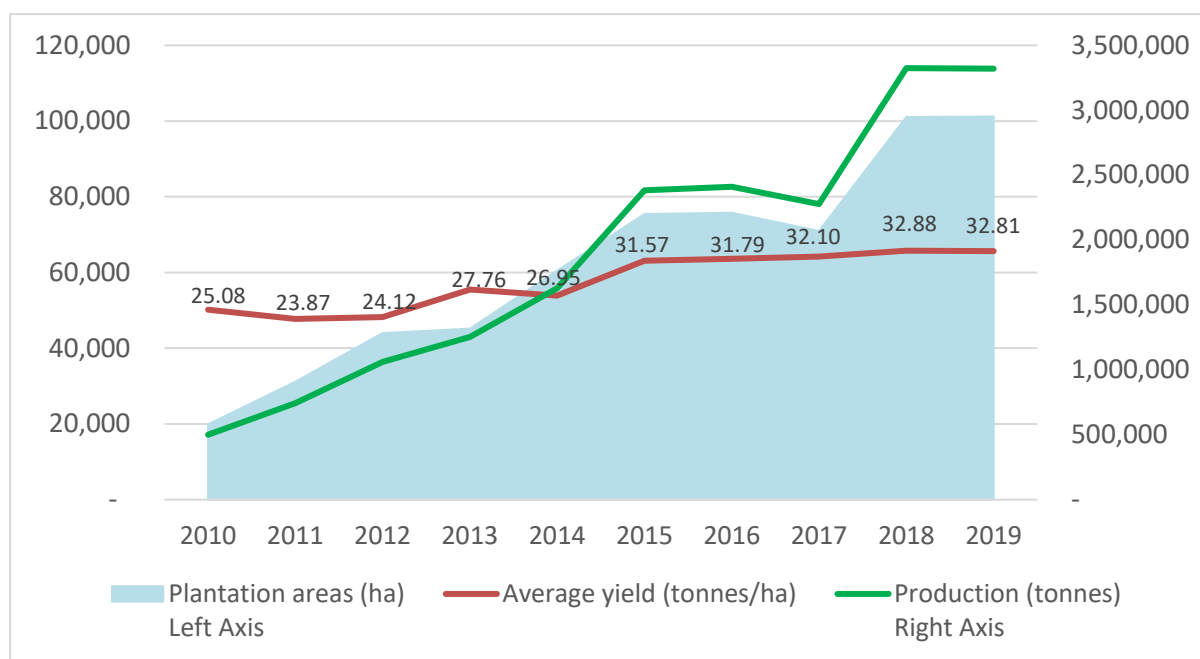
Figure 1. Sources of imported cassava into China market, 2019



Source: Observatory of Economic Complexity (n.d.b)

Another reason is the government policy on agricultural commercialisation, with cassava designated as one of nine prioritized crops for commercial agriculture in the country. Other policy support includes the input and machinery import fee reduction, planting variety import facilitation, and domestic and foreign investment in the priority industry (MAF, 2011).

Figure 2. Cassava production, areas and yield in Laos between 2010 and 2019



Source: MAF (2017b, 2020)

Cassava is therefore a significant agricultural crop for Lao’s social economic development. With more than 100 thousand hectares of cassava plantations in Laos, and steadily increasing, it brings in more than US\$ 225 million for Lao’s smallholders, just behind gold, copper and bananas in overall export value in 2020 (Alliance Bioversity International and the International Centre for Tropical Agriculture, n.d.). Table 4 shows that in February 2021, the export value of cassava in Laos was ranked first with

**Table 4. Monthly exported value of Lao's main products, between December 2020 and June 2021 (US\$ million)**

	Dec 2020	Feb 2021	Apr 2021	Jun 2021
Cassava	41	67	18	3
Gold	45	40	74	75
Bronze	54	39	24	27
Banana	24	23	22	15
Textiles	19	17	15	16
Fruits	*	9	9	5
Rubber	37	8	6	15
Coffee	13	7	9	10
Sugars	*	*	4	5
Others	217	222	246	264
<b>Total</b>	<b>450</b>	<b>432</b>	<b>427</b>	<b>435</b>

\* data is not available. *Source:* Laophatthana Daily News (2021a, 2021b, 2021c, 2021d, 2021e)

US\$ 67 million, about 15 per cent of the total value of all exports. However, the value of cassava exports reduced from April to June due to the off-season of cassava selling.

Cassava in Laos is exported in three main types - fresh roots, dried chips and starch, and the main markets are Thailand, Vietnam and China. According to the Ministry of Industry and Commerce (MIC), Lao's total export of cassava was nearly 0.7 million tonnes in 2018, which accounted for about US\$ 87 million. Within this, the Thai market covered about 65 per cent of the total export value, while Vietnam and China accounted for 31.5 and 3.4 per cent respectively. Dried chips comprised 67 per cent of the total export volume, followed by 25.2 per cent of fresh roots and 7.8 per cent of starch (MIC, 2019a).

Table 5 demonstrates that Lao's cassava, which excludes starch, is mostly exported to Thailand, which took about 80 per cent of the total Lao's cassava export value each year between 2015 and 2019, while exports to Vietnam took about 15.5 to 19.8 per cent during the same period. Another interesting point is that the export value of Lao's cassava to China increased from only about US\$ 73,000 in 2016 to US\$ 6.8 million in 2019.

**Table 5. Export value of Lao's cassava (exclude starch) in global markets, 2015-2019 (US\$ million)**

	2015	2016	2017	2018	2019
Thailand	22.2	50.3	73	61.3	69.5
Vietnam	5.5	11.6	13.9	13.6	14
China	-	0.07	0.14	1	6.8

*Source:* Tridge (n.d.a)

## Mapping the Value Chain of Cassava in Laos

### Characteristics of the main actors

#### *Farmers*

The majority of Lao's cassava producers are smallholders with small and fragmented land. Farmers with a supply contract form a group in their village to collaborate with collecting companies and factories. Generally, collecting companies and factories will provide support to farmers in the contract, including planting material and marketing information. Most of these planting materials are imported from Vietnam and Thailand, the companies also guarantee to buy the cassava from the farmers (National Agriculture and Forestry Research Institute [NAFRI], 2019). On the other hand, farmers

without contracts grow and sell their cassava product independently to any trader. Although some of these farmers buy planting materials from local input providers, most of them are using planting material from their own areas in the previous season. This results in low productivity and low quality of products (Manivong et al., 2018).

### **Traders**

Small and large traders are the main two categories of cassava traders in Laos. Small traders can be described as farmers who play both roles as farmers and local traders, however some traders are not cassava farmers. Most small traders buy cassava products in the village and from neighbouring villages and sell to collecting companies or cassava processors (NAFRI, 2019). Large traders are entrepreneurs who have trucks with large loading capacity and they buy cassava from farmers in different areas and sell to collecting companies and cassava processors (Manivong et al., 2018; NAFRI, 2019).

### **Collectors**

Cassava collectors are companies that are playing a role as traders to collect cassava products from farmers and traders. The collecting companies are owned by domestic or foreign investors. As they buy cassava fresh roots as well as dried chips from farmers and small traders, the collecting companies normally store and process the fresh roots to dried chips before selling to factories (Manivong et al., 2018). Some firms are in the contract farming system with the collaboration among farmers, collectors and starch factories with a general cassava trade agreement (NAFRI, 2019). Some collecting companies, mostly foreign companies, also export cassava products (fresh roots and dried chips) to international markets, including Thailand and Vietnam (Manivong et al., 2018; NAFRI, 2019).

### **Processors**

The main cassava processors in Laos are chip factories (chopping and sliding factories) and starch factories. Generally, chip factories buy cassava fresh roots and dried chips from farmers and traders, then those products will be dried in the large drying areas before being transported to starch factories and export companies. Some chip factories also export to neighbouring countries. On the other hand, starch factories play a role in processing cassava products to starch, and the starch is supplied to both domestic and international markets. Some starch factories utilise contract farming systems with collectors and farmer groups to guarantee their cassava supply (NAFRI, 2019). According to MIC (2019b), in 2018, there were 11 starch factories and ten chip factories in Laos, about half of these were owned by foreigners (see details in Table 6). Of all 18 provinces in the country, starch and chip factories are located in ten of the large cassava production provinces.

### **Exporters**

The cassava exporters in Laos can be categorised into three types. Firstly, cassava collecting companies, owned by foreigners, generally export both fresh roots and dried chips to neighbouring countries. Secondly, some chip factories export chips to nearby countries. Lastly, starch factories export starch to international markets, such as Thailand, Vietnam, China, Taiwan and the Philippines (NAFRI, 2019).

## **Cassava value chain in Laos**

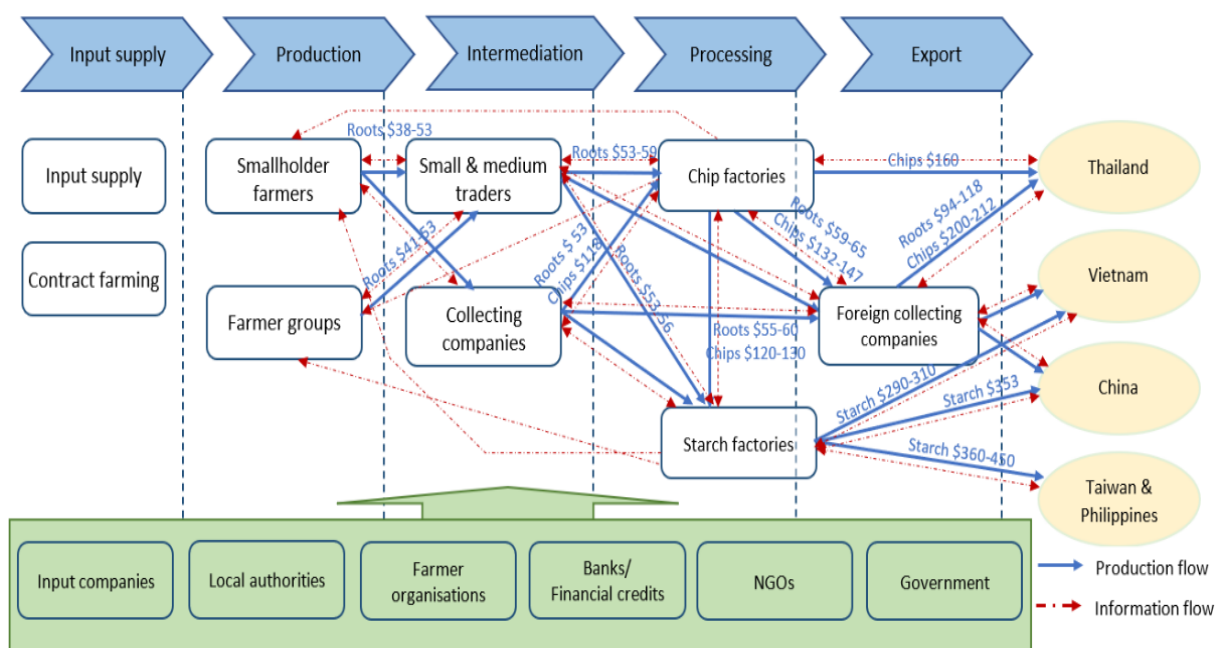
In general, the cassava value chain in Laos consists of four main parts: production, intermediation, processing and exports (Figure 3). According to Manivong et al. (2018) and NAFRI (2019), cassava smallholder farmers mainly sell cassava roots to traders and collecting companies. The price selling to traders ranges US\$ 38-53 per tonne. On the other hand, farmers who formed in groups with contract farming systems sell to traders at the price of US\$ 41-53 per tonne. Prices differ depending on the period of selling and the quality of the products (Manivong et al., 2018; NAFRI, 2019).

**Table 6. Numbers of starch and chip factories in Laos, 2018**

	<b>Starch Factory</b>	<b>Chip Factory</b>	<b>Foreign ownership</b>
<b>Northern provinces</b>			
Luangnamtha	1	-	1
Xayyabury	1	-	1
<b>Central provinces</b>			
Vientiane Capital	1	2	-
Vientiane	2	-	1
Xiengkhouang	1	-	1
Borlikhamxay	2	1	3
Khammouane	1	-	1
<b>Southern provinces</b>			
Salavan	1	2	1
Champasak	1	4	-
Attapeu	-	1	1
<b>Total</b>	<b>11</b>	<b>10</b>	<b>10</b>

Source: MIC (2019b)

**Figure 3. Mapping the current value chain of cassava in Laos**



Source: Adjusted by the author based on Manivong et al. (2018), NAFRI (2019)

After that, in the intermediation part, the cassava roots from traders are transported to chip factories (US\$ 53-59/tonne) and starch factories (US\$ 53-56/tonne). Some collecting companies also transfer cassava roots to dried chips before selling to processors. Collecting companies transport roots (US\$ 55-60/tonne) and chips (US\$ 120-130/tonne) to foreign collecting companies. The roots from collecting companies are transported to chip factories at US\$ 53/tonne, while the price is US\$ 118/tonne for cassava chips.

In the processing part, chip companies process all bought products to chips with their quality check and export chips to Thailand at US\$ 160/ tonne. Chip companies also sell their roots and chips products



to foreign collecting companies with the price at US\$ 59-65/tonne for roots and US\$ 132-147/tonne for chips. On the other hand, starch factories buy cassava roots from traders, and both roots and chips from collecting companies and chip factories to produce starch and export to international markets.

For the export part, some chip companies export their chips to Thailand at US\$ 160/tonne. Foreign collecting companies export roots and chips to the Thai market at the price of US\$ 84-118/tonne for roots and US\$ 200-212/tonne for chips, they also export to Vietnam and China, but the information on prices is not available. Alternatively, starch factories export cassava starch to China (US\$ 353/tonne), Vietnam, Taiwan (US\$ 360-450/tonne) and the Philippines (US\$ 360-450/tonne).

### Assessing Performance of the Value Chain

According to Aramyan et al. (2007), a conceptual framework of a performance measurement system in agri-food supply chains should include four main indicators: efficiency, flexibility, responsiveness, and food quality. In this paper, efficiency and responsiveness are the two main indicators that are analysed for Lao's cassava value chain. Efficiency measures resource utilisation, which includes the cost of production, profits and productivity. Responsiveness indicates the level of satisfaction from the supplied markets and the temporal dimensions of the chain activities, which includes customer satisfaction, information flow and response time.

#### Efficiency

##### *Production cost and profits*

The cost for cassava planting by small farmers in Southern Laos on average is about US\$ 800/ha, whereas the average income is about US\$ 1,490/ha (NAFRI, 2019) (see Table 7). Accordingly, the average profit is US\$ 21.5/tonne of cassava. If comparing to Thai cases, the average cassava cost is about US\$ 750/ha and the revenue profile is about US\$ 1,135/ha. Thus, the profit of Thai cassava production is US\$ 17.7/tonne (Arthey, Srisompun & Zimmer, 2018). One reason for the difference is because the yield of cassava in Laos is higher at 32.1 tonnes/ha, while it is only 21.7 in Thailand. Another reason might be because the yield of cassava will decrease year by year due to the reduction of soil fertility and re-use of planting materials (Newby, 2017). Cassava depletes soil nutrients rapidly. However, in Laos, the prices of cassava in the southern part are slightly higher than prices in central and northern parts, because the cassava areas there are flat and the proportion of fertiliser adaptation is also higher than other parts, which lead to higher yield and better quality (NAFRI, 2019).

**Table 7. Average production cost, revenue and profits of cassava production in Laos and Thailand, 2017**

	Laos	Thailand
Cost of production (US\$/ha)	800	750
Revenue (US\$/ha)	1,490	1,135
Average yield (tonne/ha)	32.1	21.7
Average profit (US\$/tonne)	21.5	17.7

*Source: NAFRI (2019), Arthey, Srisompun & Zimmer (2018)*

There is no published information on costs and revenues of other actors in the cassava value chain in Laos, such as traders, collectors, processors and exporters. Research is necessary on this matter in order to understand the efficiency of cassava production for all stakeholders in the chain.



### Productivity

Cassava productivity in Laos is extremely high compared to other cassava producers in the region with an average of 31.8 to 32.8 tonne/ha from 2016 to 2018. Thailand, the largest cassava exporter in the world, had about 21.4 to 22.3 tonne/ha, while in Vietnam it was about 24.4 to 24.6 tonne/ha for the same years (see more details in Table 8). This is a significant advantage for Lao's cassava sector in producing among major global cassava producers.

**Table 8. Average yields of cassava in South-East Asia countries, 2016-2018 (tonne/ha)**

	2016	2017	2018
Thailand	21.4	21.7	22.3
Indonesia	24.6	24.6	24.4
Vietnam	19.2	19.3	19.2
Cambodia	21.7	22.5	21.1
Laos	31.8	32.1	32.8
Myanmar	11.8	11.7	12.0
Philippines	12.0	12.0	12.0

Source: ACIAR (2020), MAF (2020)

### Losses

There are some losses occurred in Lao's cassava value chain because of natural disasters, climate change, and unclear quality standards on trade that are defined by collectors and traders.

Natural disasters, such as flood and drought are factors affecting agricultural production in Laos, which destroys agricultural land, crop production and livestock, including cassava production. Pests and diseases are other challenges leading to losses of the cassava industry. Major diseases impacting on Lao's cassava production are Cassava Witches Broom Disease and Cassava Mosaic Disease, which threaten not only Lao's cassava industry and farmers, but also millions of Asian farmers (Alliance Bioversity International and the International Centre for Tropical Agriculture, n.d.). Additionally, climate change, which is resulting in extreme temperature and rainfall pattern changes, is another factor affecting cassava production.

Quality standards for cassava products is one criterion that traders and collectors use when trading with farmers. These standards include aspects of quality grading, colouring, dryness levels, and moisture condition. If the products do not meet the standards, the buying price will be decreased by the traders and collectors. The reduction of prices is about 10-30 per cent of the general price level at the time (NAFRI, 2019). However, with limited knowledge on trading conditions and low levels of education, farmers generally accept whatever price reduction is offered by traders and collectors. It is sometimes not clear whether traders are following the standard deductions or using this potential mismatch in knowledge to reduce prices when buying products from farmers. This means that the profitability is highly sensitive to the quality standards.

### Prices

Prices of cassava in Laos fluctuate by regions, although all are broadly influenced by global demand and supply. In the country, prices from different parts are also different due to the differences in product quality and distance from international markets. In general, prices of cassava in all types (roots, chips and starch) in southern provinces are a bit higher than in other parts. Details of different types of cassava prices are illustrated in Table 9. Cassava farmgate prices are in the high range, particularly for chips. The interesting point is the price at the middleman level for fresh roots is very small, this might be because traders and collectors normally transport the products that are bought from farmers on the same day of buying and made only small benefits.

**Table 9. Cassava prices in Laos by different types of products, 2018 (US\$/tonne)**

	Northern	Central	Southern
<b>Farmgate price</b>			
Fresh roots	38-53	47-53	41-71
Chips	118-141	94-114	94-141
<b>Middleman price</b>			
Fresh roots	53-59	53	-
Chips	132-147	106-118	-
<b>Export prices</b>			
Fresh roots	*	-	94-118
Chips	*	160	200-212
Starch	353	290-310	360-450

\* data is not available. *Source:* Manivong et al. (2018), NAFRI (2019)

## Responsiveness

### **Customer satisfaction**

As mentioned, the export value of Lao's cassava has been increasing in the last decade. Based on the increase in export volume and value, it seems like cassava products from Laos can satisfy the demand from importing countries.

However, it is difficult to find evidence that the markets are satisfied with Lao cassava products or not. Lao cassava products, both fresh roots and dried chips, shipped to Thailand mostly do not meet the standard to get the high price (Manivong et al., 2018). This is because of the low quality of products due to the production process, planting material selection and harvesting. Additionally, evidence also shows that the cassava chip exports from Laos to Vietnam were getting low prices due to high moisture content (Newby, 2017). Therefore, it can be agreed that the qualities of Lao cassava fresh roots and dried chips do not meet the satisfaction of the importing countries.

### **Information flow**

Generally, information flow comes from the demand side to the supply side. The information on cassava demand, quality, prices and trade should go from exporters and processors to collectors, traders and farmers. However, there is evidence showing the opacity of information on the trade of cassava in the chain (Manivong et al., 2018). While processors and exporters obtain global cassava trading information from neighbouring markets, farmers are not provided with this trade information.

Basically, cassava farmers only get information on prices from traders, collectors and processors. Information regarding standards requirements and demand volumes is still far away from farmers. Traders will inform cassava farmers in general terms that cassava products should be good, clean and dried but without any specific details, which lead to unclear understanding by farmers. Most farmers have limited knowledge and low educational levels (Manivong et al., 2018). At the factory level, the standard requirements are printed to show to cassava sellers, such as level of moisture content, sizes of roots and chips, flour content and others, but farmers generally do not know how to meet those requirements to get high prices for their products (Manivong et al, 2018; NAFRI, 2019).

### **Response time**

As cassava is a seasonal harvested crop, the responsiveness in the value chain is still low. The responsiveness of cassava starch is in a better situation than cassava fresh roots and dried chips. Generally, cassava in Laos is harvested between December to April, which provides about five months of cassava fresh roots and dried chips being available to trade internationally. However, in the off-

season, the volumes of cassava fresh roots and dried chips are very low (NAFRI, 2019). Although there are some factories that store dried chips, most cassava products are exported only in the on-season. As Table 4 demonstrates the value of cassava exports, the high values of cassava exports were from December to February, which is the cassava harvesting season, while the value was decreasing after April, which is the off-season of harvesting.

At the production level, farmers sell all their products in the harvesting season, and therefore do not have any product to sell in the off-season. This is the same at the intermediation level. On the other hand, at the processing level, starch can be stored and then exported all through the year.

As mentioned above, this means that Lao cassava products mostly transport to the main international markets as fresh roots and dry chips, whereas the processed products are still at a very low level (NAFRI, 2019). This can be assumed that the capacity of the processing process to respond to the market changes is still low.

## **Major Constraints and Challenges in the Value Chain**

### **Production systems**

Laos cassava farmers face several challenges that limit the possibilities of gaining more profit. Limited knowledge of modern cultivation techniques and low levels of education are the main constraints. This leads to low levels of pest and disease management, fertiliser application, soil improvement, machinery utilisation, and new technology adaptation. One significant example of this is that the proportion of cassava farmers who use planting material from their own previous harvest, is still high, and the utilisation of planting material that can protect from diseases is very low (Newby, 2017). Additionally, the proportion of older people is higher than young farmers due to migration to cities and neighbouring countries (Manivong et al., 2018). Labour productivity is low. Additionally, accessibility to credit by cassava farmers is very low, particularly those in remote regions. This might be because of low education levels, and the processes for accessing credit for farmers are complicated.

### **Communication system**

The information flow in the cassava value chain in Laos is unclear and unstable. Communication occurs in the chain mostly from the demand side to the supply side. The communication of quality signals is a constraint confronted by cassava producers. The most widely known information along the value chain is price information, while another trade information is missing, particularly information related to standards (Newby 2017). Many collectors receive different information of quality requirements from buying markets that lead to inappropriate transportation, which results in low quality of the products due to time delays at the borders for standard checking (Newby, 2017). This lack of market information may lead to a poor understanding of cross-border trades.

Although the government, development partners and private sectors are investing in research and development, the collaboration among key important stakeholders in the value chain is weak. The consequence of this is that there are several research results available on productivity improvement, pest and disease control and other issues, but the practical extension of those is still in question (MAF, 2015).

### **Value subsystem**

The majority of cassava in Laos is exported to neighbouring countries in the form of fresh root or dried chips, particularly in the northern part. Lao's farmers are losing potential opportunities to gain more

profits from adding value to the product, with subsequent flow-on impacts to Lao's economy in terms of employment and national income.

Cassava chips are the primary processed products from the fresh root. Although this is primary processing, it gains a lot of benefits compared to just exporting fresh roots (see the price differences in Table 9). It is interesting to note that most cassava in the southern provinces of Laos is exported in the form of chips, which result in a higher export value (NAFRI, 2019).

Starch is the only main form of processed products of cassava in Laos. As mentioned, there are 11 starch factories in nine provinces. However, cassava can be processed in many forms and in various industries, including sweeteners, MSG, paper, textiles and ethanol for biodiesel (Newby, 2017). Research into these alternate processing approaches needs to be considered in terms of enhancing domestic manufacturing to boost the country's economy.

### **Governance system**

Cassava is one of the nine cash crops prioritised by the government supporting the nation's agricultural commercialisation, and this is one of the main reasons for the increase in production and the export value of Lao's cassava products. There are emerging collaborations through contract farming between farmers, traders, collectors and processors, in the major cassava provinces. This helps to guarantee the demand and supply among the stakeholders in the chain. However, the proportion of producers using contract farming is still low (Manivong et al., 2018).

Logistic costs are major issues for Lao's cassava industry. One of the main challenges of agricultural agribusiness in Laos is the high costs of transportation (Manivong et al., 2018). The domestic cost in Laos is about US\$ 2.50/km, whereas it is only US\$ 1.10/km in Thailand. Additionally, goods transportation between Laos and Thailand is also struggling with document fees at border checkpoints, and exporters need to respond to those transportation costs and fees (Newby, 2017). One of the main reasons for this is low investment in infrastructure, which leads to poor road conditions.

In addition to this, although the government promotes foreign direct investment and industrialisation in the country, demand for documentation for trading in both domestic and international markets is another major barrier against the export of cassava products to international markets (MPI, 2016).

Apart from this, there are insufficient services to support cassava farmers, particularly in terms of production improvement, technology advancement, farmers' capacity building and trading systems (NAFRI, 2019). These limitations of technical knowledge and training lead to low productivity, poor quality of the cassava products, and loss of opportunities from trade.

### **Possible Interventions in the Cassava Value Chain**

Based on the constraints and challenges outlined above, this study proposes some possible recommendations to improve the cassava value chain for further sustainability of the cassava industry in Laos. Each suggestion would require a formal evaluation of the costs and benefits of implementation as details below.

#### **Establishment of Cassava Associations**

Enhancing the strengthening of groups of all stakeholders can increase the collaboration for sustainability. The creation of a farmer association will increase the performance, capacity and

negotiation power for cassava smallholder farmers. Cassava farmers groups can achieve more efficient marketing compared to individual farmers. This is because forming groups of producers will have more power to negotiate in trading and to obtain support from the government, private sectors and development partners in terms of input provision, capacity building and marketing.

Apart from the production part, the establishment of trader associations is also important in order to gather small and medium traders for greater capacity of trading and to guarantee the fairness of trading between farmers and processors or exporters. This is also a way of making standards of cassava trading in the value chain for sustainability.

At the same time, an association of exporters is also needed. This association will be the core supporting all exporters to meet the requirements of all international markets and to obtain support from the government to reduce all trade barriers.

In the beginning, the government should take part in leading the creation of all associations with collaboration and support from development partners. After that, all associations can implement their own roles depending on trade situations in the value chain. A good example of this is the success of the Lao Coffee Association with the support from the government and development partners to develop and improve Lao coffee quality to access to international markets such as the European Union, Japan and other markets (Lormany, 2009).

#### **Establishment of a national cassava strategic plan**

An establishment of a specific strategic plan for cassava is one key step for sustainability. The Ministry of Agriculture and Forestry (MAF) of Laos has already regulated several significant crop strategic plans, including rice, coffee, organic vegetables and rubber. The result of Lao's coffee export industry can be a good example of these, as the strategic plan can facilitate the industry to meet the high-end global markets (Setboonsarng & May, 2015). The Ministry should consider cassava as a priority crop for making specific strategies. This is because of the high demand and the increase in production of cassava in the country, and its role in contributing to the country's economy. By doing this, the cassava industry will be more sustainable in the long run.

#### **Establishment of a transparent quality-linked pricing system**

As the prices of Lao's cassava mostly are affected by the quality criteria, the creation of a transparent quality-linked pricing system should be explored. The government should support the creation of this transparency by linking it to the creation of the associations of farmers, traders, processors and exporters. This might be introduced as a means of addressing both performance and risks, with longer-term implications for investment in the sector.

#### **Increasing the investment in research and development**

Investment in research and development (R&D) will be one of the significant aspects of the Lao cassava industry. The investment will focus on R&D in productional improvement, processing and value-added development, quality control, and pest and disease management. This investment should come from the government as well as the development partners. A good example of this is the investment of the International Centre for Tropical Agriculture (CIAT) in cassava stem development to prevent, control and reduce risks from cassava diseases and pests in Laos. This is the programme of providing free quality cassava planting material for cassava farmers in order to improve productivity and reduce the negative effects from pests and diseases (Alliance Bioversity International and the International Centre for Tropical Agriculture, n.d.). By providing better planting material, it may also

guarantee better yield and quality as well as resilience with pests and diseases that will lead to better prices of the cassava products.

### **Strengthening extension services**

Most Lao cassava farmers have limited knowledge and low educational levels, therefore, increasing training and capacity building to cassava farmers will solve these problems (Manivong et al., 2018). The main capacity building should focus on production improvement, quality control and management, technology adaptation, machinery utilisation, postharvest techniques, primary processing and basic knowledge on trade and marketing. The government should strengthen these through all existing extension services in the main cassava production areas.

### **Increasing the investment on infrastructure**

Another important factor for cassava development in Laos is infrastructure improvement. The government should invest more in road development. The improvement in road conditions for good transportation does not benefit only the cassava industry, but also all trade and logistics in the whole country (Newby, 2017).

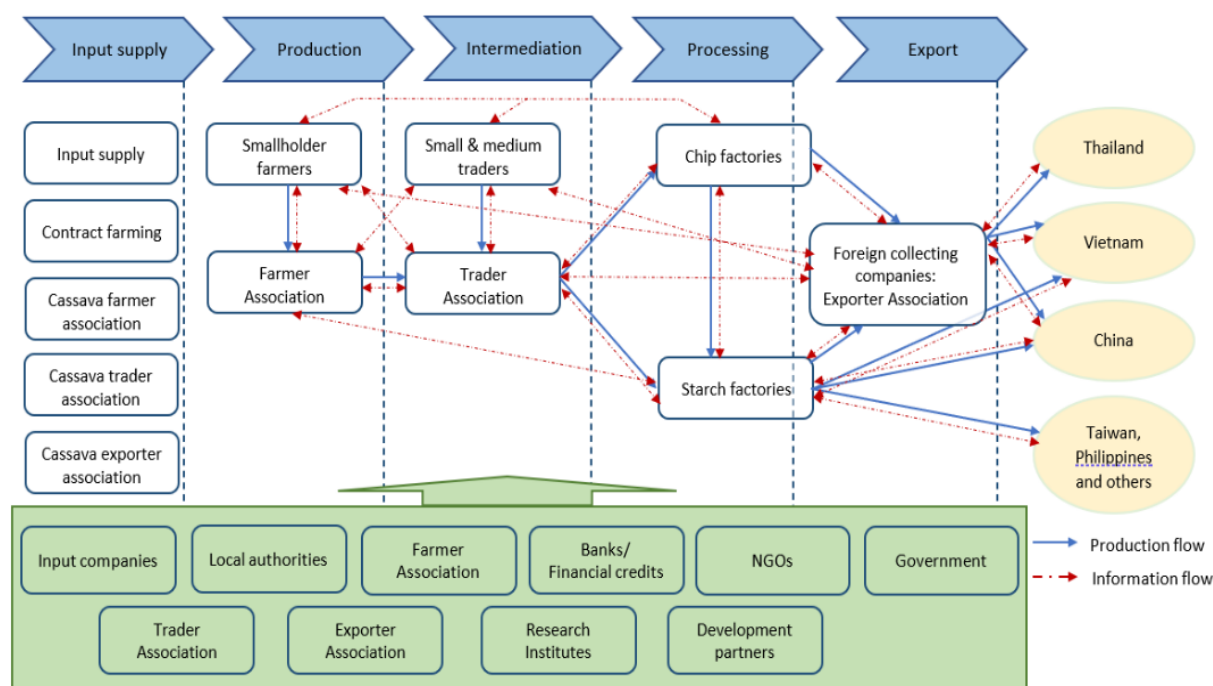
If these proposed interventions for the improvement of Lao's cassava value chain were implemented, a value chain such as shown in Figure 4 might be achievable. Producers will form together to increase their capacity and negotiation power in trading as well as obtaining support from the government, private sectors, NGOs and development partners. This concept will apply to traders as well in order to maximise the potential and increase trade fairness. Processors will still focus on chips and starch but will be more concerned with the quality of the products to meet international requirements. For the export part, forming exporters as an association will increase the ability to trade internationally, and will focus only export of chips and starch.

### **Conclusion**

Cassava is a significant crop that contributes to the Laos economy and farmer's livelihoods. As the global demand for cassava has increased, this had led to an increase in cassava production in Laos, so that Laos has become one of the major cassava exporters in the region. Based on the analysis reported in this paper, it seems like cassava farmers have lower levels of performance than others in the value chain due to limitations of knowledge and low education levels that have led to low quality of the products. Intermediate actors, particularly traders and collectors, are more powerful in terms of controlling prices for producers. Domestic processors are still young and focus only on starch processing. Additionally, there are still many constraints and challenges that Lao's cassava stakeholders are facing that lead to the loss of opportunities to maximise profits from this significant industry. Although product volumes are increasing, the quality of products is still low and does not meet the international standards to get optimal benefits. The information flow in the value chain is still not smooth and has low levels of transparency, which some actors can take advantage of. The value adding to cassava products is still low and current government support is insufficient. Because of these, the creation of cassava associations, the establishment of the national cassava strategic plans, transparency of the quality-linked pricing system, the increase in the R&D investment, the strengthening extension services, and the increase in the investment in infrastructure are needed for the sustainability of the cassava industry in Laos.



Figure 4. The suggested improved cassava value chain in Laos



Source: The author

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