

No. 06/2013

Mekong Institute

Research Working Paper Series 2013



An Assessment of Longan Value Chain in Pailin Province, Cambodia

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December 2013

This publication of Research Working Paper Series is part of the three-year project on “Capacity Development Program for Integrating CLMV Economy into AEC” funded by the New Zealand Aid Programme in the CLMV Countries (Cambodia, Laos, Myanmar and Vietnam). This research has been pursued by the MI research team of Rural Development Department of Mekong Institute.

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List of Abbreviation

ACMECS	Ayeyawady - Chao Phraya - Mekong Economic Cooperation Strategy
AEC	ASEAN Economic Community
AFTA	ASEAN Free Trade Agreement
CLMV	Cambodia, Lao-PDR, Myanmar and Vietnam
CO	Certificate of Origin
CSES	Cambodia Socio-Economic Survey
DOA	Department of Agriculture
EWEC	East West Economic Corridors
FC	Farmer Cooperative
FDI	Foreign Direct Investment
FGD	Focus Group Discussion
FAO	Food and Agriculture Organization of the United Nation
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GDCE	General Department of Custom and Excise
GMS	Greater Mekong Sub-region
IFAS	Institute of Food and Agricultural Sciences
ICT	Information Communication Technology
JICA	Japan International Cooperation Agency
MAFF	Ministry of Agriculture, Forestry and Fisheries
PPDA	Pailin Provincial Department of Agriculture
PPDC	Pailin Provincial Department of Commerce
SEC	Southern Economic Corridors
VCD	Value Chain Development

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Acknowledgements

This publication of Research Working Paper Series is part of the three-years project on “Capacity Development Program for Integrating CLMV Economy into AEC” funded by the New Zealand Aid Programme (NZAP) and implemented by the Mekong Institute (MI).

The research team would like to convey their special thanks to Vice Governor of Pailin province for his warm encouragement and invaluable suggestions. The team is thankful to Mr. Phan Pich, Director of Pailin Provincial Department of Agriculture for supporting and joint interaction collaborating research during data collection. The team indebted to the value chain actors and supporters in Pailin and Chanthaburi provinces who welcomed us and were willing to participate in the surveys and focus group discussion interviews. In particular, they are grateful to the staff of the Pailin’s Provincial Department of Agriculture and Pailin Governor Office for their assistance during conducted survey.

Abstract

Longan is the third important crop in Pailin province, after cassava and maize. It has a high growth potential in the years to come. The production area has shown a steady growth over the past five years with annual production output increasing respectively. In 2012, the total planted area was 425 ha with a production of about 1, 000 tons. Recently, longan producers can receive a considerably higher profit if compared to other crops and they have been able to enjoy fruit-bearing trees in different seasons to secure a higher market price. However, there are many problems in longan production and marketing. To understand the overall situation clearly, value chain mapping and analysis including supply chain were conducted. To identify issues and constraints along the chain faced by value chain actors have been identified and recommend upgrading strategies. Three approaches were employed in data collection namely the structured interviews, key informant interviews and focal group discussions (FGD). The structured interview was conducted mainly with actors in the value chain using a questionnaire developed for each actor. The key informant interviews were conducted with value chain supporters while FGD was used to understand the role of gender in longan cultivation such as labor division, financial decision-making, livelihood strategies, and constraints and issues in longan production.

The core processes of longan value chain in Pailin province is comprised of input provision, production, collection and retailing. There are approximately 165 households growing longan, 60% of which are large privately owned farms of up to 10 ha while the remaining 40% of farms lie between 1 to 1.5 ha. To obtain higher price, farmers use chemical treatments to induce flowering of longan and make the fruit ripe for high demand seasons. It takes about six months from flowering to fruit development, so harvesting is done between 5.5-6.0 months after blooming. Approximately 60% of fresh longan is supplied to domestic markets whereas remaining 40% is collected by Thai buyers through negotiation with the longan farmer cooperative. Thai buyers use Thai quality standards for longan by grading the fruits into three grades, namely A (55-75 fruits/kg or 14-18g/fruit), B (76-80 fruits/kg or 12.5-13.2g/fruit) and grade C which consists of more than 80 fruits per kg. The latter grade encompasses most small fruited seedless types and does not meet export market requirements. There is no existing quality standard for longan in Cambodia and the domestic markets for fresh longan do not require standards.

The relationships between the different actors within the longan value chain and the farmer cooperative is quite dynamic in developing efficient channels to get the product grown and marketed. However, there is little or almost no relationship between actors and government agencies because the development of longan research, education and extension services are weak and there is no effective mechanism to foster these links. The relationship among farmers is seen in the form of exchanging the production knowledge and agricultural inputs. There is no relationship among collectors while

there are some linkages between farmers and collectors or between farmers and exporters in terms of doing supply agreements or providing credits.

The major costs in longan production consist of installing irrigation systems planting, plant husbandry and induced flowering on bearing plants. The basic investment cost including installed irrigation, seedling and land constitute 42% of total production cost in three years. Plant husbandry consists of water management, fertilization, weeding, and pruning. The cost and margin analysis suggests that the cost and net profit are shared more by farmers and retailers although farmers incur the highest percentage of added unit cost.

Farmers have been using advanced cultural practices as well as off-season cultivars for higher productivity, quality and profitability. Some farmers are very experienced in cultivation of longan. Despite some success, farmers have experienced a number of problems such as non bearing-trees, high mortality rate of seedlings, adverse weather conditions, price instability, and large proportion of fruits not meeting quality standards for export market, trade facilitation issues at border, and so on. Nevertheless, farmers remain optimistic as the demand for high quality fruit remains high, especially in the export market. Hence, future intervention should be focused on improving productivity and promoting high quality of longan.

1. Introduction

The Agricultural sector remains an important driver for the economic growth of GMS countries, particularly Cambodia, Lao PDR, Myanmar and Vietnam (CLMV). Smallholder cultivation and small-scale production dominate the landscapes throughout the southern economic corridors (SEC), one of the dynamic economic corridors in the GMS due to ongoing and completed infrastructure projects that will enhance cross-border trade and investment as well as would facilitate the movement of goods and people. Approximately, 75 percent of the population of provinces along the SEC is engaged in agriculture and agriculture-related industries. Small scale production, informal marketing arrangements and undependable internal transport and communications links prevail. At the same time, globalization, trade liberalization, promotion of market-oriented agricultural production, and increased regional cooperation under cooperation frameworks, notably the Association of Southeast Asian Nations (ASEAN), the ASEAN Free Trade Agreement (AFTA), the Ayeyawady - Chao Phraya - Mekong Economic Cooperation Strategy (ACMECS) and the setting up ASEAN Economic Community (AEC) by 2015 have moved CLMV from subsistence farming to more open and market-oriented systems with more diversified economies.

Cambodia imports over 60 percent of its fresh vegetables and fruits to meet its domestic demand from Thailand, while exports over 80 percent of commercial crops like maize and cassava to Thailand, Vietnam, and China. In May and June 2012 alone, Thailand exported fresh tropical fruits to Cambodia and Vietnam via SEC valued at more than USD 66 million, an average of 20 tons per day.¹ Fresh fruits are widely grown in the eastern provinces of Thailand like Trat, Chantaburi, Sa Kaeo, Surin, Sisaket, and Ubon Ratchathani as well as in the west provinces (Battambang and Pailin) and northwest provinces (Banteay Meanchey and Oddar Meanchey) of Cambodia. Fresh fruits and tropical fruit products of these provinces have already been exported, mostly to China.

Similar patterns have also been observed for Vietnam. Vietnam shipped 7.2 M tons of rice exports in 2011. It is seen as an area with huge potential. Vietnamese lychee, rambutan, longan and vegetables are widely grown in Southern Provinces and imported to Cambodia and Cambodia exports glutinous rice to Vietnam. The volume of trade increases annually between the two. The importance of cross-border trade of these products between the two countries justifies the focus on improving the cross-border value chain for the products.

Thus, the potential for the development of agricultural value chains in Cambodia, especially in light of increasing cross-border trade with Thailand and Vietnam, is substantial and promising, both from the supply (sufficient natural resources) and

¹Khom Chad Luk Thai daily newspaper 13 July 2012

demand (opportunities for export) perspectives. Emerging new agribusiness and agro-industry can increase competitiveness in international and domestic markets, but the benefits to rural communities are not automatic as they may be not shared by all stakeholders in the agricultural and rural sector. Such changes pose risks to all actors in value chains, especially smallholder farmers, local traders, and SME processors. Smallholder farmers in particular can experience short-term difficulties in meeting agro-industry standards and contract requirements; agribusiness SMEs increasingly must compete with large-scale food manufacturers that benefit from economies of scale; and, traders in local markets can be squeezed by specialized procurement practices, supermarkets, hypermarkets, and certified products.

By engaging all actors, especially smallholder farmers into an improved value chain is expected to contribute to increased income, employment and poverty reduction as well as to achieving food security at household level. Previous surveys conducted by MI along SEC involving interviews with key government and private players indicate the need for promoting value chains, business-to-business networking, and product-market linkages. However, value chains in these countries are characterized by a predominance of small producers, local traders and SME exporters (over 75 percent). Moreover, value chain coordination and self-organization of actors are limited and there is insufficient government support to value chain coordination and improvement, especially in the border twin provinces of the GMS countries.

The human resource development for value chain actors who are involved in the development and promotion of value chains and in improving the productive capacities of enterprises along the chain remains a key issue in the GMS countries. Value chain actors (producers, traders, processors, etc.) cannot successfully integrate into regional or global markets if they operate independently. They need to understand the benefits of forming into groups to gain market access, meet the quantity and quality requirements of foreign buyers, and to have greater bargaining power during business negotiations. Forming into groups also allows them to develop a shared vision of how the chain should perform and to identify collaborative ways among them to keep improving value chain performance.

Not only human resource capacities, but also institutional capacities need to be improved, both in the public and private agencies and organizations to promote cross-border value chains. These will provide necessary business support services to local SMEs. Currently, there is a lack of knowledge and limited resources among concerned agencies. The capacities of the staff of both the public and private sectors need to be oriented toward a value chain development approach in order to be more effective in providing support to value chain coordination and upgrading efforts and responding to specific needs of relevant value chain actors in the areas of business planning and management, product development and processing, entrepreneurship development, etc. The Value Chain Development (VCD) approach provides a framework for systematically

identifying strengths and weaknesses of a particular chain and designing appropriate interventions.

Nevertheless, improving the performance of specific value chains requires a good understanding of value chain complexities and the constraints and opportunities for their development. Lack of information on the status of value chains of specific commodities and analysis of performance prevents the concerned agencies from designing appropriate interventions to improve the efficiency and effectiveness of crop value chains.

Therefore, value chain studies on the most promising products between the twin provinces of the countries in GMS would help policy makers and all stakeholders to develop policy and design appropriate strategies to upgrade the value chains in order to address key issues. One purpose of the study is understand the constraints and opportunities at each level of the chain in order to engage all relevant value chains actors and public and private agencies into a common strategy to make the value chains more efficient and competitive amidst the increasing domestic and cross-border product flows.

The study on longan value chain was conducted in two stages. The first stage is to identify the agricultural commodities that are traded across border between the twin provinces and to select the most promising commodity. The second stage was to conduct an in-depth study on value chain of the selected promising commodity in order to understand the constraints and opportunities at each level of the chain.

1.1. Objectives of the Study

The overall objective of this study is to assess longan value chain in Pailin province of Cambodia. The specific objectives are:

- To map the value chain of fresh longan fruits in Pailin province
- To identify issues and constraints in the value chain of longan
- To propose interventions to improve the value chain of longan

1.2. Research Questions

There are four research questions that are particularly important in the assessment of longan value chain. These include:

- What are the main activities carried out in the value chain? Who are the value chain actors involved in these activities and what are their roles?
- What are the flows of products, information and knowledge in the value chain, and what are the production volumes and number of actors involved?

- What types of relationships and linkages exist among the various chain actors? What types of business services are feeding into the chain, including the regulatory and policy framework in which the sector is operating?
- What are the key constraints and difficulties faced by actors at different stages of the chain and what are the prioritized value chain upgrading strategies for future intervention?

1.3. Scope and Limitation

The study was carried out in Pailin province, so the report does not necessarily reflect the overall longan value chain scenarios in Cambodia. A limitation of this study was that the volume of work was considerable given the quantity of information required relative to the time available and lack of recent value chain studies on this crop. The value chain actors are from different municipalities and provinces throughout the country and include even Thai traders, so to capture all the complexities along the chain would take many weeks of field visits. Therefore, the team considered to interview the value chain actors and supporters who have residence in Pailin province only.

During the interview with value chain actors, respondents tended to provide arbitrary answers particularly to historical questions such as previous years' income, investment cost, etc. In order to mitigate these inconsistencies, a series of clarifying questions were initiated to cross check vague responses. A validation workshop on preliminary findings was also held with value chain actors and supporters to clarify the results of the study. During the workshop, the related stakeholders also discussed the proposed value chain upgrading strategies and the prioritized strategic areas for future interventions.

2. Review of Literature

2.1. Study Site's Profile

Pailin is one of 24 provinces of Cambodia and is located in the western part of the country (Figure 1). To the west, Pailin shares border with Chanthaburi province of Thailand and to the North, South and East it shares borders with Battambang province of Cambodia. Like the rest of the country, the climate in this province is tropical, with two distinct seasons, the dry seasons and the wet season. The wet season starts in May and ends in October, but the rainfall may continue showering till mid or even late November. The annual rainfall varies from year to year, but on average, the annual rainfall is 0.92 meter height (PPDA 2012). The temperature also varies from year to year and depends on seasons. In December – January, the temperature could fall to 16 degrees Celsius and rise to 34 degrees Celsius in April.

Formerly, Pailin was a town and was part of Battambang province. Later in 2010, it was reconstituted as a province. Administratively, the province is composed of two districts,

namely Pailin and Salar Krau. There are 4 Sangkats (equivalent to commune) with a total of 36 villages in Pailin district and 4 communes in Salar Krau district with a total of 43 villages. It is the second smallest province with a population of 63,935 people in 2012. Of which 31,796 (49.73 percent) are females. There are 14,084 households in the province (PPDA, 2012). The average household size is 4.5 members and the average family labor about is 2.70 persons (CSES² 2011).

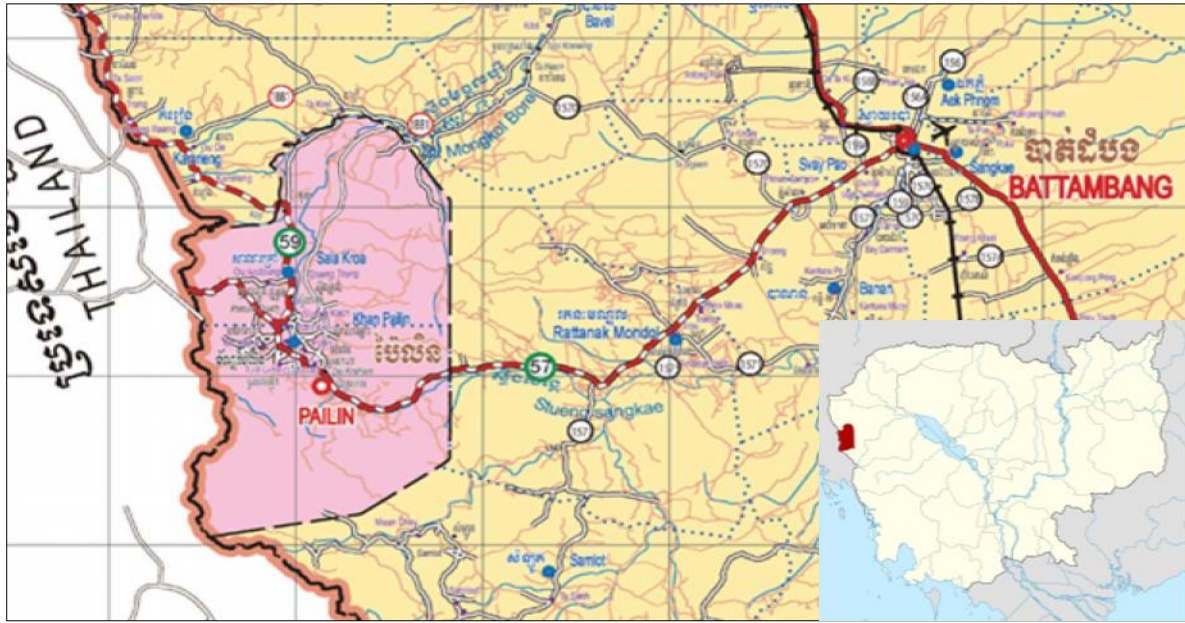


Figure 1. Map of Pailin Province
 Source: <http://www.mpwt.gov.kh/2012/05/page/4>

The society of this province is characterized by a moderately low dependency ratio of 0.38 if compared to national ratio of 0.54 (World Bank Databank). Children aged less than 15 years old is about 34 percent of the total population, while the elderly population accounts for only 4 percent (Figure 2).

Pailin has one of the highest illiteracy rates in Cambodia. More than 25 percent of household heads could not read and write in this province. And more than 37 percent of household-heads have never completed primary education in this province (Table 1). Totally, there are more than 61 percent of household heads, who did not complete even primary education in this province. The majority of them (55 percent) are smallholder farmers, who farm on less than 3 hectares of land, while 22 percent of them are smallholder farmers, who cultivate on land less than 2 hectares (CSES, 2011). Most

² Cambodia Socio-Economic Survey (CSES), a household Statistics periodically

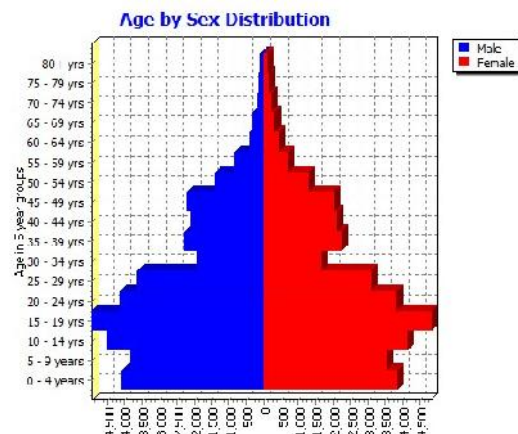


Figure 2. Age by Sex Distribution in Pailin

of them engage in maize cultivation, but some of them engage in cassava cultivation as well. Only those who have land less than one hectare engage mainly in subsistence farming.

Pailin has one of the highest poverty incidences in Cambodia. In 2004, the poverty rate was more than 46 percent and was mainly among farm households in the rural areas (Ministry of Planning, 2006), with small farm land holdings for subsistence-oriented farming (World Bank, 2006). More than 39 percent of farmers or 67 percent of farmers of the province hold land less than 1 hectare or 3 hectares, respectively (CSES, 2011). However, the poverty incidence has declined gradually over time. In 2007, as in other rural areas in the country, the poverty rate was dropped to around 35 percent (World Bank, 2009).

Table 1. Education Level of the Head in Pailin Province

Education Level	Male	Female	Total
Illiterate (No Education)	18.48	6.84	25.33
Primary Not Completed	32.99	4.74	37.73
Primary School	20.25	1.88	22.13
Lower Secondary	12.45	0.8	13.25
Secondary/Technical Diploma	0.58	0.03	0.61
Beyond Secondary	0.81	0.08	0.89
Other Education	0.06	0	0.06
Total	85.62	14.38	100

Source: Population Census, NISC, 2008

In 2010, the poverty rate was estimated to fall to between 20 – 30 percent in Pailin town and between 30 – 40 percent in rural areas of Pailin (JICA³, 2010). The decline of poverty incidence is observed to move in tandem with economy growth. In Cambodia, the GDP grew about 7 percent during 1994 – 1999 and 8.14 percent during 2004 – 2010 (World Data Bank). Despite inequality in benefit sharing, the rural households benefitted from the economic growth of these periods. The inequality in living standards was due to the divergence of living standards during the 1990's, but not in the 2000's (World Bank, 2006). The stabilization in living standards during the 2000's might explain the drop in the poverty rate in Cambodia as whole and in Pailin in particular.

2.2. Overview of Pailin's Economy and Agricultural Sector

The province has a total land area of is 1,062 km². Of which the cultivated area is 456 km² and mainly is in the Salar Krau district, the forest area is 448 km², and the residential area is 158 km². More than 82 percent of the cultivated area is agro-industrial farmland and the rest is paddy field (PPDA, 2012). Most cultivated areas are

³ Map of Distribution of Household Poverty Rate, by District, 2010

located within the Salar Krau district. Currently, agriculture is the main livelihood activity of the population in this province. About 95 percent of the population are farmers, while less than 1 percent are government officials and the remaining 1 percent include businessmen, self-employed or employed by private sector such as the casino, a foreign enterprises, international NGOs and private companies (CSES, 2011).

There are two main agro-industrial crops, cultivated in this province, namely cassava and maize. The two constitutes about 67 percent of all crops grown in the province, while the 23 percent consists of paddy rice (planted in the lowland areas) – accounting for 19%. The remainder of the cultivable land is planted to fruit (such as longan, mango, rambutan, mangosteen, orange, coconut, durian, jackfruit, guava, etc.), mung bean, soybean, ground nuts, rubber and vegetables. Most of these crops (excluded cassava, maize, soybean and longan) are grown mainly for household consumption and locally sold (CSES, 2011). Most smallholder farmers engage in maize production and only small proportion of smallholder farmers, especially those who own less than more than 2 hectares, grow cassava and maize. Most cassava growers are medium and large scale farmers. The medium scale farmer comprises of more than 60 percent of all farmers, while the smallholder farmer constitutes about 30 percent and the large scale farmer constitutes less than 10 percent (FGD, 29 February 2013). Nevertheless, the small scale farmers and medium scale farmers grow both cassava and maize, while the large scale farmers mostly grow cassava and some high value perennial crops, especially longan.

Cassava and maize are the predominant crops that are traded across border between Pailin and Chanthaburi although other crops such as longan, sesame, soybean, mung bean and ground nuts have been reported as being exported from the province to Thailand through Chanthaburi province. Currently, the province has one international cross-border check point located in Salar Krau district, called Phsar Prom, which shares border with Ban Pakkad of Chanthaburi province in Thailand. Currently, all goods and people moving between the two provinces pass through this border check point. The Provincial Government of Pailin is planning to open one more crossing gates with Chanthaburi province. This operation is in the process of negotiation with the Provincial Government of Chanthaburi (Deputy Director of Pailin Administrative Department, per. com. 28 January 2013).

2.3. Longan Sector Overview

Cambodia is considered as one of the richest resources of tropical fruits in the region. Besides high diversification in tropical fruit species, some subtropical fruit are also able to adapt and perform well in certain areas of high elevation, mainly in upland areas and western part Cambodia. The major fruits include: longan, mango, durian, orange, milk fruit, guava...etc. According to MAFF's statistics, the area under fruit production was approximately 174, 533 hectares (MAFF, 2010). Production figures are not well known, by using average fruits crop yields and MAFF's statistics on crop area, approximately 617,000 tons of fruits could be produced annually. However, fruit production in

Cambodia is insufficient for supplying local markets. The exception to this conclusion is longan. So Cambodia imports many kinds of fruits from Vietnam and Thailand to meet the local market demand. Moreover, Cambodia also imports some fruits from Europe and United States such as apple and grape (MAFF, 2010). Longan is one of a top three fruits in Cambodia; recently about 2,376 hectares are covered by longan plantations. Major longan growing provinces include Battambang, Banteay Meanchey, Pailin and Kandal (MAFF, 2010).

Table 2. Area of Fruit and Permanent Crop in Cambodia (ha)

Fruit Name	Longan	Mango	Milk Fruit	Sapota Fruit	Custard apple	Orange	Guava	Jujube
Areas (ha)	2,376	23,734	1,216	2052	3,218	3,553	1,745	20

Source. MAFF, 2010

In Pailin, The longan was introduced in 2005. It has a high growth potential in the years to come. The production area has shown a steady growth over the past five years with annual production output increasing respectively. In 2012, the total planted area was 425 ha with a production of about 1, 000 tons. The revenue generated by longan was approximately USD 1.25-1.50 million in 2012 (Pailin PDA, 2012).

Pailin's juicy longans are en route to becoming Cambodia's third food product to attain Geographic Indicator (GI) status. The longan will join Cambodia's only other GI-recognized food products: Kompong Speu palm sugar and Kampot pepper, which earned this status in 2010.

Compared with other longans, Pailin longans are known for their meatiness and subtle sweet taste, said Soth Visal, chief of agricultural production in Pailin's agriculture department. According to Mr. Visal, the Pailin longan will become GI compliant in 2014.

One hundred and five farmers established the Association for Agricultural Development of Pailin Longan six months ago, and are developing guidelines for growing the fruit.

Recently, longan producers have been able to achieve considerably higher profit compared with other crops. In addition, the introduction of two seasonal bearing trees aims to obtain a higher price in local markets. In spite of these achievements, there are many problems in longan production and sale. The main problem facing the longan farmer is the increasing production cost due to unsuccessful attempts to induce flowering of longan. Moreover, the produce does not meet the standards of export markets. The demand in domestic markets is very limited and there are no processing facilities in the province. The intervention strategies are needed to promote higher productivity and quality of longans.

2.4. Longan Production and Consumption

Longan (*Dimocarpus longan* Lour.) is a sub-tropical fruit in the family *Sapindaceae* and the origin is still disputed with some authors limiting the area of origin to the mountain chain from Burma to southern China while others extend it to south west India and Sri Lanka (Wong and Ketsa, 1991). It is now primarily cultivated in Cambodia, China, Laos, Taiwan, Thailand, and Vietnam as well as in Queensland (Australia), Florida and Hawaii (Crane, 2000). The word “longan” or “long Yan” or “lungngan” come from the Chinese and literally mean “dragon eye” which an appropriate description of the fruit after the skin has been removed. Other vernacular names of longan include “lam-yai” (Thailand), “mein” (Cambodia), “Lam nhai” or “nam nhai” (Laos), “Kyet mouk” (Myanmar), and “nhan” (Vietnam) (FAO, 2000). The longan is normally eaten fresh and very popular among Asians, particularly among the Chinese. To extend use, longan can be frozen, canned and dried. The seed is used as a shampoo like soapberries (*Sapindus saponaria* L.), due to its saponin content. Dried leaves, which contain Quercitrin and flowers of longan are also sold as ingredients of Chinese herbal medicine (FAO, 2000).

Table 3. Longan Cultivar in Thailand and Pailin, Cambodia

Cultivar	Fruit Size ¹	Seed Size ¹	Fruit Quality ²	Bearing Habit	Season
Edau (daw)	M-L	S-M	G	Erratic	Late-July to Sept
Biew Kiew	M-L	S-M	G-VG	Erratic	Late-July to Sept
Chompoo	L	S-M	G-VG	Erratic	Mid-July to Early August
Haew	L	L	G	Erratic	Late August
Peetsakorn	M	M	F-G	Regular	Sept to Oct
Dang	L	L	G	Regular	Mid-July to Early-August
Baidum	M	S	G	Regular	Mid-July to Early-August
Talub Nak	M	S	F-G	Regular	Mid to Late July
1: Fruit and seed size: S=small, M=medium and L=Large					
2: Fruit quality: F= Fair, G=Good, VG=very good					

Source. FAO, 2000, University of Florida: IFAS Extension, 2005

There are several cultivars that have been developed with thick flesh and small seeds in Thailand. Off-season cultivars have also been selected from bud sport although some have been chemically treated to bear fruits off-season. In Thailand, among the popular cultivars, “Edaw” occupied the largest area, or 75%, followed by ‘Haew’, ‘Biew Kiew’ and “Chomphu”, covering 7% each of the total longan areas (Chomchalow et al., 2008). In Pailin, similarity Edaw and Biew Kiew are the most popular cultivars occupying about 95% of total cultivated areas. The use of non-seasonal flowering cultivars and the application of chemicals to induce flowering in the seasonal flowering cultivars is practiced from knowledge supplied by Thai farmers.

Under natural conditions, the flowering of longan depends on the weather. A period of cool and dry weather is ideal for flowering. Longan is quite sensitive to environmental conditions with irregular yields from year to year. It is believed that inductive conditions trigger changes in endogenous hormones. During the immature stage, a combination of organic and inorganic fertilizers may be used. Organic fertilizer such as animal manure is recommended at the rate of about 10 kg/tree/year, applied about 3-4 times in a year. The organic manure may be supplemented by inorganic fertilizer such as 15:15:15 (N: P₂O₅: K₂O ratio) at the rate of 5-10 kg/tree/year. Fertilizing bearing trees is accomplished by manipulating the crop cycle, especially by promoting panicle growth, fruiting and vegetative flushing after cropping. The recommended fertilizer schedule for longan production in Thailand is indicated in Table 3:

Table 4. Fertilizers Recommendation for Bearing Trees after Harvesting

App N ^o	Time of Bearing	Recommended Rate of Fertilizers		Purposes
		Inorganic	Organic	
1	Two weeks after harvesting	20:10:10 (1kg/tree)	6-10 (kg /tree)	New growth flush
2	when the panicle is about 5 cm long	16:11:14 or 15:15:15 (1kg/tree)	-	Help in fruit setting
3	2 weeks after fruit set	16:11:14 or 15:15:15 (1kg/tree)	-	Fruit development
4	the seed coloration stage	14:14:21 (2-3kg/tree)	-	Fruit development

Source. FAO, 2000

Since the introduction of potassium chlorate to induce flowering in longan, Thai and Cambodian producers have applied this chemical as soil drench with the rate of application depending on tree size. Other factors that must be considered before the application include soil type, the availability of water supply, the management of the orchard, and the degree of healthiness of the trees. Studies from Mae Jo University in Chiang Mai (Manochai et al., 1999) report the induction of 100% flowering in longan variety Edaw with the rate of potassium chlorate at 8 g/m² as a soil drench. This experiment was conducted in November, which is not the normal flowering time of longan. Lowering the rate to 4 g/m² induced the flowering to 86%. In See Chompoo variety, 100% flowering was seen at even lower rates of this chemical, i.e. all trees flowered when they were treated with 1-4 g/m².

Table 5. Effect of Potassium Chlorate applied as Soil Drench on Flowering of Longan cv. See Chompoo

Rate of Chemical (KClO ₃)	Flowering (%)
0	28
1 (g/m ²)	100
2 (g/m ²)	100
3 (g/m ²)	100
4 (g/m ²)	100

Source. Manochai et al., 1999

An experiment was conducted using potassium chlorate as soil drench for longan trees at different stages of leaf development, i.e. when the trees have new young leaves of less than 10 days, at fully expanded leaf (20-25 days) and at mature leaf (40-45 days). The rate of chemical applied was 8 g/m² at all treatments. The results showed that trees with mature leaves proved the most responsive to potassium chlorate in flowering while trees with young and immature leaf stage were the least responsive (Table 5). Thus, it was concluded that in order to obtain good induction of flowering, potassium chlorate should be applied when the trees stopped growing vegetative material, i.e. when all leaves were fully matured and no new flushes occur.

Table 6. Use of KClO₃ as Soil Drench to Induce Flowering in Longan cv. Edaw at Different Stages of Leaves

Application	Stage of Leaves	% Flowering after application	
		45 days	65 days
KClO ₃	Control	0.00	0.00
KClO ₃ (8 g/m ²)	Young leaves (less than 10 days)	5.00	6.70
KClO ₃ (8 g/m ²)	Fully expanded leaf (20-25 days)	30.00	61.70
KClO ₃ (8 g/m ²)	Mature leaves (40-45 days)	85.00	100.00

Source. Manochai et al., 1999

3. Research Methodology

3.1. Sample Size

The target group of value chain study comprising both the value chain actors and supporters. Supporters are the government agencies, private companies and farmer cooperatives as listed in table 1. The value chain actors are longan farmers, collectors, dealers or wholesalers and retailers. There was no exporter in the longan value chain in Pailin due to approximately 40% of fresh longan export to Thailand conducted by Thai buyers following negotiations with the Pailin Longan Product Agricultural Cooperative.

Due to time limitation, the sample was randomly selected through purposive sampling and the sample size was not representative of the population sampling frame. There were 156 farmers in total but only four of them were selected for individual interviews.

Similarly, only two collectors out of 12 were selected for interview. One of them is a dealer and the other one is local retailer. They are from the different municipalities and provinces and are very busy and are difficult to make appointments for the interview. Therefore, the information was supplemented through focal group discussion with farmers and the cooperative as well as review of past related studies.

Table 7. List of Supporters Interviewed

Nº	Institutions	Person Interviewed
1	Investment and Planning Office, Pailin	Head office
2	Legislation Office, Pailin Governor	Head office
3	Provincial Department of Agriculture, Pailin	Director & technical staff
4	Provincial Department of Commerce, Pailin	Director
5	Custom Checkpoint Office (Phrom, Pailin)	2 Deputy Heads
6	ACLEDA bank	Branch Manager
7	Pailin Longan Product Agricultural Cooperatives	Head
8	Agricultural input shop owned by farmer cooperative	Technician of the Cooperative

3.2. Data Collection and Analysis

To map actors and supporters and analyze the value chain of longan, three approaches were employed, namely the structured interview, in-depth interview and FGD. The structured interview was conducted mainly with actors in the value chain. The questionnaire method was developed for each actor and consisted of questions about general information, costs, productivity, resource access, market, policy and regulation, relationship and linkage, problems and other value chain constraints. Due to time and resource constraints, there were four farmers, two collectors, one dealer and one retailer selected for the interviews.

The in-depth interview was conducted with supporters in the value chain in order to understand their roles and responsibilities with regard to the value chain. They are from public sector and private sector and civil societies. FGD was also used to understand the role of gender in longan cultivation, such as labor division, financial decision-making, livelihood strategies, and constraints and issues in longan production. Direct observation was also conducted on the border between Pailin (Phsar Prom) province and Chanthaburi (Ban Pakkad) province and the border between Battambang (Komrieng) province and Chanthaburi (Ban Laem) province to observe main products that were exported across these borders to Thailand.

Supplemented by secondary data, the information received from reports of Pailin Provincial Department of Agriculture (PPDA), Pailin Provincial Department of

Commerce (PPDC), MAFF, policy frameworks, regulations, and related research papers were used to understand the whole process of the value chain both production and marketing aspects.

The quantitative data were tabulated and analyzed using basic MS Excel formula and descriptive statistics were used to analyze the cost and margins associated to value chain actors. Rich descriptive, problem trees and objective trees analysis were used to identify the issues and constraints faced by different value chain actor and proposed the upgraded strategies areas for future intervention.

4. Results and Discussion

4.1. Mapping Value Chain

4.1.1. Core Process of Value Chain

The core process of the longan value chain comprises input provisions, production, collection and retailing as shown in figure 2, together with the specific activities undertaken by actors. Forty percent of the total production volume of fresh longan in Pailin is exported to Thailand, The export activities are carried out by Thai buyers through following negotiations with the farmer cooperative. The cooperative acts as the lead firm in negotiation by providing supporting documentation for Thai buyers. Local/regional collectors identify the trees that will bear the best fruit and then contract with the farmer to purchase the entire produce of these selected trees. They supply the standard longan to Thai buyers whereas a remaining is supplied to domestic markets.

	Input Provision	Production	Collection	Retailing
Actors	<ul style="list-style-type: none"> FC (1) Local Shops (36) Thai supplier 	<ul style="list-style-type: none"> Farmers (156 HH) FC (1) 	<ul style="list-style-type: none"> Local and regional collectors (2) Municipal and provincial wholesalers Municipal and provincial retailers 	<ul style="list-style-type: none"> Municipal and provincial retailers Local retailers
Activities	<ul style="list-style-type: none"> Selling fertilizers and chemicals (local shop and FC) Selling seedlings (FC) Providing marketing information and linkages (FC) Installing irrigation system and pruning trees (Thai suppliers) 	<ul style="list-style-type: none"> Plant propagation Cultivation Watering Weeding Fertilization Pruning trees Induce flowerings Harvesting Dressing and grading fruits 	<ul style="list-style-type: none"> Doing agreements and providing credits to farmers (local/ regional, municipal/provincial collectors) Providing services on reducing flowers of off season (local/regional collectors) Harvesting Dressing and grading fruits (hired labor) Supplying to municipal and provincial wholesale markets 	<ul style="list-style-type: none"> Dressing and grading fruits Selling fruits to consumers

Figure 3. Mapping of Specific Activities Undertaken by Actors from Core Processes of Longan Value Chain, Pailin 2013

The main actors are input providers (both local agricultural input shops and the farmer cooperative), producers, collectors (local, regional, municipal and provincial collectors), dealers and retailers.

4.1.1.1. Input Providers

The main inputs in Longan production are young plants, irrigated water materials, fertilizers and pesticides.

The longan propagation is produced by using the air layering (or marcotting) techniques, as it is convenient and yields a high percentage of successful planting materials since the marcotted branches readily produce roots. Usually long stands farmers produce seedlings and supply them to new longan producers at a price of 1.0-1.5 USD per plant. It was reported that farmers learned these technologies from Thai farmers. Thailand is known as a major longan producing country. Selection of the mother plant is most important. It should be a good bearer with no symptoms of witch’s broom disease. Normally, this operation is done in the wet season, starting from

May, using coconut husk or coconut coir as the marcotting medium. Rooted marcot can be cut off from the mother plant in 30 days and planted in black polyethylene bags, 8 x 10", using soil and burnt rice husk at a ratio of 2:1 as the rooting medium. The marcot is kept for 1-3 months before transplanting in the field. In addition to marcotting, the longan can be propagated by cutting, top grafting and budding. All of these operations should be done within one year before transplanting.

In Pailin province, most of longan producers often buy their inputs (fertilizers, pesticides, etc) from the agricultural store of Pailin Longan Product Agricultural Cooperative. To be the member of this association, farmers are required to buy a share (one share equal 25 USD) and they use the share money to operate their business as the longan's input provider. The association plays a very important role in term of technical supports and linking the products to the markets. The members are provided input materials in advance or loans for tree husbandry. The expenses of these input materials are paid back after harvest. For the large scale longan farmers, they usually buy the inputs in large quantities from Chanthaburi province and transporting by their own truck.



Figure 4. Component of coconut husk using for plant propagation



Figure 5. Young Longan plant

4.1.1.2. Farmers

Farmers began planting longan since 2005. The trend has rapidly grown in terms of expansion in the number of producers and land plantation coverage. There are approximately 165 households growing longan, 60% of which are large privately owned farms of up to 10 ha while the rest 40% owned farm of up between 1 to 1.5 ha. The majority of producers rely on the weather and water sources due to longan need for proper irrigation systems. Farmers use pesticides and herbicides to control insect

attack and clean the weeds. In general, farmers share their knowledge how to cultivate and grow trees trees from agricultural cooperative and other farmers.

During FGD and in-depth interviews with farmers, the plantation techniques and cultural practices of longan production were transferred from Thai farmers in Chanthaburi province. Some of them used to work for Thai farmers as the laborers in longan production. They have learnt how to do plant propagation, plantation and tree husbandry include pruning trees, fertilizer applications, water management, cincturing of branches and stem, pest and disease controls as well as how to induce off-season flowering.

For planting activities such as land preparation, making the pits, install irrigation systems were undertaken by men while women are normally involved in tree husbandry and harvesting. In practice, farmers plough the soil to a depth of 30 cm and expose the soil to sunlight for a period of 20-25 days. The made a pit of 80 x 80 x 80cm with a spacing of 8 x 8m or 8 x 10m with applying the manure at the bottom of the pit, at the rate of 3-5 kg per pit. A stake is placed in order to keep the young plant secure. In general, planting is done in the early rainy season and. During plant development stage, the correct cultural practices are undertaken by hired labors or family member both male and female who work on tree husbandry. Most labor employed by longan farmers are local labor, who stay permanently with a whole family in the farm. Migratory labor are employed in specific activities; the majority for harvesting at about 7-10 people per ha.


Cultural practices of off season longan in Pailin												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Pruning tree					M+F							
Fertilization	M				M			M			M	
Weeding					M+F							
Spraying pesticides								M		M		M
Irrigation/watering	Two times per week				One time per week (M+F)						(M+F)	
Supporting the branches	M+F											
Dwarfing of longan tree					M+F							
Chemical treatment									M			
Harvesting		F+M										
Dressing/grading fruits		F+M										

Figure 6. Crop Calendar of Cultural Practices for Off-Season Longan Production

Note: M=Male, F=Female

Wet season longan does not induce the uniform of flowering and to obtain a higher price, dry-season longan productions have been introduced in response to greater

opportunity. There are routine activities in cultural practices for dry season longan production. The tree husbandry is done after harvesting for mature trees or plants in mature stages of four years of age.. The tree husbandry includes all activities of cultural practices consisting of pruning, weeding, fertilizing, pest management, supporting the branches and dwarfing trees as shown in figure 5 with the specified activities undertaken by males and females. Applying chemical treatment namely potassium chlorate ($KClO_3$) and sodium chlorate ($NaClO_3$) are a great contribution to induce flowering of longan. This activity is carried out by men or household heads who has the required knowledge. To successfully induce flowering, the plant must be healthy and be in the mature stage of leaves with a good management of watering operations.

The domestic markets for fresh longan fruits is good from February to April caused by several events such as Chinese and Khmer New Year. To obtain higher prices, farmers use chemical treatment to induce flowering of longan and make the fruit ripe for a high demand seasons. It takes about six months of flowering and fruit development stages, so harvesting are done at 5.5-6.0 months after blooming. Normally, collectors go to the farms directly with hired labor of 4 -5 people to harvest , grade and dress the fruits before transporting to wholesale markets or o contract Thai buyers.

4.1.1.3. Collectors and Dealers

There were about 12 collectors doing their activities during harvesting periods. The overall activities of collectors are simply to collect and dress fruit. The collectors operation is of rather short duration per year. Some collectors make contracts with farmers to have exclusive rights to buy langan during the flowing stages with an agreement on price. When the harvest season arrives, they collectors come with the labor to harvest and dress the fruits. There is only one big wholesale market called, Phsar Nheak Meas in Phnom Penh which collects many kinds of fruits, both domestically cultivated and imported from neighboring countries. There are also wholesale markets in other provinces of Cambodia. The fruit merchants buy produce and sell to the retail markets around Phnom Penh on a day-to-day basis.

4.1.1.4. Retailers

Longan fruit is normally distributed by retailers to various consumers in a variety of places like fresh fruit stores in city, shops in markets or along roadside, or even at gates of garment factories and bus stations. Normally, with a limited demand and working capital, retailers personally take fresh longan at wholesale markets or farms of 100-200 kg at a time at 2-3 day intervals. Some retailers obtain lower quantity of fresh longan, but along with other fruits from wholesale market for retail sales to different consumers. Retailers at provincial level take fresh longan from dealers who transport fruit from Phnom Penh wholesale markets by various means of transportation such as van, small trucks and other transportation services. Fresh longan receives good prices

on Buddha days, or four days per month Prices are particularly robust during the annual festival when the Cambodian people provide food for the spirits following cultural practices in Cambodian life. In retailing shops of high quality of fruit, longan is usually not in high demand for consumers as compared to other fruits; especially those imported for use in making fruit baskets However, along roadsides, fresh longan fruits are well displayed along with other fruit. Retailers obviously play important roles in distributing and marketing fresh longan fruit directly to consumers. Some of retailers are not satisfied with their longan business as longan has a short life of about 3-4 days with 10-20% losses and retail prices are somewhat stable if quality remains good for 1-2 days under good storage conditions after harvesting. Prices decline rapidly after 3-4 days.

4.2. Flow of Product, Information and knowledge

4.2.1. Flow of Product and Volume

From farmers to consumers, fresh longan passes through collectors, dealers/wholesalers and retailers. The majority approximately 60% of Pailin fresh longan is supplied to domestic markets whereas a remaining 40% is exported to the Thailand or China markets (Figure 7). For processed fruit, the Thai processing company takes on a role of fruit collector as they purchase the fresh fruit from farmer cooperatives and collectors, and deliver it to process plants in Thailand.

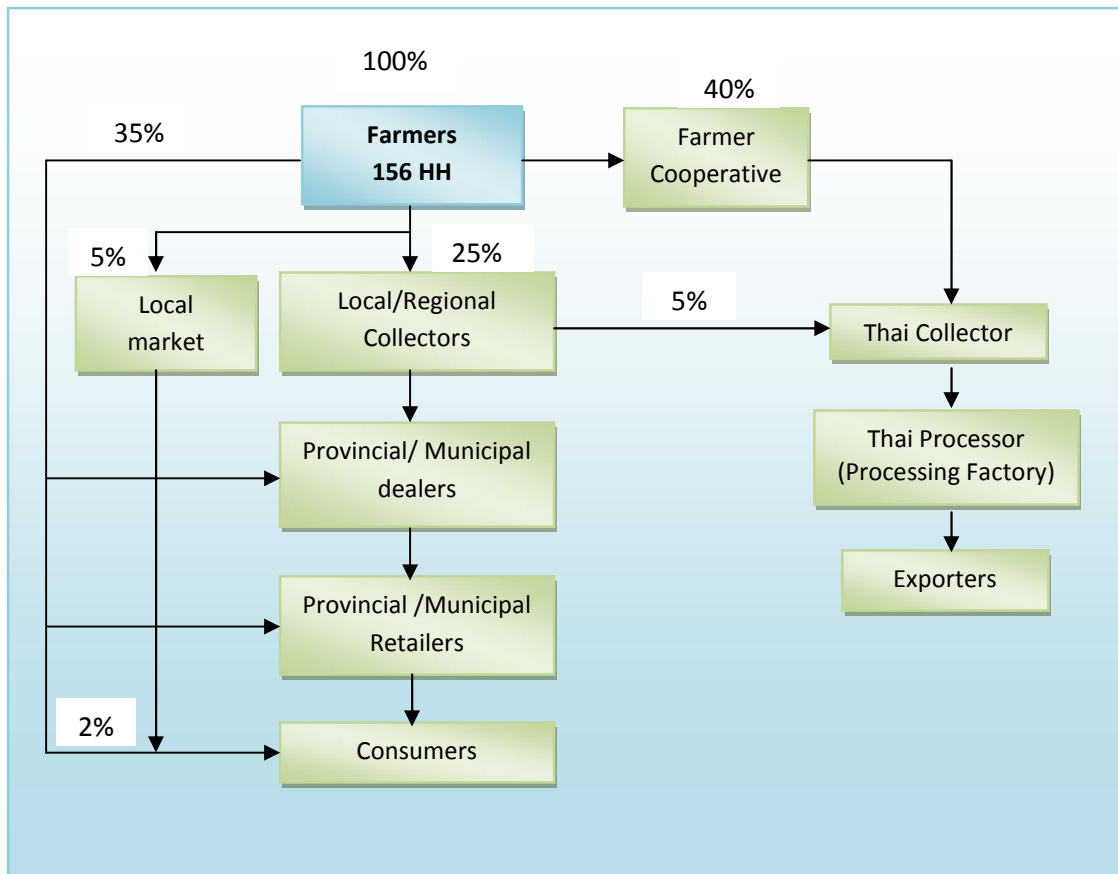


Figure 7. Flow of Product and Volume in Longan Supply Chain

The value chain of Pailin fresh longan follows three channels and each different channel is not complicated if compared with other crops (figure 8). The different channels of the chain are described below:

- **Channel 1:** consists of farmers, local/regional collectors, municipal/provincial dealers and municipal/provincial retailers. This is the main channel of fresh longan value chain in Pailin. Basically longan harvesting is done at 5.5-6.0th month after blooming. During fruit development stages, a farmer usually contacts local/regional collectors and municipal and provincial dealers to estimate productivity of their fields as well as the quality of fruit and an unofficial contract is made between farmer and collector with advance deposits provided. When the harvesting days come, collectors go to farms directly with hired labrs for harvesting and dressing and packing the fruits. Fruit is then weighed and transported to wholesale stores. The price determination longan is generally done by collectors who offer farmers a buying price, based on market information of the previous days. Farmers, who have a long relationship with traders from various wholesale markets in Phnom Penh, arrange the fruit and ship it to the trader in accordance to his or her orders, including information such as amount of quantity and fruit dressing requirements. In most cases, dealers and inter-provincial traders take responsibility to distribute longan fruits to retailers, however, nearby retailers sometimes also transport fruits from wholesale fruit markets and sell to consumers.
- **Channel 2:** The actors of this channel are farmer, local/regional collector and Thai buyers. Normally, farmer and collectors sell to Thai buyers through the farmer cooperative based on the setting price in Thailand. The current grades setting by Thai buyers are not yet fully complied with by producers and collectors. The grading depends very much depending on sizes and colors of fruits and demand. Approximately 50% of the produced longan does not meet export markets.
- **Channel 3:** This channel consists of farmer, local retailers and consumers. Famers usually sell both lower classes and un-graded fresh longan directly to consumers or local retailers who latter sell fruit to consumers in the province. The low class of longan is sold in low price about KHR 1000-1500 while the un-graded fruit in branches form is sold about KHR 5000-6000 per kg. From the economic point of view, this channel is not very significant based on the volume of produce flow.

Since road conditions have improved drastically in recent years, a steadily growing number of collectors and individual farmers alike have stepped into the trading business. This has changed the traditional nature of marketing channels, in that farmers themselves load their produce to sell directly to the wholesale and retail markets in

Phnom Penh and other large cities. This change cuts out the middlemen and increases farmer profits.

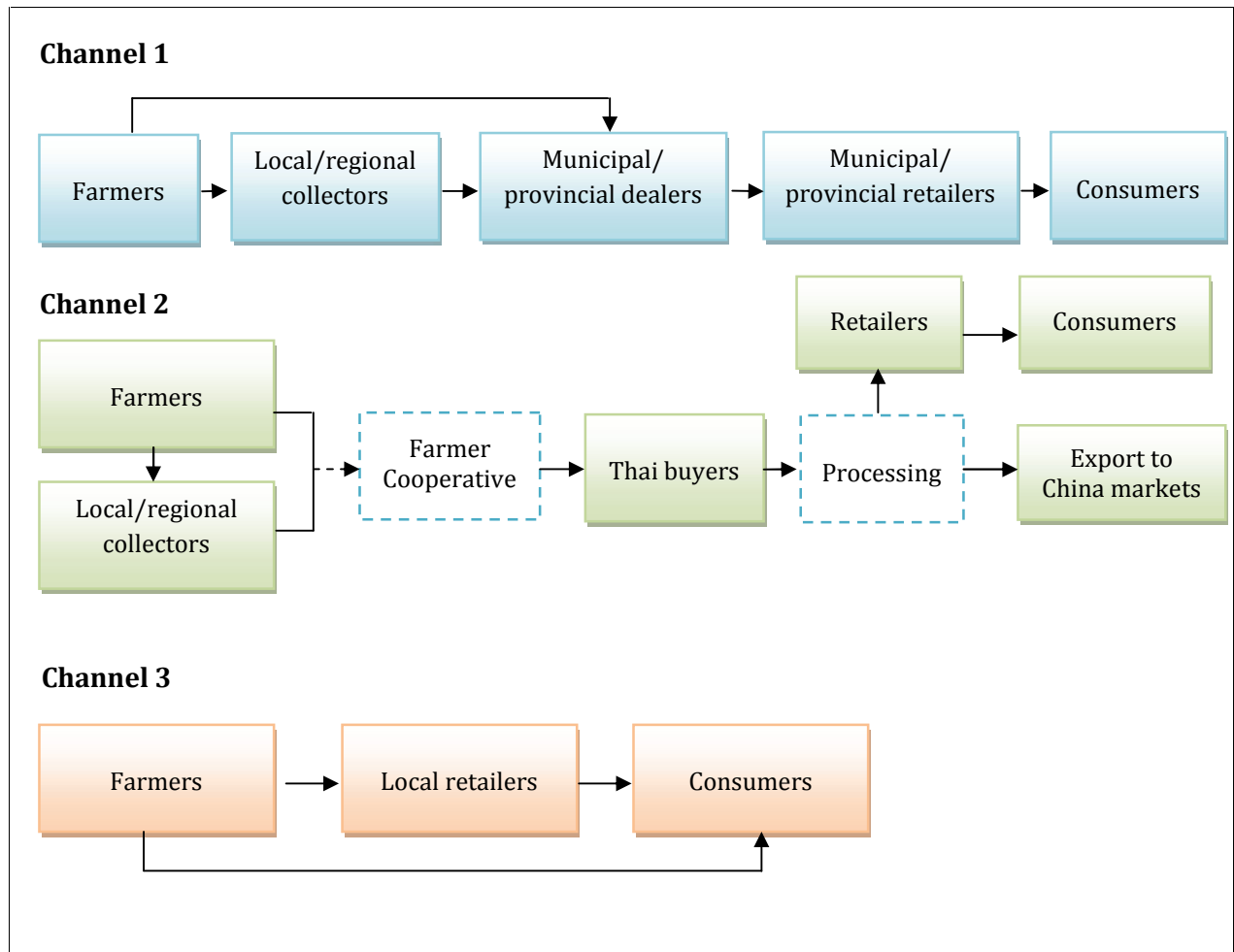


Figure 8. The Different Channels of Product Flow Chain of Pailin Fresh Longan Fruits

4.2.2. Knowledge and Information Flow

Longan is one of the major agricultural exports in Pailin, however, cultivation of off season, is knowledge intensive, and weather conditions are favorable to cultivation when too cold or when there is too much rain. Farmers need to know in detail the optimal timing and quantity of the application of flowering chemical ($KClO_3$ and $NaClO_3$), which depends on several factors including the age and type of the tree, the amount of light, etc. that only experienced farmers know. The farmers also need to know appropriate pruning techniques that will allow optimal application of the flowering chemical. Most importantly, farmers need to know the market conditions in order to ensure that the timing of the production meets the market’s demand. It was reported that, inducing the flowers is the most challenging in the off season longan production and about 50% of farmers who cultivated off-season longan succeed.

In growing off-season longan, farmers often seek casual advice from technical advice of Pailin Longan Product Agricultural Cooperative and Provincial Department of Agriculture or other long stand farmers that provide advice regarding agricultural farming. Farmers normally access the cultivation techniques (watering, application of fertilizer and pesticides, harvesting, etc.) and share experiences with longan producer groups through annual meeting of famer cooperative or consulting with a long standing farmers who have successfully induced flowering of off season longan concerning their problems. It was reported that no experts from related government agencioes as well as related research institutes and universities. Technical knowledge on off season longan production was disseminated from Thai farmers at Chanthaburi province because some Cambodian farmers used to work in Thai farmer’s longan farm. Recently, almost of inputs such as chemicals, fertilizers and pesticides used for longan production are exported from Thailand as well as longan cultivars. It had been found only two cultivars of off season longan were grown in Pailin namely Edaw and Biew Kiew, comprising 95% of total cultivated areas due to high yields, good markets and relative ease of meeting cultivation practices.

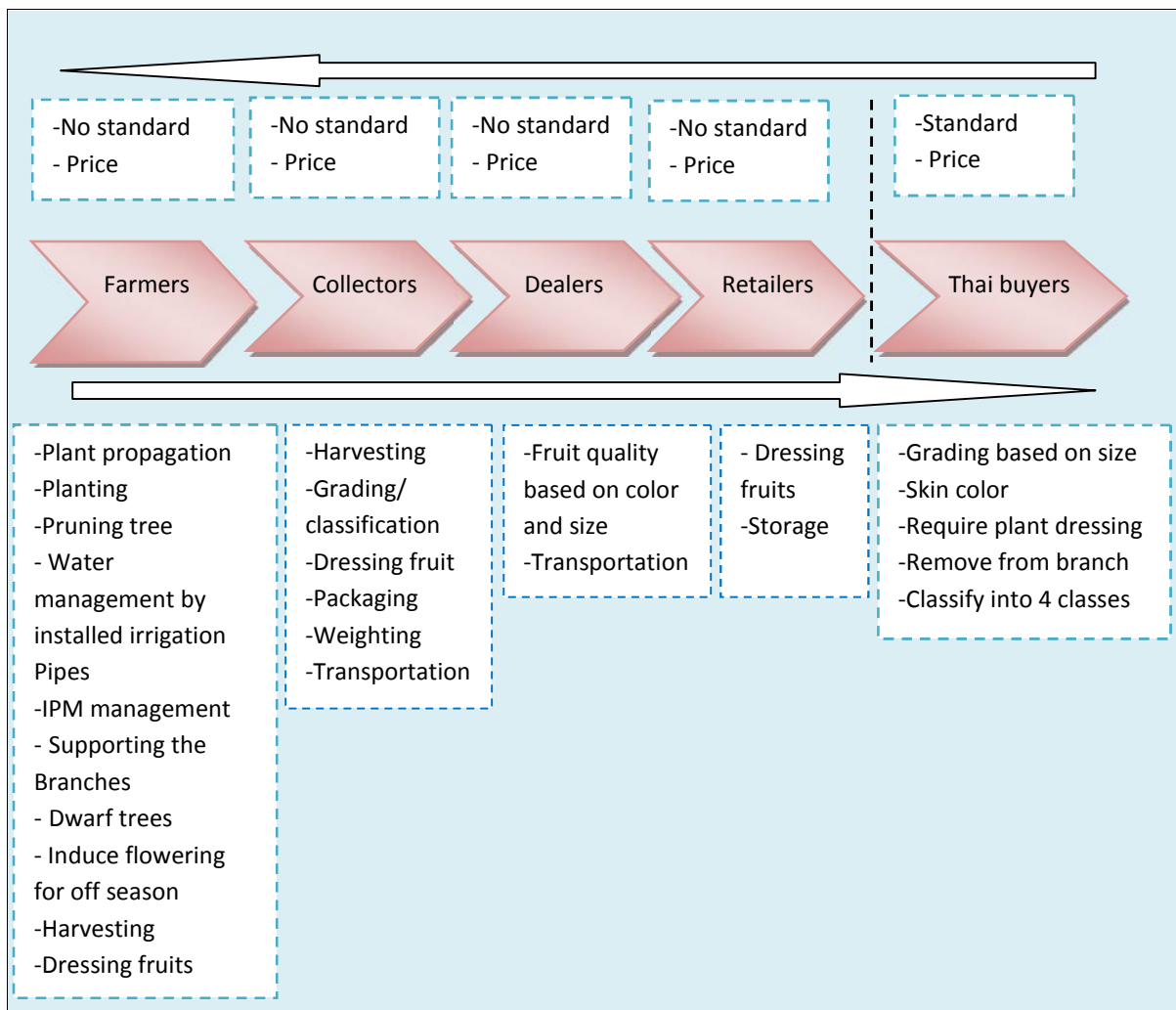


Figure 9. Knowledge and Information Flow of Longan Value Chain

There is no existing quality standard for longan in Cambodia and the domestic markets for fresh longan do not require standards. Regarding to FGD with farmers and individual interview with the leader of farmer cooperative, Thai buyers have used Thai quality standards for longan by grading of fruits into three grades, namely A (55-75 fruits/kg or 14-18g/fruit), B (76-80 fruits/kg or 12.5-13.2g/fruit) and grade C which consists of more than 80 fruits per kg. The latter grade encompasses most small fruited seedless types and does not meet export market requirements. This grade is used to supply domestic markets in lower prices because local markets prefer fresh longan in branches forms. Farmers complained that grade C is composed of about 50-60% of the total production and the market demand for this type is very small. Most of farmers preferred domestic markets and each farmer normally has dealings with 2-3 collectors for selling fresh longan more easily as better price could be secured due to competitive buying prices among those collectors. The contract is usually not initiated by the farmer but the collector who deposits advance payments at during the pre-harvesting period and the rest money is paid to grower on the day of harvesting fruit. However, some collectors break the contracts due to price declines, so they did not come to harvest the fruit. In this case, farmer would be able to sell their product to other traders based on the prevailing market price. Most of growers are satisfied with current price stability.

4.3. Relationship and Linkages

The relationships between the different actors within the longan value chain and farmer cooperative is quite dynamic in developing efficient channels to get product grown and marketed. At the production level, the cooperatives play a critical role in providing technical support. in response to farmer's needs. They also help farmers to access inputs at lower prices and provide the input materials in advance or on in kind credit loans for tree husbandry. Concerning marketing aspects, the cooperative acts as the lead firm and maintains good relationships with the supporting service providers and Thai traders in terms of identifying the better markets, increasing negotiating power to get better and more consistent prices through contract arrangement and provide internal governance to ensure that these contracts are met. Recently, the cooperative acts as exporter and the the planned processing factory is planned to increase export capacity and boost the demand for higher production volumes.

Plant husbandry and induced flowering of lonagan require technical knowledge. Most of longan producers are members of the Pailin Longan Product Agricultural Cooperative. They gain benefits through exchange of production experience and measures to produce a high quality product for export markets. Normally, farmers produce the fresh longans that do not meet export standards, particularly fruit size. The linkages between farmers and the cooperative helps the farmers acquire advanced technologies. Therefore, if the linkage is effective, it will bring benefits to three parties include the cooperative, input supply enterprises and producers.

There is little or almost no relationships between actors and government agencies because the development of longan research, education and extension services are weak and there are no effective mechanisms to foster these links. The relationships among farmers are seen in form of exchange of production knowledge and agricultural inputs. There is almost no relationship among collectors while there are some linkages between farmers and collectors or among farmers and exporters in terms of supply contracts or providing input credits.

4.4. Rules and Regulations

There are restrictions on standards for export markets while domestic markets are basically unrestricted. Normally domestic markets do not require standards. Retailers sell the whole fruit bunches and then undertake some activities such as dressing the fruit before selling to consumers. Fruit dressing is done at the farm before weighting and transporting to the wholesale and retail stores.

Table 8. The Classification of Longan Developed by the Ministry of Agriculture and Cooperatives Concerning Thai Longans Standard

Classification	Notifications/Characteristics
Extra class	Longans in this class must be of superior quality. They must be characteristics of the variety. The colour of longans's skin must be uniform. They must be free of defects, with the exception of very slightly superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.
Class I	Longans in this class must be of good quality. They must be characteristics of the variety. The colour of longans's skin must be uniform. Slight defects may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package. Slight skin defects not exceeding a total area of 0.5 cm ² .
Class II	This class includes longans which do not qualify for inclusion in the higher classes. Slightly defects may be allowed, provided the longans retain their quality, the keeping quality and presentation in the package. Skin defects not exceeding a total area of 0.5 cm ² .

Source. Thai Agricultural Standard for Longan, 2003

There are no quality standards for longan in Cambodia. For export markets, Cambodia farmers adopted the Thai Agricultural Standard for Longan that was developed by National Bureau of Agricultural Commodity and Food Standards of Ministry of

Agriculture and Cooperatives of Thailand. During harvesting season, Thai traders in cooperation with farmer cooperative, go to collect fresh longan using Thai Standard for Longan. The Fruit colors, apart from fruit size determine the price and meeting the standard requirements of export markets. The “golden yellow” color is desired with 4 grads of longan for export market. The price and product standard is set by Thai collector that usually determine the export market price.

The longan fruit must be properly harvested according to the harvesting pattern and post-harvest operation in order to arrive at quality specific to the cultivar and location. The fruit must be mature and acceptable conditions upon reaching the destination. For every grade of the Standard, the fruit must be a whole fruit not spoiled, not blemished nor have obvious scars, free from pests or damage caused by pests, and free from abnormal odor and taste, except the odor resulting from specified food additives. For fruit size, this is determined by the number of fruits per kilogram or the diameter of the equatorial section of the fruit, in accordance with the following table 7 below:

Table 9. Provision Concerning Sizing of Bunch and Individual Longan

Size Code	Number of Fruits (per kilogram)		Diameter (in millimeters)
	Bunch	Individually (pedicel cut at the first knot)	
1	<85	<91	>28
2	85-94	91-100	>27-28
3	95-104	101-111	>26-27
4	105-114	112-122	>25-26
5	≥115	≥123	>24-25
6	-	-	22-24

Source. Thai Agricultural Standard for Longan, 2003

4.5. Support Services

4.5.1. Pailin Longan Product Agricultural Cooperatives

Regarding to the compilation of legal framework for promoting agricultural cooperatives in Cambodia, the main purpose of the establishment of Agricultural Cooperatives is to facilitate the effective leadership and management of production, business, and marketing of production and agricultural inputs of the cooperatives to promote the better living standard of cooperative member and contribute to the socio-economic development (MAFF, 2011).

The Pailin Longan Product Agricultural Cooperative plays very important roles in terms of providing technical support and linkages of product to export markets. The business of the cooperative is to inputs and technical support on production techniques and application of the recommended rates for fertilizer in bearing trees and flowering induction. Therefore, Longan production has remarkably increased in the cultivated

area where the marketing for the product is driven by the cooperative. However, the capacity of the cooperative is limited in terms of promoting a vertical linkage among the value chain stakeholders. The development and application of a collective technique based on Good Agricultural Practice (GAP) does not yet exist and recently the production techniques used are not applied in the same direction as the results fall far behind the standards for export markets. Moreover, there are no activities related to fruit processing in province. Recently, the processing factory to process fresh longan for drying and canning is planned in order to increase export capacity as output and demand rise.

4.5.2. Provincial Department of Agriculture (PDA)

The main role and responsibilities of Provincial Department of Agriculture is to provide the appropriate training and technical supports to the farmers. The PDA staff is responsible for extension and technology transfer programs down into communes and villages and for coordination and integration agricultural planning for districts, communes and village levels. They are also responsible for data and information collection such as statistical information and some regulatory activities.

The PDA in collaboration with donor projects, provide facilitating the formation of agricultural cooperatives on the relevant laws, regulations and administrative procedures and also providing training courses to agricultural cooperative leaders and members with all relevant topics in order to strengthen the capacity of cooperative leaders and its members. From this activity, 37 Agricultural Cooperatives have been formed through ADMAC and Food Security projects and still under control by PDA after project are finished.

In terms of longan production, there are no experts in Pailin PDA and the application of a collective technique based on Good agricultural Practices (GAP) does not yet exist. A technology transfer to farmers is done by the cooperative which has the technical working group to take required actions for technical supports to members and other farmers. Interestingly, the large scale farmers were reported as the skillful producers with their own property and they can handle their business effectively by themselves.

4.5.3. Provincial Department of Commerce (PDC)

The Provincial Department of Commerce is one of the important supports and plays an important role in the value chain. Its functions are to identify potential markets, organize exhibitions, to facilitate cross-border trade with Thailand, to monitor and regulate market monopoly, to promote export of the provincial products, and to attract foreign direct investment (FDI). A number of meetings between Pailin and Chanthaburi have been held to discuss cross-border trade facilitation for agricultural commodities, especially cassava and maize. There have been a number of issues with regard to exporting cassava, maize and soybean with Thailand. The recent issues include quota restrictions on imports of cop maize, fresh cassava, and soybean from Pailin. All

products imported from Cambodia are in form of semi-processed in order to prevent subsidy advantage of Thai government for Thai farmers. Little progress has been made on the talks (Director of Provincial Department of Commerce per. com. 30 January 2013). Like the Provincial Department of Agriculture, the department faces the same problems and issues including negotiation skills. Export licensing has not been decentralized to the department. All export companies must apply export license and Certificate of Origin (CO) from the Ministry of Commerce resided in Phnom Penh.

4.5.4. Custom Checkpoint Office

The customs checkpoint in Phsar Phrom and Ban Phakat cross border checkpoint is under direction of Provincial Customs Branch of Pailin province. The roles and responsibilities are include i) carrying out the collection of all duties and taxes in accordance with the various laws and regulations on imported and exported goods, ii) investigating, preventing and suppressing all customs offenses, in particular combating against all kinds of smuggling activities in geographical areas under its control as determined by the General Department of Custom and Excise (GDCE), iii) issuing the customs clearance documents and directly controlling all documents related to imported and exporting goods at its entry points based on laws and regulation in effect and iv) collecting data on imports and exports. Export declarations have to be made triplicate and be submitted to the Customs Office, accompanied with the documents such as customs declaration, commercial invoices, packing lists, export license and certificates of origin (CO). The import and export procedure has been done as mentioned in figure below:

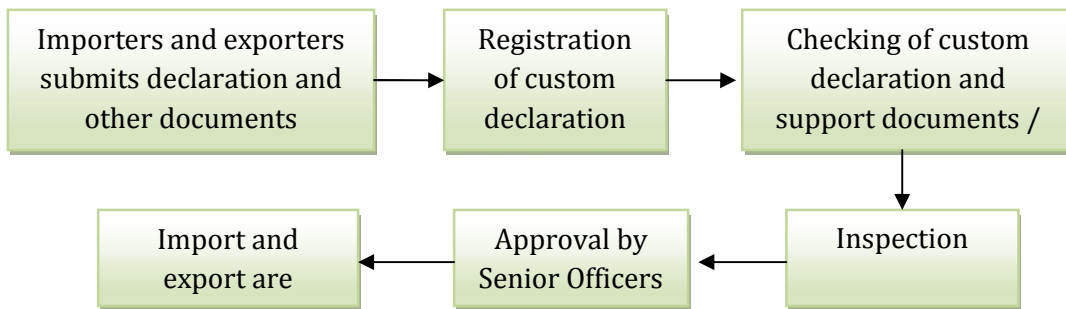


Figure 10. Import and export declaration Procedure in Phsar Phrom Cross Border Checkpoint

4.5.5. Bank

The banking system in Cambodia actually plays only a minor role in agriculture sector. Most of the farmers have little contact with banks due to have a very complicated system in borrowing. Normally they borrow from their relatives, business associations, shopkeepers, or other nonfinancial entities and are often charged exorbitant interest rates.

Due to high production cost, Longan farmers need loans to buy agriculture inputs such as installation the irrigated system, fertilizers and pesticide. Increasing interest rates on loans could make it difficult for farmers and traders to expand their business. There were complaints of interest rate as high as 10% compared to neighboring countries, where banks charge around 3-4% per year. Farmers would have a better chance of getting loans to expand their production capacity if the banks lower rate to around 5-6% per year. Recently, ACLEDA Bank, Cambodia's largest domestically owned bank, has been increasing its percentage share of its loan portfolio into agriculture from 15% to 19% at the end of March 2012. Nevertheless, farmers still suffer because of higher interest rates offered by micro lenders, while strict requirements from banks were still a barrier for investors in the longan sector.

4.5.6. Civil Societies

There have been a number of NGOs such as CARE and World Vision working in the province. However, all of these NGOs have phased out their projects. Most of their programs targeted farming systems on a small scale basis, but not agro-industry farming such as cassava, maize or soybean. They do not have any direct roles in value chain.

There are 37 farmer associations in Pailin. The functions of the farmer association are to buy agricultural products, sell seeds, provide credit and offer savings to members and non-members. The capacity of the associations is weak and could not compete with private sector such as retail shops and private companies because business skills are very limited. Unlike the Thai collectors and the private companies which operate in the province as seed providers, the association could not provide extension services such as training to farmers on field demonstration. The associations are more engaged in money lending and buying products as brokers.

4.6. Analysis of Value Chain

4.6.1. Costs and Margins

Despite having the highest percentage of added unit cost (Table 10), farmers and collectors receive the highest percentage of added unit profit, while the retailers have the lowest percentage of added unit cost but receive the second highest percentage of unit profit. The dealers have the second lowest percentage of added unit cost, and also receive the lowest percentage of unit profit. The exporter in the longan value chain who act as the collector, has the second highest percentage of added unit cost, but receives the lowest percentage of unit profit. Moreover, farmers receive the highest net profit (Table 10), while collectors and dealers receive the lowest net profit. Farmers have the highest ratio of net profit to total cost, whereas dealer has the lowest ratio of net profit

to total cost. The differences in net profit among the actors in the chain are affected by the differences in the quantity they produce or buy and sell.

Table 10. Costs and Marketing Margins

Actors	Costs (Kg)			Profits (Kg)			Margins	
	Unit Total Cost	Added Unit Cost	% Added Cost	Unit Price	Unit Profit	% Total Profits	Unit Margin	% Retail Price
Farmers	0.22	0.22	39%	1.10	0.882	57%	1.100	52%
collectors	1.10	0.23	39%	1.50	0.175	11%	0.400	19%
Dealers	1.50	0.08	13%	1.75	0.175	11%	0.250	12%
Retailers	1.75	0.05	9%	2.13	0.325	21%	0.380	18%
Total		0.57	100%		1.557	100%	2.130	100%

The data seem to suggest that the cost and net profit are shared more toward lower value chain actors although farmers incur the highest percentage of added unit cost. In addition, the financial rate of return for farmer ranges from 213 percent to 366 percent and the average the rate is about 300 percent.

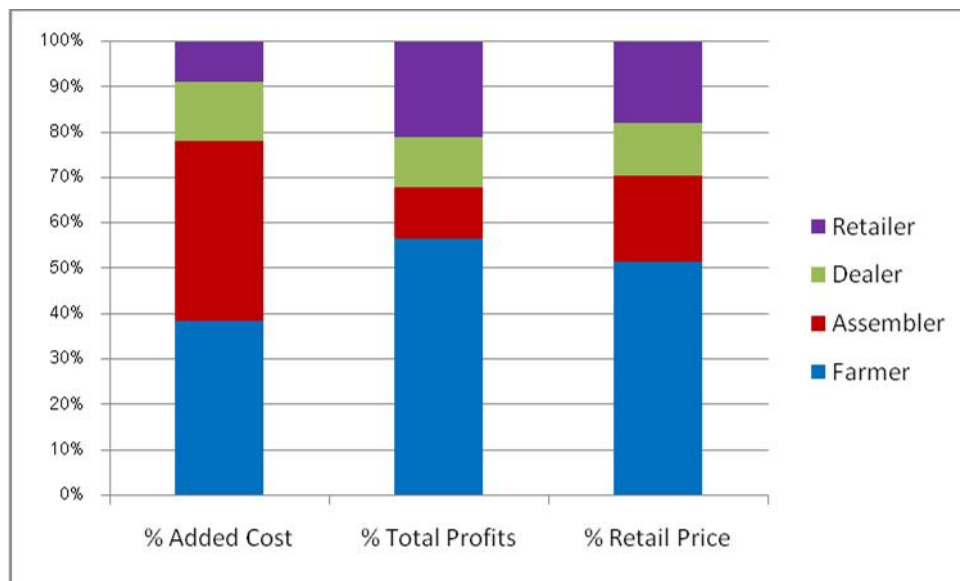


Figure 11. Value Chain Margin for the Each Level of the Value Chain per kg of Fresh Longan Fruit

The major costs of farmers consist of installing irrigation systems and planting, plant husbandry including induced flowering of bearing plants. The basic investment cost including installed irrigation, seedling and land constitute 42% of total production cost in three years (Table 11). Most farmers own the land and only a few rent lands for longan production. It is included in the calculation as an opportunity cost because

farmers are able to rent their lands to others or can be used for cassava cultivation or maize growing. The rental price was extrapolated from the rental price for cassava or maize cultivation. As a perennial crop, longan requires three years to reach maturity and produce the first yields in fourth year. Plant husbandry consists of water management, fertilization, weeding, and pruning and dwarf trees represent 58% of total production cost in three years.

Table 11. Production Post per ha for Longan (3 years Production Cost)

Longan Production Cost	Cost (USD)	%
Basic investment cost (per ha)	3489.33	42%
Installed irrigation system and Planting (Digging holes, install irrigation system and labors for operating)	3000	36%
Land rental	333.33	4%
Plant propagation (1\$ per plant) (Spacing 8m x 8m therefore 156 Plants per ha)	156	2%
Annual expense (routine activities in cultural practices/ha)	1586	19%
Weeding (herbicide and labor)	720	9%
Fuel for irrigated machine (1 time/week)	90	1%
Pest control (two times/month, 50000R/ha/time, pesticide and labor)	300	4%
Fertilization (a time for each 3 months, fertilizer 2 bags per ha, 1600B/ha + labor)	320	4%
Pruning plant and dwarf trees	156	2%
Total expense of 3 years cultural practices (\$1586 x 3)	4758	58%
Total production cost (3 year/ha)	8247.33	100%

4.7. Challenges and Constraints

4.7.1 SWOT Analysis

Pailin longan is one of the main potential crops supporting the livelihoods and improving the economic level of many rural households in Pailin. Further development of longan production will contribute to creating employment and raising the incomes and standards of living of Pailin farmers. The following section deals with the strengths, weaknesses, opportunities and threats of longan value chain in Pailin.

Table 11. SWOT Analyzing of Fresh Longan Value Chain in Pailin Province

<p>Strength</p> <ul style="list-style-type: none"> ▪ Pailin Longan product agricultural cooperative has been formed ▪ Most climatic conditions are suitable for longan production ▪ High and stable prices, compared with other fruits ▪ Strong stable demand for export markets ▪ No competition from import market ▪ Variety awareness & preference from buyers and consumers ▪ Longan products in panicles form is preferable to domestic market ▪ Some trade promotion with support from government policies 	<p>Weakness</p> <ul style="list-style-type: none"> ▪ Lack of production knowledge (induce flowering and fruit sizes) ▪ Lack of post harvest treatment and processing knowledge ▪ Low customers and demand in domestic markets ▪ No standard pricing ▪ Rating products by collector or exporters ▪ Supply agreement for exportmarket is required for high production volume and regularity ▪ Seasonal labor shortages ▪ Immature and over mature fruit at extremes of season ▪ Lack of national quality and grading standards ▪ Retailer frustration with consumers taking only choice fruit from panicle
<p>Opportunities</p> <ul style="list-style-type: none"> ▪ Demand for new foods and variety forms ▪ High demand for export markets particularly China markets but require standards ▪ The drying factory for processing is initiated in research areas ▪ Government policy supports to register Pailin longan as the third GI products of Cambodia 	<p>Threats</p> <ul style="list-style-type: none"> ▪ Low uptake by smallholder farmers ▪ Loss of export markets challenging all fruit to the domestic market ▪ Resistance from retail buyers because of slow sales ▪ High retail margins because of post harvest losses ▪ Damage during transportation ▪ High cost of production

5. Recommendation

5.1. Problem Tree Analysis

Longan is considered one of potential crops in Pailin province as the government has a policy to promote this crop as the GI product of Cambodia. In 2012, forty percent or approximately 400 tons of fresh longan were exported to Thailand while the rest were supplied in domestic markets. The export figure represents 60 percent of the total volume. Farmers have been applying advanced cultural practices as well as off season cultivars for higher productivity, quality and profitability. Some farmers are very experienced in cultivation of longan as they have learnt from Thai farmers and their own experience through trial and error process. Despite some successes, there are a number of problems such as maintenance of trees, inducing flowering, high mortality rate of seedlings, adverse weather conditions, price instability, large proportion of fruits do not meet quality standard for export market, domestic market constrained in ceremonial days, trade facilitation issues at border and so on (for detail see Annex). Nevertheless, these issues are related to two main issues in productivity and quality.

5.1.1. Production Stage

There are three major issues at production level. These are maintenance issue, flowering inducement and high mortality rate of seedlings. They might have been related to the following conditions:

- **Improper use of chemical treatment:** two related chemicals namely potassium chlorate ($KClO_3$) and sodium chlorate ($NaClO_3$) have been used effectively in producing off season longan. Both chemicals have almost the same effect in inducing flowering of longan. However the applications of these chemicals might have not been in the recommended rates and in the conditions, especially in growing stages of the plants and inducing flowers.
- **Improper application of fertilizers:** farmer's knowledge about fertilizer's applications is inconsistent. Different farmers apply chemical fertilizer inconsistently. As the results these could have effects on flowering, survival rate of seedling and quality of fruits
- **Poor practices in water management:** water is the most important factor in longan production, particularly related to seedling survival rate and fruits bearing. Drought is also unfavorable condition to seedling survival and fruit bearing. Some farmer used water from the streams, but the water is dried up in dry season. The Irrigation is required at the time of panicle emerging, flowering, and fruit development and after harvesting until the maturation of the post-harvest growth flush. Due to high cost, some farmers are unable to afford to install the irrigation system properly. Insufficient water supply leads to unsuccessful flower inducing and even death of seedling. Besides, improper of installation of the irrigation system is the key to low productivity and quality standard of longan. There is no irrigation

system in Pailin province, so farmers have to take more investment to make the pond to keep water.

- Improper uses of cultural practices:** Cultural practices including pruning tree, fertilization and pest controls are required to apply in the right time of plant development stages. To be successful in inducing flowering of longan, the mature longan plant must be healthy and in the stage of mature leaves. To make this done, the proper practices should be applied together with right recommended rates of fertilizers and pesticides.

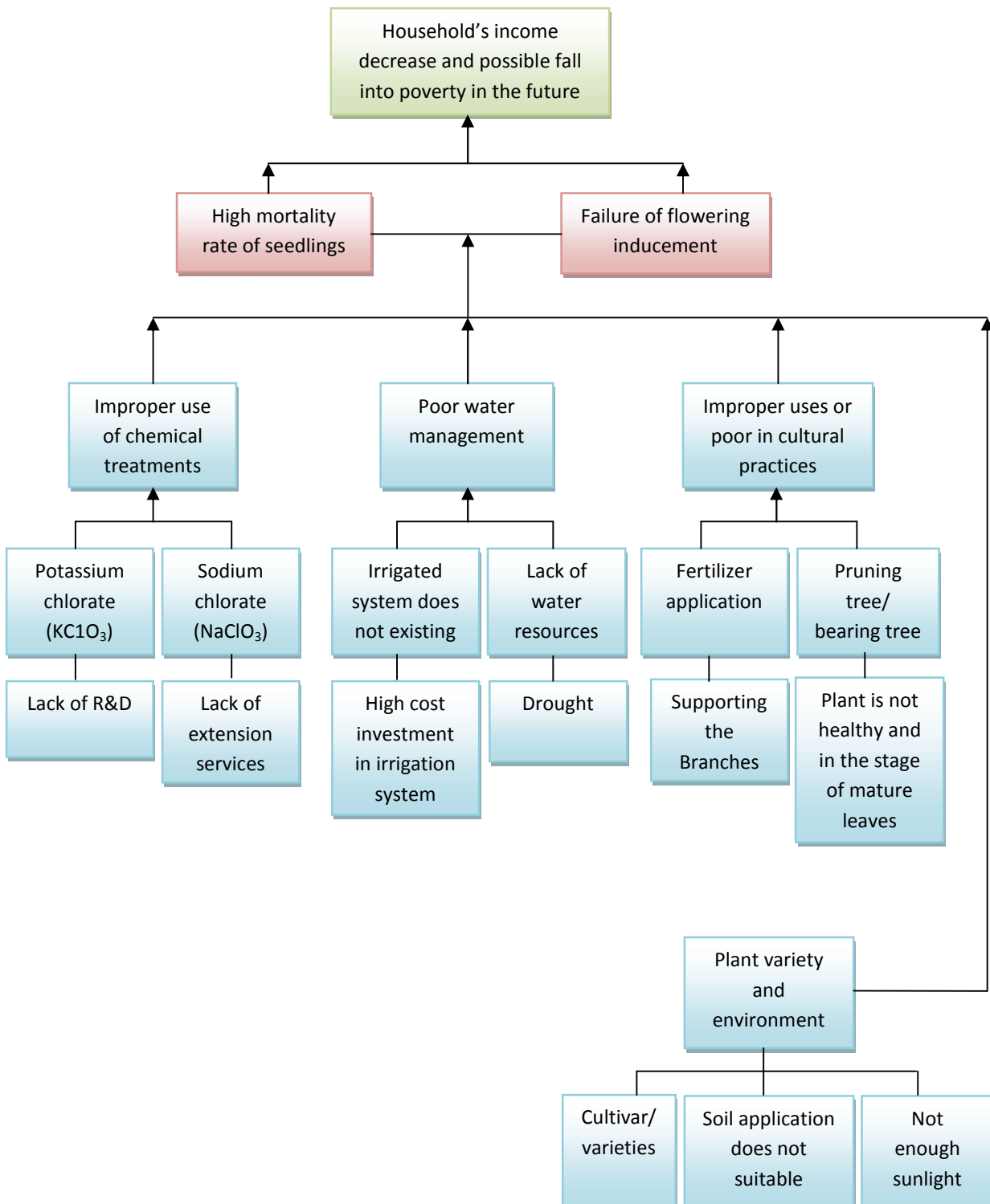


Figure 12. Problem Tree Analysis in Production Stage of Longan Value Chain

- **Plant varieties and environment condition:** the constraints in this areas are include:
 - a. Farmer might not use off season cultivars: regarding to DOA of Ministry of Agriculture and Cooperative, Thailand, only a few cultivars have been selected to produce off season fruits. Among them, “Phet Sakhon” and “Edaw” have been quite popular in many growing areas. In Pailin “Edaw” and “Biew Kiew” occupied approximately 90% of plantation areas. However, about 75% of induce flowering per plant has been done by knowledgeable farmers while still high percentage of failure in inducing flowering has been reported in these areas. Inducing the uniformed flowing is still a main constraint for famer.
 - b. Soil application might not be suitable for longan palnts: Pailin soils are identified as very suitable soil for longan trees, however, some plots of land do not have proper soils for this crop .
 - c. Not enough sunlight: pruning and dwarfing of the longan trees by cutting the central branches is required to open the grown to receive sunlight and not allowing it to grow to high, as well as to induce the tree to spread out sideward, which makes it easier to manipulate.

Weather fluctuation sometime causes a big problem for longan growers; especially for the inexperienced farmers who could face a high risk of loss totally longan productivity due to improper handling of watering, pests and diseases and other problems arising due to adverse climate change.

5.1.2. Marketing Aspects (Quality of Product)

Despite 60 percent of longan produced in the province has been reported to export to Thailand, the figure varies from year to year depending upon change in market demand for the fruits. In focal group discussions with collectors and the export group, it was revealed that there is high demand, for almost all grades were exported to Thailand, but only grade 1 and 2 were bought by Thai buyers. This suggests that large proportion of fruits do not meet the export market standards. The demand for high quality of fruits remains high. Thai buyers have used Thai quality standard. There are three grades, namely A (55-75 fruits/kg or 14-18g/fruit), B (76-80 fruits/kg or 12.5-13.2g/fruit) and grade C (more 80 fruits per kg). The latter grade encompasses most small fruited seedless types which do not meet export market is supplied to domestic markets in lower prices because local markets prefer fresh longan in branches forms. Farmers complained that the remained latter grade constitutes a high proportion of about 50-60% and the market demand for this grade is very small.

The domestic demands for fresh longan comes mainly in annual holidays and Buddha days. Sales of longan outside these events are limited due to low demand and no direct supply in supermarkets or fresh fruit stores. There is no existing quality standard for longan in Cambodia. Farmers are unaware of quality standards and are unable to produce fruits to meet the quality standard, particularly for export market. It is believed that there are a number of factors that affect the quality standards of the fruits: These are maintenance, variety, water management, and variety selection.

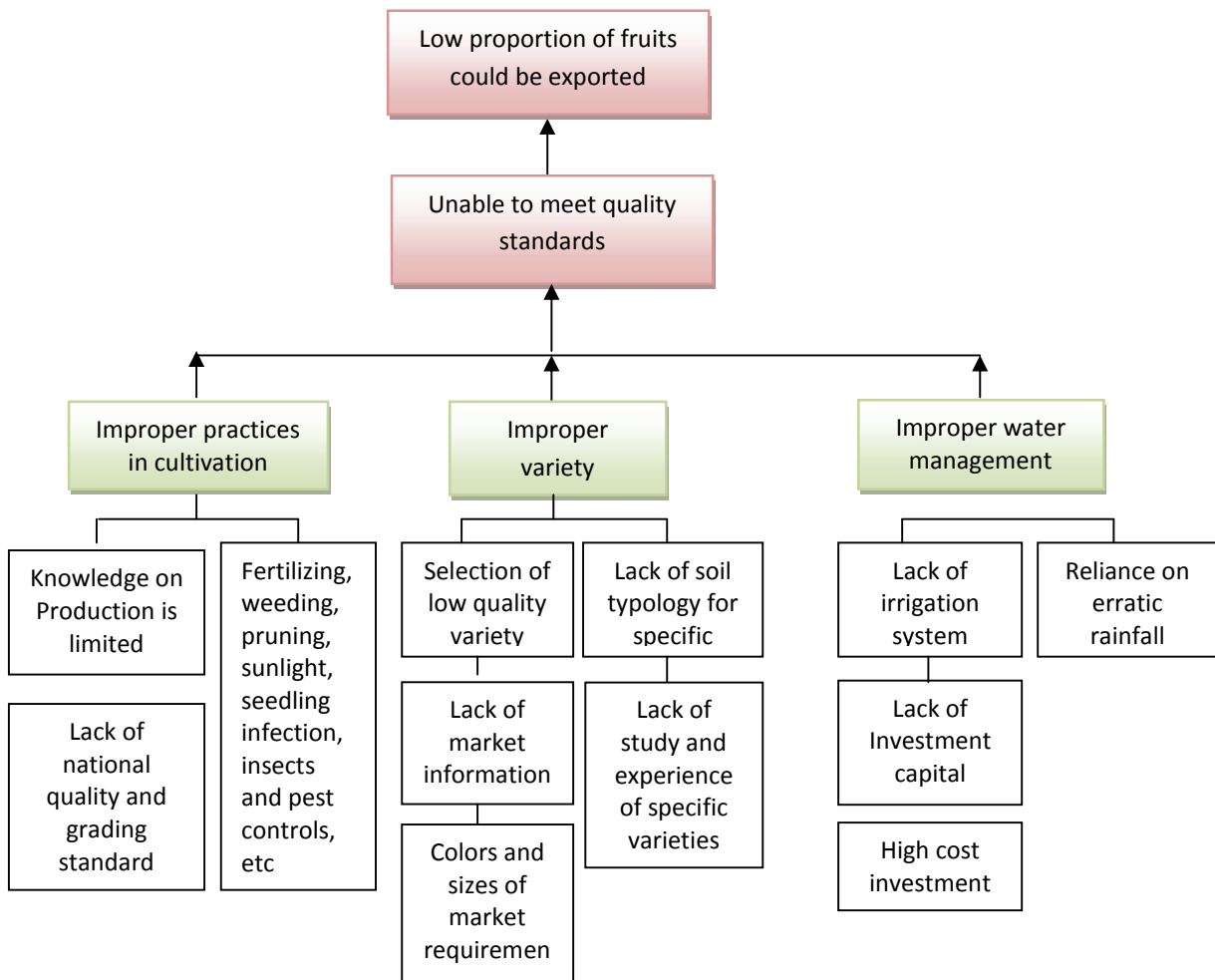


Figure 13. Problem Tree Analysis in Marketing Stage of Longan Value Chain

As it was discussed earlier, the improper maintenance is believed to affect the quality of fruits for the export markets. This was due to limitations of farmer’s knowledge in production including fertilizer application, pruning, weeding, pesticide, sunlight requirements and so on as well as a lack of national quality standards as guide in production.

Lack of water supply is one of the main factors contributing to quality standard of the fruits as this will water content, taste and nutrition contents of the fruits. The lack of water supply is attributed to lack of an installed irrigation system. The installation of

irrigation is expensive and some farmers, especially the small scale farmers are unable to afford and have to rely on erratic rainfalls to supply water to lognan.

Improper selection of variety is attributed to selection of low quality variety due to farmer's lack of information about market such as color, taste, and size of fruits. In addition, this is also attributed to geographical location that could have an effect on variety of the trees suitability and adaptation and weather affects applications of chemicals for flower inducing and fruiting and fertilizers.

5.2. Strategies and Intervention Areas

As mentioned earlier that the productivity and the quality of longan are the two major issues in value chain of longan that all actors are facing. These two issues affect the volume of trade and access to export markets. Although the market of longan is constrained in ceremonial days, the demand for high quality of the fruits remains high, especially the export market, thus the objective of intervention is to improve productivity and high quality of longan by developing and application of collective cultivation techniques for fresh longan based on Good Agricultural Practices (GAP).

Production Aspects

- a. Improving cultivation techniques through
 - i. Proper use of chemical treatments. This includes the applications of right doses of $KClO_3$ and $NaClO_3$ in flower inducement
 - ii. Good practice of water management. This is consisted of installing irrigation system and adequate water supply , especially at different stages of growth
 - iii. Good practice of maintenance. This includes appropriate applications of fertilizer at different stages of growth, carrying out pruning and bearing trees and branches to ensure that there is enough sunlight penetration

Quality Aspects:

- iv. Good environment and selection of right cultivar. This includes selection of the right cultivar of the trees that the market demands, conducting soil typology for appropriate cultivars in land
- v. A national quality standard is developed for farmer's use as reference for selecting the right cultivar and for improving exporting market

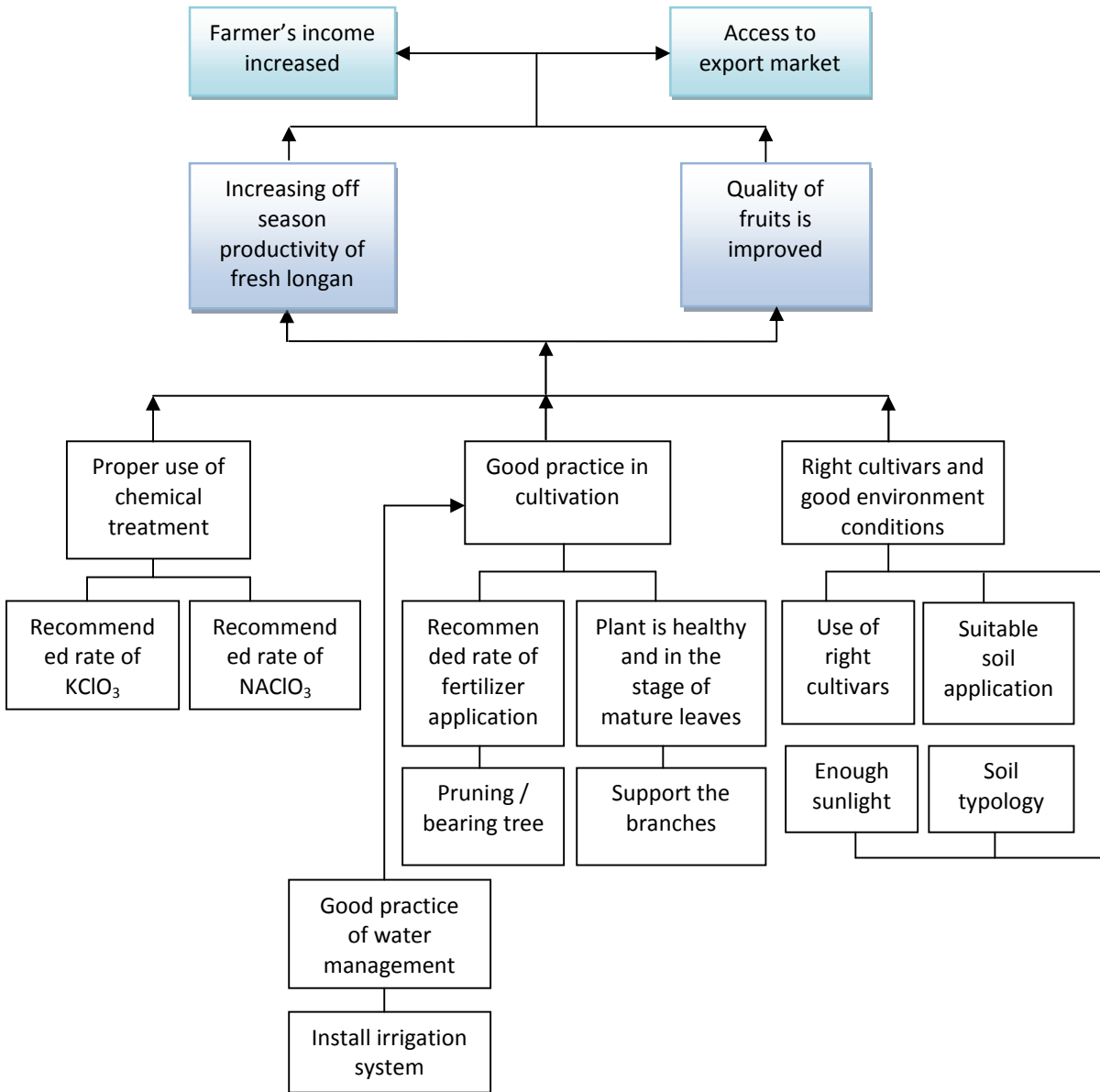


Figure 14. Objective Tree Analysis of Longan Value Chain

6. Policy Issues Related to Value Chain Strengthening

6.1. Demand Side Policy Imperatives

The preceding Value Chain Analysis shows a reasonably well functioning value chain on the **demand side** with functional linkages and a high degree of competitiveness and price stability. The most prominent constraints in the demand side include cumbersome and time consuming border transaction and export procedures, including Thailand import quotas and rent seeking behavior on the part of some officials on both sides of the border. Both of these phenomena inhibit the upstream end of the total chain from functioning efficiently and tend to add costs rather than much value to the export track beyond the production area in Cambodia.

The factory gate price from Cambodia maize in Thailand is \$3.30/kg. The ex-farm gate price in Cambodia is \$1.10. Taking the mean distance from the Cambodian border to Thailand fruit processing factories of 350 km and a mean Thailand transport cost of Baht 4/ton-km, the transport cost from the border to the factory is $4 \text{ baht}/\$31/\text{ton} \times 350\text{km} = \$45.00/\text{ton-km}$, or $\$0.045/\text{kg-km}$. Assuming 50% losses from border transaction and transport delays, this suggest that transaction costs from fees and rent seeking and NTBs at the border amount to $3.20 \times 0.50 - 1.10 - 0.045 = \text{US\$ } 0.45/\text{kg}$. These estimates suggest that there is an urgent need for the EWEC states to agree on a common single window border procedural regime, including uniform SPS standards with a regional inspection mechanism to curb border rent seeking and non-tariff barriers to cross border trade.

Although the value chain study regards the Thailand import quotas to be temporary exogenous restraints to trade. There is no room for for import and export quotas in a common market framework. ASEAN states should be encouraged to discuss and dismantle import and export quotas within the framework of the emerging EWEC economic cooperation.

6.2. Supply Side Policy Measures

6.2.1 Climate Change

A critical supply-side policy intervention addressee the issues of impending climate change and requirements to address climate change by strengthening value chain resilience.

IPCC global climate change models utilizing middle range carbon emissions scenarios forecast an average annual temperature worldwide to rise 2 degrees celsius by 2050. But the impact and adaptation study forecasts a far more extreme future for the lower Mekong. As shown in the map below, some parts of the basin, including the eastern plains of Cambodia and parts of the central highlands of Vietnam could see average annual temperature increases of 4C to 6C. This increase will mean dramatic changes in the comfort zone of crops and fish and livestock species, which could have serious

negative consequences for the livelihoods, health and food security of the local communities in these areas.⁴

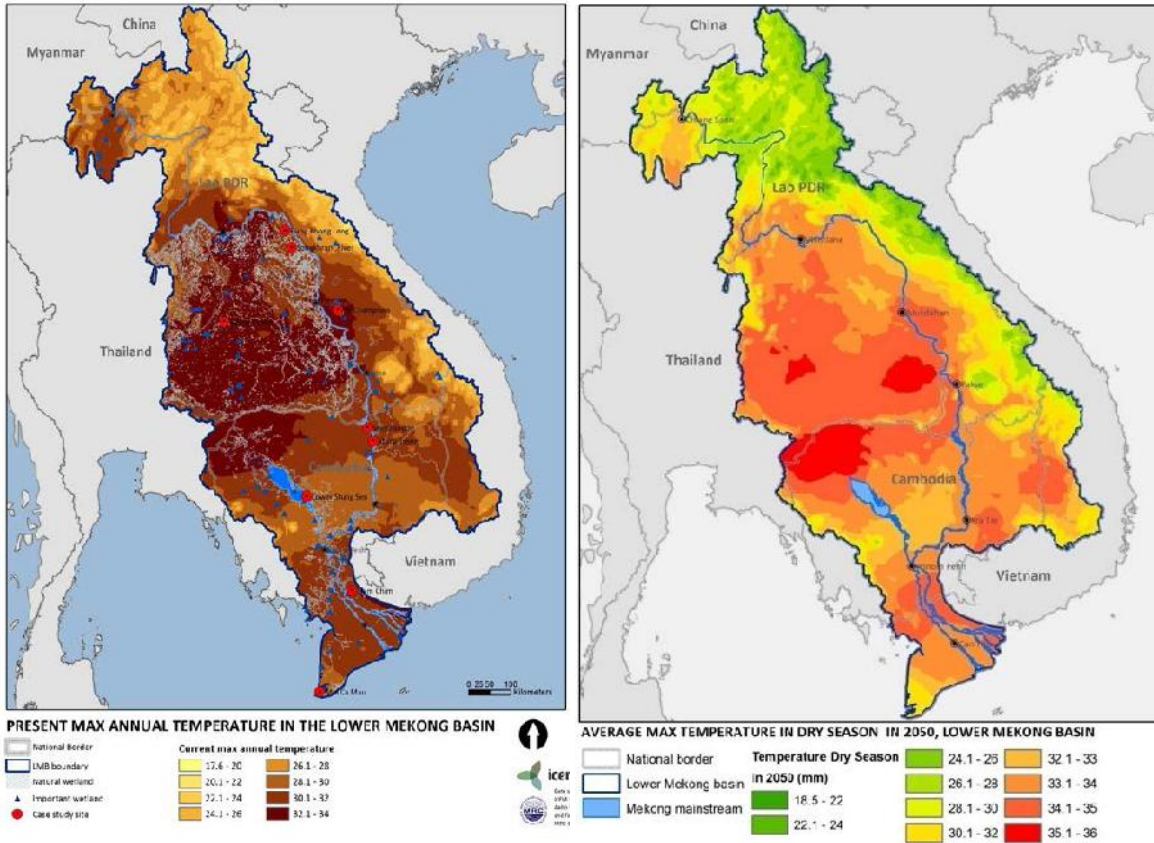
The Climate Change Impact and Adaptation Study for the Lower Mekong Basin study adopts a basin-wide, spatial approach in quantifying shifts in the geographical suitability of the key crop species and impacts on other livelihood sectors by 2050. Statistical downscaling of Global Circulation Models was used to regionalize global climate projections and coupled with a land use suitability assessment tool to examine the impacts of projected changes in climate on the suitability of seven crops: fruit , rainfed rice, soya, maize, cassava, robusta coffee and rubber. The spatial approach applied in the Study not only highlights areas projected to experience major changes due to climate change but also identifies the priorities for adaptation response.

The Integrated Water Resources Management (IWRM) watershed model, developed by the EIA Ltd, MRC, World Bank, Aalto University and ICEM was applied for the whole Mekong Basin. The Land Suitability Evaluation Tool (LUSET), developed by IRRI, was adapted by the study and coupled to the IWRM model to assess the suitability of seven crop species when projections of future changes in climate are factored together with topographical characteristics. These crops are: **fruit crops, rainfed rice, soya, maize, cassava, robusta coffee and rubber**. Lastly, the Aqua Crop yield model developed by FAO was also coupled to the IWRM model to estimate impact of climate change on rice, maize and fruit yields in a number of locations across the basin.

An important output of the study is the identification of climate change hotspots to better understand how climate change will alter ecosystems and impact the 'comfort zones' of key crops and other community livelihood and subsistence options. Comfort zones are ranges where temperature, rainfall and soil conditions create favorable conditions for production. These will shift as a result of climate change making conditions unsuitable that are today thought of as ideal for certain crops, like the Central Highlands of Vietnam for coffee or Thailand's Chiang Rai Province for rice.

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⁴ Source: USAID Asia. Climate Change Impact and Adaptation Study for the Lower Mekong Basin



To address the negative impacts of climate change, there is a need to improve linkages between research and extension. The goal is to develop draught resistant varieties of fruits and other crops as well as to develop cultural practices that can improve crop resilience to climate change as well as to determine changes in agricultural zoning that will emanate from climate change as well as to identify optimal areas for crop production as climate changes takes hold and accelerate.

6.2.2 Adopting Thailand Grading and Quality Systems

In view of Thailand’s dominant position is the largest exporter of longan as well as other fruits, the recommended policy is for Cambodia to study and adopt Thailand grades and standards and apply Thailand systems and procedures for strengthening the Pailin demand side of longan production. As there is no need to reinvent the appropriate demand side systems, the clear need is to replicate and scale up existing proven systems. The basic outline of the recommended demand side policy intervention measures are summarized below.

Thailand is one of the largest fruit producers and exporters. For example, it is the world’s largest producer of pineapple, and largest exporter of canned pineapple juice, satisfying 54% of the world demand. Thailand is also a major producer and exporter of longan, durian, mangosteen, lychee, mango, pomelo and rambutan. Thailand is the largest exporter of longan in the world. The planted area in 2004 was 152,297 ha and the area in production was 101,159 ha. The main markets of longan are China and ASEAN countries which account for more than 85% of exports. Clonal selection in three

longan varieties, viz. 'E Dor', 'Bieo Khieo' and 'Haeo' were carried out and the selected clones have been regionally tested. Seasonal changes in total non-structural carbohydrate and total nitrogen content were measured and relationships between those to flowering were examined. Foliar sprays of chemicals and micronutrients have been found to promote flowering. Chemical treatments and SO₂ fumigation have been investigated in order to extend storage life of longan. Thai tropical fruits can be divided into two groups; in the first group are fruits of major economic importance and with a great potential to support the demand to both local and oversea markets; they are durian, longan, mangosteen, lychee, mango, pomelo, rambutan, pineapple, young aromatic coconut and tamarind. The second group comprises a number of less economically important fruits, which are cultivated with a view of meeting the local demand rather than for export purpose, they are santol, java apple and sugar apple. A national policy committee on horticultural crops has been set up to firstly define policy and facilitate implementation of research and development, focusing on improvement of quality, economic efficiency, marketing and trade. Secondly, the Department of Agriculture has developed programs in 1999 for Good Agricultural Practice (GAP) in order to improve productivity and quality of fruits at farm levels. Thirdly, the Ministry of Agriculture and Cooperatives has established the Agricultural Product Export Promotion Center in 1998 to promote production techniques ensuring yield, quality conforming with international standard, gain worldwide recognition. It is the so-called 'one stop service' to speed up documentary procedures for Champion Products which include durian, longan, orchid and rubber. But it will also include major fruits such as mangosteen, mango, pineapple and pomelo. Lastly, the government has set a policy to encourage producers to meet standards set by FAO Codex, SPS and HACCP for all crops, including Thai fruits. Hence, the food safety project was one of the main projects focused in the DOA to improve clean, green and healthy products from the farm to the table and increase the quality and value for export.

Under current situation, according to FTA and WTO, each country has to reduce tax to zero for imported products and they use the non-barrier tariff such as SPS, HACCP, for the countries which export their agricultural products so the Thai Government has to set up food safety projects to get quality products and safety for consumer. One of the major targets in the fruit production policies of Thailand is to encourage the establishment of standardized fruit production processes, thus contributing to the development of the hazard analysis critical control point (HACCP) system. In order to facilitate more efficient marketing and export services, the Thai government has developed a so called 'one-stop service' policy. Food safety is currently recognized as a global concern. Food safety control in all countries requires close collaboration and cooperation among all stakeholders along every step in the food chain - production, processing, storage and distribution. Effective national food control systems are not only essential to protect the health and safety of domestic consumers, but they are also critical in enabling countries to assure the safety and quality of their food entering the international trade system, as well as to ensure that the standards for imported foods conform to national requirements. Currently, the Food Trade Agreement in many countries, including Thailand, emphasizes the need to strengthen food safety control

and management systems, and to implement and enforce risk-analysis-based strategies in their national food safety control systems along the entire food chain ("from farm to table", or "from farm to fork"). The Food and Drug Administration of the Ministry of Public Health enforces the Food Act. The Department of Agriculture (DOA) of the Ministry of Agriculture and Cooperatives (MOAC) is responsible for food safety of exported fruits and vegetables according to a Cabinet Directive of March 4, 2003. The Food and Drug Administration is responsible for food safety, including fruits and vegetables, in the domestic market. Implementations of GAP and HACCP are voluntary, while implementation of GMP for packing houses and processing establishments is mandatory. The Department of Agriculture inspects and certifies GAP for farm, GMP and HACCP for packing houses and processing establishments upon request. The department is also responsible for the collection of samples from farms, packing houses and processing establishments for laboratory analysis. Fruits and vegetables in Thailand are diverse in terms of products, markets, levels of risk and consumer's habits. The GAP program in Thailand started only a few years ago. The first GAP certification was granted at the beginning of 2004.

FAO defines four pillars of Good Agricultural Practices that apply to all scales of farming:

1. Efficient production of sufficient, safe and high quality food and non-food products
2. Sustainable use of natural resources
3. Viability of farming enterprises and contribution to sustainable livelihoods
4. Responsiveness to the cultural and social demands of society

In line with guidelines provided by FAO and member countries at FAO's Committee on Agriculture in 2003 and 2005, FAO's GAP work focuses on three main areas:

1. First, providing global, independent information on GAP, including through a GAP website and GAP database and analytical inventories on existing GAP standards, their benefits, constraints and costs of implementation, and regulatory requirements.
2. Second, defining scientifically-based global principles of GAP, based on FAO's long standing experience in food and agriculture.
3. Third, providing policy and technical assistance to developing countries, helping them review or define their GAP programs, understand policy trade-offs and potential benefits. FAO also has an important facilitating role to play in helping public and private stakeholders identify win-win situations for GAP implementation in specific food chains.

The ultimate policy objective should be to gradually introduce Thailand marketing quality systems to Cambodia in general, and in Pailin in particular. Ultimately, compliance with these systems should move from voluntary to mandatory requirements.

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Annex 1. The Results of the Constraints and Challenges in Longan Value Chain faced by Different Actors in Production and Post Harvest Stages, and Possible Solutions Against the Constraints

Identified Problems	Suggested Solutions
Farmer Group (Production Stage)	
1. Lack of technical knowledge on cultural practices	<ul style="list-style-type: none"> - Install irrigation system - Pruning and bearing tree (for 4 years longan tree) - Apply fertilizer based on recommend rate - Weeding - Insects and pest controls - Support branch to prevent the tree fall down - Enough sunlight
2. Induce flowering of off season longan tree is not fully success	<ul style="list-style-type: none"> - Good in cultural practices (Healthy and plant in stage of mature leaves) - Weather forecasting before use chemical treatment induce flowing (Do not apply chemical treatment when raining) - Do not use herbicide to clean weeds during chemical treatment applied.
3. High percentage of plant failure in vegetative stage (30% of young plants per hectare are dead).	<ul style="list-style-type: none"> - Good management in watering - Do not use pest infestation seedling (unhealthy plants) - Roots does not growth well - Suitable propagation plant for planting is when young plant in 2-3 months
Farmer Group (Marketing Stage)	
1. Quality of longan fruit does not meet to export standard in term of size and colors	<ul style="list-style-type: none"> - Good in cultural practices (proper uses of fertilizer (both chemical and organic fertilizers based on recommended rates), integrated pest management (IPM), Watering, Pruning and bearing tree - Depend on weather
2. Price instability (Because of no national quality standard and low quality of products, challenges with other fruits)	<ul style="list-style-type: none"> - Produce high quality product by using good in cultural practices - Produce longan fruit in collection (collecting season for Thai buyers and supporters: September-May) - Scheduling for induce flowering of longan for domestic markets based on market demand
3. Non existing processing activities (No facilities in postharvest)	<ul style="list-style-type: none"> - Develop SME for longan sector - Invite investor to invest in this sector - Expand cultivated areas to increase production

stage)	<p>volume</p> <ul style="list-style-type: none"> - Market segmentation: standard products for export markets and the later grade for processing to be dried and canned longan.
Mixed Group (Collector, Dealers and Retailers)	
<p>Production Stages</p> <ol style="list-style-type: none"> 1. Unfavorable color 2. Small fruits 3. Market constrained to ceremonial days 4. Low quality of fruit 5. Use of poor variety 6. Burst fruits 7. Farmers don't respect contract 8. late harvesting of collector 9. Irregular fruiting 10. Farmers request cash advance 11. Price issue 12. Lack of processing factory 	<ul style="list-style-type: none"> - Training farmers about technology such as variety selection, cultivation techniques, tree maintenance, pruning, fruit care, harvesting time etc. - Explain farmers to understand about the quality standards
<p>Marketing Stage</p> <ol style="list-style-type: none"> 1. Large price discrepancy between grade 1 and grade 4 2. Quantity determined 3. Close border 4. Informal charges 5. Difficult in contractual arrangement to meet export market 6. consumers raise concern about health issues as farmers use chemicals to inducing fruits 	<ul style="list-style-type: none"> - Training farmers about technology such as variety selection, cultivation techniques, tree maintenance, pruning, fruit care, harvesting time etc. - Explain farmers to understand about the quality standards

Source: Focus Group Discussion on 26 August 2013, Pailin, Cambodia

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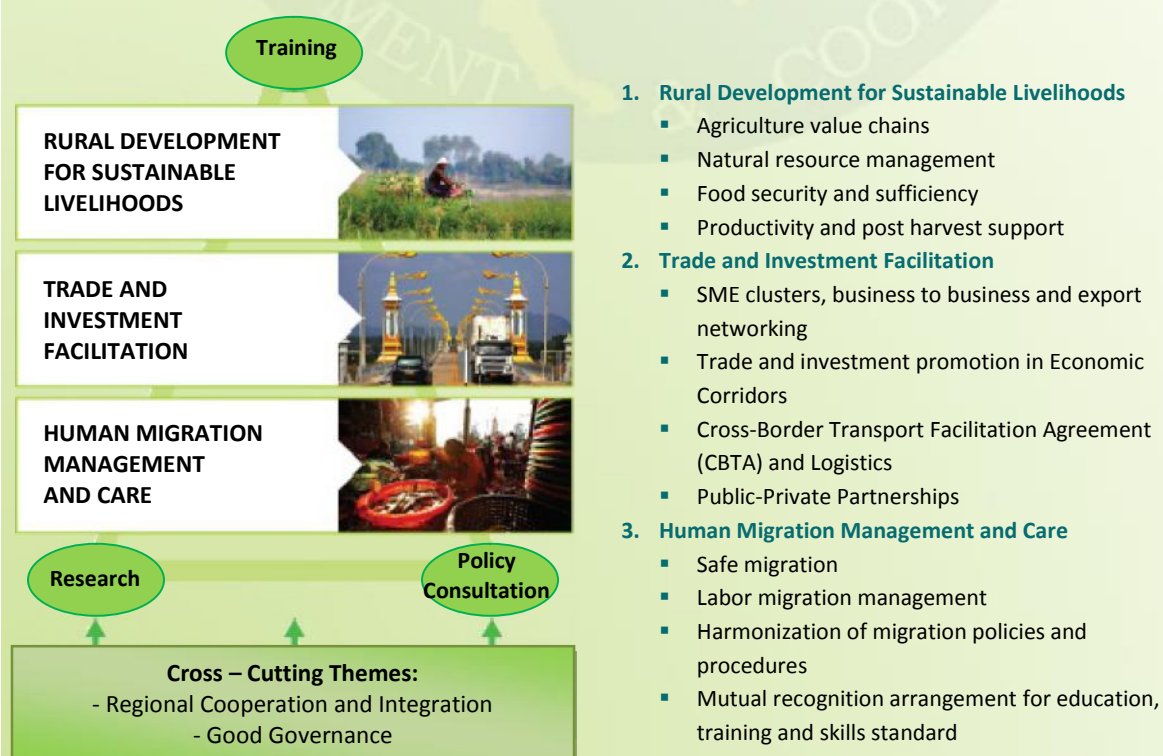
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This publication is part of the three-year project on “Capacity Development Program for Integrating CLMV Economies into AEC” funded by the New Zealand Aid Programme