Lao People's Democratic Republic

Data Collection Survey on Selecting the Processed Food to Be Focused and Promoting Foreign Direct Investment in Food Business in Laos

Final Report

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Laos and Neighboring Countries

Abbreviations

ADS	Agricultural Development Strategy
AFA	Areas Focused on Agriculture
ASYCUDA	Automated System for Customs Data
CADC	Clean Agriculture Development Center
DAFO	District Agriculture and Forestry Office
DPI	Department of Planning and Investment
FAO	Food and Agriculture Organization of the United Nations
FDQCC	Food and Drug Quality Control Center
FTA	Free Trade Agreement
GAP	Good Agricultural Practice
GPM	Good Manufacturing Practice
HACCP	Hazard Analysis Critical Control Point
IFOAM	International Federation of Organic Agriculture Movements
JICA	Japan International Cooperation Agency
IRRI	International Rice Research Institute
MAF	Ministry of Agriculture and Forestry
MOCI	Ministry of Commerce and Industry
NSEDP	National Socio-Economic Development Plan
PAFO	Provincial Agriculture and Forestry Office
PDM	Project Design Matrix
PPC	Plant Protection Center
SAFREC	Southern Agriculture and Forestry Research and Extension Center
SAZLM	Special Agricultural Zone Lao Model
SEZ	Special Economic Zone
S-NCSEZ	Secretariat Office of the Lao National Committee for Special Economic Zones
TEU	Twenty-Foot Equivalent Units
UXO	Unexploded Ordnance
WHO	World Health Organization
WTO	World Trade Organization

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Summary

1. Background of the Survey

The agricultural, forestry, and livestock sector is important for Laos, as 32% of the GDP in 2008 was generated from that sector and about 80% of the total workforce is engaged in that sector. Expansion of Japanese business into agriculture, food-processing, and related logistics in Laos is to be promoted because the expansion will enhance farmers' income and generate employment in Laos, while contributing to the expansion of Japanese business overseas, food security, and a stable supply of safe foods for Japan.

2. Objectives of the Survey

The objectives of the survey are to identify processed foods that can be strategically focused and to promote Japanese food-related businesses through collecting and analyzing information on agriculture, food processing, logistics, food safety, etc., and through consultation with public and private stakeholders. The survey also examines the possibility not only of ODA projects but also of collaboration between ODA projects, Japanese private companies, and Laotian public and private sectors.

3. Society in Laos

Laos has a population of 6.26 million, which is outstandingly small in comparison to neighboring countries. The population density is low. On the other hand, the annual population growth rate, 2.16%, and the ratio of people younger than 15 years old, 38.2%, are higher than in neighboring countries. This indicates that the demographic composition is young and that the population will continue growing. Laos' poverty ratio decreased from 33.5% in 2002/03 to 27.6% in 2007/08.

4. Economy in Laos

Laos' GDP in 2010 amounted to 56.5 trillion Kip, equivalent to about 6.8 billion dollars. It has grown by 7.5% to 8.1% annually from 2007 to 2010. The agricultural sector accounted for 28% of the GDP in 2010; industrial sector, 26%; service sector, 39%. GDP per capita was 714 dollars in 2007, 875 dollars in 2008, 907 dollars in 2009, and 1088 dollars in 2010.

5. Raw Material Production

Agricultural land area is 2,346,000 ha, accounting for 10% of the total land surface area in Laos. Agro-ecological zones as the raw material production environment are further divided into six areas according to their characteristics: (1) Vientiane plain, (2) Mekong corridor, (3) Central-Southern highland, (4) Northern highland, (5) Northern lowland, and (6) Bolaven Plateau. Rice is the largest-scale crop in terms of cultivation area and production. Laos has achieved self-sufficiency in rice. Rice is followed by maize, vegetables, and coffee. Heads of both livestock and poultry have gradually increased. Livestock production is practiced in a so-called backyard system and using an extensive free-range method. A typical farm household keeps a few livestock and poultry together with cultivating crops.

6. Processed Food

Processed food is divided into the three categories: the first category is Primarily Processed Foods such as milled rice; the second category is Traditionally Processed Foods such as fermented fish seasoning; the third category is Processed Foods by Modern Technologies such as seasonings and foods packed in bottles and cans for long storage and long-distance transportation. The third category is done on a small scale in Laos. Rice milling is the largest food-related industry in Laos in terms of

the number of factories. Drinking water, ice production, and slaughter house businesses follow.

7. Distribution of Food

Rural roads account for 40% of all the roads in Laos; each of national roads and provincial roads accounts for 20%. The pavement ratio across the country is 15%. Transportation routes to overseas from Vientiane capital, Thakhek, Savannakhet, Pakse, and Vientiane are via Bangkok. Some 30% of all cargos are exported through Houaixay border gate; 17% through Thakhek or Naphao border gate; 15% through Savannakhet or Densavan border gate; and 14% through Thanaleng border gate.

8. Legal and Tax System

The system of food safety in the Laos is based on the Codex Alimentarius Standards and Hazard Analysis Critical Control Point (HACCP) stipulated by the Codex Standard Commission. The laws, decrees, and standards are prescribed by reference to International Standards and ASEAN Standards below. Regarding the procedure for foreign investment, a company and/or an individual who is willing to invest shall prepare and submit the required documents to the Investment Promotion Department of the Ministry of Planning and Investment (MPI).

9. Four Types of Japanese Food-Related Businesses in Laos

The type of "Japanese businesses as the Buyer of Laotian Products (BLP)" describes a business model where Japanese businesses purchase agricultural products grown in tropical Laos. The type of "Manufacturer in 'Development and Import Scheme'" describes a model where Japanese businesses produce the same agricultural products as are produced in Japan. The type of "Manufacturer for Local Market (MLM)" describes one where Japanese businesses produce foods targeted not to the Japan market but to the local market in Laos and neighboring countries. The type of "Supplier for Local Food Processors (SLP)" describes a model where Japanese businesses supply materials and equipment to Lao farmers and Lao food-related businesses.

10. Shortlist of Potential Food Items to Be Focused on in Laos

The JICA survey team examined the potential of 12 food items that were proposed at the beginning. The following three points had to be taken into account in the examination: (1) The item must have an actual possibility that Japanese businesses can collaborate in the promotion; (2) Raw materials of the item are actually produced in Laos or have high potential of production; and (3) The item has actual market or high market potential. The examination shortlisted the following five items: coffee, processed vegetables, rice, sesame, and tea.

11. Raw Material Production for Coffee

The four southern provinces produce 99.7% of the total coffee production of Laos. In particular, Champasack province accounts for 62.5% of the production of the southern provinces. Bolaven Plateau has volcanic red soil, suitable for coffee cultivation. The total production in Laos increased by 80% from 2005 to 2009. The yield increased likewise, but is still lower than that of neighboring countries. The productivity per hectare on a green-bean basis is 1-1.5 tons for Robusta coffee, 2-3 tons for Arabica Catimor, and 300–400kg for Arabica Typica, according to the Southern Agriculture and Forestry Research and Extension Center.

12. Processing of Coffee

There are two measures to process cherries, which are the fruits of coffee, into green beans: wet processing and dry processing. Dry processing first dries cherries and then takes out seeds, whereas wet processing first takes out seeds, then washes them, and finally dries them. In the Japan market,

wet-processed Arabica coffee is highly evaluated for having a simple taste with strong aroma. The procedure for wet processing is the following: harvesting → de-pulping → drying → parchment → milling → grading → green bean. Coffee processors want to buy raw materials in the cherry form to unify quality, whereas skillful farmers want to process cherries into parchments so as to add value.

13. Market and Distribution of Coffee

The price of coffee has risen since 2005 and reached 5.56 dollars per kilogram for Arabica coffee and 2.51 dollars per kilogram for Robusta coffee in 2011. These prices in 2011 are four to five times as high as those in 2001. It is certain that world demand for coffee is increasing, because prices and the amount of production are increasing at the same time. Laos coffee is exported mainly to Europe, Japan, Vietnam, Thailand, and the USA. Japanese companies want more Laos coffee and must purchase more Laos coffee if production of coffee in Laos increases. A main transportation route from south Laos to overseas is via Vang Tao border gate and Bangkok.

14. Raw Material Production for Processed Vegetables

Champasack province has by far the largest cultivation areas and highest production. Bolaven Plateau is the main production area in Champasack province. In particular, production of leaf and stem vegetables is outstanding in the province. The north of Laos produces more root and bulb vegetables than the other types of vegetables; the central produces more fruit and bean vegetables. Contract farming between enterprises and farmers is prevalent for producing vegetables as raw materials for processing in neighboring countries, but contract farming is rarely successful in Laos. A lesson learned from a few successful cases is that it is crucial that enterprises definitely secure a market to sell processed food. If a market is not secured, contract farming between enterprises and farmers eventually fails. Apart from contract farming, there exists a Japanese enterprise that produces vegetables on its own farm.

15. Processing of Processed Vegetables

Two methods are applied to produce dried vegetables that are used for instant noodle and rice seasonings. The one is freeze-drying, and the other is air-drying. The former produces a higher-quality final product than the latter, but requires a higher start-up production cost. Frozen vegetables are manufactured in the following steps: (1) washing; (2) cutting; (3) blanching in hot water for 1–2 minutes; (4) cooling; and (5) quick freezing. Pickled vegetables such as cucumber are pickled in high salt content to sell to Japan for secondary processing. Dried and frozen vegetables are not produced in Laos but pickled ones have been manufactured.

16. Market and Distribution of Processed Vegetables

A considerable amount of frozen green soybean, spinach, broccoli, and green beans is imported from China, Thailand, and so forth. Demand for asparagus is increasing because of China's growing economy. Japan is the biggest importer of salted vegetables. Mostly cucumber is imported to Japan, followed by eggplant and rakkyo. Japan imports salted vegetables mainly from China. The transport of frozen vegetables from Bolaven Plateau is via the Vang Tao border gate by reefer containers. Salted vegetables are produced in Khammuane province and exported to Japan via the Thakhek border gate.

17. Raw Material Production for Rice

Laos' total harvested paddy area is 851,145 ha, of which rain-fed paddy cultivation production accounts for about 73%. The total paddy production is 3,070,640 tons. Rain-fed cultivation, dry season irrigated cultivation, and upland paddy cultivation contribute to the total: 75.9%, 16.7%, and 7.4%, respectively. The average yield of rain-fed paddy cultivation is 3.76 tons/ha. Savannakhet

province is a leading province, accounting for more than 40% of the total national production under rain-fed paddy. Glutinous rice is a popular staple; thus, 80–85% of paddy produced is the sticky variety. Gross margin per hectare ranges from 5,060,000 Kip to 8,860,000 Kip. It was calculated that net profit is 1,040,000 Kip–4,840,000 Kip/ha and profitability is 2 –55%.

18. Processing of Rice

Milling is a process to remove the husk of paddy, converting it to brown rice, and then peeling off the pericarp and embryo, to generate white rice. A total of 12,700 mills are operated and 18,531 people are engaged in milling work. Most of the mills are small-scale custom mills, accounting for 80% of the total number. Medium- and large-scale mills are seldom seen and estimated to be 15% and 5%, respectively, of the total. Milling recovery of 60–62.5% and head rice recovery of 30–40% are low, calculated on the basis of results from interviews with millers during the Study. Vital milling machinery is mostly provided from Japanese-owned manufacturers in Thailand. On the other hand, medium-scale mills of 1–3 tons capacity and small-scale ones are equipped with milling machinery produced by Thai and Vietnamese firms.

19. Market and Distribution of Rice

Currently, a new rice variety, namely Home-Savanh rice, that is modified from Thai Jasmine rice, is being grown on a trial basis. A rice exporting company in Thailand said that the intrinsic quality of Home-Savanh rice is similar to that of medium premium fragrant rice such as Thai Pathumthani Fragrant rice and medium-premium rice that has begun to be produced in Vietnam and China. The company also said that the rice is able to be traded at a price similar to medium premium fragrant rice. However, the current quality of milling and selection is unacceptable for export. In order to export rice, the quality must be improved. Routes from the basin of the Mekong River to overseas are via Bangkok.

20. Raw Material Production for Sesame

The sesame produced in Laos is not black sesame but mostly white sesame for oil extraction. The total production is 15,000 tons, of which 98% is produced in the Northern part. Luang Prabang is a leading province among the Northern provinces, accounting for 71.6% of the national total. Average farm size for a farm household in the province is 1.0 ha. However, sesame is grown extensively in backyard gardens without fertilizer and chemical application. Some farmers practice mixed or intercropping with Job's tears and upland paddies.

21. Processing of Sesame

When a pod of sesame becomes matured, it splits open naturally and seeds fly off. In Luang Prabang province, farmers put a small container under dried pods in the field and beat the pods manually or cut stems, bind them, and dry them for a while, then beat the stem to take the seeds out. If the drying is not done sufficiently, white sesame becomes blackish. Seeds, dried and taken out of pods by farmers, are collected by processors/traders and graded by them. Machines with various screens or gravity sorters provide sesame of similar size and with less foreign matter. A trader/processor in Luang Prabang province has a grading machine with the capacity of 10 ton/day.

22. Market and Distribution of Sesame

Both production and the world price of sesame have been increasing, which indicates that the global demand for sesame has been growing. China's importation of sesame is increasing remarkably. China imported 230,000 tons of sesame and was the biggest importer in 2008, while it imported only 37,000 tons and was the fourth biggest importer in 2000. This strong demand from China makes it urgent for Japanese companies to secure suppliers. At present, Laos produces small-size sesame that

has no marketability in Japan. Therefore, other varieties such as black sesame for food are necessary for production.

23. Raw Material Production for Tea

The total harvested area of tea in Laos is 2,145 ha and the total production was 1,165 tons in 2009. The main tea growing area is the northern part of Laos. Wild tea and ancient tea trees are found particularly in the northern part, which indicates that the areas are suitable for tea growth. Tea cultivated in Laos is scientifically named *Camellia sinensis var assamica*, which is cultivated in Yunnan, also. The productivity of extensive cultivation is 700–1,000 kg/ha on a dried leaves basis or 3.5–5.0 ton/ha on a fresh leaves basis. The farm-gate price of fresh leaves is 3,000–5,000 Kip/kg on average, although it fluctuates significantly.

24. Processing of Tea

Tea processed in Laos today mainly becomes Chinese green tea and red tea. With Japanese green tea, harvested leaves are first steamed to deactivate enzymes in order to prevent changes in quality. Then, the steamed leaves are kneaded. In contrast, Chinese green teas are cooked in a pot without steaming. Then they are kneaded and dried. According to one tea specialist, Lao farmers and processors have not necessarily completely standardized their Chinese-style tea-processing techniques.

25. Market and Distribution

In Japan, in the case of green tea, packed tea leafs including tea bags make up about 75% of all consumption of green tea, and industrial usage for bottled, canned, and paper-packed tea constitutes about 25%. Industrial usage is increasing. Tea soft drink production in 2007 amounted to 5.7 million kiloliters and accounted for 30.7% of all soft drink production. Lao tea leaves are evaluated as providing storylines, concept, and an image that can be utilized for creation of new tea beverages. Their intrinsic quality received a high evaluation in a cupping test. They contain valued chemicals, such as catechin, in more than average amounts. A transport route from the north to overseas is via Nam Ngeun border gate and Bangkok.

26. Candidate Project-Cluster 1: Development of Coffee in Sekong Province

The demand of Japanese companies for Laos coffee has not yet been satisfied. Now, Dakchung district in Sekong province is beginning to attract attention as a new coffee production area. Dakchung district has 15,000 to 20,000 ha of land appropriate for coffee cultivation, which has not been developed for coffee production due to poor traffic access, but improvement of a trunk road has started recently and traffic accessibility will improve in coming years. Taking these circumstances into account, the JICA survey team proposes a “Sekong province coffee development projects cluster.” The cluster would comprise (1) ODA Project: Project for Strengthening Coffee Cultivation and Supporting Post-Harvest Processing in Sekong Province, (2) Private Project 1: Coffee Processing by Local Processing Companies, (3) Private Project 2: Purchase of Laos Coffee by Japanese Companies, (4) Public Project 1: Removal of Unexploded Ordnance by Laotian Government, and (5) Public Project 2: Development of Rural Infrastructure by Laotian government.

27. Candidate Project-Cluster 2: Promotion of Vegetable Production for Processing in Central and Southern Regions

Labor costs in Thailand are rapidly increasing as the national economy grows and Japanese companies that have produced processed vegetables such as frozen ones for the Japanese market are forced to reconstruct their business strategies. On the other hand, some areas in Laos, including Bolaven plateau, have sufficient climatic conditions to cultivate vegetables grown in temperate countries because the areas have relatively high altitude with cool temperatures. The reality in Laos,

however, is that there are limited numbers of farmers who can provide raw materials stably under contract farming. Stable production of vegetables of a certain quality is a significant challenge in Laos. In addition, it should be noted that there is a shortage of young human resources, especially, with the knowledge of vegetable production, post-harvest work, and processing in Laos. A candidate project cluster, Promotion of Vegetable Production for Processing in the Central and Southern Region, is proposed. The cluster would contain (1) ODA Project 1: Vegetable Production and Marketing Support Project in Central and Southern Regions, (2) ODA Project 2: Post-Harvest and Food Processing Human Resource Development Project, (3) ODA Project 3: Border Gate Infrastructure Construction Project in Southern Region, and (4) Private Project: Private Processing Factory Construction by Private Investment.

28. Candidate Project-Cluster 3: Rice Mill Modernization for High-Quality Non-Glutinous Rice

Laotian rice production has been centered on food security and characterized by low productivity and low milling technology. Today, the government of Laos PDR has a policy to promote irrigation agriculture development in seven major plains. The JICA survey team proposes a project cluster, namely, “High-quality non-glutinous rice mill modernization” to produce high-quality non-glutinous rice by establishing medium-scale, modern rice mills that are equipped with highly efficient and sophisticated rice mill processing machinery. The equipment would be those manufactured and supplied by Japanese-owned firms with high technology in the field of rice processing. Using this approach, non-glutinous rice, especially improved Jasmine rice, can be exported to Europe, the Middle East, and neighboring countries of South East Asia. Thus, a rice production industry centered on self-sufficiency can be converted into a rice export giant industry by introducing Japanese high processing technology. The project’s cluster would consist of (1) irrigation agriculture investments by the public sector, and (2) modernization of rice mill investments by the Laotian private sector.

29. Candidate Project-Cluster 4: High-Quality Sesame Promotion in Northern Laos

In the Northern region of Laos, farmers are forced to cultivate a few kinds of crops due to the hilly landscape with limited flat areas. Luang Prabang province is the top sesame production area and has several local traders/processors. Currently, the sesame produced there, however, is mainly for oil extraction in neighboring countries and is not of the high quality varieties directly consumed as food in developed countries such as Japan. World demand for sesame, including the Japanese market, is robust. An experienced Japanese sesame buyer, for example, indicated strong interest in the potential of Laotian sesame, saying that he wanted to purchase as soon as high quality sesame is produced in Laos. In the light of the facts and information above, a candidate project cluster “High Quality Sesame Promotion in the Northern Region” is proposed. This cluster would include (1) ODA Project: High-Quality Sesame Production Support Project in Northern Region, (2) Private Project 2: Purchase of High-Quality Sesame by Local Traders, and (3) Private Project 2: Purchase of High-Quality Sesame by Japanese Companies.

30. Candidate Project-Cluster 5: Development of Tea Industry in Mountainous Areas in Northern Laos

Suitable areas for tea cultivation can be found in the north of Laos and some provinces promote a tea industry, but tea cultivation and its industry in the north have not yet been successful due to the following three challenges: poor cultivation technique, low quality of tea processing, and weak marketing. Japanese beverage manufacturers are looking for tea leaves that can be used to develop new products, and Japanese trading companies require cheap tea leaves that are to be blended with other tea leaves. Taking into account the abovementioned background, the JICA survey team proposed the Project-Cluster for Development of the Tea Industry in North Laos. The cluster would consist of (1) ODA Project: Project to Support Tea Cultivation, Processing, and Marketing in Mountainous Areas in Northern Laos, (2) Private Project 1: Strengthening of Processing and

Marketing by Local Processing Companies, and (3) Private Project 2: Advising of Processing Methods and Purchase of Laotian Tea by Japanese Companies.

1. Background and Objective of the Study

1.1 Background

Recently, in Japan, people have become more conscious about food safety than before after several incidents involving questionable and dangerous foods. Safety of imported foods, in particular, is the focus of nationwide discussions. At the same time, from a food security point of view, diversifying import countries is also important because Japan depends on foreign countries for substantial amounts of its food.

The Japan International Cooperation Agency (JICA) has studied Mekong regions such as Vietnam, Cambodia, and Laos, where Japanese businesses are seeking investments and finding many opportunities in agriculture. With the intention of contributing to Japan's food security and supporting Japanese companies in expanding their business to those countries, JICA has collected basic socioeconomic information to promote a food-processing industry.

The agricultural and livestock sector in Laos, which is responsible for nearly half of its GDP and in which 80% of Laotians are employed, is the socioeconomic foundation of the country. In the Agricultural Development Strategy 2011–2020, it is emphasized that selling value-added agricultural products and processed foods to neighboring countries and the world market is important for a gradual transformation from subsistence farming to market-oriented agriculture.

The promotion of Japanese food-related businesses in agriculture, food processing, and food distribution in Laos could expand Laotian agricultural production, enhance the income of farm households, and increase the opportunity of employment in food-processing businesses. It could contribute to the development of Japanese food businesses overseas and provide a stable supply of "safe" foods in Japan at the same time.

1.2 Objectives

The objectives of the study are the identification of potential food items in Laos and the promotion of Japanese food-related businesses through information gathering and its analysis, as well as consultation with public/private stakeholders on agriculture, food processing, food distribution, and food safety. The study discusses the possibility not only of the ODA project but also of collaborative projects between Japanese private businesses and Japanese public and Laotian public/private organizations.

2. Overview of the General Situation and Macroeconomy of Laos

2.1 Socioeconomic Situation

A. Population

Table 2-1 shows the population of Laos, which is 6.26 million and is much smaller than those of neighboring countries: Vietnam (86 million), Thailand (66.9 million), and Cambodia (14.2 million).[1] Laos is the smallest country in Indochina in terms of population. The population density of Laos is 26 person/km^2, which is lower than those of Vietnam, 261 person/km^2; Thailand, 130 person/km^2; Myanmar, 87 person/km^2; and Cambodia, 78 person/km^2. It is evident that the population in Laos is sparse. On the other hand, the growth rate of population and ratio of people younger than 15 years of age in Laos are 2.16% and 38.2%, respectively, and are higher than neighboring countries, which means that the population structure in Laos is young and that the population will continue to increase.

Table 2-1 Population Statistics in Laos

	Area*,1	Population*,2	Population density*,2	Population growth rate *,2	Ratio of people younger than 15 years old**
Unit	km^2	Persons	Persons/km^2	%	%
Year		2010[3]	2010[3]	2010[3, 4]	2008
Vientiane capital	3,920	768,743	196	1.94	n.a
Phongsaly	16,270	176,151	11	1.20	n.a
Luangnamtha	9,325	164,310	18	2.49	n.a
Oudomxay	15,370	299,935	20	2.49	n.a
Bokeo	6,196	165,661	27	2.66	n.a
Luang Prabang	16,875	447,541	27	1.92	n.a
Huaphanh	16,500	317,946	19	2.51	n.a
Xayabury	16,389	374,666	23	2.04	n.a
Xiengkhuang	16,358	269,887	16	3.29	n.a
Vientiane	22,554	480,440	21	4.32	n.a
Borikhamxay	14,863	264,513	18	3.26	n.a
Khammuane	16,315	375,504	23	2.16	n.a
Savannakhet	21,774	906,440	42	1.88	n.a
Saravan	10,691	366,723	34	2.49	n.a
Sekong	7,665	97,900	13	2.87	n.a
Champasack	15,415	652,552	42	1.45	n.a
Attapeu	10,320	127,285	12	2.57	n.a
Total	236,800	6,256,197	26	2.16	38.2
Reference					
Vietnam	329,241	86,000,000	261	1.1	27.4
Thailand	514,000	66,900,000	130	0.6	22.3
Myanmar	680,000	59,300,000	87	1.5	27.1
Cambodia	181,000	14,200,000	78	1.5	34.1

Source: * Laos National Statistics Bureau Website (http://www.nsc.gov.la/, retrieved on 29th November 2011) ** ADB (2010)
Legend: n.a = not available
Note: 1. The Areas of Vietnam, Thailand, Myanmar, and Cambodia are based on the website of the Ministry of Foreign Affair of Japan (http://www.mofa.go.jp/mofaj/area/index.html, retrieved on Nov 29, 2011). 2. Statistics on Vietnam, Thailand, Myanmar, and Cambodia are based on ADB (2010). 3. Statistics on Vietnam, Thailand, Myanmar, and Cambodia are of the year 2009. 4. The growth rate of population of Laos is the average of annual growth rates from 2005 to 2010.

With regard to the population of provinces, Savannakhet (910 thousand), Vientiane capital (770 thousand), and Champasack (650 thousand) have higher populations. With regard to population density, Vientiane capital has the highest density—196 person/km^2, whereas Phongsaly province located in the North has the lowest density—11 person/km^2.

B. Industry

Table 2-2 presents the GDP, which in 2010 was 56.5 trillion Kip, which is equivalent to approximately 6.8 billion dollars. The annual growth rate from 2007 to 2010 was 7.5 to 8.1%. In

[1] The populations of Vietnam, Thailand, and Cambodia are for 2009 and are based on ADB (2011).

2010, the agriculture sector constituted 28% of GDP, the industry sector 26%, and the service sector 39%. These ratios did not change much from 2007 to 2010. The growth rate of the industry sector in 2010, 17.5%, was outstanding. GDP per capita was 714 dollars in 2007, 875 dollars in 2008, 907 dollars in 2009, and 1088 dollars in 2010, and has continued to increase.[2]

Table 2-2 GDP in Laos

Sector	GDP (billion kip)				Composition (%)				Growth rate (%)			
	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
Total	46,215	46,215	47,562	56,523	100	100	100	100	7.8	7.8	7.5	8.1
Agriculture	13,889	13,889	14,511	16,056	30	30	31	28	8.6	3.7	2.8	3.0
Industry	11,954	11,954	11,669	14,657	26	26	25	26	4.4	10.4	18.5	17.5
Service	17,282	17,282	18,420	22,227	37	37	39	39	9.1	9.7	6.0	7.0

Source: The National Statistics Bureau (http://www.nsc.gov.la/, retrieved on 29, 11, 2011)
Note: Since the total GDP includes tax, the sum of Agriculture, Industry, and Service does not correspond to the total GDP.

Table 2-3 presents regional and provincial GDP. The growth rate in the South, 10.65%, is the highest and 2.20% higher than that of the North. As for the industrial structure, the ratio of the agriculture sector is comparatively high in the North; the ratio of the industry sector is high in Central Laos; the ratio of the service sector is high in the South. GDP per capita in Central Laos is 1142 dollars, which is the highest among the three areas of the country. GDP per capita of the provinces is much higher in Vientiane capital than other provinces, whereas that of Huaphanh province at 397 dollars, Sekong province at 412 dollars, and Oudomxay province at 651 dollars are low.

Table 2-3 GDP by Province

Province	Annual growth rate of GDP	Composition rate (%)			GDP per capita (USD)
		Agriculture	Industry	Service	
North	8.45	55.63	21.20	23.07	771
Phongsaly	6.72	53.44	25.77	20.78	720
Luangnamtha	7.81	69.74	14.52	15.73	668
Oudomxay	10.86	58.34	20.54	21.10	651
Bokeo	7.65	49.04	19.07	31.92	1,004
Luang Prabang	9.36	47.00	18.00	35.00	821
Xayabury	8.41	48.83	25.10	25.36	1,057
Huaphanh	8.97	65.60	14.14	20.24	397
Xiengkhuang	7.78	53.08	32.46	14.43	852
Central	9.94	40.67	34.03	22.81	1,142
Vientiane capital	11.85	19.64	44.67	35.55	2,148
Vientiane	8.69	48.55	39.54	11.91	751
Borikhamxay	7.80	38.03	27.27	34.19	1,029
Khammuane	10.84	44.81	36.28	17.14	887
Savannakhet	10.5	52.33	22.40	25.27	897
South	10.65	46.87	24.04	29.09	718
Saravan	10.14	56.86	18.41	24.73	710
Champasack	9.76	45.00	26.30	28.70	1,097
Sekong	10.43	49.60	15.08	35.31	412
Attapeu	12.28	36.01	36.36	27.60	654

Source: MPI (2011b)
Note: This statistics are from 2006 to 2010.

With regard to labor force composition by industry (Table 2-4), the composition rate in agriculture is 75.1%, which implies that most people make a living from agriculture. The composition rate of agriculture decreased by 3.4% from 2005 to 2010, while the rate of industry increased by 0.7%, and that of service increased by 2.8%, all of which implies that the industrial structure has moved gradually from agriculture to industry and service.

Table 2-4 Work Force by Industry Sector

Sector	Ratio of workforce (%)	
	2005	2010
Agriculture	78.5%	75.1%
Industry	4.8%	5.5%
Service	16.7%	19.5%

Source: MPI (2011b)

C. Trade

Now, we focus on the trade situation. Both imports and exports have increased remarkably during the 2000s, as Table 2-5 shows, the value of imports in 2008 was 1.8 billion dollars, and that of exports in

[2] Website of the National Statistics Bureau (http://www.nsc.gov.la/, retrieved on Nov 29, 2011)

2009 was 1.2 billion, which shows an increase of over five times that of imports and exports in 2001. Imports that have a high value are oil and mineral products, such as gasoline, electrical and mechanical machines, transport equipment, base metals and their products, and processed foods, beverages and tobacco, while exports that have a high value are oil and mineral products, base metals and their products, and textiles and apparel.

Table 2-5 Value of Imports and Exports by Items

(Unit: 1000 USD)

Code	Item	Imports				Exports				
		2001	2005	2007	2008	2001	2005	2007	2008	2009
1-5	Animals and animal products	4,283	6,870	9,577	21,198	2,674	2,381	162	2,082	1,249
6-14	Vegetable products	10,593	14,479	17,014	48,586	19,774	18,912	49,500	57,764	37,501
15	Animal fat and vegetable oil	807	1,805	2,285	4,618	5	_	10	5	0
16-24	Processed foods, beverages, and tobacco	19,219	26,004	31,195	200,252	786	1,365	3,192	3,918	23,315
25-27	Oil and mineral products	76,852	180,822	256,878	416,593	113,218	21,070	16,488	204,823	366,316
28-38	Chemical products or industry–related products	18,337	325,944	37,438	88,236	142	5,361	876	1,101	18,092
39-40	Plastic and rubber products	12,396	26,498	29,115	50,708	36	47,311	789	182	1,315
41-43	Skins, furs, and their products	203	268	202	1,233	1,185	85	426	421	196
44-46	Wood and wood products	588	849	977	1,801	79,219	61,221	45,062	44,419	29,625
47-49	Pulp of wood and paper	5,506	7,948	8,692	14,717	505	305	541	413	870
50-63	Textiles and apparel	13,165	19,335	10,510	19,411	1,810	1,034	1,133	1,410	178,417
64-67	Shoes, hats, umbrellas, etc.	1,215	1,671	1,508	2,826	1			3	154,074
68-70	Stone, ceramic, and glass products	8,484	10,651	13,936	25,677	65	32	75	49	38
71	Jewelry and precious metal products	2,987	2,466	12,792	23,052	518	40,277	91,135	76,335	73,283
72-83	Base metals and their products	24,432	83,114	79,638	236,426	350	89,913	214,152	432,868	330,790
84-85	Electrical and mechanical machines	64,613	226,846	213,391	393,830	595	1,951	1,209	20	14,684
86-89	Transport equipment	54,469	87,190	103,987	227,330	84	16	360	53	4,011
90-92	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments, parts and accessories of such articles and parts thereof	4,728	8,434	5,762	14,190	144	5	126	1	1,934
93	Weapons and ammunition and parts thereof	52	1	326	13	86				0
94-96	Miscellaneous articles	2,556	5,800	3,975	12,499	773	353	918	1,806	1,443
97	Art, antiques	7		13	33	14		4	3	2
98-99	Other	10,014	1,800	893		929	775	94	38	0
	Total	335,506	1,038,796	840,105	1,803,228	222,911	292,368	426,250	827,713	1,237,158

Source: Website of the National Statistics Bureau (http://www.nsc.gov.la/, retrieved on Nov 29, 2011)

As it is expected that the processed food of Laos will primarily be exported, the current situation of exports will be analyzed in detail subsequently. Table 2-6 presents values of major export items, which include minerals, particularly copper; electricity by hydropower; industrial products, such as garments; and agricultural products. Among these, the export value of minerals and electricity is particularly high, which suggests that exports in Laos depend on availability of natural resources. Since the export of processed food is low, it is omitted in Table 2-6.

Table 2-7 lists major export counterpart to show current situation of export from Laos. The most significant country is Thailand, which imports 67.5% Laos' exports. Exports to Thailand mainly include minerals and electricity; exports of machinery parts for vehicles, electric machinery, and the

electronics industry—which advanced as businesses were outsourced to Laos for its cheap labor costs—have increased. Exports to the second most significant country, Australia, mainly include minerals.[3] The third and fourth most significant countries are Vietnam and China respectively. Exports to Vietnam are primarily minerals and industrial products, and exports to China consist primarily of agricultural produce. Japan is the eighth most significant country, yet imports only 0.91% of all of Laos' exports.

Table 2-6 Export Value of Major Export Items

	Export Value (USD1000)			
Items	2006/07	2007/08	2008/09	2009/10
Minerals	545,831	774,239	523,611	1,048,524
Copper	441,028	621,267	406,076	376,203
Electricity	72,110	97,134	274,593	288,997
Industrial products	142,575	281,139	167,155	280,927
Garments	132,187	255,011	141,705	167,304
Agricultural products	69,946	59,403	84,562	118,661
Coffee	32,339	15,428	13,821	19,859
Wood and wooden products	72,529	59,328	46,016	37,106
Diamonds	12,867	27,671	15,824	12,735
NTFP	4,495	3,363	3,909	1,012
Livestock	339	888	2,518	577
Handicrafts	954	340	476	398
Other expendables	814	481	281	0
Other	3,107	3,473	5,457	0

Source: the Import-Export Department of Ministry of Industry and Commerce

Table 2-7 Major Export Counterparts (2009/10)

Importing Countries	Proportion of total export value (%)	Export items (in descending order of export value)
Thailand	67.50	Minerals, electricity, industrial products, wood and wooden products, agricultural produces/livestock
Australia	9.41	Minerals, industrial products
Vietnam	7.47	Minerals, industrial products, agricultural produce/livestock, wood and wooden products
China	4.43	Agricultural produce/livestock, wood and wooden products, minerals, industrial products
England	2.31	Industrial products, agricultural produce/livestock
USA	2.05	Industrial products, minerals, agricultural produce/livestock
German	1.94	Industrial products, agricultural produce/livestock
Japan	0.91	Industrial products, agricultural produce/livestock, wood and wooden products
Switzerland	0.76	Diamonds, industrial products, agricultural produce/livestock
France	0.60	Industrial products, agricultural produce/livestock

Source: the Import-Export Department of the Ministry of Industry and Commerce

D. Foreign Direct Investment

Although Laos has a relatively small population and a correspondingly small domestic market, direct foreign investment has increased because of the country's low-cost labor force and plentiful natural resources and land.[4] The cumulative total number of direct foreign investments from 2005 to 2010 is 1136, and the cumulative total value amounts to USD 12.2 billion dollars (Table 2-8). The amount of investment is relatively high in the sectors of service, agriculture and forestry, industry and handicraft, and mining and fuel, while the amount of investment is high in the sectors of hydropower, mining

[3] Since mineral resource development is being implemented through Australian capital, minerals dominate exports to Australia.

[4] Monthly salary of an ordinary-level worker is USD 263 in Bangkok in 2011, USD 114 in Ho Chi Minh in 2011 (JETRO, 2011), while the monthly salary in Vientiane capital was only USD 45 to 60 in 2009 (website of Japan ASEAN Centre (http://www.asean.or.jp/ja/asean/know/country/laos/invest/guide/section02/section02_02.html, retrieved on Dec 3, 2011)

and fuel, service, and agriculture and forestry.

Table 2-8 Number and Value of Direct Foreign Investment in Laos

Sector	Number of investments (upper cell) Value of investment (1000 USD, lower cell)						
	2005	2006	2007	2008	2009	2010	Total
Agriculture-forestry	21	39	43	37	30	32	202
	17,352	458,519	183,839	101,562	289,833	168,156	1,219,261
Industry and handicrafts	19	31	26	28	34	55	193
	14,596	122,997	134,183	171,447	198,720	285,134	927,077
Wood industry	8	3	6	9	2	1	29
	5,690	1,010	56,965	20,992	13,634	12,634	110,925
Mining, fuel	39	26	22	17	37	22	163
	93,539	73,806	115,271	100,066	2,280,459	268,774	2,931,915
Hydropower	10	13	4	3	4	3	37
	1,065,250	1,776,702	360,539	830,000	218,260	443,317	4,694,068
Garments	1	5	8	5	2	1	22
	300	3,885	5,521	5,109	1,200	300	16,315
Construction	3	3		10	9	6	31
	1,550	130,600		70,500	27,194	75,000	304,844
Service	20	21	40	18	30	89	218
	20,865	12,099	181,185	36,810	1,055,059	518,834	1,824,852
Hotel, tourism	10	9	43	8	16	6	92
	13,109	32,224	183,839	30,130	44,220	6,300	309,822
Bank, insurance			26	4	8	1	39
	5,000		134,183	28,200	77,000	12,000	256,383
Trade	11	17	15	12	18	36	109
	7,855	86,049	13,928	10,088	16,640	75,875	210,435
Consultancy	1	4	11	10	17	9	52
	200	1,800	2,319	3,460	6,892	15,870	30,541
Total	143	171	191	162	208	261	1,136
	1,245,307	2,699,691	1,136,903	1,440,815	4,312,887	1,882,194	12,717,797

Source: Website of the National Statistics Bureau (http://www.nsc.gov.la/, retrieved on Nov 29, 2011)

E. Poverty Ratio

This paragraph explains the poverty situation relative to the information regarding its social situation. The poverty ratio in Laos was 27.6% in 2007/08, which is lower by 5.9% than the ratio in 2002/03, which was 33.5%. It can be said that Laos has achieved some success in alleviating poverty. When the poverty ratio is examined within the provinces, the ratio is high in Sekong province (51.8%), Huaphanh province (50.5%), Phongsaly province (46.0%), Xiengkhuang province (42.0%), and so forth. In these provinces, approximately half the people live below the poverty line. On the other hand, the ratio is low in Champasack province (10.0%), in Vientiane capital (15.2%), Xayabury province (15.7%), and so forth.

Table 2-9 Poverty Ratio by Province

Province	Poverty ratio (%)	
	2002/03	2007/08
North		
Phongsaly	50.8	46.0
Luangnamtha	22.8	30.5
Oudomxay	45.1	33.7
Bokeo	21.1	32.6
Luang Prabang	39.5	27.2
Xayabury	25.0	15.7
Huaphanh	51.5	50.5
Xiengkhuang	41.6	42.0
Central		
Vientiane capital	16.7	15.2
Vientiane	19.0	28.0
Borikhamxay	28.7	21.5
Khammuane	33.7	31.4
Savannakhet	43.1	28.5
South		
Saravan	54.3	36.3
Champasack	18.4	10.0
Sekong	41.8	51.8
Attapeu	44.0	24.6
Nation	33.5	27.6

Source: MPI（2011b）

2.2 Development Plan and Strategy on Agriculture and Food Processing

This section introduces the development plan and strategy of the Laotian government that are related to agriculture, forestry, and the food processing industry, since this survey is intended to examine directions for creating processed food to be focused and for promoting Japanese food-related business.

A. The Seventh Five-Year National Socio-Economic Development Plan 2011–2015

The Seventh Five-Year National Socio-Economic Development Plan 2011–2015 (7th NSEDP) stipulates the four overall targets: (1) maintain economic growth of more than 8% per year and increase GDP per capita in 2015 to USD 1,700; (2) achieve Millennium Development Goals, acquire modern technologies and infrastructure, diverse economic foundation, and graduate from the status of being one of the least developed countries by 2020; (3) ensure sustainable development by integrating economic development, sociocultural development, and environment protection; and (4) ensure political stability and fairness, social order, and public security and be open to regional and international integration (Part 2. I. 2 of the 7th NSEDP). In line with these overall targets, the 7th NSEDP provides directions, targets, and measures in each sector.

The directions of the agriculture and forestry sector include developing agriculture and forestry intensively in potential regions for industrialization and modernization, and ensuring food security and promote commercial agriculture for both local consumption and export. The targets of the sector include attaining a 3.5% annual growth rate for gross products of the sector, and increasing production and cultivation area for rice, vegetables, and coffee to 4.2 million tons and 1.04 million hectares, 1.5 million tons and 110 thousand hectares, and 55.3 thousand tons and 65 thousand hectares, respectively. (Part 2. II. 2.1.1 of the 7th NSEDP).

With regard to the food processing industry, enhancing the capacity of the industry and commerce in Laos to be competitive in domestic and export markets, especially in agro-processing industry, is set as one of the directions of the industry and commerce sector in the 7th NSEDP. The 7th NSEDP stipulates growing the gross product of the whole processing industry, including food processing industry, by 13% annually as one of the targets in the industry and commerce sector (Part 2. II. 2.1.2 of the 7th NSEDP).

B. Agricultural Development Strategy 2011–2020

The final draft of the Agricultural Development Strategy for 2011 to 2020 (ADS 2011–2020) issued by the Ministry of Agriculture and Forestry provides that long-term and sustainable development based on a holistic concept, taking account of economic, social, and ecological dimensions, is the vision for the development in agriculture, forestry, natural resources management, and rural development (the 81st paragraph of the final draft of ADS 2011–2020). The final draft sets two development targets to be achieved by the year 2020: (1) gradually introducing and applying modernized and market-oriented lowland agriculture adapted to climate change and practiced by smallholder farmers, and (2) conserving upland ecosystems, ensuring food security, and improving livelihoods of rural communities (the 82nd paragraph of the final draft).

The final draft of ADS 2011–2020 emphasizes connection with markets as one of the main thrust for the development strategy. The final draft states that the Ministry of Agriculture and Forestry will focus on the two aspects: (1) improving trade and business environment and (2) improving the readiness of farmers to be connected with markets (the 119th, 120th, and 121st paragraphs of the final draft).

3. Five Aspects of Processed Food to Be Focused

This chapter provides an overview of its issues on the following five aspects processed food to be focused: (1) raw material, (2) processing, (3) market, (4) distribution, and (5) law and institution. However, the market aspect on some potential foods is discussed in Chapter 6 because it is not a suitable topic of an overview.

3.1 Current Situation of Raw Material Production and Issues

3.1.1 Elements of Raw Material Production

A. Agricultural Land

According to FAO, the total land surface area of the Lao PDR is 23,080,000 ha while the total surface area of the country is 23,680,000 ha. In 2009, the agricultural land area, which is composed of cultivated farm land as well as permanent crop and pasture land, was 2,346,000 ha, accounting for 10% of the land surface area. The rest are mountain and forest areas. Table 3-1 shows change of agricultural land areas in the 5 years from 2005 to 2009. The agricultural land area increased by nearly 30% in the period.

Table 3-1 Change of Agricultural Land Area (1,000 ha)

	2005	2006	2007	2008	2009
Agricultural land	2,009	2,060	2,046	2,277	2,346
Cultivated land	1,050	1,100	1,070	1,300	1,360
Permanent crops	81	82	98	99	108
Permanent pasture land	878	878	878	878	878

Source: FAOSTAT 2011

Table 3-2 shows change of irrigated land area. The total irrigated land area changed by 10 to 18%, and the central region used irrigation much more extensively than the other two regions.

Table 3-2 Change of Irrigated Land Area (ha)

Season	Location	2005	2006	2007	2008	2009
Rainy	North	71,488	71,635	75,836	91,589	68,268
	Central	140,711	203,218	206,829	151,436	134,310
	South	58,543	61,452	62,155	24,104	28,461
	Total	270,742	336,305	344,820	267,129	231,039
Dry	North	26,350	27,414	22,379	26,774	31,219
	Central	66,049	121,908	98,384	90,053	115,498
	South	8,535	50,273	32,915	21,099	25,329
	Total	100,934	199,595	153,677	137,925	172,046
Total	North	97,838	99,049	98,215	118,363	99,487
	Central	206,760	325,126	305,213	241,489	249,808
	South	67,078	111,725	95,070	45,203	53,790
	Total	371,676	535,900	498,497	405,054	403,085

Source: Ministry of Agriculture and Forestry (2007 and 2009)

B. Labor Force

According to FAO (Table 3-3), in 2009, the agriculture, forestry and fishery population of the Lao PDR was 4,822,000 out of 6,320,000, the country's total population. Thus, 75% of the total population engaged in agriculture, forestry and fishery. Moreover, the labor force for agriculture, forestry and fishery accounted for about 80% of the total labor force in the country. The female labor force in agriculture, forestry and fishery was larger than the male one.

Table 3-3 Change of Agricultural Population (1,000)

	2005	2006	2007	2008	2009
Total population	5,753	5,842	5,931	6,022	6,112
Agriculture, forestry and fishery population	4,363	4,420	4,477	4,534	4,591
Non agriculture, forestry and fishery population	1,390	1,422	1,454	1,488	1,521
Total economically active population	2,754	2,825	2,910	2,993	3,077
Total economically active population in agriculture, forestry and fishery	2,088	2,138	2,197	2,254	2,311
Male economically active population in agriculture, forestry and fishery	989	1,011	1,041	1,070	1,100
Female economically active population in agriculture, forestry and fishery	1,099	1,127	1,156	1,184	1,211

Source: FAOSTAT 2011

C. Natural Environment

Raw material production is affected by natural environmental factors such as climate, topography, and water resources. More than 80% of the national land is mountainous with altitudes between 500 and 2,000 m above the sea level. Rainfall is concentrated in the period from May to October and the annual precipitation depends much on location and altitude. There are three precipitation areas by annual precipitation: (1) 1,500 – 2,000 mm in mountainous areas of Northern Laos and plains spreading from Savannakhet province to Saravan province; (2) 2,000 – 2,500 mm in areas from Xiengkhuang province of Northern Laos to Khammuane province of Central Laos; and (3) 2,500 – 3,000 mm in areas of the southern part of Champasack province, Sekong province, and the southern part of Attapeu province. The dry season is 6 months from November to April. The temperature ranges from 20 to 35 degrees Celsius and it becomes low between November and February. A temperature of lower than 15 degrees Celsius is recorded depending on the location.

The raw material production system under the natural environment is classified into two: (1) low land rain-fed and irrigation farming; and (2) mountainous slash and burn farming. In addition, horticulture and coffee farming are practiced in limited areas of Bolaven Plateau of southern Laos.

Agro-ecological zones as raw material production environment are further divided into the following six: (1) Vientiane plain, (2) Mekong corridor, (3) Central-Southern highland, (4) Northern highland, (5) Northern lowland, and (6) Bolaven Plateau. Below are brief descriptions of the types.

(1) Vientiane Plain

The Vientiane plain extends over Vientiane capital, some parts of Vientiane province, and Borikhamxay province and covers the higher plains and lower slopes in the areas. The landform is dominated by middle mountain areas. Natural forests still exist, but they have been affected by slash and burn cultivation. Upland paddy is one of the main crops.

(2) Mekong Corridor

The Mekong corridor includes the banks and floodplains of the Mekong River and the lower alluvial valleys of its tributaries. Altitudes range from 100 to 200 m and the landscape consists mainly of plain to modestly sloping areas. The area is well suited for a wide range of crops, particularly lowland rain-fed and irrigated rice in flatlands and cash cropping on sloping areas.

(3) Central-Southern Highlands

The Central-Southern Highlands include Khammuane, Savannakhet, Sekong, and Attapeu provinces and extends parallel to the Mekong covering the upper valleys of its tributaries and upland areas. Altitudes vary from 200 to 500 m. The highlands have limited potential for productive agriculture due to poor acid soil and high risk of unexploded ordnance (UXO).

(4) Northern Highlands

The Northern Highland zone covers the mountain areas of Phongsaly, Luangnamtha, and Bokeo in the extreme Northwest, parts of Huaphanh and Xiengkhuang and the eastern parts of Borikhamxay. Altitudes vary from 1,500 to 2,500 m. The zone is characterized by remoteness and high erosion risk due to steep slopes. However, soils are suited for farming as well as for both annual and perennial cash crops. Natural forests have been largely removed by slush and burn agriculture and rubber plantations.

(5) Northern Lowlands

The Northern Lowlands area comprises parts of Luang Prabang, Phongsaly, Oudomxay, and Xayabury provinces. The altitude ranges from 500 to 1,500 m. The landforms in this zone area are predominantly mountainous and similar to those in the Northern Highlands. The original natural forests have been removed and the remaining forests are largely shaped by slush and burn cultivation and livestock grazing.

(6) Bolaven Plateau

Bolaven Plateau zone includes parts of Saravan, Sekong and Champasack provinces in the South. With altitudes ranging from 500 to 1,500 m, good annual precipitation between 2,500 and 3,000 mm and very rich soils, the Plateau is very well endowed for a wide range of farming systems.

3.1.2 Raw Material Production

In 2008, the agriculture sector accounted for 30.1% of USD 5,228,000,000, the Lao PDR's GDP. The sector's annual growth rate is 2.8%.[5] Thus the sector is the most important industry of the country. Below are brief descriptions of the production of crops, livestock and fishery as raw material.

A. Crop Production

Table 3-4 shows cultivated area, yield, and total production of major crops in 2009. The cultivated area of paddy is overwhelmingly wide and its production is large. Although uneven food distribution exists in the country,[6] the Lao PDR has achieved self-sufficiency of rice, and the agriculture sector is centered on paddy production. The policy of the Ministry of Agriculture and Forestry (MAF) is to increase paddy up to 4.2 million tons by 2015 and have 1 million tons of paddy processed for export.[7] In terms of size of the cultivated area, maize is the second largest with 175,965 ha, followed by 118,705 ha of vegetables and 65,101 ha of coffee.

Maize is produced as feed for livestock. Its production grew three times from 2005 partly due to increase of demand from China and the neighboring countries. Although the demand for animal feed is still low in the Lao PDR, the consumption of livestock and processed products increases as the people's standards of living improve. Thus the demand for maize as raw material of feed will increase in the near future.[8]

Vegetables are common food items on the Laotians' table, restaurants and street stalls every day. Leaf and stem vegetables, long beans, and cabbage are served as essential items for food culture in the country. Vegetable production increased 39% from 750,000 tons in 2005 to 1,030,000 tons in 2009. Moreover, as shown in Table 3-5, USD 140,737,000, the contribution of vegetables to the monetary value of production in 2008, was the second largest after paddy. Coffee is an export crop and its production increased 84% from 25,000 tons in 2005 to 46,035 tons in 2009. Sweet corn, groundnut, Job's tears and yam follow in terms of cultivated area.

[5] MPI (2009)
[6] JICA (2009)
[7] Interview with the Department of Planning, MAF (August 2011)
[8] JICA (2009)

Table 3-4 Cultivated Area, Yield, and Production (2009)

Raw Material	Cultivated area (ha)	Yield (ton/ha)	Production (ton)
Paddy (Rainy season)	680,850	3.76	2,468,750
Paddy (Dry season)	94,316	4.79	452,050
Upland paddy	129,109	1.83	224,000
Maize	175,965	4.82	848,745
Sweet corn	24,740	3.25	80,365
Soybean	12,635	1.54	19,425
Mung bean	3,250	1.36	4,415
Groundnuts	20,920	2.14	44,665
Black beans and small beans	2,560	1.02	2,610
Cassava	10,375	1.71	152,590
Sweet potato	5,770	11.74	67,740
Potato	540	24.95	13,475
Yam bean	405	11.00	4,455
Taro	13,900	9.29	129,165
Coffee	65,101	0.88	46,035
Tea	2,155	0.54	1,165
Rubber	12,835	1.15	14,745
Cardamom	7,257	0.33	2,190
Job's tears	15,340	2.24	34,305
Tobacco	4,830	10.01	48,355
Sugar cane	13,830	31.34	433,500
Leaf and stem vegetables	66,170	9.39	621,445
Bulbous and root vegetables	10,465	5.93	62,085
Fruit vegetables	42,070	8.37	352,295
Orchard	13,121	8.04	91,120
Banana	13,599	12.80	173,900
Pineapple	3,827	12.14	45,780
Papaya	1,810	8.86	16,045
Watermelon	6,370	18.02	114,780
Melon	105	12.24	1,285

Source: Ministry of Agriculture and Forestry (2009)

Table 3-5 Production in USD (2008)

Rank	Raw material	Production (USD 1,000)
1	Paddy	536,218
2	Vegetables	140,737
3	Tobacco	90,851
4	Maize	74,743
5	Coffee	31,872
6	Pepper	20,791
7	Cassava	16,989
8	Groundnuts with shell	14,860
9	Sweet potato	10,651
10	Watermelon	10,427

Source: FAOSTAT 2011

B. Livestock and Fishery

Table 3-6 shows the number of head of livestock and poultry. The head of both livestock and poultry increased gradually because the demand for animal protein rose among people of the Lao PDR since their income increased.

Table 3-6 Change of Head of Livestock and Poultry

Raw material	Head (1,000 head)				
	2005	2006	2007	2008	2009
Water buffalo	1,096	1,108	1,123	1,154	1,178
Cattle	1,167	1,321	1,353	1,397	1,430
Pig	1,826	2,033	2,186	2,359	2,554
Goat and sheep	190	210	243	269	339
Poultry	19,801	20,803	20,453	21,214	22,529

Source: Ministry of Agriculture and Forestry (2007 and 2009)

Livestock is an important industry as it contributes half the agricultural income for a farm household. However, livestock production is practiced in the so-called backyard system and extensive free-range method. A typical farm household keeps a few livestock and poultry together while practicing crop cultivation. Meanwhile, intensive livestock production is seen. Thus the demand for feed crop production increases as the livestock processing industry grows.

Livestock is so-called "live stock." Large and medium animals like cattle and pig in particular are sources of earnings for farmers when they need cash urgently. Water buffalo is still utilized for some farm work while agricultural mechanization is in progress. Animal waste or manure can be alternative material for organic fertilizers since the country imports chemical fertilizers from Thailand. Therefore, livestock and crop cultivation are close linked to the ecological agricultural production system in the country.

Although the Lao PDR is a landlocked country, fish protein is important as well. Table 3-7 shows production of fishery by production method. Natural catch for the last 5 years did not change much and aquaculture production fluctuated. The number of large-scale commercial aquaculture facilities is limited; traditional small-scale subsistence aquaculture is dominant. The government aims to increase supply of fish from 11 – 12 kg annually per capita in 2005 to 20 – 23 kg in 2020. Therefore, the country recognizes the importance of promoting fish culture.

Table 3-7 Change of Production in Fishery

Method of production	Production (tons)				
	2005	2006	2007	2008	2009
Natural catch (meat)	30,000	30,000	28,410	29,200	30,800
Aquaculture (meat)	72,600	78,000	63,250	64,300	74,200

Source: Ministry of Agriculture and Forestry (2007 and 2009)

3.2 Current Status and Issues on Food Processing

3.2.1 Processed Foods in Laos

Processed foods for Laotian people are preserved plant- and animal-derived foods, traditionally produced at home. They also purchase processed foods at local markets. Processed foods available at markets in Laos are categorized as follows.

The first category is primarily processed foods, such as milled rice and coffee beans that are depulped and dried. In this category, processing is done by private processing factories, such as rice mills, that collect raw materials, as well as by farmers, such as some coffee farmers who have depulping machines of their own.

The second category is traditionally processed foods, such as fermented fish seasoning, fermented fish and pork sausage, deep-fried garlic, pickled vegetables, rice noodles, and traditional liquors. Most of these foods are processed by local, small-scale manufacturers. One of the major characteristics of traditionally processed foods is that they are processed and preserved without any refrigeration systems. Even protein-rich and perishable foods, such as meat and fish, are not traded in the cold chain, or under refrigeration. To preserve them, even under hot temperatures over 30 degrees Centigrade, they use cooking, salting, and drying. In addition, materials are kept for a certain period of time by traditional lactic-acid fermentation techniques. Fermented fish, with lactic acid bacteria, is widely produced, especially in the southern part of Laos. This is an intelligent method of preserving raw materials, utilizing lactic acid bacteria as beneficial microorganisms. It seems somewhat old-fashioned, however, for the Japanese food business to collaborate immediately with the Laotian traditional food-processing sector, because the Japanese food-processing industry has already been developed to more scientifically control beneficial microorganisms.

Figure 3-1 Processed Meat (Left) and Deep-Fried Garlic and Onion in a Local Market

The third category is processed foods by modern technologies, such as seasonings and foods packed in bottles and cans for long storage and long-distance transportation. Although most available processed foods in this category in Laos are imported from foreign countries such as Thailand and Vietnam, some are manufactured in Laos.

In this study, considering the involvement of Japanese businesses is conditioned when we identify potential food items in Laos and devise strategies in their value chain. How could these three categories potentially work with Japanese food businesses? In the case of primarily processed foods, Japanese businesses, as Buyers of Laotian Products, which will be discussed in Chapter 4, may purchase them as they are or after some investment in quality improvement.

Most of the traditionally processed foods are home-processed foods, sold by measuring the products in a local market, and do not address processing, hygiene management, and/or packing for long storage and long-distance transportation. It is difficult to imagine Japanese businesses purchasing these foods (as they are), or to directly collaborate with small-scale food manufacturers, when considering both from a quantity, as well as a quality, point of view. In the future, (to some extent) we should think about the possibility of Japanese businesses becoming involved when the traditionally processed foods in Laos are developed.

Processed foods by modern technologies are in short supply in Laos, as shown in the next section. If we discuss only the current situation of this category, the potential for strategic food items cannot be sufficiently considered. Consequently, processed foods by modern technologies should be examined without limiting their present status, but by considering similar food processing in neighboring countries and the potential of their development in Laos.

3.2.2 Current Situations of Food-Processing Industry in Laos

It is meaningful to refer to the factory statistics by Ministry of Industry and Commerce to draw a present-day, big-picture look at the food-processing industry in Laos (Table 3-8).

Table 3-8 Number of Factories by Province[9]

Province	Large	Medium	Small	Total	Working Members
Vientiane Capital	87	86	304	477	37,137
Phongsaly	0	0	8	8	46
Luangnamtha	4	19	74	97	1,167
Oudomxay	0	19	260	279	1,181
Bokeo	11	6	380	397	2,155
Luang Prabang	19	46	16	81	1,004
Huaphanh	1	7	50	58	984
Xayabury	5	6	169	180	869
Xiengkhuang	1	6	1,898	1,905	2,949
Vientiane	13	11	1,487	1,511	4,824
Borikhamxay	7	5	1,941	1,953	5,282
Khammuane	25	20	1,833	1,878	4,123
Savannakhet	23	52	2,058	2,133	7,403
Saravan	5	0	695	700	1,533
Sekong	0	0	0	0	0
Champasack	15	9	1,167	1,191	3,488
Attapeu	0	0	2	2	41
Total	216	292	12,342	12,850	74,186

Source: Ministry of Industry and Commerce (2010) Factory Statistics

Small factories, with working members of more than 10 and less than 50, number 12,343 and account for 96% of all factories in Laos. Factories with working members of less than 10 are not counted in these statistics. Large factories, with working members of more than 200 and medium factories, with working members of more than 51 and less than 200, are only 216 and 219, respectively. By province, 76% of all factories are located in the top five provinces (Savannakhet, Borikhamxay, Xiengkhuang, Khammuane and Vientiane), while Vientiane Capital of Laos, different from Vientiane province, retains 50% of the labor force, with 40% of the large

[9] According to Table-1, above, the designation “Large” means more than 200 working members, with processing machines of more than 200 horsepower, or large environmental impact. “Medium” means working members of more than 50 and less than 200, with processing machines of more than 50 and less than 200 horsepower, or medium environmental impact. “Small” means working members of more than 10 and less than 50, with processing machines of more than 10 and less than 50 horsepower, or small environmental impact.

factories.

Table 3-9 Number of Food-related Factories by Type of Industry

Type of Industry	Factories				Working Member		Investment		
	Large	Medium	Small	Total	Foreigner	Total	Lao	Foreign	Joint
Slaughter house	7	1	115	117	0	574	28	0	0
Meat processing	0	0	1	1	0	5	1	0	0
Soybean processing	0	0	1	1	0	7	1	0	0
Fruit/vegetable processing	1	0	3	4	8	43	3	1	0
Sweet corn/palm seed	3	11	13	27	98	372	13	13	0
Fruit/vegetable juice	1	1	2	4	16	368	2	0	1
Cooking oil production	0	0	1	1	0	55	1	0	0
Ice production	4	2	197	203	3	624	183	1	0
Ice cream production	0	0	3	3	0	7	3	0	0
Tapioca starch production	3	0	0	3	35	204	1	2	0
Paddy cover crush	0	0	1	1	0	2	1	0	0
Rice milling	3	7	9,016	9,026	28	12,370	9,020	5	0
Bread/sweets production	0	2	12	14	10	132	14	0	0
Sugar production	2	0	0	0	162	1,126	0	2	0
Traditional noodle production	0	0	41	41	0	65	26	0	0
Various noodle production	0	3	23	26	2	126	25	1	0
Coffee processing	2	0	1	3	21	63	2	1	0
Tea processing	0	3	7	10	36	117	1	8	1
Tomato sauce	0	0	0	0	0	0	0	0	0
Salt production	1	3	1	5	0	442	5	0	0
MSG production	0	0	3	3	0	40	3	0	0
Liquor production	1	4	9	14	0	470	10	4	0
Beer production	3	1	1	5	0	915	1	1	3
Soda production	1	0	2	3	0	24	3	0	0
Drinking water production	7	15	422	427	2	3,066	425	3	0
Food subtotal	33	53	9,875	9,942	421	21,217	9,772	42	5
Food ratio	9%	11%	40%	39%	12%	19%	34%	6%	13%
Non-food subtotal	315	430	14,674	15,436	3,039	89,721	18,659	670	33
TOTAL	348	483	24,549	25,378	3,460	110,938	28,431	712	38

Source：Ministry of Industry and Commerce (2010) Factory Statistics

Food-related factories are shown in Table 3-9. There are 9,942 food-related factories in the country, which account for 39% of the number of factories but employ only 19% of the number of working members, since 99% of food-related factories are small factories with working members of more than 10 and less than 50.

By type of industry, rice mills, which process their own food staples, make up the majority of food-related factories in Laos: 9,026, which is 91% of all food-related factories in Laos. Other industries have a limited number of food-related factories: the drinking water industry accounts for the second-largest number with 427 factories, 4.3% of the Laotian food-related factories, followed by ice production, the third-largest food-related industry, with 203 factories, 2.0% of all food-related factories), and slaughter houses, the fourth, with 117 sites (1.2%). After the aforementioned industries and their associated factories, the number of factories per industry is as follows: traditional noodle production, 41 factories; sweet corn/palm seed, 27; various types of noodles production, 26; liquor production and bread/sweets production, 14; and tea processing, 10. As rice milling, drinking water production, ice production, and slaughterhouses can be categorized in the primarily processed foods category, food processing, in which raw materials are metamorphosed into totally different products, is obviously limited in Laos.

It should be noted that there are still many food-processing industries not shown in these statistics. First, small-scale factories with less than 10 working members are not included in these statistics. There are also not many traditional food-processing industries on the list, because most of the traditional food processers are working in countless numbers of very small factories. Secondly, when coffee farmers depulp coffee cherries and dry them to produce parchment, this process can be considered as food processing; however, it is not shown in these statistics. We need to keep in mind that similar food-processing activities exist outside the food-related factories.

To summarize, the so-called food-processing industry in Laos with more than 10 working members is limited in several kinds of industries, such as noodle production, sweet corn/palm seeds processing, liquor production, and tea processing, with a very small number of factories, except some kind of businesses belong to the category of primarily processing foods, such as rice milling, drinking water, and ice production. A large number of traditional food processers are considered to operate with a small-scale capacity.

Some food-processing factories in the processed food by modern technologies category are producing and marketing a certain amount of products. However, there are no supporting and affiliated industries, such as package materials production, and maintenance of food-processing machinery. The reality in Laos that even factories in the processed food by modern technologies category rely on Thailand and Vietnam for their food process support needs.

3.3 Current Situation and Challenges of Processed Food Market

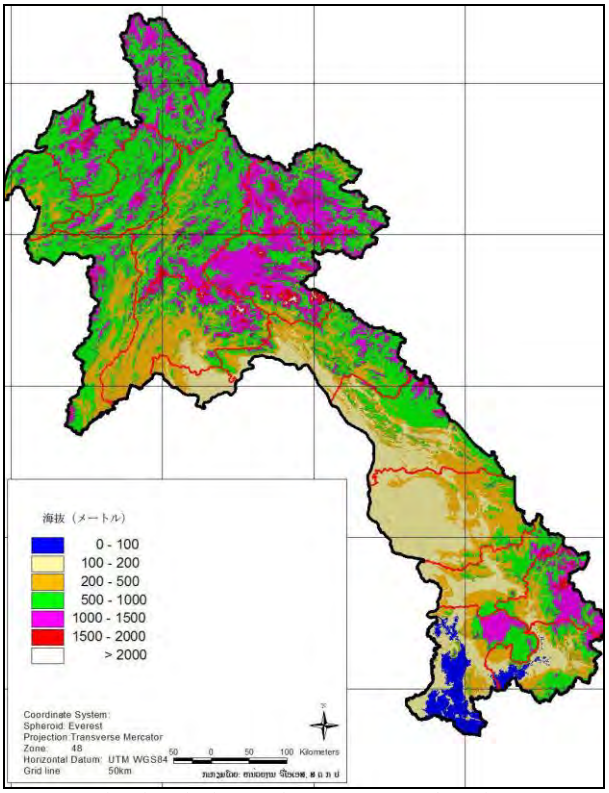
It is difficult to discuss the processed food market as a whole without first focusing on specific processed food markets. Therefore, Chapter 6 presents discussions on the markets of five items that are identified as potential processed food items.

3.4 Current Situation and Challenges of Food Distribution

Laos is a landlocked country with no seaport; in addition, there are huge, precipitous mountainous areas and poor infrastructure for transport. These conditions lead to the conclusion that Laos has great disadvantages in terms of distribution in comparison to other Mekong countries, such as Thailand, Vietnam, and Cambodia. As a result of these disadvantages, costs for distribution are high. Since food business in Laos needs careful planning of distribution, this section organizes information on transport infrastructure and distribution in Laos with the intent of supporting the formation of a distribution plan.

3.4.1 Geography

Figure 3-2 is a map of Laos with altitudes indicated by different colors. According to the map, the altitude is high and altitude range is extensive throughout the country, except in the Mekong basin to the south of Vientiane capital and Savannakhet province. In Northern Laos, north of Vientiane capital, mountainous regions expand and roads are steep and curved on the mountain slopes. In general, roads are narrow, which limits speed. Similarly, areas along borders with Vietnam in Sekong, Attapeu, and Saravan provinces are mountainous, thereby making traffic accessibility limited and crossing the border into Vietnam difficult.



Source: National Agriculture and Forestry Research Institute

Figure 3-2 Map of Laos with Different Colors by Altitudes

3.4.2 Land Transportation, Roads, and Bridges

A. Road Network

The overall situation of road network is presented in Table 3-10. The total length of roads in Laos is 39,586 km, approximately 40% of which are rural roads and approximately 20% are national roads and provincial roads. Paved roads in the country account for only 15% of all roads, although the government of Laos has exerted effort in developing traffic infrastructure. Of national roads, which include trunk road networks, approximately 61% are paved, which is a relatively high ratio; however, the ratio of paved roads among other types of roads is low. Provinces in which the ratio of paved roads is low are Phongsaly, Xayabury, Khammuane, Savannakhet, Saravan, Attapeu, and Sekong. Road density is low in Phongsaly, Oudomxay, Sekong, and Attapeu.

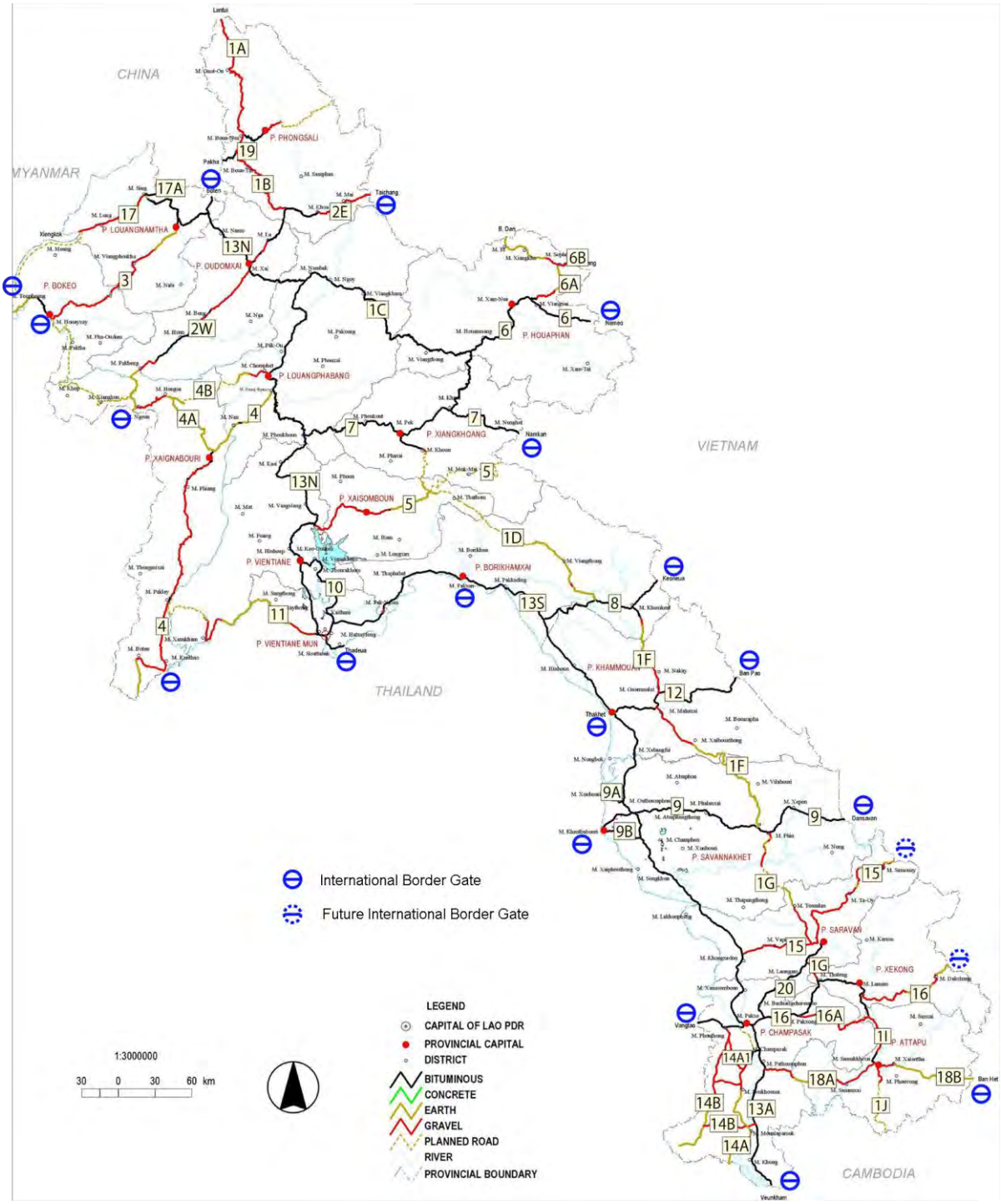
With regard to the number of lanes, 98.6% of all roads in the country have two lanes, and 1.4% has only one lane (JETRO, 2008a). Roads with three or more lanes are very rare. Except in the center of cities, streetlights are not installed, even along major trunk roads, thereby making driving at night dangerous.

Table 3-10 Overall Situation of Roads in Laos by Types of Roads and Provinces in 2010

Province	Length (km)	Ration of paved roads	Road density (km/km^2)	Road density (km/1000 persons)
By type of road (nationwide)				
National	7,235	61%	0.03	1.18
Provincial	7,962	9%	0.03	1.30
District	5,130	4%	0.02	0.84
Urban	1,915	30%	0.01	0.31
Rural	16,440	1%	0.07	2.68
Special	905	16%	0.003	0.15
All types	39,586	15%	0.17	6.46
By provinces				
Vientiane capital	2,024	25%	0.52	2.68
Phongsaly	1,363	10%	0.08	7.84
Luangnamtha	1,688	15%	0.18	10.55
Oudomxay	1,700	19%	0.11	5.80
Bokeo	1,160	17%	0.19	7.16
Luang Prabang	2,703	21%	0.16	6.14
Xayabury	2,618	7%	0.16	8.45
Huaphanh	2,249	20%	0.14	6.13
Xiengkhuang	2,478	15%	0.16	9.39
Vientiane	3,438	19%	0.19	7.36
Borikhamxay	1,943	20%	0.13	7.59
Khammuane	3,168	12%	0.19	8.61
Savannakhet	5,591	12%	0.26	6.27
Saravan	2,298	9%	0.21	6.42
Champasack	3,200	17%	0.42	33.68
Sekong	845	10%	0.05	1.31
Attapeu	1,120	13%	0.11	9.04

Source: The Road Department of Ministry of Public Works and Transport and data on area and population retrieved from the website of the National Statistics Bureau

Figure 3-3 depicts the network of major roads connecting cities and border gates. Usual routes to Vietnam include Route 9 crossing Savannakhet province, Route 12 in Khammuane province, and Route 8 in Borikhamxay province. There are routes to Vietnam from North Laos; however, these routes cross severe mountainous terrain, thus they are not usually used for freight transport. Routes to Thailand are any border gate along Route 13 south to Vientiane capital.



Source: Modified from a map provided by the Road Department of Ministry of Public Works and Transport, Laos

Figure 3-3 Major Road Networks and International Border Gates

Economic corridors that are being developed under the design of the Greater Mekong Subregion (GMS) are important routes for cross-border transport. The economic corridors are intended for the integration of traffic networks and socioeconomic activities in the Mekong region. In order to fully realize the ideal of the corridors, the development of border gate facilities, simplification of custom procedures, organization of agreements on cross-border transport, as well as improvement of roads and bridges have been undertaken.

Source: Modified from a map of a website of ADB (http://www.adb.org/GMS/Economic-Corridors/img/nsec-map-2010.jpg, accessed on Sep 7, 2011)

Figure 3-4 GMS Economic Corridors

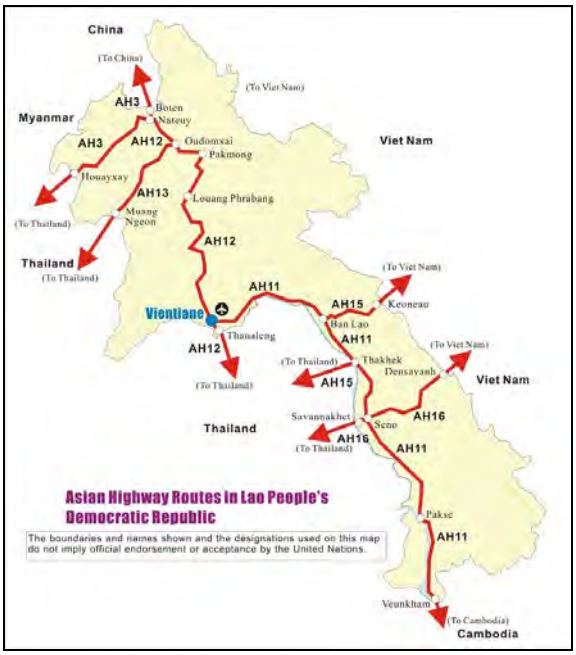
Four economic corridors cross Laos, as shown in Table 3-11: the south-north economic corridor, the east-north economic corridor, the central economic corridor, and the east-west economic corridor. The south-north economic corridor is the same as Route 3 in Laos and connects Thailand and Vietnam by crossing Luangnamtha and Bokeo provinces located in the northwest. After completion of the fourth friendship bridge construction, transit transport between Thailand and Yunnan in China along this economic corridor will increase. The east-west economic corridor is the same as Route 9 in Laos and runs east to west in Savannakhet; it connects Thailand and Vietnam and is used for transit transport between the two. The Cross Border Trade Agreement (CBTA), implemented according to the GMS design, is the most advanced for this economic corridor.

Table 3-11 GMS Economic Corridors Running across Laos

GMS economic corridor	Routes in Laos	Conditions/notes
South-north (west sub-corridor)	R3 (Thailand border-Myanmar border-Houaixay-Luangnamtha-Boten-China border)	• Paved but with many broken portions • A fourth friendship bridge near the border of Thailand is being built with the support of Thailand and China and is expected to be completed at the end of 2012. There is a high probability of delay in the completion.
East-north	R4 (Thailand border-Xayabury-Luang Prabang) + R13 (Luang Prabang-Phoukhoun) + R7 (Phoukhoun-Muang Kham) + R6 (Muang Kham-Sam Nua-Na Meo-Vietnam border)	• As of August 2010, Route 4 is unpaved and difficult for trucks to travel during the rainy season. Crossing the Mekong River along Route 4 requires a ferry, as there is no bridge. • Routes 6 and 7 are paved
Central	R1 (China border-Boten-Oudomxay) + R13 (Oudomxay-Luang Prabang-Vientiane capital-Savannakhet-Champasack-Cambodia border)	• Paved and not in bad condition • The road between Oudomxay and Vientiane capital runs through mountains and is dangerous at high speeds.
East-west	R9 (Thailand border-Savannakhet-Densavan-Vietnam border)	• Paved • Transit transport is extensive between Thailand and Vietnam, which has damaged the road. Maintenance is planned with the support of JICA.

Source: JICA study team. Information on road conditions is based on a site visit by the survey team and interviews with forwarding agencies.

In addition to the GMS economic corridors, the Asian Highway Project has been promoted by the United Nations Economic and Social Commission for Asia and the Pacific and 32 relevant countries including Laos and other nations in Mekong region with the aim of connecting Asian countries by road network. Table 3-12 and Figure 3-5 illustrate Asian Highway in Laos.



Source: Website of the United Nations Economic and Social Commission for Asia and the Pacific (http://www.unescap.org/ttdw/common/TIS/AH/maps/lao.jpg, retrieved on Sep 7, 2011)

Figure 3-5 Asian Highway in Laos

Table 3-12 Asian Highway in Laos

Route No.	Route	Length (km)
AH3	Boten/ China border, Luangnamtha-Houaixay/Thailand border	244
AH11	Vientiane capital-Thakhek-Pakse-Veun Kham/Cambodia border	823
AH12	Nateui–Oudomxay-Luang Prabang-Vientiane/Thailand border	684
AH13	Tay Chang-Oudomxay	166
AH15	Keoneau/Vietnam border-Thakhek/Thailand border	133
AH16	Densavan/Vietnam border-Savannakhet/Thailand border	241

Source: Website of the Ministry of Land, Infrastructure, Transport and Tourism of Japan (http://www.mlit.go.jp/kokusai/kokusai_tk3_000095.html, retrieved on Sep 7, 2011)

B. Governmental policy and plan for roads and bridges

The development of traffic infrastructure is one of the important development goals of the Government of Laos; in 2010, approximately half the national budget was allocated to the Ministry of Public Works and Transport. A draft of National Socioeconomic Road Network 2011–2020 Implementation Plan 2011–2015, states that issues that require focus are: strengthening the maintenance of existing roads and bridges, repairing roads in order to upgrade their classification, and capacity development of specialized expertise. A plan for 2011–2015 presents improvement projects, as listed in Table 3-13, such as road development to improve accessibility to countries in the GMS. In particular, the plan sets a high priority on the improvement of Routes 9, 8, 18A, 5, 17, 16A, and 6.

Table 3-13 Development Plan 2011–2015 for Road Networks Linking GMS Countries

No.	Section to be improved	Length (km)	Budget source	Completion year	High priority
1	R3 (Houaixay/Thailand border-Boten/China border), fourth friendship bridge	228	China, Thailand	2012	
2	R17 (Xiengkorg/Myanmar border-Pangthong/China border)	136	China	2015	○
3	R13N (Nateui-Oudomxay)	78	China	2011	
4	R13N (Oudomxay-Vientiane)	569	China	2015	
5	R2W, R2E (Pakbeng-Panghok)	250	Vietnam	2013-2015	
6	R4 (Xiengyeun-Naka), including a bridge crossing Mekong river	366	South Korea, ADB, OPEC	2012	
7	R6 (Viengxay-Namsoe), R6A (Hanglong-Dan), R6B (Sobbao-Pahang)	202	ADB, World Bank	2012-2016	
8	R6 (Hanglong-Phu Lao), R1C (Phu Lao-Kham district), R5	377	ADB, China	2015	○
9	R13S (Vientiane-Veun Kham/Cambodia border)	829	(not found)	2020	
10	R8 (Vieng Kham-Nam Phao・Vietnam border)	215	Thailand	2020	○
11	Third friendship bridge (Thakhek-Nakorn Panom)		Thailand	2011	
12	R9 (Savannakhet-Densavan/Vietnam border)	245	Japan	2015	○
13	R15 (Napong-Malay/Vietnam border)	238	Revenue from concession	2015	
14	R16 (Vang Tao-Paxon-Tat Heng-Sekong-Dakchung)	302	National budget (not found for certain section)	2015	
15	R16A (Paxon-Huansai)	64	National budget	2014	○
16	R18A (Peirphai-Phoukheua)	126	Revenue from concession	2015	○

Source: Modified from Ministry of Public Works and Transport (2011)

C. Land Transportation Routes, Charge, and Time

Transportation charges, transit times, and infrastructural conditions are organized for major land transportation routes in Table 3-14.

Table 3-14 Charges, Transit Times, and Infrastructural Conditions for Land Transportation

Section		Charge (USD)		Transit time[3]	Note (road condition, etc.)
		Container[1]	Truck[2]		
Phongsaly	Boten/China border		1000	13 hours	Route 1B between Phongsaly and Oudomxay is unpaved and runs through mountainous areas; thus, although driving is not impossible, it takes time and damages the vehicle.
	Oudomxay		750	12 hours	
	Vientiane capital		2100	3 days	Via Oudomxay and Luang Prabang
Oudomxay	Boten/China border		625	5 hours	Road condition is good.
	Luang Prabang		750	8 hours	Road is paved, but a section between Pakmong and Oudomxay on Route 1 is in very bad condition.
	Houaixay		875	9 hours	Road condition is good
	Vientiane		1800	2 days	
Houaixay	Boten/China border		800	10－12 hours	Paved road. A section between Luangnamtha and Boten is good. A section between Luangnamtha and Houaixay has many potholes. Mountainous areas spread into Bokeo.
Luang Prabang	Boten / China border		500	12 hours	Paved road. All the roads except for a section between Pakmong and Oudomxay on Route are in good condition. This section runs through mountainous areas and has many curves and steep slopes.
	Somhoun/Vietnam border		800	14 hours (Accessible only in dry season)	Road between Luang Prabang and Muang Khoua is paved. Section between Muang Khoua and Somhoun is unpaved and has only one place to cross a river with no bridge. It is not accessible in the rainy season. Section between Oudomxay and Somhoun has many curves.
	Nam Soy/Vietnam border		800	12 hours (Via Route 1) 8 hours (Via Route 7)	Road between Pak Mong and Houaphan (R1) is paved but narrow and has many potholes. It runs through mountainous areas. There is a 30km section with steep slopes and is difficult for high-speed driving. Road between Phou Khoun and Houaphan (R7 and R6) is paved and in good condition. Road between Houaphan and Nam Soy/Vietnam border (R6) is paved and in good condition.
	Namleuang friendship bridge/Thailand border		500	12 hours	R4 is unpaved. Mountains near Pakhone are difficult to go through. A bridge crossing the Mekong River is being constructed. Currently, it is impossible to drive through in the rainy season.
	Vientiane capital		1350	12 hours	Paved road. A part of the road has many potholes, but, overall, the road condition is good. This section runs through mountainous areas so that there are many curves and steep slopes. In the rainy season, mudslides sometimes occur and cut the road off.
	Bangkok	3250		2 days	
Vientiane capital	Bangkok	2150	900	1 day	
	Hai Phong		1100	2 days	Route 8 in Laos is in good condition although it runs through mountainous areas.
	Boten / China border		1200	2 days (3 days in rainy season)	
	Thakhek		750	5 hours	Road condition is good.
Thakhek	Bangkok	2450	1100	12 hours	
	Hai Phong		1100	2 days	Road between Thakhek and Naphao (R12) is paved in good condition. It is not through mountainous areas.
Savannakhet	Bangkok	1950	1000	12 hours	
	Hai Phong	1920		1.5 days	
	Da Nang		900	14 hours	
	Densavan		575	4.5 hours	There is heavy truck traffic, which has made potholes in the roads. This section crosses plain and has fewer curves. Therefore, visibility is good.
	Pakse		575	3－4 hours	Road condition is good.
Densavan	Hai Phong	1450		21 hours	
	Da Nang	700		6 hours	
Pakse	Bangkok	2100	850	1 day	
	Paxon	200	140	1.5 hours	
Paxon	Da Nang	1600	1100	2 days (2.5 days in rainy season)	Via the Phoukheua border gate in Attapeu province. Roads are paved and in good condition, but run through mountainous areas.
Bangkok	Laem Chabang	150	100		Additional charge to extend the destination of land transportation from Bangkok to Laem Chabang.

Source: JICA survey team based on interviews with local freight forwarders and truck companies
Note: 1. Charge per 20-foot dry container. Charge for reefer container is 50% more expensive. Charge for 40-foot container is not much different. 2. Charge for 12-15 ton truck. 3. Including time for custom clearance and rest for drivers.

3.4.3 International Border Gates

Border gates are classified into three types: international, national, and local border gates. While international border gates allow export to third countries and immigration of people of third countries, national border gates allow only export and import between Laos and adjacent countries and immigration of people of Laos and adjacent countries. Local border gates are allowed to use only for local people. Since food items from Laos that this survey focuses on will be exported mainly via international border gates, this section discusses only international border gates.

Table 3-15 lists international border gates. The locations of the international gates are depicted in Figure 3-3.

Table 3-15 International Border Gates

Laos side		Importing country side		Notes
Border gate	Province	Border gate	Province	
		Laos—Thailand		
Houaixay	Bokeo	Chiang Khong	Chiang Rai	
Nam Ngeun	Xayabury	Huai Kon	Nan	
Namleuang friendship bridge	Xayabury	Tha Li	Loei	
Thanaleng	Vientiane capital	Nong Khai	Nong Khai	- Automated System for Customs Data (ASYCUDA) is being trialed.
Pakxan	Borikhamxay	Bueng Kan	Nong Khai	
Thakhek	Khammuane	Nakhon Phanom	Nakhon Phanom	- A bridge over Mekong river is being constructed.
Savannakhet	Savannakhet	Mukdahan	Mukdahan	- Single Window Service has been implemented.
Vang Tao	Champasack	Chong Mek	Ubon Ratchathani	
		Laos— Vietnam		
Somhoun	Phongsaly	Tay Chang	Dien Bien	
Nam Soy	Huaphanh	Na Meo	Thanh Hoa	
Nam Kan	Xiengkhuang	Nam Cam	Nghe An	
Nam Phao	Borikhamxay	Cau Treo	Ha Tinh	
Naphao	Khammuane	Cha Lo	Quang Binh	
Densavan	Savannakhet	Lao Bao	Quang Tri	- Single Stop Service has been implemented.
Phoukheua	Attapeu	Po Y	Kon Tum	
		Laos—China		
Boten	Luangnamtha	Mohan	Yunnan	

Source: Ishida (2011), Custom Department of the Ministry of Finance, interviews by JICA survey team

According to local forwarders, Somhoun, Nam Soy, and Nam Kan border gates into Vietnam, located in North Laos, are inconvenient in terms of road accessibility and procedure required at the gates; therefore, the Nam Phao border gate is used for transporting freight from North Laos to Vietnam. Phoukheua border gate is the sole international border gate into Vietnam, located in South Laos, and it is somewhat close to the Da Nang seaport, the third biggest seaport in Vietnam. There are plans to pave and improve Routes 15 in Saravan province and 16 in Sekong province, and border gates accessed by these routes will be upgraded to international border gates after the improvement.

With regard to infrastructure and facilities at border gates, although those for customs procedures, such as X-ray machines, are provided at major border gates, such as the Thanaleng, Savannakhet, Densavan, Vang Tao border gates, those for logistics and distribution are not sufficiently developed. The following problems were found: (1) Places for transshipment in Vang Tao, Savannakhet, and Densavan border gates that were visited by JICA survey team are not spacious enough to accommodate trucks. (2) There is no garage with a roof, which is useful when it rains, at any border gate, except for the Thanaleng border gate. (3) The place for transshipment in the Vang Tao border gate is not paved so that footing is bad. (4) No border gate is equipped with a cold storage

warehouse.[10] (5) According to a custom officer, a warehouse at the Vang Tao border gate does not have enough space. (6) Cranes and forklifts were not found at the Vang Tao border during a site visit by the JICA survey team, while they were in Savannakhet and Densavan border gates.

There is no comprehensive development plan for infrastructure and facilities at border gates. The responsible office for infrastructure and facilities is the Department of Custom, Ministry of Finance.

3.4.4 Seaport and Sea Transportation

There is no seaport in Laos, as it is a landlocked region. In the event of export by sea transport via neighboring countries, Bangkok and Laem Chabang seaports in Thailand and Hai Phong and Da Nang seaports in Vietnam are usually used.

As Table 3-16 shows, the Bangkok and Laem Chabang seaports have larger facilities, handle more cargo, and have more vessels entering than Hai Phong and Da Nang seaports; the Bangkok and Laem Chabang seaports provide greater convenience.

Source: Modified from JETRO (2008a)

Figure 3-6 Seaports in Neighboring Countries

The Da Nang seaport is the third largest in Vietnam; however, it is still much smaller than the other three seaports listed in Table 3-16 in terms of handled cargo and entered vessels. The Da Nang seaport is not as convenient as the other three. A Japanese shipping company in Vietnam said that there is no greater benefit of shipping from the Da Nang seaport as compared to the Bangkok or Laem Chabang seaports unless a vessel's schedule, using the Da Nang seaport, closely matches the cargo's schedule as well.

The Hai Phong seaport is the closest from the north of Laos; however, traffic using the seaport is tremendous; thus, there is no benefit using it.

Table 3-16 Seaports in Neighboring Countries

	Thailand		Vietnam	
	Bangkok	Laem Chabang	Da Nang	Hai Phong
Facilities				
No. of Berths	84	18	10	16
Total Length of Berths (m)	7,688	6,724	1,657	2,438
Depth of Water Way (Draught) (m)	4.6－8.2	10.0－16.0	7.0－11.0	8.4－10.5
Terminal Facilities (m^2)	363,168	3,329,265	267,456	127,300
No. of Seashore Container Gantries	14	26	1	2
No. of Yard Gantries	34	68	2	4
Handled cargo				
Cargo Handling Volume (1000 ton)	16,031	35,736	2,256	10,511
Container Throughput (1000TEU)	1,349	3,766	32	398
Number of Ship Calls	2,570	6,410	1,290	2,430

Source: JETRO (2008a)

[10] A cold storage warehouse existed at Thanaleng border gate before; however, it was closed due to deficit operation.

Table 3-17 summarizes lead times, freight rates, and other tariffs for sea transportation to Japan, Taiwan, Europe, and the USA. In the case of shipping to Japan, the Hai Phong seaport is the cheapest and fastest. Transport to Japan from Da Nang, which is closer to Japan than the two seaports in Thailand, needs greater lead time and accrues additional freight rate than transport to Japan from the two seaports in Thailand because vessels from Da Nang travel to Japan via Thailand.

Table 3-17 Marine Freight Rates, Lead Time, Terminal Handling Charges

		Thailand		Vietnam	
		Bangkok	Laem Chabang	Da Nang	Hai Phong
Destination					
Japan (Yokohama)	Lead time	13 days	12 days	15–17 days	10 days
	Freight rate (dry container)	USD 400	USD 400	USD 450	USD 200
	Freight rate (reefer container)	USD 950	USD 950	n.a	USD 1,000[1]
Taiwan (Kaohsiung)	Lead time	7 days	7 days	4–8 days	3 days
	Freight rate (dry container)	USD 400	USD 400	USD 300	USD 40
	Freight rate (reefer container)	USD 950	USD 950	n.a	USD 700[1]
Europe (Rotterdam)	Lead time	23 days	23 days	28– 32 days	12–16 days
	Freight rate (dry container)	USD 925	USD 925	USD 1,000	USD 800
	Freight rate (reefer container)	USD 2,125	USD 2,125	n.a	USD 3,200[1]
USA (New York)	Lead time	36 days	36 days	32 days	32 days
	Freight rate (dry container)	USD 3,100	USD 3,100	USD 2,800	USD 2,680
	Freight rate (reefer container)	USD 4,700[1]	USD 4,700[1]	n.a	USD 4,300[1]
Tariff for custom clearance		USD 150	USD 150	n.a	n.a
Terminal handling charge (20-foot container)					
Dry container		USD 90	USD 90	USD 91	USD 91
Reefer container		USD 110	USD 110	n.a	USD 104

Source: Interview with forwarders in Bangkok and Ho Chi Minh in September 2011
Note: Freight rates are for 20-foot containers, except for figures with a superscript of 1, which are rates for 40-foot containers.

3.4.5 Airport and Air Transportation

Regular international flights are available at the four airports in Vientiane, Luang Prabang, Savannakhet, and Pakse. Cargo carriers are not in service in Laos; therefore, passenger carriers transport cargo. Since passenger carriers cannot transport considerable volumes of cargo, airlines may refuse cargo immediately before shipping. In other words, air transportation in Laos lacks reliability. Containers for airfreight are not in service; thus, cardboard boxes or Styrofoam boxes are used for packing cargo, and there is no cold storage facility in service.

Table 3-18 lists air transportation rates from Vientiane to Narita arranged by a freight forwarder in Vientiane. According to the forwarder, cargo can be transported by air to anywhere via Bangkok. Cargo owners who do not use forwarders negotiate rates directly with the airlines. For example, a company shipping fresh vegetables by air from Vientiane to Narita would pay approximately 400 Yen/kg as the freight rate to airlines.

Table 3-18 Air Transportation Charges from Vientiane to Narita

	Weight of cargo	
	Less than 45kg	More than 45 kg, Less than 80 kg
Freight rates	12.95 USD/kg	3.70 USD/kg
Service charge by forwarder	40 USD/parcel	
Fuel surcharge	0.16 USD/kg	
Security surcharge	0.12 USD/kg	
Airway bill fee charge	0.15 USD/kg	
X-Ray screening fee	0.15 USD/kg	

Source: Interview with a forwarder in Vientiane in August 2011
Note: In case the volume is over 6000cm^3/kg, the charge is calculated by dividing the volume by 6000cm.^{3}

3.4.6 Current Situation of Logistics

A. Freight Traffic

Annual volume of freight traffic in 2009 in Laos was 366 million ton-km (Table 3-19). This amount is less than even 1% of that of Vietnam. Land transportation constitutes the main proportion of freight traffic in Laos, water transportation constitutes 20%, and air transportation constitutes only 0.2%.

Table 3-19 Volume of Freight Traffic

(Unit: million ton-km)

	2003**	2004**	2005*	2006**	2007*	2008*	2009*	Reference: Vietnam in 2008***
By land	242.3	328.3	259.9	266.3	277.1	286.7	296.2	28023.5
By water	55.5	49.6	41.1	42.8	60.9	67.6	69.5	22680.3
By air	0.9	0.7	0.3	0.3	0.2	0.3	0.2	290.0
Total	298.6	378.6	301.4	309.4	338.3	354.5	365.9	50993.8

Source: * Website of the Ministry of Planning and Investment (http://www.nsc.gov.la/index.php?option=com_content&view=article&id= 7&Itemid=9, retrieved on Sep 5, 2011) **MPI (2008) ***General Statistics Office (2009)

B. Shipping companies and shipping arrangements

Table 3-20 presents the number of shipping companies and trucks by provinces. Vientiane capital, Savannakhet province, and Champasack province have the most shipping companies and trucks. There are six provinces where no shipping company provides service for cross-border transport.[11]

Table 3-20 The Number of Shipping Companies and Trucks in 2010

Province	No. of shipping companies [1]	No. of shipping companies capable of cross-border transport [1]	No. of trucks in shipping companies
Vientiane capital	48	47	474
Phongsaly	1	1	63
Luangnamtha	1	0	63
Oudomxay	7	0	232
Bokeo	2	1	23
Luang Prabang	1	0	54
Xayabury	1	1	325
Huaphanh	4	1	213
Xiengkhuang	3	2	73
Vientiane	3	1	124
Borikhamxay	4	4	191
Khammuane	10	1	217
Savannakhet	9	9	632
Champasack	18	18	616
Saravan	1	0	202
Sekong	1	0	29
Attapeu	1	0	37
Total	115	86	3568

Source: JICA survey team based on a document from the Department of Transport, Ministry of Public Works and Transport.
Note: 1. The figures do not include individuals operating shipping businesses. Due to the constraint of statistics, truck associations that are formed by individuals are counted as one.

Shipping companies form networks with other companies located in Laos and abroad and are able to handle transport services in broad areas throughout the network. For example, a large freight forwarder in Vientiane capital is able to arrange transport throughout Laos, Thailand, and Vietnam; in addition, it can accommodate seaport handling. Moreover, even small, local companies in provinces in Laos can arrange shipping to foreign countries; however, it should be noted that quality and reliability of these services vary from one company to another. It is possible to use Japanese shipping companies that seem to provide reliable and higher-quality transport. However, their operation is focused on transit transport between Thailand and Vietnam via Route 9; thus, currently that covers distribution only along Route 9.

It is possible to arrange cargo transport to either Thailand or Vietnam by not contacting shipping companies of Thailand or Vietnam but by asking Laotian companies instead. However, transport to the Yunnan province in China is not as simple as to Thailand and Vietnam. According to concerned

[11] Individuals who have trucks and operate shipping businesses are supposed to belong to truck associations in the provinces. Table 3-20 does not include individuals but count the truck associations formed by individuals as one.

organizations and persons, no shipping company or forwarder has a network in the Yunnan province. The governments of both Laos and Yunnan provinces signed a memorandum of understanding granting special, mutual permission for entry into the other's country; nevertheless, shipping companies do not have trucking services in Yunnan province. Therefore, when shipping cargo to Yunnan, cargo owners have to arrange transportation in Yunnan on their own, or receivers must accept the cargo at Boten border gate, or there are some shipping companies in China who have obtained licenses for vehicles traveling to Laos. As a result, it may possible to arrange for Chinese trucks for transportation from Laos to China.

Cold chain distribution is not yet developed in Laos. No shipping company holds refrigerated or chilled cars; furthermore, refrigerated or chilled trucks in Thailand and Vietnam, which are licensed to operate in Laos seem rare. As a result, cold chain distribution from Laos is possible only by reefer containers transported by licensed trailers.

Logistics in Laos face the problem of halfway cargo, which means that when trucks from Thailand and Vietnam are used, those trucks do not carry cargo on the way to Laos. Since Laos imports a great deal of goods from Thailand, it is expected that trucks carrying goods to Laos can transport exported cargo from Laos on the way back; currently, that is rare. According to local freight forwarders, the problem is that it is not easy to match transportation schedules. Laos faces various handicaps, such as physical distance to seaports, large amount of mountainous areas, insufficiently developed infrastructure for transportation, and the price of fuel, all of which cause high costs for logistics; however, if the halfway cargo problem is solved, the cost for logistics will be approximately half the current cost.

Further, in Laos, shipping companies are generally small in scale with insufficient equipment and their trucks are old and poorly maintained. No shipping company has refrigerator trucks. The number of vans owned by shipping companies is so limited that it is not always possible to arrange for shipping via a van. Because Laos is a landlocked country, no shipping company has containers or container trailers. Since the number of Laotian trucks licensed for cross-border transport is very small, trucks from Thailand and Vietnam are usually used for cross-border transport.

3.4.7 Cross-Border Transport

A. Time and Expense for Importing and Exporting

The World Bank surveyed the number of documents and days and the expenses that are necessary for importing and exporting in Laos, as shown in Table 3-21. It is obvious that the number of days and the expenses of Laos significantly exceed those of Thailand, Vietnam, and Cambodia.[12] An officer of the Department of Custom, Ministry of Finance said that approximately 50% of the contents of documents are overlapping.

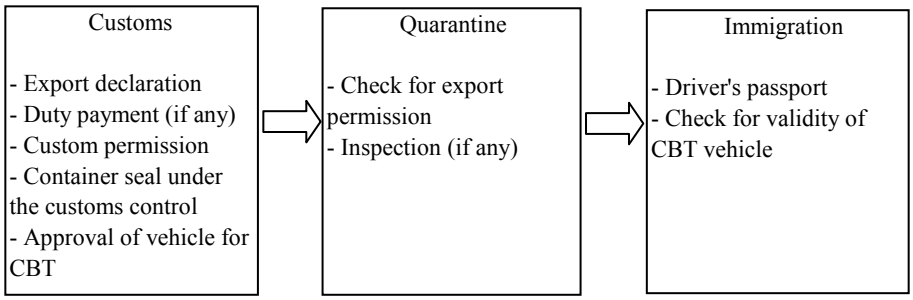
Table 3-21 Time and Expense for Importing and Exporting

	Exporting			Importing		
	No. of documents	No. of days	Expense (USD)	No. of documents	No. of days	Expense (USD)
Laos	9	48	1,860	10	50	2,040
Thailand	4	14	625	3	13	795
Vietnam	6	22	555	8	21	645
Cambodia	10	22	732	10	26	872

Source: Website of the World Bank (http://www.doingbusiness.org/data, Sep 16, 2011)

The time and expense shown in the above table are required for all procedures, from application for permission to export, while procedures at border gates include customs, quarantine, and immigration, as illustrated in Figure 3-7. According to custom officers and local shipping companies, the time spent on procedures at border gates range from 30 minutes to 1 hour, if all prior processes are completed, and there is no mistake in the application forms.

[12] The Department of Customs, Ministry of Finance does not accept these results of the World Bank.



Source: IDCJ and Nippon Koei (2011)

Figure 3-7 Procedures at Border Gates for Exporting

B. Cross Border Trade Agreement (CBTA)

The Cross Border Trade Agreement (CBTA) has been signed by the six countries in the Mekong region with the purpose of promoting transport in the region. The agreement comprises the main body of 44 articles with 20 annexes. The agreement encompasses both passenger and cargo transport and stipulates broad issues such as cross-border, entry of vehicles, development of infrastructure, standardization of systems, etc. The agreement was ratified in 2003. Thereafter, annexes and protocols have been signed; however, since not all were ratified, some terms have not yet been implemented.

Protocol 1, which was signed in April 2004, stipulates routes and border gates where the CBTA is applied. There are 15 gates where CBTA is applicable, 8 of which are at the Laos border: the Boten-Mohan border gate, the Houaixay-Chiang Khong border gate, the Savannakhet-Mukdahan border gate, the Densavan-Lao Bao border gate, the Thanaleng-Nong Khai border gate, the Vang Tao-Chong Mek border gate, and the Nam Phao-Cau Treo border gate. It turned out that the ratification of protocols and annexes took longer than expected. Then, in August 2004, 5 of the 15 border gates were selected for trial and tentative implementation of the CBTA, for which memorandums of understanding between the two countries that shared each gate were made. The five border gates include the Savannakhet-Mukdahan border gate and the Densavan-Lao Bao border gate (Ishida, 2011). In short, effort has been made for promoting cross-border transport on the basis of the CBTA, yet at present there are only two border gates that directly benefit from the CBTA in Laos: the Savannakhet-Mukdahan border gate and the Densavan-Lao Bao border gate.

The CBTA, including protocols and annexes, encompasses and specifies various issues and arrangements. Among these issues and arrangements, a remarkable agreement has simplified the procedure for crossing the border. This simplification is stipulated in Annex 4 and is expected to be practiced primarily by Single Stop Service and Single Window Service. Single Stop Service is intended to merge the procedures for customs, quarantine, and immigration, which are usually done twice at the departure and entry sides. Single Window Service is intended to combine different windows for procedures of customs, quarantine, and immigration into a single window. Currently, these two services have been implemented only at the Savannakhet-Mukdahan border gate and the Densavan-Lao Bao border gate; as of now, implementation is at the midway mark. At the Savannakhet-Mukdahan border gate, a gate on the Laos side began Single Window Service but not Single Stop Service. According to a custom officer at the border, the Laos side has already completed the necessary preparation for Single Stop Service; however, the Thailand side has not yet done so because of difficulty in permitting Thailand officers to work on the Laos side. At the Densavan-Lao Bao border gate Single Stop Service has begun, yet the service merges only the processes of physical investigation that were conducted separately by Laos and Vietnam and not the processes of customs documentation, quarantine, and immigration conducted by both countries. At the Densavan-Lao Bao, Single Window Service has not yet been implemented; nevertheless, a building and additional

facilities for the service were constructed with support from Japan in 2011, and according to a custom officer at the border, the service will begin in 2012.

The CBTA stipulates a quick procedure for perishable goods and mutual entry of vehicles as well as simplification. With regard to mutual entry, vehicles from Laos and Vietnam with passports can travel anywhere in the other country, while vehicles from Thailand, which have right-hand steering and are different from Laotian vehicles that have left-hand steering, are allowed to go anywhere in Laos and to Da Nang with prior registration.

3.5 Current Situation with and Challenges to Policy, Legal Framework, and Taxation Related to Food

3.5.1 Food Safety System

The Lao PDR's food safety system is based on the Codex Alimentarius Standards and Hazard Analysis Critical Control Point (HACCP) stipulated by the Codex Standard Commission created by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). The laws, decrees, and standards are prescribed with reference to the international standards and ASEAN Standards below.

On the other hand, it was pointed out in an interview with a trading company in Japan that, when the food was imported from the Lao PDR, a certificate for free aflatoxin could not be issued because there was no inspection regime for aflatoxin. The Food and Drug Quality Control Center (FDQCC) in charge of the inspection already has the test equipment for aflatoxin; it will buy the apparatus for the equipment early in 2012 and start testing. The FDQCC inspector has completed the training course on testing aflatoxin conducted by ASEAN.

FDQCC plans to set up branches in Luang Prabang, Savannakhet, and Champasack province to strengthen the inspection regime.[13]

In Champasack province, the officials of the district health offices inspect the markets for food safety and correct labeling four times a year. When they find something doubtful, they collect a sample and send it to the Health Department of the province. The department tests to see if the food is contaminated by chemicals; however, it cannot specify the kind of chemical and thus sometimes asks the FDQCC to test it.[14]

There is room for improvement with the inspection regime and the capacity building of inspectors; however, the government of the Lao PDR has tried to establish them properly with the cooperation of donors.

The main laws, decrees, and standards related to food safety are described below.

A. Food Law (2004)

The Food Law defines the principles, rules, procedures, and measures for the management and inspection of food-related activities. The food standards of the Lao PDR consist of safety, hygiene, and nutrition. In case the Lao standards do not exist, the food must comply with the standards, regulations, and guidance prescribed by the International Codex Alimentarius (Article 13 of the Law). Food exported from the Lao PDR shall comply with the standards prescribed by Article 13 of the Law and with the other relevant regulations. Issues regarding food quality depend upon the needs of the importing country (as per Article 23 of the Law).

[13] Interview on October 26, 2011 with the director of the FDQCC
[14] Interview on October 25, 2011 with the director of the FDQCC

B. National Food Safety Policy (2009)

The National Food Safety Policy defines the risk analysis used to carry out science-based evaluations and reach sound, consistent solutions to food safety problems. It promotes collaboration and cooperation at the national level across all the ministries and committees involved in food safety and quality (e.g., among the Food and Drug Committee, the National Codex Committee, and other related sectors, both government and private). It also promotes and supports the safety of the food trade, following the standards of the Codex Alimentarius and agreements related to food safety, such as the agreements of ASEAN and the World Trade Organization. It defines ten strategies for food safety, such as insuring the safety of foodstuff in primary production, risk analysis, and the integrated food chain approach.

C. Ministerial Regulation on the Basic Principles in the Application of Sanitary and Technical Measures for Food Safety Management (Ministry of Health, 2009)

The application of sanitary and technical measures for the administration of food safety shall follow these principles: 1) the necessity to protect consumer health; 2) the standards determined in the Lao PDR; 3) ensuring transparency; and 4) non-discrimination (as per Article 4 of the Regulation).

The Lao PDR recognizes the standards of countries that have adopted the standards of the Codex Alimentarius. The sanitary and phytosanitary certification of those countries will be accepted by Lao PDR When the product fails to meet those standards, it can be rejected (as per Article 12 of the Regulation).

D. Regulation on the Control of the Production, Export, and Import of Safe Food (Ministry of Health, 2006)

The Regulation on the Control of the Production, Export, and Import of Safe Food defines the principles, rules, and measures for the production, processing, import, export, and distribution of food in the Lao PDR in order to manage, control, strengthen, and promote the development of food business units (as per Article 1 of the Regulation).

Safe food processing begins with the selection of the raw materials and continues through the control of all the steps in food production (i.e., processing, analysis, packaging, labeling, storage, transportation, and distribution) in order to ensure the quality and safety of food products following Good Manufacturing Practice, or GMP (as per Article 4 of the Regulation).

Food exporters exporting food from the Lao PDR, besides complying with export principles, shall provide the necessary documents to the Food and Drug authority in order to receive export certification (as per Article 19 of the Regulation).

E. Regulation on Labeling of Prepackaged Food (Ministry of Health, 2009)

The Regulation on Labeling of Prepackaged Food defines the principles, rules, and measures concerning the labeling of pre-packaged food in order to monitor whether the labels are correct and to promote the development of the food business units (as per Article 1 of the Regulation).

The logo or brand mark should contain the required basic information listed below (as per Article 4 of the Regulation):

- The name of the food
- List of ingredients
- Net contents and drained weight
- Name and address of the manufacturer, packer, and distributor

- Date marking and storage instructions
- Instructions for use

F. ASEAN Common Principles for Food Control Systems

The ASEAN Common Principles for Food Control Systems outline the principles for establishing food control systems for ASEAN member countries; they include the ASEAN Common Principles and Requirements for the Labeling of Prepackaged Food and the ASEAN Common Principles and Requirements for Food Hygiene.

G. Good Manufacturing Practice for Food Establishment (Ministry of Health, Drugs:1998, Food: 2007)

The GMP follows the entire processing chain, starting from primary production to end-use consumer. Its jurisdiction includes food processing facilities, equipment, waste treatment, cleaning, temperature control, and storage. The GMP is fundamental to the HACCP.

The Food and Drug Department of the Ministry of Health (MOH) is in charge of GPM and HACCP certification. So far, only a few Laotian food processing companies have obtained GMP certificates.

The Lao Agro Industry Co., Ltd., in Vientiane province, which began operations in 1995, produces canned sweet corn for export to Europe, canned mango preserved in syrup for export to the United Kingdom, and coconut preserved in syrup in plastic cases for export to Thailand, Vietnam, and Malaysia. The company aggressively sought and received the hygiene control certificates of the British Retail Consortium (BRC) Global Standards as well as the Lao PDR's GMP and HACCP.

In administrative terms, the Department of Agriculture (DOA) of the Ministry of Agriculture and Forestry follows the Plant Protection Law, the Good Agriculture Practice, and the Organic Agriculture Standards. The Plant Protection Center (PPC) in Vientiane plays the leading role in food inspection. The PPC mainly inspects for pest-borne plant diseases. Some inspectors lack sufficient knowledge and experience and cannot detect some vegetable diseases. The FAO is implementing the Integrated Pest Management Project to build the capacity of PPC officials.[15]

A summary of the rules and systems is shown below.

H. Plant Protection Law (2008) and Plant Quarantine Framework

The Plant Protection Law defines the principles, rules, and measures regarding administration, inspection, and plant protection in order to impede the spread of pest diseases in the country (as per Article 1 of the Law). Plant protection activities include domestic plant protection, inspection of imported plants, inspection of exported plants, inspection of transit plants, inspection of plants conveyed by passengers or mail, inspection of transportation vehicles, and inspection of plant sanitation businesses. However, the chemicals used in plant protection and their residues are not covered within the scope of this law (as per Article 6, 8, and 9 of the law).

An individual or organization wishing to export plants, plant products, or other materials must request the Agriculture and Forestry Authority to inspect the plant according to the requirements of the destination country (as per Article 19 of the law). An individual or organization has the right to request that the relevant Agriculture and Forestry Authority re-inspect the exported plant, plant products, or other materials in the following cases: 1) additional inspection is required by the destination country; 2) the packaging has changed or has a defect; or 3) the phytosanitary certificate has expired (as per Article 20 of the law).

[15] Interview in the PPC on October 18, 2011 with the deputy director of the PPC

The plant quarantine framework for the export of agricultural products is based on the Sanitary and Phytosanitary Measures (PSP) stipulated by the World Trade Organization (WTO) and the International Plant Protection Convention (IPPC). The Lao PDR has been adhering to the IPPC since1965 and even more aggressively since 2006. When agricultural products are exported from the Lao PDR, an exporter must obey the Plant Protection Law of the import country. The exporter needs to study the relevant rules and be prepared for them (see 3.5.4).

I. Good Agriculture Practice (Ministry of Agriculture and Forestry, 2011)

Good Agriculture Practice (GAP) was formulated in 2011 based on the ASEAN GAP. It consists of four Agreements of the Minister: 1) the Agreement of the Minister on GAP for Food Safety Standard; 2) the Agreement of the Minister on GAP for Quality Produce Management Standard; 3) the Agreement of the Minister on GAP for Worker Health, Safety & Welfare Standard; and 4) the Agreement of the Minister on GAP for Environmental Management Standard. The establishment of an administrative framework and building officials' capacity are the key challenges. The DOA of the Ministry of Agriculture and Forestry plans to draft an inspection manual for DOA officials and establish a certification body in 2012. Certificates are issued according to the above Agreements of the Minister.

J. Decision of the Minister of Agriculture and Forestry on Organic Agriculture Standards (Ministry of Agriculture and Forestry, 2005) and Organic Agriculture Certification Framework

Organic Agriculture Certification commenced in 2006 based on the Decision of the Minister of Agriculture and Forestry on Organic Agriculture Standards. These Organic Agriculture Standards are based on the International Federation of Organic Agriculture Movements (IFOAM) Basic Standard (as per Article 2 of the Decision).

The Laos Certification Body (LCB) of the DOA of the Ministry of Agriculture and Forestry has issued around 20 certificates to individuals and organizations since 2006. Certificates require yearly renewal. However, only one company renewed it this year (as of October 2011). One reason for this is that some are no longer growing organically; also, some have submitted renewal forms, but LCB staff members do not have enough time to certify them for lack of human resources.

The LCB has not yet been accredited by IFOAM as an international standards certification body. Obtaining this accreditation is one of LCB's goals; however, it is unlikely to receive accreditation under the current circumstances: the DOA (LCB) must pay USD 6 million for it, while approximately only 20 certificates have been issued over the past six years, and the revenue consequent to certification is only 5.5 million Kip (around USD 7).

In cooperation with the Organic Agriculture Certification Thailand (ACT), a Thai certification body, the LCB has been improving the capacity of its staff. When a farmer or organization in the Lao PDR applies for ACT certification, the LCB collaborates with the ACT. For instance, the farmer or organization consults with staff at the LCB instead of the ACT during the preparatory stage. After the LCB has sufficiently consulted with the applicant, the ACT inspector comes to the Lao PDR to certify. The LCB staff member also participates in the certification activity.

The labeling of organic agricultural products harvested in the Lao PDR must comply with the regulations on labeling in the import country or region. For example, organic agricultural products exported to Thailand and Japan need the certification of ATC or JAS standards (respectively) for organic food. Where one certification body (e.g., the ATC) is accredited by another certification body, a farmer or organization can ask the accredited body (e.g., the ATC) to certify as a substitute in order to get the certificate of the latter certification body. However, as mentioned, the LCB has not been accredited by the IFOM, so it cannot certify as a substitute for another certification body.

The Clean Agriculture Development Center (CADC) of the Ministry of Agriculture and Forestry is in charge of the Internal Control System (ICS), the system for organizing farmer groups. The PPC is responsible for the quarantine of agricultural products. Technical support for organic agriculture has been provided from 2005 to December 2011 by a nongovernmental organization (NGO) based in Switzerland through a Project for the Promotion of Organic Farming and Marketing (Profil Project). This NGO worked with the DOA and the CADC.

3.5.2 Legal Framework on Land Use

Article 15 of the Constitution of the Lao PDR (2003) reads, "The state protects the right to ownership (rights to governing, using, and transferring) and the rights to inherit property of organizations and individuals. As for the land under the ownership of the national community, the state ensures the rights to using, transferring, and inheriting it in accordance with the law. Aliens, apatrids, foreign individuals and their organizations living, investing, and conducting lawful activities in the Lao PDR may lease or receive concessions of land from the State" (Article 64 of Land Law [2003]). It continues, "The period of land lease or grant of concession from the State to aliens, apatrids or their organizations shall be based on the characteristics, size, and conditions of the intended operations on the land (Article 65 of Land Law [2003]).

Article 58 of the Law on Investment Promotion (2009) states, "Foreign investors with registered investment capital of five hundred thousand US Dollars or above are entitled to buy land use rights from the Government according to the allocation and investment timeframe in order to build housing or office buildings with the agreement of the local authorities in accordance with rules and regulations." Article 28 says, "The term of concession shall not exceed ninety-nine years and can be extended with the approval of the Government or the concerned Provincial Authority."

Article 42 of the law states, "The term of investment in the Special Economic Zones and Specific Economic Zones shall not exceed ninety-nine years and may be extended with the approval of the Government." The provisions above guarantee land use rights.

The scope of agricultural land use rights is determined by Article 17 of the Land Law, which reads, "The State authorizes individuals and families to use agricultural land in accordance with the allocation plan and objectives, for the long term and in an effective manner, according to areas determined as follows…and when granting approval for the use of agricultural land to an organization for production purposes, [such approval] shall be based on the actual capacity of the concerned organization."

Article 28 continues, "Regarding industrial land, the Ministry of Industry and Handicrafts is charged with managing industrial land, [and] with studying and developing regulations on the management, protection, development, and use of this category of land, including environmental protection, and, thereafter, submitting them to the government for consideration and approval. In case of the management of land used for electricity transmission lines, energy and gas pipelines, and pipe-lines for water supply, it is required to coordinate with the transport, post and construction sector and other concerned sectors."

According to Article 15 of the Decree on the Implementation of the Investment Promotion Law (2011), the investor shall deposit warranties to guarantee the implementation of the MOU/ agreement. The conditions and amount of the warranties will depend on the size, type, sector and agreement made during the MOU/ concession agreement negotiation. For example, for a land concession project covering an area between 2 and 150 ha, the warranties are USD 30,000.

3.5.3 Taxation and Export Duty

The main taxes on food businesses in the Lao PDR are described below. Income tax is imposed on

foreign investors as well as on Laotians.

A. Profit Tax

Article 33 of the Decree on the Implementation of the Investment Promotion Law (2011) says the following (refer to 3.5.5): "The investment in promoted activities and investment promoted zones as set out in Annex 1 and 2 of the Degree on the Implementation of the Investment Promotion Law shall be exempted from profit tax as defined in Article 51 of the Investment Promotion Law. The incentives and duration of profit tax exemption start from the date the company generates revenue."

B. Customs Duty

Article 37 of the Decree on the Implementation of the Investment Promotion Law (2011) states, "A business that invests in promoted activities as defined in Annex 1 and concession activities as defined in Annex 3 of the Decree on the Implementation of the Investment Promotion Law shall be exempted from customs duties for import of raw material, equipment, machineries and vehicles to be used for direct production."

C. Export Duty

Article 52 of the Law on Investment Promotion (2009) states, "The Investor shall be entitled to the exemption from export duty for exporting general products."

3.5.4 Export Formalities

The export formalities for primary product such as vegetables and processed food are based on the laws and regulations of the Lao PDR and the import countries and regions (e.g., Thailand, Japan, and the EU). Generally, the import laws and rules of Japan and the EU are stricter than Thailand's, so a company or individual intending to export must pay close attention. A summary of the export formalities between Japan and Thailand is shown below.

A. Preparation in Lao PDR

The results of hearing from a trading company in Champasack province regarding the export of vegetables to Thailand are shown below:

(1) To issue a phytosanitary certificate on behalf of the Agriculture Department of the province, a provincial official visits the farm and collects a vegetable sample to inspect.
(2) A Form D for ASEAN countries must be completed by the trade company to get a Certificate of Origin (CO) from the Industry and Commerce Department of the province. Either the farmer or the organization can fill out the form, but the trading company generally does it instead, with the fee for the form paid by the import company in Thailand.
(3) The vegetables are conveyed from the farming place to the transshipment place near the border by a truck paid by the farmer or the organization after harvesting.
(4) The vegetables are weighed by the Chamber of Commerce of Champasack province before crossing the border. At this time, the Thai import merchant pays some fees.
(5) Export documents are brought to the custom office at the border every month to declare customs based on each CO.[16] The individual or company declares through the Automated

[16] According to Article 3 of the Agreement of the Minister of Finance for the Implementation of the Law and Custom Policy (No. 0491/Ministry of Finance, Vientiane Capital, March 12, 2009), the declaration documents have to been submitted to the customs office within 30 working days after the day on which the products were recorded in the warehouse. The product owner must type the product details into the form, collect the originals of documents such as the invoice, packing list, buying or selling contract, phytosanitary certificate, and export license for limited goods, and then enclose them with documents such as the business license, tax license, and the certificate of origin.

System for Customs Data (ASYCUDA). The declaration fee is 100,000 Kip. One can ask a temporary staff member in the custom office to type the documents, at a commission charge.

Before getting the CO in step (2), a certificate of exportation is usually issued by the Health Department of the province, but this is not always necessary; it depends on the trading company and the objectives of the exportation.[17]

The ASYCUDA mentioned in step (5) started as a pilot project in 2009. It operates from the Thanaleng custom office in Vientiane, so an individual or company can declare on the Web from their office. In other offices, such as the Vang Tao customs office in Champasack province, that are not fully operational, an individual or company can declare on the Web in the customs office.[18]

Each document related to exportation is described below:

(1) Phytosanitary Certificate

A phytosanitary certificate can be issued in twelve provinces (except Houaphan, Vientiane, and Saravan, and Sekong province) and in Vientiane capital. The PPC in Vientiane is the central plant quarantine lab. To serve the rural areas, 7 provinces have a lab run by the Plant Quarantine Section of the Agriculture Department.

According to Japan's Plant Protection Law, an import company or individual must arrange for an inspection and get a phytosanitary certificate from the export country. When dried tea and green coffee beans are imported into Japan, a plant quarantine is needed. On the other hand, when manufactured tea, roasted coffee beans, hermetically sealed tea, or coffee in cases is imported into Japan, this procedure is not needed.

For the importation of frozen vegetables into Japan, a document showing that the vegetables have been frozen and preserved at a －17.8℃ or lower temperature is prepared.

(2) Export Certificate

An exporter shipping food from the Lao PDR (besides applying all export principles) shall provide the relevant documents to the Food and Drug authority in order to obtain export certification (as per Article 19 of the Regulation on the Control of Production, Export, and Import of Safe Food).

Export certificates for foods such as vegetables can be issued by the Food and Drug Department of provinces like Champasack province. However, export certificates for processed food products can be issued only by the Food and Drug Department of the Health Ministry in Vientiane.

(3) Certificate of Origin

One document required for exportation into Japan, the EU, and ASEAN countries is the Certificate of Origin (CO). The CO is necessary in order to receive tax incentives under the Free Trade Agreement (FTA).

In order to receive a CO, documents should be prepared and a fee must be paid.[19] When coffee beans

[17] Interview in the Health Department of Champasack province on October 25, 2011 with the department's chief of the Food and Drug Section

[18] Interview in the Customs Office of Champasack province on October 25, 2011 with the customs officer

[19] According to an October 24, 2011 hearing in the Industry and Commerce Department of Champasack province with the Chief of the Import/ Export Section, when coffee beans are exported, the necessary documents are the following: 1) exporter's invoice; 2) exporter's packing list; 3) phytosanitary certificate; 4) certificate of quality control from the Science and Technology Department of Champasack province; 5) test report from the Science and Technology Department of Champasack province; 6) receipt when the exporter buys in; and 7) contract/ confirmation between the seller (exporter) and

are exported from Champasack province, the Industry and Commerce Department of Champasack province is the issuing authority.

The application form for exportation to Japan and the EU is different from the one for exportation to ASEAN countries. An explanation of how to obtain a CO is available only in the Lao language on the website of the Ministry of Industry and Commerce of the Lao PDR. The ministry plans to publish it in English by the end of 2011.

(4) Import/ Export License

The Lao PDR products requiring export permission are rice (seed paddy, brown rice, low-quality rice, high-quality rice, and white rice), cars, gasoline, cement, and other products important to the public. According to the Import/Export Department of the Ministry of Industry and Commerce, an Automatic Import-Export License System has been completed and will start operating soon.

(5) Inspection Report on Self-imposed Tests, etc.

When products are exported to Japan, the exporter and/or importer shall make sure that the products conform to the Food Hygiene Law of Japan. They will arrange for tests if needed and obtain the inspection report. The importer will prepare and submit documents regarding the raw materials (as in the case of frozen vegetables), process identification documentation, the name of the manufacturer, the name and address of the manufacturing site, and the name of the product as attached documents with the Food Import Declaration Form.

B. Necessary Inspection in the Import Country

(1) Import Formalities Based on the Plan Protection Law

When an individual or company imports products that require inspection, they must submit an Import Inspection Application Form with the applicable documents (such as the phytosanitary certificate issued in the export country) to the Plant Protection Office in Japan.

(2) Import Formalities Based on the Food Hygiene Law

When an individual or company imports fresh or frozen vegetables, they must submit a Food Import Declaration Form with the applicable documents to the Plant Protection Office in Japan.

3.5.5 Framework of Foreign Investment

The procedure for foreign investment and incentives is shown below. Tax incentives are described in 3.5.3.

A. Summary of the Procedures for Foreign Investment

A company or individual wishing to invest prepares and submits the required documents to the Investment Promotion Department of the Ministry of Planning and Investment (MPI) through its One Stop Service. Investments are divided into those with concession and those without.

The former needs the approval of concession. To receive this, the MOU from the Planning and Investment Department, the Project Development Agreement (PDA), the Concession Agreement, and the Production Agreement are requested. For an investment without concession, the Planning and Investment Committee, consisting of a chairperson from MPI and members from the Ministry of Agriculture and Forestry, the Ministry of Industry and Commerce, the National Land Management

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the buyer (importer).

Authority, the police, and concerned provinces, discuss the matter and provide an investment license if the request is approved.

A Planning and Investment Committee is held every Thursday. As a rule, investment approvals with concession take up to 45 days, and investment approvals without concession take up to 25 days. After the approval of an investment, corporate and tax registrations are needed.

The application form is available from the website of the Ministry of Planning and Investment.

B. Promoted Sectors and Zones

Promoted sectors are divided into 3 levels: Level 1 is the top level of promotion; Level 2 is the medium level of promotion; and Level 3 represents the low level of promotion (as per Article 49 of the Law on Investment Promotion [2009]). As to promoted zones, Zone 1 comprises areas with insufficient socio-economic infrastructure favorable to investment. These areas, mainly remote mountainous areas, are classified as the top level of investment promotion. Zone 3 encompasses zones with good infrastructure that supports investments. These zones are classified as a low level of investment promotion (as per Article 50 of the Law on Investment Promotion). All districts in every province and Vientiane are classified as a zone. Depending on the combination of Sector Level and Zone, the term of profit tax exemption varies from 2 to 10 years (as per Article 51 of the Law on Investment Promotion, Annex 1, Promoted Activities, and the List of Investment Promoted Zones in the Decree on the Implementation of the Investment Promotion Law [2011]).

C. Special and Specific Economic Zone

A Special and Specific Economic Zone is defined by the Law on Investment Promotion (2009), the Decree on Special Economic Zone and Specific Economic Zone in the Lao PDR (2010), the Decree on the Organization and Activities of the National Committee for Special and Specific Economic Zones (2010), and other laws. 6 Special and Specific Economic Zones have been officially endorsed (see Table 2). Five Special and Specific Economic Zones are under consideration (see Table 3). The Special Economic Zone is projected as a new town, unlike the Specific Economic Zone. A Specific Economic Zone can be developed within a Special Economic Zone.

When a developer applies to establish or invest in a Special or Specific Economic Zone, he submits the required documents below to the Secretariat Office of the Lao National Committee for Special Economic Zones (S-NCSEZ):

1) Technical and economic feasibility study report
2) Master plan of the proposed development
3) Environmental impact assessment
4) Draft of contract agreement between the developer and the government
5) Certified documents on the financial status
6) Certified documents on individual and legal personnel status
7) Other related supporting documents

Additionally, the investor contacts the Administrative Committee or Economic Executive Board through the One Stop Service at the Special Economic Zone and Specific Economic Zone. A business license can be obtained within 24 hours.

The government determines the investment incentives for each Special and Specific Economic Zone (as per Article 35 of Law on Investment Promotion).

Table 3-22 Endorsed Special and Specific Economic Zones

Name	Year	Province	Proposed Development Plan	Developer
Savan-Seno Special Economic Zone	2003	Savannakhet	Trade, Service, and Industrial Park	Government
Boten Dankham Special Economic Zone	2003	Luangnamtha	Trade and Service	Chinese Enterprise
Golden Triangle Special Economic Zone	2007	Bokeo	Trade and Service	Chinese Enterprise
Vientiane Industrial and Trade Area	2008	Vientiane Capital	Trade and Industrial Park	Taiwanese (Chinese) Enterprise
Phoukiew Specific Economic Zone	2010	Khammuane	Trade, Service, and Industrial Park	Laotian Enterprise
Saysettha Development	2011	Vientiane Capital	Trade, Service, and Industrial Park	Joint Venture Government-Chinese

Source: JICA Study Team based on "Basic Information on Special and Specific Economic Zone Development and Management in Lao PDR." issued by S-NCSEZ

Table 3-23 Special and Specific Economic Zones under Consideration

Name	Province	Proposed Development Plan
Vientiane Naramit Dongphousy	Vientiane Capital	Trade and Service
Goflongteng	Vientiane Capital	Trade and Service
Saysettha Development Zone	Vientiane Capital	Trade and Industrial Park
Lao Bao Border Trade	Savannakhet	Trade and Production
3rd Lao-Thai Friendship Bridge (Lao side)	Khammuane	Trade and Service

Source: JICA Study Team based on "Basic Information on Special and Specific Economic Zone Development and Management in Lao PDR." issued by S- NCSEZ

3.5.6 Other Related Systems

A meeting on contract farming and business matching was organized in March 2011 as a discussion between the Department of Industry and Commerce of Champasack province and the Commerce Department of Ubon Ratchathani province in Thailand. Consequent to 2010's contract farming and business matching, seven business units in Champasack, Saravan, and Sekong provinces signed agricultural trading contracts with 17 business units in Ubon Ratchathani province and the north-eastern provinces of Thailand involving 25 products, such as cabbage, bananas, and Chinese cabbage. Moreover, 18 business units from Laos signed agricultural trading contracts with 15 business units from Thailand involving 20 organic agricultural products, such as cabbage, Chinese cabbage, and Japanese cucumbers. Contract farming and business matching helped Lao PDR farmers produce agricultural products for Thailand stably and sustainably. In the meeting, it was agreed that training and workshops on production and processing techniques would be conducted for Lao farmers and producers to enhance the quality of their production and ensure quantity and quality.[20]

Import duties on the agricultural products listed in the above report were waived in Thailand according to the agreement between the Lao and Thai governments.

[20] The report on Contract Farming and Business Matching (No. 0512/ Department of Industry and Commerce of Champasack province, Pakse, April 8, 2011)

4. Four Types of Japanese Food-Related Businesses in Laos

Assembling the information on Japanese, or Japanese-related, companies that have already been operating in Laos, or are considering the possibility of operating in the country, there are four types of involvement of Japanese businesses contributing to the development of the food industry in Laos: (1) Buyer of Laotian Products (BLP), (2) Manufacturer in the Development and Import scheme (MDI), (3) Manufacturer for Local Market (MLM), and (4) Supplier for Local food Processors (SLP).

A. Buyer of Laotian Products

Japanese businesses, as BLPs, purchase agricultural products grown in tropical Laos. Being able to produce agricultural products that cannot be grown in Japan is an advantage for the country of Laos and an attraction for Japanese businesses.

A typical case is coffee. Japanese businesses, such as trading companies, are now buying Laotian coffee in response to an increasing demand for coffee in the world market. Tea; sugar; tapioca starch; cacao; sesame; processed tropical fruits, such as dried fruits and jam; and spices are included in the same category.

There are three patterns of processing after harvesting crops: (1) processing in Laos, (2) processing in Thailand or Vietnam, and (3) processing in Japan. Although the actual purchase of Laotian products by Japanese companies is limited, except for coffee thus far, there are many cases in neighboring countries, such as sugar production in Bangkok (Thailand's capital) and tapioca starch production in Hanoi (Vietnam's capital). Japanese businesses interested in starting a BLP business in Laos can establish a partnership with those neighboring capitals that have know-how and local connections in Laos.

B. Manufacturer in the Development and Import Scheme

Japanese businesses manufacturer in the Development and Import scheme type produce the same agricultural products that are produced in Japan. Typical types of produce include frozen spinach, frozen pumpkin, and frozen barbecue chicken. The primary function of Japanese companies is as manufacturer of the products. They can physically produce the items in Japan; however, producing in Laos with its low labor and land costs lends a competitive edge to the businesses. This is another Laotian strength in the food industry, together with the opportunity for Laos to attract Japanese businesses to the country.

Both completing the process in Laos and primary processing in Laos and completing the process in neighboring countries or Japan are considered, but actual cases involving Japanese businesses are rare so far. This is partly because cold-chain distribution system is not available in Laos, while producing frozen foods for the Japanese market has already been functioning in Thailand and Vietnam. In contrast, pickled vegetables, which do not require cold-chain systems, have been produced by Laotian companies for the Japanese market. As Laos has a comparative advantage in labor cost relative to Thailand and Vietnam and electric power is sufficient, at least from a macro point of view, it is not difficult to suppose that full-scale food processing businesses in Laos, as MDI, can be developed. At the same time, it should be noted that the requirement level of quality and hygiene management is significantly higher in Japan, and efforts in technology and human resource development in Laos to meet those Japanese needs has become necessary.

C. Manufacturer for Local Market

Though the primary function of Japanese businesses in MLM is as manufacturer, as MDI, manufacturers in this case produce foods not for the Japanese market but for the local market in Laos

and neighboring countries. The strength of Japanese food businesses in MLM is to produce food for local markets, applying superior technologies and know-how that has been developed in Japan. There is no actual case in Laos, but many types of food in Thailand and Vietnam, such as instant noodles, mayonnaise, and snack foods adhere to these standards. Similar market demand could increase in Laos, where full-fledged economic development in the future is expected. On the other hand, the number of people in Laos is smaller than in neighboring countries, which makes it less attractive as a market and results in a bottleneck for investment in business development in the MLM type. Products manufactured by Japanese MLM businesses in Thailand and Vietnam are imported to Laos at present.

D. Supplier for Local Food Processors

Japanese companies play a major role in BLP, MDI, and MLM. In contrast, Japanese SLP businesses supply materials and equipment, such as processing machinery, while food processing itself is implemented by Lao farmers and Lao businesses.

Rice, for example, is a staple food in Laos, and the country is fostering the rice production sector to develop it into an exporting industry. Rice milling of exporting quality with a high head rice ratio is a specialty for Japanese mill manufacturers. Most rice mills in Laos are manufactured in neighboring countries, and the broken rice ratio is high. It is difficult to export milled rice in a low head rice ratio, because rice quality goes down from broken parts during the long distribution period.

Table 4-1 summarizes the four types of Japanese food-related businesses in Laos.

Table 4-1 Four Types of Japanese Food-Related Businesses in Laos

	Buyer of Laotian products (BLP)	Manufacturer in Development and Import scheme (MDI)	Manufacturer for local market (MLM)	Supplier for local food producers (SLP)
Description	Japanese companies purchase agricultural products that are not grown in Japan.	The same products that are made in Japan are processed in Laos at a lower cost.	With experienced know-how, Japanese food businesses produce foods in Laos for the Laotian market.	Japanese businesses supply processing input, and farmers and manufacturers in Laos process agricultural produce.
Primary functions of Japanese businesses	Buyers	Manufacturers	Manufacturers	Supplier of machinery and materials
Raw materials	Local farm products	Local farm products that are produced in Japan	Any materials	Local farm products
Market	Japan and other countries	Japan	Laos and neighboring countries	Laos and neighboring countries
Implementation body in food production	Japanese businesses	Japanese businesses	Japanese businesses	Laotian farmers, Laotian businesses
Typical example	Buying coffee by Japanese trading companies	Producing frozen vegetables by Japanese manufacturers	Producing instant noodles for local market by Japanese manufacturers	Farmers' rice milling business using Japanese milling machine

Source: JICA Study Team

5. Short List of Potential Food Items to Be Promoted in Laos

On the basis of collected information in a preliminary study, we listed 12 items as candidates of potential food items to be promoted in Laos in the inception report submitted directly after starting this study. After the field research performed in Laos, Thailand, Vietnam, and Japan in August and October 2011, we narrowed them down into five items.

Table 5-1 Selected Potential Food Items to Be Promoted in Laos

	Initial candidates	Selected
1.	Coffee	✓
2.	Processed vegetables	✓
3.	Rice	✓
4.	Processed tropical fruits	
5.	Tapioca starch	
6.	Cacao	
7.	Sesame	✓
8.	Tea	✓
9.	Instant noodle	
10.	Liquor	
11.	Dry sausage	
12.	Spice	

Five short-listed items are coffee, processed vegetables, rice, sesame, and tea. We concluded that it is difficult to adopt processed tropical fruits, tapioca starch, cacao, instant noodles, liquor, dry sausage, and spice as potential food items to be strategically promoted. When short-listing, the following were taken into account to the greatest degree.

- The item has an actual possibility that Japanese businesses will collaborate in the promotion.
- The raw materials of the item are actually produced in Laos or have a high potential of production.
- The item has an actual market or high market potential.

5.1 Coffee

Coffee is produced mainly in the southern part of Laos, and Japanese companies have already bought it. Because some local governments in southern Laos are promoting coffee production in their policies, increased production is expected in the near future. Processing capacity is high, as local private companies have already been operating there. Most Japanese companies that purchase Lao coffee are buying coffee through those local processing companies as partners. On the other hand, the global price of coffee is increasing in response to a strong demand for coffee. According to coffee experts, the market demand for high-quality coffee with superior flavor and safety will increase even further in the future. Coffee can be regarded as an income-generating crop for small farmers. The issues for coffee are (1) to accelerate production through expanding planted areas, and (2) to increase quality through technology improvement when farmers process the crop.

Figure 5-1 Cupping on Lao Coffee (A Japanese Trading Company in Tokyo)

5.2 Processed Vegetables

Vegetables grown in a temperate climate can be cultivated in Bolaven Plateau, where night temperatures fall. Some vegetables, such as cabbage, are being exported fresh to Thailand. A Japanese-origin company has started vegetable production in the plateau. Processed vegetables in Laos are limited to canned vegetables produced by a couple of companies and pickled vegetables marketed to Japan. The Japanese market demands dried and frozen vegetables, as well as pickled ones, and Japanese companies of the MDI type in Thailand and Vietnam are producing frozen and dried vegetables and exporting them to Japan. When considering increases in labor costs there, especially in Thailand, processed vegetable production could flourish in Laos in the near future. Thus, we concluded that processed vegetables have a high potential for market growth in Laos. The challenge in processed vegetable production is stable raw material production through training the farmers about vegetable growth management, whose intensity is higher than such ordinary crops as rice and maize.

Figure 5-2 Asparagus Cultivated in Bolaven Plateau (Advance Agriculture Co. Ltd. See 6.2.2)

5.3 Rice

Rice is a staple in Laos, and its glutinous varieties are cultivated throughout the country, especially in the lowland along the Mekong River. Currently, rice farming in Laos is expensive, partly because irrigation facilities are limited, and farmers still depend exclusively on rainfall to sustain their crops; if irrigated areas expand, an increase in the production of non-glutinous and highly marketable varieties is expected. The Ministry of Agriculture and Forestry of Laos has already started to promote non-glutinous rice for exportation. From the viewpoint of the world rice market, rice demand is expected to expand further in the future. To participate in the trend, Japanese businesses can take part in the rice value chain in Laos as suppliers of rice-milling machines. Current rice-milling technology in Laos cannot achieve exporting quality of rice; thus, demand for superior rice-milling technologies will increase. Accordingly, we concluded that rice should be an item to be promoted. The challenges include (1) extension of cultivation methods of high-quality varieties and (2) enhancement of rice milling recovery and head rice ratio. High levels of technologies in Japanese manufacturers could contribute to solving the milling quality problems in Laos.

Figure 5-3 Low Head Rice Ratio under Current Milling Technology is a Bottleneck for Exportation (A Rice Mill in Vientiane Province)

5.4 Processed Tropical Fruits

Processed tropical fruits, such as canned mango and dried jackfruits, are produced in Laos. The reality, however, is that processing factories are struggling in procuring raw materials, even for the current small amounts of production. In terms of market potential, the global and Japanese processed tropical fruit market is not easy to estimate. Currently, it is not Japanese companies but those of Laos

and neighboring countries that have actually achieved success in processed tropical fruit production. Through field research in this study, we could not obtain any information on the possibility of Japanese business' involvement in this sector. Consequently, it is difficult to retain processed tropical fruits on the short list.

5.5 Tapioca Starch

Cassava, which is the raw material to produce tapioca starch, is cultivated in Laos, although the amount produced in Laos is far lower than that produced in Thailand. Tapioca starch factories in Laos are mainly the investment of neighboring countries. The world market for tapioca starch is gradually growing, due to superior characteristics of tapioca starch that is less prone to be retrograded than other starch.[21] Japanese companies, however, do not seem to be interested in tapioca starch in Laos. According to Japanese tapioca starch traders, this is because the Japanese government imposes high customs taxes on tapioca starch. As the government sets low customs taxes on chemically modified tapioca starch, demand for modified tapioca is much stronger in Japan. A modified tapioca plant is a large-scale operation because of the mass production of cassava (as in Thailand) that is required. Currently, because of the sheer size of a tapioca plant factory, tapioca starch production in Laos is not viable. For these reasons, we removed tapioca starch from the short list of potential food items to be promoted in Laos.

5.6 Cacao

As a result of field research, there seem to be rare cases of cacao production in Laos. The biophysical conditions for cacao production are satisfied in certain areas in Laos; however, it takes time for new seedlings to grow, develop, and produce a stable harvest. At the same time, Japanese chocolate manufacturers are procuring cacao primarily from West Africa. A chocolate manufacturer whom we contacted said they have no problem purchasing cacao from West Africa and no interest, thus far, in other areas. We concluded that cacao does not have the potential to be promoted in Laos in the context of this study.

5.7 Sesame

Sesame is widely cultivated in northern Laos. It is used both for domestic consumption, as well as exportation to neighboring countries to extract the sesame oil. As sesame can be grown in relatively small space per farmer, farmers can physically increase production relatively easily, once they are convinced that sesame is marketable. Sesame is harvested by manual labor, and the low labor cost in Laos could be an advantage for the country. In terms of marketing, the actual purchase of the plant by Japanese companies has not yet occurred; however, a sesame expert in a Japanese company evaluated the potential of sesame in Laos and expressed strong interest in purchasing the plant, if a certain quality of sesame were to be produced, in a certain volume. This remark is based on the fact that there is strong market demand worldwide for sesame, primarily because newly developing countries (such as China, in particular) are growing and consuming more sesame than before. China was a leading sesame-exporting country in the past but has already become the largest importer in the world. Accordingly, it is appropriate to add sesame to the short list

Figure 5-4 Young Fruits of Sesame (Luang Prabang Province)

[21] initial The process when gelatinized starch returns to its initial state.

of potential food items. The challenges for sesame in Laos are (1) insufficient production of varieties with export quality, (2) low skill of farmers in post-harvest handling, including drying.

5.8 Tea

Tea is cultivated in high-altitude areas in northern Laos that are suitable for tea, as even wild tea trees are growing in several areas. Presently, harvested tea is being chiefly exported to China. According to local stakeholders and tea specialists, there are more places with high potential for growing tea, and an increase in production is expected. Lao tea is grown naturally without the need to fertilize the plant. Additionally, it is a fact that Lao tealeaves are highly valued in the Chinese market place. The major processed tea in Laos is Chinese green tea, which is different from that in Japan. In Japan, the market for Chinese tea is not very large; however, recently, the Japanese people have started drinking it as bottled tea. As a result, Japanese beverage companies are seeking tealeaves (including Chinese style tealeaves) with the potential for satisfying the demand. If Laos can produce tea whose quality satisfies their needs, they will purchase Lao tea. Thus, we concluded tea is a potential food item to be promoted in collaboration with Japanese businesses. The problem with tea in Laos is that harvesting and processing techniques are insufficient and the potential for Lao tea is not yet realized.

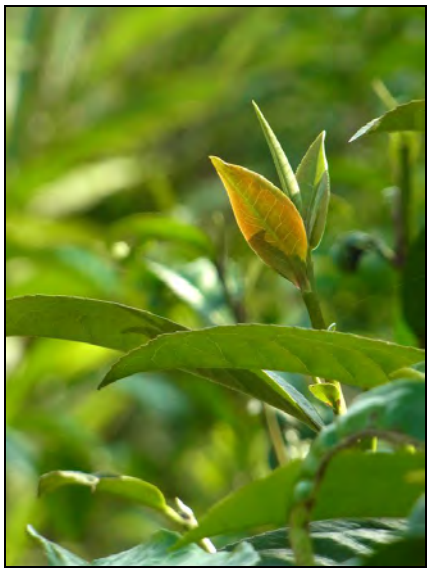


Figure 5-5 Tea Buds and Young Leaves (Oudomxay Province）

5.9 Instant Noodles

In terms of instant noodles, there are successful cases of MLM Japanese companies in Thailand and Vietnam, and currently, their instant noodles are imported to Laos. The market for instant noodles in Laos will grow, in step with economic growth. We had a hypothesis that production of instant noodles in Laos could occur with lower labor costs. Field research revealed that the Laotian population size does not warrant the construction of an instant noodle production line. We felt it unlikely for the population to increase dramatically; thus, we decided to not place instant noodles on the short list.

5.10 Liquor

Laos has traditional rice liquor, which is distilled everywhere in the country. If the quality of the liquor is high, it can be marketed worldwide. Our field research showed that traditional liquor is manufactured by cottage distillers in rural areas, and it was difficult to locate distillers who operate in a high-quality, stable manner. There is a Japanese distiller who produces rum, but it is difficult to consider rum as a national strategic food item to be promoted. We concluded that putting liquor on the short list was not appropriate.

5.11 Dry Sausage

As Laos experiences very dry weather, which is suitable for drying meat, we generated the hypothesis that dry sausage, which does not require refrigerated distribution, may be a potential Laotian food item for promotion. Our field research revealed that both dried meat, such as dried beef and water buffalo, and Chinese-style dry sausage are produced in Laos. There is no information, however, that Japanese businesses would move into that sector in Laos. Current Laotian processing

technologies and hygiene management, of which the levels for both categories should be very high (due to the nature of perishable meat) seemed to be somewhat rudimentary and, therefore, difficult to meet the Japanese standards. There was no information on Japanese companies to whom the products could be sold locally; thus, we surmised that it was not relevant to regard dry sausage as a potential food item to be promoted strategically in collaboration with Japanese businesses.

5.12 Spice

Black cardamom (whose seed pods have a strong camphor-like flavor, with a smoky character derived from the method of drying) is produced in Laos. When considering its climate and soil conditions, Laos has the potential to produce other spices, as well. Other countries in Southeast Asia, however, have similar potential and there was no information on the possibility that Japanese businesses might commence spice production and processing in Laos. A Japanese company does in fact produce Chinese herbs in Laos, but spice is not classified as a food item. In this study, therefore, we did not include spice on the short list of potential food items.

6. Potential Food Items to Be Promoted in Laos

6.1 Coffee

6.1.1 Activities of Japanese Businesses and Potential of the Product

Japanese businesses involved in coffee production in Laos are buyers of Laotian products (BLPs). Processing of green coffee beans is performed by coffee farmers or local processors, and Japanese companies only purchase the green beans. This is a major modality of involvement by Japanese companies while a Japanese company is prepaying charge for supporting farmers and stabilizing the procurement cycle.

According to statistics of the Japan Coffee Association, Japan purchases coffee from many countries, including Laos. The amount of coffee imported into Japan from Laos, however, is 1,723 tons, or only 0.4% of Japan's total coffee importation of 410,000 tons. Lao coffee imported to Japan, however, has been rapidly increasing: 112 tons in 2007, 442 tons in 2008, and 1,260 tons in 2009. A coffee buyer from a Japanese company said that the largest problem with Lao coffee is an undersupply of the product. Thus, if more Lao coffee that is able to adhere to certain quality standards is produced, it appears as if the product will be a stable future commodity in the Laotian market and sell well in Japan.

6.1.2 Raw Material Production

A. Production

Table 6-1 shows changes in harvested areas and production of coffee in the Lao PDR. The southern part produces the highest amount of green coffee beans in the country. In 2009, the four southern provinces accounted for 99.7% of the country's total coffee bean production. Champasack accounted for 62.5% of the total production in the southern provinces. From 2005 to 2009, the total national coffee production increased by 80% mainly due to the productivity increase from 0.59 ton/ha in 2005 to 0.88 ton/ha in 2009 and a slight increase in harvested areas.

Table 6-1 Harvested Area and Production of Coffee in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	-	-	-	-	15	-	-	-	-	5
	Luangnamtha	20	-	-	-	-	10	-	-	-	-
	Oudomxay	60	-	-	45	45	40	-	-	40	40
	Bokeo	-	-	-	-	-	-	-	-	-	-
	Luang Prabang	45	-	-	-	-	30	-	-	-	-
	Huaphanh	-	-	-	-	-	-	-	-	-	-
	Xayabury	-	-	-	-	-	-	-	-	-	-
	Total of North	125	-	-	45	60	80	-	-	40	45
Central	Vientiane Capital	-	-	-	-	-	-	-	-	-	-
	Xiengkhuang	30	-	60	60	65	20	-	30	50	60
	Vientiane	-	-	-	-	-	-	-	-	-	-
	Borikhamxay	-	-	-	-	-	-	-	-	-	-
	Khammuane	-	-	-	-	-	-	-	-	-	-
	Savannakhet	-	-	165	-	-	-	-	100	-	-
	Total of Central	30	-	225	60	65	20	-	130	50	60
South	Saravan	13,100	13,250	15,545	18,680	20,390	7,830	7,400	8,350	11,175	14,205
	Sekong	3,865	3,840	4,175	4,515	4,515	2,200	2,300	3,230	2,980	2,980
	Champasack	25,100	25,700	24,780	25,255	27,400	14,610	15,250	21,300	24,740	28,745
	Attapeu	360	360	265	-	-	260	300	190	-	-
	Total of South	42,425	43,140	44,765	48,450	52,305	24,900	25,250	33,070	38,895	45,930
	Ground total	42,580	43,140	44,990	48,555	52,430	25,000	25,250	33,200	38,985	46,035

Source: Ministry of Agriculture and Forestry (2007 and 2009)

Although the productivity of coffee in the Lao PDR increased, it is still lower than the neighboring countries. According to FAO, the productivity in Vietnam is 2.33 tons/ha, 1.20 tons/ha in Cambodia, and 0.60 ton/ha in Thailand. Vietnam produces mainly Robusta, a high productivity variety that tends to be processed into instant coffee. Meanwhile, Arabica, whose productivity is normally low and suited to grow at a high altitude, is also cultivated in addition to Robusta in Bolaven Plateau in Saravan, Sekong, and Champasack provinces.

Mainly due to the low productivity, the Arabica coffee of the Lao PDR amounts to only 0.05% of the total production of coffee in the world.[22] However, the country's Arabica coffee of an old variety with a premier value and the Catimor coffee are gradually being appreciated for their high quality in the markets worldwide while the overall demand for coffee is increasing.[23]

A Japan-based multinational trading company evaluates that the Arabica coffee produced in Bolaven Plateau suits Japanese customers well with its mild and acid taste. Therefore, it aims to ship 1,000 tons of Arabica coffee beans from the Lao PDR to the Japanese market.[24] Moreover, it might be possible to ship Laotian organic coffee to Japan. A Japanese trading company buys organic coffee beans of the Typica variety, which is characterized by an extremely low yield, from about 150 farm households of Pakse district of Champasack province under contract farming. Typica's characteristics are appreciated by Japanese customers as well; the aroma is pleasant although the coffee body is weak.[25]

The coffee produced in Bolaven Plateau is well accepted in the European markets as well. Organic coffee produced in the plateau, which is certified by the European organic coffee certification bodies, is exported to Germany and France.[26] While Vietnam produces the Robusta variety and dominates the world market of the variety, producers of high quality Arabica coffee are increasing, and the prestige of the coffee produced in the Lao PDR is rising across the world.

B. Cultivation

This section describes the cultivation practices for Robusta and Arabica in Bolaven Plateau. Normally, Robusta needs a mild temperature in a wet condition; meanwhile, Arabica grows well only at a high altitude of more than 1,000 m above the sea level with annual rainfall of between 1,200 and 1,500 mm. The ideal annual average temperature for Arabica is between 20 and 24 degrees Celsius.

The altitude of Paxon district, a part of Bolaven Plateau and in Champasack province, is 1,200 m. As shown in Figure 6-1, the average annual temperature is 19.5 degrees Celsius with the highest temperature of 23 degree Celsius and the lowest of 18 degrees Celsius. The annual precipitation is 3,500 mm with the rainy season between April and September and the dry season between October and March. Thus the climate of Bolaven Plateau, where there is a certain period with no rainfall which is required to induce uniform flowering of coffee trees, is best suited to cultivate coffee, especially the Arabica variety.

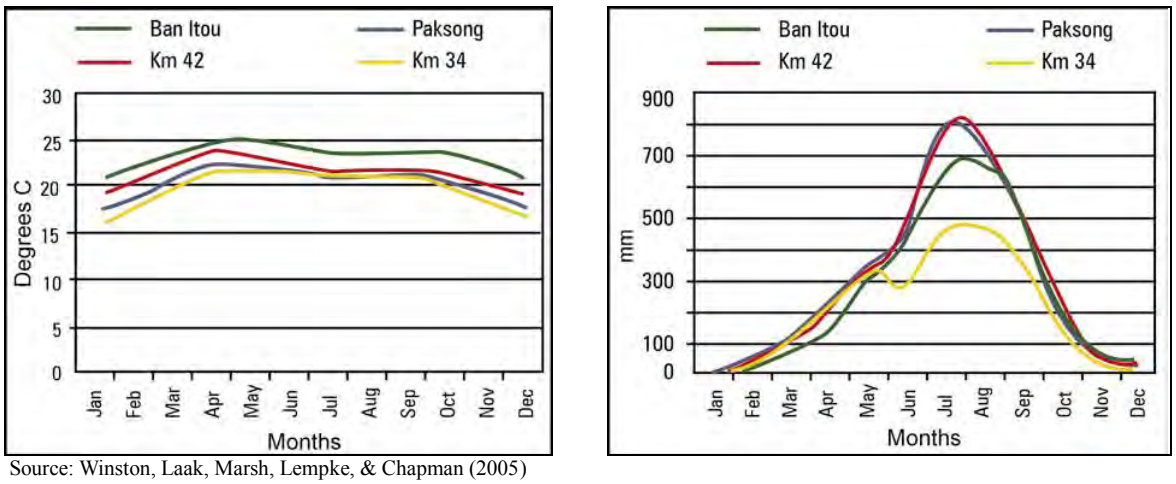
[22] Special Final Report – Some Key Findings, Future Issues and Interventions for the Lao Coffee Industry, FAO-LAO TCP/LAO/2903 (A) Phase I & TCP/LAO/3101 Phase II, Coffee Project, March 2006

[23] The three main coffee varieties produced in the world are Arabica, Robusta, and Liberica. Arabica originates from Typica and Bourbon, both of which are ancient varieties. Catimor is a cross breed between Arabica and Robusta.

[24] http://www.nikkan.co.jp/news/nkx0920090807ceao.html

[25] Interview on 15 August 2011 with a stakeholder who supports buyers of organic coffee. Body is the feeling that the coffee has in one's mouth as well as the viscosity, heaviness, thickness, or richness that is perceived on the tongue.

[26] Interview with Sinouk Café Lao Ltd on 15 August 2011



Source: Winston, Laak, Marsh, Lempke, & Chapman (2005)

Figure 6-1 Temperature and Rainfall in Bolaven Plateau

For coffee cultivation, a well-drained one (1)-m thick top soil layer with any type of soil is needed. The preferred soil is fertile volcanic red earth with sandy loam. On these points, the soil of Bolaven Plateau is suitable for coffee cultivation. Table 6-2 shows soil analysis results.

Table 6-2 Soil Analysis Results of Coffee Farms in Bolaven Plateau

Analyzed items	Appropriate range	Evaluation
pH	pH 5.5－6.0	pH 4.2－5.2; It must be neutralized by applying lime composed of basically calcium and magnesium.
Organic matter	1.0－3.0%	Optimum
Nitrogen	More than 20 mg/kg	High
Phosphoric acid	60－80 mg/kg	Lacking in most coffee farms
Potassium	More than 0.75 mg/100g	Low

Source: Special Final Report – Some Key Findings, Future Issues and Interventions for the Lao Coffee Industry, FAO-LAO TCP/LAO/2903 (A) Phase I & TCP/LAO/3101 Phase II, Coffee Project, March 2006
Note: Soil sample number is 15 obtained from coffee farms located at altitude between 1,030 and 1,282 m. Soil analysis was conducted at Mae Jo University in Chaing Mai, Thailand.

Under the cultivation conditions above, Arabica Typica is cultivated at an altitude of more than 1,000m, Arabica Catimor at more than 800 m, and Robusta at more than 600 m in Bolaven Plateau.

According to the Southern Agriculture and Forestry Research and Extension Center (SAFREC), the productivity of Robusta coffee is 1 – 1.5 tons/ha; Arabica Catimor, 2 -3 tons/ha; and Arabica Typica, 300 kg – 400 kg/ha.[27]

The cultivation methods of Arabica and Robusta are basically the same. It takes 18 months to 3 years until the first harvest after planting seedlings of 6 – 8 months old.[28] Two (2) cultivation scales exist: (1) small-scale traditional farming with the average farm size of 4 – 5 ha performed by mainly manual means; and (2) large-scale commercial farming with the farm size of 1,000 – 3,000 ha by using heavy agricultural machinery for land reclamation and land preparation. The small-scale one spends 10,000,000 Kip per ha to start and maintain the coffee farm in the first year and 7,000,000 Kip per ha for the second year. Meanwhile, it takes 19,000,000 Kip per ha to start and maintain coffee cultivation for the large-scale production in the first year and 10,000,000 Kip in the second year.

[27] Interview with the Deputy Director of the Southern Agriculture and Forestry Research and Extension Center on 25 October 2011
[28] Interviews with the Deputy Director of the Southern Agriculture and Forestry Research and Extension Center on 25 October 2011, and the Agriculture Officer, Agriculture and Forestry Office, Champasack province, on 11 August 2011

Table 6-3 presents the farm work sequence and relevant information of an organic coffee producer who happens to be the vice president of the JCFC, a coffee producers' group shipping coffee to Japan from Paxon district in Champasack province through a Japanese trading company.

Table 6-3 Farm Work Sequence of an Organic Coffee Farmer

Farm work	Contents or cost
Scale	7000 trees of Catimor and 400 trees of Robusta in 2 ha. 1,000 trees of Typica will be transplanted in 2011.
Transplanting	Manual transplanting of seedlings aged 6－8 months with 30 cm high Planting density of Robusta: 3.0 m × 3.0 m (1,111 trees/ha) Planting density of Typica: 2.0 m × 1.5 m （3,333 trees/ha), cost of seedling: 600 – 700 Kip Planting density of Catimor: 1.8 m × 1.5 m (3,703 trees/ha), cost of seedling: 500 – 600 Kip
Fertilizer application	No chemical fertilizer is used. One (1) kg of organic fertilizer is applied for a tree. Fertilizer is produced by the farmer for 2 ha. It is an organic fertilizer made of 3 tons of cattle manure mixed with coffee husk. Lime is applied to neutralize soil. The cost of lime is 20,000 Kip per kg.
Chemical application	No chemical is applied. 25 units of insect traps are installed for one (1) ha.
Weed control	Manual weeding is done six (6) times a year. The cost of hiring a laborer is 25,000 Kip a day. In 2010, 1,000,000 Kip was spent to hire for one for weed control of 2 ha.
Harvest	Manual harvesting is practiced for three months centered on the period between October and November. The labor cost for harvesting was 3,000,000 Kip for 2 ha in 2010.
Post-harvest and Processing	Wet type processing (see the Processing section)
Market	Green bean of Robusta: 3,600 Kip/kg in 2010 Green bean of Arabica Typica: 31,000 Kip/kg bought by a Japanese trading company Green bean of Arabica Catimor: 5,400 Kip/kg

Source: Interview with the vice chairman of an organic coffee producers' group in Paxon district of Champasack province, on 11 August 2011

Coffee Seedlings　　Coffee Beans

Figure 6-2 Seedlings and Green Beans of Coffee in Bolaven Plateau

According to the Ministry of Agriculture and Forestry, the production cost of one (1) kg of green

coffee beans is 10,910 Kip.[29] Thus the production cost per ha is 8,728,000 Kip if the yield is 0.8 ton/ha. Consequently, the total sale per ha is 24,800,000 Kip, the gross margin is 16,072,000 Kip, and the rate of profit is about 65% in the case of a farmer producing Arabica Typica and selling it at 31,000 Kip/kg at the farm gate.

According to the Agriculture and Forestry Office of Champasack province, seedlings of Arabica Typica are easily damaged by the disease of red rust (*hemilia cercospora*) in the initial growth stage after transplanting. Thus the fertilization technique is important in preventing coffee trees from contracting the disease.[30] Moreover, the Japanese cooperative company knows that Typica is vulnerable to the disease and the yield is extremely low, and farmers are unlikely to shift their coffee production to Typica. In addition, the yield, which is low to begin with, becomes even lower because farmers do not apply fertilizer. However, the Japanese cooperative firm would like to save Typica.

Although the farm gate prices of Typica and Catimor are similar, the yields of the two varieties differ greatly as explained above. To reduce the risk of a low yield, farmers grow not a single variety but several. In 2010, Sinouk Café Lao Ltd purchased Typica at 45,000 Kip/kg and Catimor at 35,000 Kip/kg. Meanwhile, the price difference between Typica and Catimor in the European coffee markets is small, and customers in Europe are satisfied with Arabica whether it is Typica or Catimor. Thus farmers are likely to produce Catimor due to the better yield than Typica although the niche market in Japan demands Typica. If the price difference between Typica and Catimor is 100%, i.e., 70,000 Kip/kg for Typica while 35,000 Kip/kg for Catimor, then farmers are likely to produce more Typica.[31]

C. Relevant information

As the demand for high-quality Arabica coffee produced in the Lao PDR increases, the major production area in Champasack province is spreading. The potential production area is estimated to be 18,000 ha to 20,000 ha in Paxon district.[32] However, the farmer referred to in the previous section said that he was already fully occupied with managing coffee production in 2 ha and was unlikely to expand the production.[33] Thus, only new farmers have the potential to promote and expand coffee production in the province.

Meanwhile, Sekong province has a virgin land suitable for coffee production, especially in Dakchung district. The Planning and Investment Office of Sekong province proposed coffee production in its five-year development plan to the governor as a means to help farmers earn cash and alleviate poverty.

It is estimated that additional 15,000 – 20,000 ha of land can be developed in Dakchung district for coffee production. The road condition of Route 16 between the capital of Sekong province and Dakchung district was poor.[34] Thus the development of coffee production was stagnant. Today, the improvement work of Route 16 is underway and will finish in 2015.[35] Distribution of coffee from Dakchung will be more efficient when the road work is completed, promoting coffee production.

The average annual temperature in Dakchung district ranges between 18 and 20 degrees Celsius. The district is mountainous with an altitude of 12,000 m above the sea level. The soil there is acidic with pH of 4 to 5. To earn a living, farmers in Dakchung district rely on the production of cabbage, cassava and coffee, as well as some livestock. The land area for current coffee production is

[29] Agricultural Statistics Year Book 2009, Department of Planning, Ministry of Agriculture and Forestry
[30] Interview with the Agriculture officer, Agriculture and Forestry Office, Champasack province, on 11 August 2011
[31] Interview with Sinouk Café Lao Ltd on 13 August 2011
[32] Interview with the Deputy Director, Planning and Investment Office, Champasack province, on 27 October 2011
[33] Interview with the Vice President of an organic coffee producers' group in Paxon district, Champasack province, on 15 August 2011
[34] Interview with a coffee farmer in Dakchung district of Sekong province on 25 October 2011. Route 16 is not passable by cars during the rainy season.
[35] Interview with the Director of the Planning and Investment Office on 24 October 2011

reportedly 700 ha. Farmers use cattle manure as fertilizer and the yield is between 4 and 5 tons/ha. According to the Agriculture and Forest Office of Sekong province, the district needs (1) technology and equipment for coffee processing and (2) intercropping of coffee with vegetables and rice in upland paddies.[36]

6.1.3 Processing

There are two styles of processing raw materials into green coffee beans: wet and dry processing. Dry processing is taking out the seeds after drying the raw fruits with pulp, while wet processing is depulping first and drying the seeds after washing. It is controversial as to which processing method is superior. In Brazil, for example, some processors have natural drying with pulp as a feature. In Laos, Robusta coffee beans, which is used for manufacturing instant coffee or exported to the European market as green beans, is processed utilizing the dry method. In this case, farmers sun dry raw fruits with pulp on the farm.

Figure 6-3 Parchment (right) and Green Bean

On the other hand, in the Japanese market, wet-processed Arabica coffee is highly regarded as a more simple taste with a strong aroma. Most green beans purchased by Japanese companies are indeed wet-processed Arabica beans.

The wet-processing method adopted by small-scale farmers in Laos is as follows. Some steps are automated in mass processing by large-scale processors.

1. Harvest only perfectly matured red fruits, which are called “cherry” in the coffee industry. If immature green fruits are harvested, the quality of the green beans is lowered.
2. Immerse the harvested cherries in water on the same day of harvesting. Remove floating light fruits as well as any foreign matter. Remove the pulp with a de-pulping machine.
3. Put the coffee cherries in a bag for 18 hours.
4. Sticky liquid will come out onto the surface. Wash the liquid in water. Remove any floating material.
5. Spread out and dry the materials on the platform under the sun for 18-20 days, to reach 18% of moisture. During the drying period, find and remove imperfect and defective beans. Dried products are called “parchment.” Put the parchment into a sack to keep them covered.
6. Mill parchment by a milling and grading machine when the amount of parchment comes to a certain level. The products after being taken out of the white skin of the parchment are called “green beans.” Weight loss from the parchment to the green beans phase is about 20%.
7. Grade green beans in another grading machine to remove light beans. Manually remove defective beans.

Figure 6-4 Steps of Wet Coffee Processing, from Cherry to Green Beans

Progressive farmers among Arabica growers have their own small de-pulpers. There are farmers who share a communal de-pulper, which has been supplied by the governmental project. In contrast, a

[36] Interviews with the Planning and Investment Office as well as the Agriculture and Forestry Office on 24 October 2011, and with a farmer in Dakchung on 25 October 2011

majority of coffee farmers have no machines. They harvest and sell the coffee cherries to local processors on the same day. Some farmers individually transport their cherries by motorbike, and others sell to the truck that is sent by local processors.


Figure 6-5 Small De-Pulper (Champasack Province)

According to the Southern Agriculture and Forestry Research and Extension Center (SAFREC) in Champasack province, it is advantageous for farmers to process the coffee cherries to long-lasting parchment on their own; then, they can stock them, and attain the ability to sell them when the market price is high. If they sell as parchment, it is true that they are able to take advantage of the market by selling more value-added products, thus attaining a higher profit than the coffee cherries.

Processing to parchment, however, is not easy—either technically, or financially. From the buyer's point of view, in order to better stabilize the quality of the green beans, it is better to uniformly process the coffee beans in a large machine using raw cherries than purchase variously processed parchment. According to an experienced Japanese coffee buyer, the quality of coffee is primarily determined in the process up to parchment. Staff at Dao Huang, the largest coffee processor in Laos, said that to meet the needs of their overseas customers, it is best to purchase cherries and uniformly process them in their factory. In terms of Arabica, the company purchases 60% in the cherry phase, 20% in the parchment stage, and 20% in green beans.

At the same time, there was a concern about the transportation cost of coffee cherries whose weight is five times that of parchment. Another local processor said that they may need to construct factories near production areas to minimize transportation cost of the coffee cherries.

Issues pertaining to coffee processing are as follows: (1) how to train farmers on the optimum harvesting time; (2) how to minimize transportation costs of the cherries; (3) how to train farmers on processing up to the parchment phase, when they process cherries on their own; (4) how to support farmers financially when they need to introduce processing machinery; and (5) how to get harvesting labor when planted area is increased substantially.

6.1.4 Market

A. Market Trend

Table 6-4 shows the amount of production and export of green coffee beans in the world. Production for the whole world has been increasing gradually. The production in 2009—8.34 million tons—was 10% higher than the 7.56 million tons produced in 2000. Brazil accounts for about 30% of world production, and the top four countries—Brazil, Vietnam, Colombia, and Indonesia—together represent 60%. As for export of green coffee beans, 2008 total world exports were 6.35 million tons, 25% from Brazil, and 60% from the leading four countries. These facts suggest that the world coffee market is influenced strongly by the production of the major countries. Specifically, the market for Arabica coffee is affected by Brazil and Colombia, and the market for Robusta is affected by Vietnam and Indonesia.

Laos produced only 46 thousand tons in 2009, which is equivalent to just 0.6% of the world production, although the production in Laos has doubled in the last 10 years. Exports from Laos make up a very small portion of world export, as well. The facts that coffee from Laos has a small

Table 6-4 World Production and Export Of Green Coffee Beans

(Unit: 1,000 tons)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Production										
World	7,564	7,405	7,871	7,184	7,710	7,369	8,005	8,158	8,235	8,343
Brazil	1,904	1,820	2,650	1,987	2,466	2,140	2,573	2,249	2,797	2,440
Vietnam	803	841	700	794	914	831	985	1,251	1,067	1,176
Colombia	637	656	697	694	674	667	725	757	689	888
Indonesia	555	569	682	664	647	640	682	676	683	700
Laos	24	26	32	28	23	25	25	33	39	46
Export										
World	5,499	5,440	5,492	5,229	5,615	5,577	5,922	6,154	6,354	-
Brazil	967	1,252	1,551	1,369	1,411	1,352	1,476	1,488	1,567	-
Vietnam	734	931	719	749	870	892	981	1,232	1,061	-
Colombia	508	560	579	578	575	616	601	637	603	-
Indonesia	338	249	323	321	340	443	412	321	468	-
Laos	17	18	17	14	16	14	7	17	14	-

Source: FAO Website (http://faostat.fao.org/, retrieved Sep. 12, 2011)

presence in the world does not mean Laotian coffee has no potential, but rather that there is opportunity for Laos to expand its coffee sales and exports. Laos has to confront the risk that coffee prices in the world vary largely depending on major producing countries such as Brazil, regardless of matters in Laos.

Table 6-5 summarizes the consumption of coffee in the world. Total world consumption increased from 6.33 million tons in 2000 to 8.09 million tons in 2010, which means demand for coffee has increased. The top consuming countries are the United States, Brazil, Japan, and European countries. The United States accounts for 16% of world consumption, Brazil 14%, Germany 7%, and Japan 4%. Other than Brazil, these countries produce very little coffee, so they are top-importing countries as well. It is remarkable how consumption in Brazil has increased recently. From 2000 to 2010, Brazil's consumption increased by 350 thousand tons, and its share of world consumption increased from 12% to 14%. It is said that soaring coffee prices in recent years can be attributed partly to this increasing consumption in Brazil.[37] China, which is attracting attention as an emerging nation, imported only 36 thousand tons of green coffee beans in 2008 (International Coffee Organization, 2011). It is expected that China will import more coffee as its income level increases, although its current impact on the world market of coffee is limited.

Table 6-5 also shows consumption per capita in 2010. Consumption per capita is 3.1 kg in England, 3.4 kg in Japan, 4.1 kg in the United States, and 6.5 kg in Germany. These amounts are not as high as the 12.1 kg/capita consumed in Finland, 9.5 kg/capita in Denmark, 9.2 kg/capita in Norway, and 8.0 kg/capita in Switzerland (International Coffee Organization, 2011). Therefore, there is probably room to increase coffee consumption in major countries such as Japan and the United States.

[37] Japan Coffee Association (http://ajca.or.jp/publication/worldmarket.html, retrieved on Sep. 19, 2011)

Table 6-5 World Consumption of Coffee

(in the form of coffee green beans)

	Consumption (1,000 tons)											Consumption per capita (kg)
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2010
World	6,330	6,588	6,686	6,842	7,200	7,248	7,477	7,767	7,978	7,918	8,087	
USA	1,125	1,173	1,148	1,212	1,258	1,260	1,240	1,262	1,299	1,286	1,307	4.1
Brazil	785	810	823	845	886	924	968	1,016	1,052	1,092	1,137	5.8
Germany	526	544	510	570	627	520	549	518	572	534	558	6.5
Japan	398	416	413	406	427	428	436	437	424	428	432	3.4
France	324	315	332	324	296	287	317	338	309	341	356	5.5
Italy	309	315	311	330	328	333	336	349	354	348	347	5.8
Spain	179	168	170	164	162	180	181	192	209	201	194	4.5
Canada	143	152	138	129	165	168	184	195	193	198	215	5.9
England	141	133	136	134	147	161	184	169	184	193	188	3.1

Source: International Coffee Organization (2011)

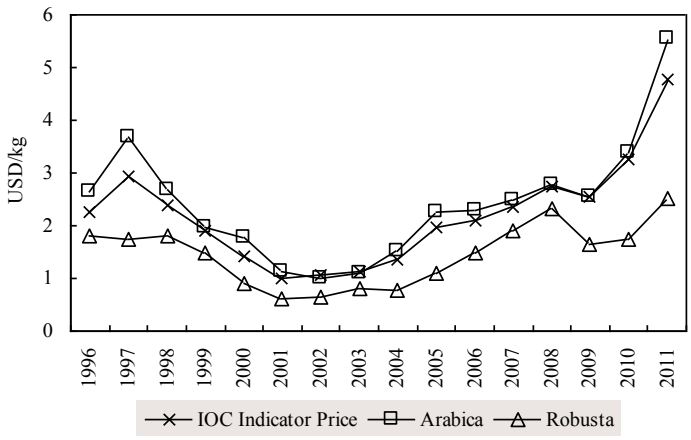
The trend of coffee prices is presented in Table 6-6 and Figure 6-6. Coffee prices were low from 1998 until around 2005, and then began to rise. In 2011, price of Arabica reached 5.56 dollars/kg, and the price of Robusta 2.51 dollars/kg, prices four to five times higher than in 2001. In particular, the price of Arabica has risen sharply since 2010. The price of Arabica in 2011 is 47% higher than it was in 2010. The fact that the price has risen as the production has increased means that demand for coffee has expanded.

Table 6-6 Trend of Coffee Prices

(Unit: USD/kg)

Year	Indicator price of IOC	Arabica[1]	Robusta
1996	2.25	2.64	1.81
1997	2.95	3.68	1.74
1998	2.40	2.69	1.82
1999	1.89	1.96	1.49
2000	1.42	1.76	0.91
2001	1.01	1.12	0.61
2002	1.05	1.00	0.66
2003	1.14	1.11	0.82
2004	1.37	1.52	0.79
2005	1.97	2.26	1.11
2006	2.11	2.29	1.49
2007	2.37	2.47	1.91
2008	2.74	2.79	2.32
2009	2.55	2.54	1.64
2010	3.25	3.39	1.74
2011[2]	4.78	5.56	2.51

Source: IOC website (http://www.ico.org/coffee_prices.asp?section=Statistics, retrieved on Sep. 12, 2011)
Notes: 1. Brazil natural 2. Average price from Jan. to Aug. 2011



Source: JICA survey team

Figure 6-6 Trend of Coffee Prices

In the following paragraphs, variety, production area, grade, certified coffee, and specialty coffee are explained, as these factors determine the quality of coffee.

(1) Variety, Production Area, and Grade of Coffee

Coffee quality is characterized by variety, production area, and grade. The varieties are divided into Arabica, Robusta, and hybrids of Arabica and Robusta. Arabica and hybrids in general have superior taste and aroma and are traded at high prices. They are usually used for regular coffee. Robusta is

used mainly as raw material for canned coffee and as a supplement to Arabica. Almost all coffee produced in Laos is Catimor,[38] a hybrid variety, and Robusta, while Typica, one of the Arabica varieties, is produced in a very small amount. Typica has a strong aroma and weak body, as does Blue Mountain. Catimor has stronger body than Typica. A coffee company in Laos said that Typica is preferred by Japanese, but not by Europeans.

Production area is an important factor characterizing coffee quality, as taste and flavor vary based on the production area. Famous brands based on production areas are Blue Mountain of Indonesia, Kilimanjaro of Tanzania, Mocha of Yemen and Ethiopia, Santos of Brazil, Supremo of Colombia, and so on.[39] The degree of international recognition of Laotian coffee is not high, and no brand has been established for the production areas of Laos.

There is no international unified standard for grades; each producing country specifies its own standards for grade. In general, standards hinge on bad beans, contamination, size of beans, altitude of production areas, and postharvest processing (whether wet processing or dry processing). Standards do not necessarily reflect taste and flavor. It is said that wet processing produces green beans with less contamination, better appearance, and more uniform quality than dry processing, so wet-processed beans are more highly valued. However, in Brazil, dry-processed beans are preferred for some occasions because dry processing seems to be more natural. Laos does not have any standards for grades of Laotian coffee.

(2) Certified Coffee

Certified coffee can be certified for different aspects: variety, production area, and grade. Prominent types of certified coffee are organic coffee, fair-trade coffee, Rainforest Alliance coffee, and bird-friendly coffee. Certified coffee is now dealt with by global companies such as Nestle and Starbucks.

Organic-certified coffee is certified as being grown organically. There are certifying organizations for various countries and regions. Japan has JAS organic certification according to JAS standards. There are two cases of organic-certified coffee in Laos.

Fair-trade certification is intended to support small coffee producers in making themselves independent socially and economically. Fairtrade Labelling Organizations International is a certifying organization. Criteria for certification include the social, economic, and environmental development of producers; working conditions; and conditions of trade for importers.

Rainforest Alliance certification has the main purpose of environmental protection. It certifies sustainable agriculture. The certifying organization is Rainforest Alliance, NPO in New York.

Bird-friendly certification aims to protect migratory birds and certifies farms that provide habitat for birds and take account of wild animal protection. The Smithsonian Migratory Bird Center, of The Smithsonian National Zoo in the United States is a certifying organization.

(3) Specialty Coffee

Specialty coffee is similar to highly evaluated wine. Per the Japan Specialty Coffee Association, the definition of specialty coffee is based on its wonderful taste and aroma unique to a specific production area, which is different from a definition based on the size of coffee beans. In other words, specialty coffee is recognized as having a nice taste and flavor. Criteria for specialty coffee are

[38] Catimor is a hybrid, but often categorized as Arabica. For example, some people in Laos treat Catimor as one variety of Arabica.

[39] Coffee produced in Brazil is called Brazil or Strong. Almost all coffee in Brazil is dry-processed coffee (Hirose and Hoshida, 2002).

sweetness, sourness, texture in mouth, uniqueness and profile of taste and flavor, impression of finish, and balance. In addition, it is important for specialty coffee to have specific and consistent taste and flavor within a production area.

B. Distribution

As for distribution in Japan, trading companies first import coffee in the form of green beans and distribute it to beverage manufacturers, roasters, and big companies operating chains of coffee shops. Then, roasters roast the green beans and distribute them to mass retailers and medium- and small-scale coffee shops. Almost all coffee in Japan is imported by trading companies, whereas some roasters and fair-trade companies directly import precious and unique coffees in relatively small volume.

Laotian coffee distributed in Japan is passed over to Japanese trading companies after the green beans are processed by local coffee processors and producers' associations.

C. Potential and Challenges of Potential Food Item in the Japanese Market

Table 6-7 below presents the export performance of Laotian coffee as information for analyzing the potential of the coffee. According to the table, Laotian coffee is exported mostly to Europe. Major export destinations are Belgium, Italy, Poland, and Germany in Europe; and Japan, Vietnam, and Thailand in Asia. More than 1,000 tons of Laotian coffee were exported annually to the United States until 2009, while only 189 tons were exported in 2010. From the table, it is obvious that Laotian coffee is currently accepted in Europe, Japan, Vietnam, Thailand, and the United States.

Table 6-7 Export of Coffee Green Bean from Laos

(Unit: ton)

	2007	2008	2009	2010		2007	2008	2009	2010
Europe	10,800	7,641	5,361	14,019	Asia	5,796	4,281	4,740	4,742
Belgium	3,240	671	2,261	6,242	Japan	112	438	1,020	1,691
Italia	205		112	2,597	Vietnam	2,618	2,606	2,211	1,483
Poland	4,807	3,667	1,439	2,496	Thailand	678	282	835	897
German	768	1,944	1,153	2,337	Oman	77	346	308	493
France	38	45	135	116	Taiwan	72	17	37	76
Spain	745		168	79	Indonesia	1,831	191	174	38
Sweden				58	New Zealand	1		19	38
Haifa				56	Australia	38		24	16
Portugal	859	661	74	38	Hong Kong	19			5
Netherland	134				South Korea	4			5
Russia	4				Dubai	266			
Romania		365			Israel	37	326	77	
Slovenia		288			Cambodia	33			
Switzerland			19		China	10			
USA	4,274	1,673	1,067	189	Singapore		75	35	

Source: Based on information from Laos Coffee Association

Examining export of Laotian coffee in 2010 by variety (Table 6-8), it is clear that the export of Robusta exceeds that of Arabica;[40] that Arabica is exported largely to Asia, especially to Japan; and that Robusta is exported largely to Europe and the United States. It seems that most of the Laotian coffee exported to Vietnam, which amounted to 1,404 tons in 2010, is re-exported to Japan, because a trading company that imports more than a thousand tons of Laotian coffee annually processes Laotian coffee in Vietnam and thereafter exports it to Japan, and because Robusta, rather than Arabica, is prevalently consumed in Vietnam. If all the Laotian coffee exported to Vietnam is re-exported to Japan, about 60% of all Laotian coffee is consumed in Japan. In fact, the biggest coffee processor in Laos sells two-thirds of its product to a Japanese company.

Table 6-8 Export of Coffee Green Beans from Laos by Variety

(Unit: tons, 2010)

Country	Arabica	Robusta	Exelsa	Total
Europe	1,864	12,192		14,056
Belgium	1,057	5,185		6,242
Italy		2,597		2,597
Poland		2,496		2,496
Germany	657	1,680		2,337
France		115		115
Spain	79			79
Sweden	58			58
Haifa		56		56
Portugal		38		38
Asia	3,269	891	589	4,749
Japan	1,595		96	1,691
Vietnam	1,404	79		1,483
Thailand	221	676		897
Oman			493	493
Taiwan	24	52		76
Indonesia		38		38
New Zealand	13	25		38
Australia	16			16
Hong Kong	4	1		5
South Korea	5			5
USA		189		189
Total	5,133	13,272	589	18,994

Source: JICA survey team based on information from the Laos Coffee Association

The abovementioned statistics on export make it clear that Laotian coffee is accepted and consumed all over the world, that the Japanese market accepts Laotian Arabica coffee, and that most Laotian Arabica coffee is exported to Japan. Interviews with Japanese companies and Laotian companies reveal that Japanese companies want to purchase more Laotian coffee. Therefore, there is no doubt that the more coffee Laos produces, the more Laotian coffee Japanese companies will purchase.

At the end of this section, the authors would like to introduce an evaluation of Laotian coffee. As Laotian coffee is already exported to various countries, it must be evaluated well. For example, a Japanese company evaluates that it has mild sourness, is easy to drink, and matches the preferences of Japanese consumers. A Singaporean company rated it not bad in its evaluation. On the other hand, it is clear that Laotian coffee has significant room for improvement in postharvest processing. A trading company that purchases Laotian coffee in considerable volume mentioned that the processing quality needs improvement, but that it has been improving and that the coffee cherry quality has been no problem. In short, there is no doubt that export of Laotian coffee will continue to grow from now on.

D. Relevant Information

Thai, Vietnamese, and Singaporean companies have expanded their businesses into south Laos by establishing plantations and processing factories. Some of these companies plan to purchase coffee cherry produced by local farmers, process it along with coffee cherry harvested from their own plantations, and export the processed coffee through their global network. If the companies strengthen their processing capacity and purchase more coffee cherry from farmers, there is a possibility that these companies will dominate Laotian coffee production. At the moment, Japanese companies purchase most Laotian coffee, and there is no domination of Laotian coffee by foreign companies, but it is necessary for Japanese companies and relevant organizations to be aware that foreign companies may threaten the business of Japanese companies in Laotian coffee in the future if

[40] Catimor, which is a hybrid of Arabica and Robusta, is categorized as Arabica.

they strengthen their processing capacity.

6.1.5 Distribution

A. Conditions of Distribution

It is efficient in terms of transportation cost to process coffee cherry into parchment or green beans near the location where it is harvested, because cherry is 1.2 and 6 times as heavy as parchment and green beans, respectively.

Since roasted beans lose their freshness, taste, and flavor shortly after they are roasted, coffee is stored and transported in the form of green beans. Transport of coffee requires serious attention to humidity, water leakage, and dew condensation, because these cause fungus. As for temperature control, chilled transport and storage are preferable, but not common.

B. Routes, Carriers, and Cost

The coffee production areas are in south Laos. Several routes for exporting green beans from the south are possible. Among the possible routes, the one most used is via Vang Tao border gate in Champasack province to Bangkok. This route is paved and has no problems with infrastructure.

Other routes that have high potential are via Phoukheua border gate in Attapeu province to Da Nang seaport and via Dakchung district in Sekong province to Da Nang seaport. The road to Phoukheua border gate is well developed, and the border gate is international, which allows export to Japan. The road running through Dakchung district, Route 16, is being improved, with completion planned for 2015. The border gate is to be upgraded into an international border gate after the completion, which will make export to Japan possible. The route via Vang Tao border gate to Bangkok port is convenient, though, because processing factories are located in Paxon district in Champasack province. If processing factories are established in Sekong and Attapeu provinces in the future, the routes to Da Nang seaport may be convenient and be utilized.

An efficient form of carriers for transporting green coffee beans is containers. There are no obstacles involving infrastructure or legal systems when transporting by container. Due to vehicle weight limitations, it is difficult to use a 40-foot container; therefore, it is the most cost-efficient to transport coffee using two 20-foot containers linked to each other. The cost for transportation of two 20-foot containers from Paxon district to Bangkok, arranged by a freight forwarder based in Bangkok, is as follows: Paxon to Bangkok seaport costs USD 2,350; Bangkok to Yokohama seaport costs USD 1,170.[41] Two 20-foot containers are capable of transporting 38 tons. In short, transportation cost per kilogram is USD 0.092.

6.2 Processed Vegetables

6.2.1 Activities of Japanese Businesses and Potential of the Product

In terms of vegetable production, a company of Japanese origin with long experience in Thailand has opened its own farm in Sekong province and is growing asparagus, green beans, and okra. This company, which is now selling fresh and frozen vegetables in Thailand, is discussing the possibility of processing vegetables in Laos. It already produces vegetables that meet the requirements of the Japanese market. Thus, it can be categorized as a typical manufacturer involved in a development and import scheme (MDI).

[41] Including charges for custom procedures and handling at seaports, but not insurance.

In addition, a Lao company is producing pickled vegetables in Khammuane province and exporting them to Japan. The Japanese company that purchases these products is regarded as a BLP. However, considering that this company indicates the necessary specifications of the products and processing methods to the Lao company, the Japanese company can also be categorized as an MDI.

In Thailand and Vietnam, Japanese and Japan-related companies produce frozen and dried vegetables for the Japanese market within an MDI arrangement. Although there are no explicit MDIs in Laos so far, according to our field research, some Japanese companies have the view that it will be necessary to process vegetables in Laos owing to the rapid increase in labor costs in Thailand and Vietnam. Most Japanese companies that were interviewed said that stable production of raw material might be a serious bottleneck in that event. According to one Lao company, which produces canned vegetables, it also faces a shortage of raw materials.

6.2.2 Raw Material Production

A. Production

Table 6-1 shows vegetable production and harvested areas in all Lao PDR provinces. Vegetable production increased by about 300,000 tons, from 740,000 tons in 2005 to 1,030,000 tons in 2009. The increase and decrease in production were slight, ranging from 350,000 to 400,000 tons in central Laos over the last 5 years. There was a drastic increase, from between 130,000 and 150,000 tons to between 330,000 and 340,000 tons, in both north and south. Today, the three areas, north, central, and south, are maintaining a production of 330,000 to 350,000 tons, contributing 30% each to the national production.

Champasack province is the leading vegetable producing province due to Bolaven Plateau, which covers parts of Champasack, Saravan, and Sekong, a key production area suitable for vegetable production with its cool climate.

Table 6-9 Harvested Areas and Vegetable Production in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	1,995	3,735	2,180	2,725	4,230	13,190	23,835	14,915	18,580	40,735
	Luangnamtha	2,235	1,230	1,115	1,250	1,630	20,025	10,165	8,410	9,220	14,745
	Oudomxay	2,335	2,505	4,845	3,495	13,085	17,585	16,510	33,515	32,795	129,950
	Bokeo	940	655	510	670	545	6,620	4,650	5,195	4,720	3,970
	Luang Prabang	5,260	6,545	7,530	6,200	13,027	37,170	47,450	67,120	63,385	110,895
	Huaphanh	2,850	5,610	2,815	3,955	3,700	19,925	40,580	17,675	24,130	24,475
	Xayabury	2,395	1,930	1,175	1,970	2,725	17,695	14,030	9,340	12,790	17,585
	Total for north	18,010	22,210	20,170	20,265	38,942	132,210	157,220	156,170	165,620	342,355
Central	Vientiane Capital	10,670	8,775	9,720	7,640	6,510	116,510	94,115	114,040	84,860	80,185
	Xiengkhuang	3,845	2,860	3,605	2,420	3,150	32,420	13,800	23,790	13,570	18,730
	Vientiane	11,650	12,355	12,620	9,675	11,683	111,840	99,655	113,415	84,435	94,780
	Borikhamxay	6,285	7,540	5,950	6,090	7,155	63,100	59,480	50,120	46,460	48,480
	Khammuane	5,005	5,470	5,115	5,140	4,545	38,090	33,510	34,420	35,165	32,170
	Savannakhet	11,095	9,250	9,565	9,140	11,690	90,225	72,720	69,350	72,150	85,475
	Xaisomboun	-	-	-	-	-	-	-	-	-	-
	Total for central	48,550	46,250	46,575	40,105	44,733	452,185	373,280	405,135	336,640	359,820
South	Saravan	5,920	6,765	3,160	7,180	5,005	49,785	51,900	28,950	58,205	38,965
	Sekong	880	640	795	1,430	1,190	8,220	4,520	9,050	15,180	13,280
	Champasack	11,350	7,255	13,365	22,700	28,415	94,890	76,670	132,050	232,415	278,235
	Attapeu	725	715	270	420	420	4,490	4,440	3,030	3,170	3,170
	Total for south	18,875	15,375	17,590	31,730	35,030	157,385	137,530	173,080	308,970	333,650
Grand total		85,435	83,835	84,335	92,100	118,705	741,780	668,030	734,385	811,230	1,035,825

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

Vegetables are categorized, according to the statistical data, into (1) leaf and stem vegetables, (2) root and bulb vegetables, (3) and fruit and bean vegetables. The country's typical leaf and stem vegetables are cabbage, Chinese cabbage, asparagus, and fragrant grass. Common root and bulb vegetables include potatoes, onions, garlic, ginger, and taro. Common fruits include tomatoes, eggplant, cucumbers, bitter ground, and green beans.

Table 6-10, Table 6-11, and Table 6-12 present the statistical data for leaf and stem vegetables, root and bulb vegetables, and fruit and bean vegetables respectively. The proportions of each kind of vegetable to the total harvested area in 2009 were 56%, 9%, and 35% respectively; the proportions to total production were 60%, 6%, and 34% respectively.

Southern Lao is main producer of leaf and stem vegetables, as seen in Table 6-10. The south's production share of total national production is 40%, followed by 33% in the northern and 27% in the central regions. The harvested areas of the southern and northern provinces increased by between 100 and 140% in 2009 over 2005. Meanwhile, they decreased by 20% in the central region; thus, there has been a decrease of overall production in the central region over the last 5 years.

Champasack province in southern Laos is the biggest producer, accounting for 36% of the total production of leaf and stem vegetables in the country. The province's Paxon district is the key site for vegetable production; the potential for the production of vegetables like cabbage and Chinese cabbage offered by the cool climate of Bolaven Plateau is being well utilized.

It should be noted that, in 2009, Oudomxay province's harvested area increased 10 times and its production increased 12 times over the 2008 totals. This is why northern production in 2009 exceeded 200,000 tons, much higher than the central region's. Oudomxay province's increase contributed to 70% (about 130,000 tons) of the northern production.

Table 6-10 Harvested Areas and Leaf and Stem Vegetable Production in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	1,095	2,605	1,590	2,090	3,640	7,800	18,600	13,280	17,000	39,315
	Luangnamtha	1,060	435	440	455	515	7,000	4,190	3,520	3,850	3,985
	Oudomxay	1,245	970	2,060	1,005	9,655	8,770	6,950	14,755	8,355	96,560
	Bokeo	580	535	305	495	415	3,710	3,850	3,440	3,730	3,140
	Luang Prabang	2,215	1,925	1,575	1,735	4,102	15,250	15,135	15,510	18,970	37,240
	Huaphanh	1,570	4,690	1,600	2,315	2,385	10,810	37,250	13,565	17,335	16,460
	Xayabury	1,350	830	730	965	1,245	8,150	6,600	6,050	8,070	10,220
	Total for north	9,115	11,990	8,300	9,060	21,957	61,490	92,575	70,120	77,310	206,920
Central	Vientiane Capital	7,000	3,935	6,820	3,625	3,445	70,600	33,820	79,350	45,720	42,560
	Xiengkhuang	2,150	820	1,160	780	1,100	16,400	5,600	10,800	6,780	10,300
	Vientiane	5,460	5,170	5,250	5,020	5,348	51,530	43,325	51,630	44,635	47,215
	Borikhamxay	2,315	3,040	2,220	2,890	2,565	22,900	23,200	18,560	21,805	18,605
	Khammuane	2,560	2,790	2,355	2,835	1,985	17,450	14,110	15,870	17,180	14,935
	Savannakhet	3,845	3,885	4,035	2,970	4,345	23,230	27,850	31,950	25,040	31,940
	Xaisomboun	175	-	-	-	-	1,400	-	-	-	-
	Total for central	23,505	19,640	21,840	18,120	18,788	203,510	147,905	208,160	161,160	165,555
South	Saravan	3,520	2,690	1,250	4,330	2,375	26,250	17,650	10,450	33,890	17,320
	Sekong	360	485	595	1,155	990	2,330	2,960	7,200	12,700	11,110
	Champasack	8,190	5,075	10,200	18,230	21,930	61,940	56,600	103,000	189,450	219,590
	Attapeu	550	700	125	130	130	3,090	4,170	1,580	950	950
	Total for south	12,620	8,950	12,170	23,845	25,425	93,610	81,380	122,230	236,990	248,970
Grand total		45,240	40,580	42,310	51,025	66,170	358,610	321,860	400,510	475,460	621,445

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

Table 6-11 shows the statistical data for root and bulb vegetables. Potato, onion, garlic, ginger, and taro are produced mainly in the northern part of the country. The north's harvested area is about 58% of the total harvested area of the country, and northern production accounts for 43% of the country's total production, followed by central and southern production. Luang Prabang province is the biggest contributor to northern production; in 2009, its harvested area had doubled over its 2005 total, and its share of production represents 44% of the total northern production.

Meanwhile, Champasack province recorded the country's highest production in 2009. Champasack's production was higher than Luang Prabang's because the former's productivity increased even though its harvested area, 1,580 ha in 2009, was smaller than Luang Prabang's 1,960 ha.[42]

Table 6-11 Harvested Area and Root and Bulb Vegetable Production in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	800	1,130	575	635	590	4,490	5,235	1,570	1,580	1,420
	Luangnamtha	170	180	165	265	255	605	630	1,130	1,440	1,245
	Oudomxay	490	780	930	1,355	1,670	1,545	4,640	5,290	5,510	5,590
	Bokeo	100	85	100	95	75	420	640	1,145	590	535
	Luang Prabang	950	2,105	1,465	440	1,960	3,220	11,750	8,150	5,070	11,595
	Huaphanh	530	485	885	1,090	715	2,755	1,380	2,560	4,130	3,025
	Xayabury	430	710	-	645	760	1,600	3,830	-	2,410	3,035
	Total for north	3,470	5,475	4,120	4,525	6,025	14,635	28,105	19,845	20,730	26,445
Central	Vientiane Capital	1,610	740	1,115	1,330	615	11,660	8,575	9,730	10,300	4,955
	Xiengkhuang	615	780	1,180	915	655	2,820	1,550	5,950	3,930	4,330
	Vientiane	120	370	270	145	325	1,270	3,000	2,560	1,000	3,465
	Borikhamxay	390	1,200	790	240	700	2,200	6,900	6,750	2,045	4,045
	Khammuane	510	570	825	165	430	1,660	570	2,960	915	2,210
	Savannakhet	105	70	310	75	125	425	300	1,000	635	1,140
	Xaisomboun	-	-	-	-	-	-	-	-	-	-
	Total for central	3,350	3,730	4,490	2,870	2,850	20,035	20,895	28,950	18,825	20,145
South	Saravan	430	380	-	215	-	3,200	1,650	-	750	-
	Sekong	85	130	35	100	-	670	1,300	240	750	-
	Champasack	610	160	535	1,360	1,580	4,150	1,750	6,200	12,085	15,465
	Attapeu	10	-	-	10	10	60	-	-	30	30
	Total for south	1,135	670	570	1,685	1,590	8,080	4,700	6,440	13,615	15,495
	Grand total	7,955	9,875	9,180	9,080	10,465	42,750	53,700	55,235	53,170	62,085

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

According to Table 6-12, which shows the harvested area and the production of fruit and bean vegetables (such as tomato, eggplant, cucumber, green beans), the central region represents 55% of the country's total harvested area and 50% of 2009's total production (followed by the north, with 30%, and the south, with 20%). A drastic increase is seen in both the harvested area and production. The former, 5,425 ha in 2005, almost doubled to 10, 960 ha in 2009, and production increased. Meanwhile, the harvested area in the central region did not change significantly; thus, only a slight change is seen in its production.

Luang Prabang province's production, 62,000 tons, was the highest among all provinces in 2009 and was almost equal to the south's total production of 69,000 tons. Savannakhet and Vientiane in the central regions and Champasack in the south follow.

[42] According to the MAF (2007 and 2009), Champasack's 2009 productivity was 9.79 tons/ ha and Luang Prabang's was 5.92 tons/ha.

Table 6-12 Harvested Areas and Fruit and Bean Vegetable Production in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	100		15	-	-	900	-	65	-	-
	Luangnamtha	1,005	615	510	530	860	12,420	5,345	3,760	3,930	9,515
	Oudomxay	1,855	600	1,855	1,135	1,760	7,270	4,920	13,470	18,930	27,800
	Bokeo	260	35	105	80	55	2,490	160	610	400	295
	Luang Prabang	2,095	2,515	4,490	4,025	6,965	18,700	20,565	43,460	39,345	62,060
	Huaphanh	750	435	330	550	600	6,360	1,950	1,550	2,665	4,990
	Xayabury	615	390	445	360	720	7,945	3,600	3,290	2,310	4,330
	Total for north	5,425	4,745	7,750	6,680	10,960	56,085	36,540	66,205	67,580	108,990
Central	Vientiane Capital	2,060	1,800	1,785	2,685	2,450	34,250	51,720	24,960	28,840	32,670
	Xiengkhuang	1,080	1,260	1,265	725	1,395	13,200	6,650	7,040	2,860	4,100
	Vientiane	6,070	6,815	7,100	4,510	6,010	59,040	53,330	59,225	38,800	44,100
	Borikhamxay	3,580	3,300	2,940	2,960	3,890	38,000	29,380	24,810	22,610	25,830
	Khammuane	1,935	2,110	1,935	2,140	2,130	18,980	18,830	15,590	17,070	15,025
	Savannakhet	7,145	5,295	5,220	6,095	7,220	66,570	44,570	36,400	46,475	52,395
	Xaisomboun	100	-	-	-	-	1,270	-	-	-	-
	Total for central	21,970	22,880	20,245	19,115	23,095	231,310	204,480	168,025	156,655	174,120
South	Saravan	1,970	3,695	1,910	2,635	2,630	20,335	32,600	18,500	23,565	21,645
	Sekong	435	25	165	175	200	5,220	260	1,610	1,730	2,170
	Champasack	2,550	2,020	2,630	3,110	4,905	28,800	18,320	22,850	30,880	43,180
	Attapeu	165	15	145	280	280	1,340	270	1,450	2,190	2,190
	Total for south	5,120	5,755	4,850	6,200	8,015	55,695	51,450	44,410	58,365	69,185
	Grand total	32,515	33,380	32,845	31,995	42,070	343,090	292,470	278,640	282,600	352,295

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

B. Cultivation

Laos cultivates many vegetables. Therefore, this section reports the cultivation of only those vegetables that contribute to the Japanese firms doing business in the Lao PDR. In addition, contract farming is discussed, providing useful lessons to Japanese firms about the successful operation of contract farming using Laotian farmers.

The focus will be on cucumbers, a raw material for pickles, and green beans, sold as frozen vegetables. The contract farming pursued by Laos Agro Industry Ltd (LAI), an exporter of canned sweet corn, will be discussed. Vegetable farming in Sekong province performed by Advance Agriculture (AA), a Japanese firm, will also be discussed in this section, describing its experiences and the lessons it holds for Japanese firms investing in the country.

(1) Cucumber and Green Bean

The cucumber, namely the Mark Teng, is cultivated in relatively low lying areas along the Mekong River in Pakse, capital of Champasack province, during the dry season. Green bean is grown in the highland areas of Paxon district in Champasack province. However, neither as ever been exported; they are cultivated for the domestic market and home consumption.

The cucumber's seeds are obtained from previous produce. The sowing season is in June, and the produce is harvested from September to October. There are three (3) sizes of harvest: large, medium, and small. The yield is between 20 and 25 tons/ha. During cultivation, no chemical fertilizers or agro-chemicals are used; instead, cattle manure and plant and wood ash are applied. Therefore, the cost of the inputs is almost nil. The farm gate cucumber price is 2,000 Kip/kg when the supply is low and 500 Kip/kg in the peak harvest season, according to the Agriculture and Forestry Office of Champasack province. Cucumber's retail price was found to be 5,000 Kip/kg and its wholesale price between 2,000 and 4,000 Kip/kg in a Pakse city wet market in October 2011, during the study.[43]

[43] Interview with a retailer in Dao Phan Market located in Pakse city in Champasack province (25th October 2011)

For the green bean, a raw distance of 80cm and a hill distance of between 15 and 20 cm are used for planting density. Chemical fertilizers are not used; rather, one (1) ton of cattle manure is applied per one (1) hectare. The yield is between 5 and 6 tons/ha. The farm gate price is between 2,000 and 3,000 Kip/kg. The retail price was found to be 6,000 Kip/kg and the wholesale price 4,000 Kip/kg at the same wet market in October 2011.

Cucumbers[44]

Green beans

Figure 6-7 Cucumbers and Green Beans Sold at a Wet Market in Pakse in Champasack Province

As explained, the current cultivation method uses only cattle manure for input. The production cost can thus be estimated at around 400,000 Kip/ha.[45] However, producers who cultivate and supply cucumbers and green beans to processing factories as raw materials must ship them at regular intervals and at a certain volume, maintaining their supply all year round. Producers find it difficult to produce efficiently enough to increase productivity while avoiding pests and diseases. Thus it will be necessary for producers to receive technical, cultivation,[46] and financial support for their agro inputs.

Apart from technical support, the grouping of farmers is important to the supply of vegetables to processing factories. Contract farming can function if the minimum compulsory purchase price is set at between 5,000 and 6,000 Kip/kg, according to the Agriculture and Forestry Office of Champasack province.[47] Grouping is one way to ensure the regular supply of quality vegetables. However, there have been no successful farmers' groups in the Paxon district of Champasack province.[48]

According to Department of Planning of MAF, most of the contact farming failed in the past in the country. There are some reasons: (1) farmers cannot comply with contract; (2) they are not aware of importance of contract due to low education; (3) products do not meet required standard; and (4) farmers sell products to other buyers even though original contractor supply them agro-inputs. In addition, contractors also failed to buy products due to their own reasons: (1) quality test is not clearly disclosed to producers; (2) contractors do not instruct farmers to quality products; and (3) contractors themselves never comply with written contract so that they do not buy products from

[44] The Laotian cucumber is short and thick and is called "Mark Teng." It is different from the cucumbers in Japan.
[45] According to an interview with a coffee farmer (conducted on August 15, 2011), the price of 25kg of cattle manure is 10,000 Kip, so that 1 ton of manure can be calculated at 400,000 Kip.
[46] However, the mobility of extension officers at the district level is extremely low; there are about 20 extension officers, and they are not supplied with fuel nor money for fuel, though they have motor bikes, according to interviews with the Agriculture and Forestry Office, Paxon district, Champasack province (conducted on October 25, 2011).
[47] Interview with the Agriculture and Forestry Office (October 25, 2011).
[48] Interview with the Agriculture and Forestry Office, Paxon district, Champasack province (October 25, 2011).

farmers.[49] However, the next section provides some tips by way of a successful example.

(2) Contract Farming

The key to success for contract farming is that markets exist and the contracting firms maintain those markets. Laos Agro Industry Ltd (LAI) produces canned sweet corn and exports it to Europe, mostly to Spain. The company concludes contracts with sweet corn farmers, and their contracts are viable, though most firms have failed to follow this example.

Contracting firms should set a minimum compulsory purchase price and maintain the contract. In addition, firms must market the processed products; otherwise, both sides will have failed to maintain their contract.

As shown in Table 6-13, LAI negotiates with the contract farmers and sets up a production plan before each planting season three times a year.[50] Moreover, much attention is given to the farmers;[51] purchasing motivates them to produce what they have agreed with the firm.[52] As shown in Table 6-13, LAI contracts with 7 farmers' groups in the Thoulakhom district of Vientiane province, and more local farmers will participate in contract farming in the near future, according to LAI.

Table 6-13 Cultivation Plan with Contract Farmers (September to December 2011)

Group	Villages	Number of farmers	Cultivation area (ha)
1	North Gern	80	48.00
2	Jang	86	32.00
3	Joum	38	48.00
4	Hardxai	20	16.00
5	Boumphao	114	104.00
6	Ling Sun	74	35.20
7	Phone Phang	7	19.20
	Total	419	302.40

Source: the study team, based on interviews with LAI (2011)

The growing period for sweet corn is 75 days, and it has three planting seasons, November to February, March to May, and June to October. LAI provides seeds, fertilizers, and a little amount of cash to the farmers before planting. A technical staff member observes the farmers' fields and instructs the farmers at least four times a season, (1) 10 days after planting, (2) 25 days after, (3) 45 days after, and (4) 7 days before harvesting.[53]

The seeds used are Sugar 75 (a hybrid made in Thailand). For planting density, the raw distance is 75cm, and the hill distance is 25cm. Chemical and organic fertilizers are both used; however, agro-chemicals are used less often. 65% of the farmers rent their farm land and pay 1,250,000 Kip/ha for one cultivation season in irrigation land. If the land is not allocated in an irrigation scheme area, the rate is 312,500 Kip/ha.

The farmers harvest the sweet corn individually. The minimum compulsory purchase price does not change year to year; however, when the price of agro inputs increases with inflation, the price changes. The minimum contract price is calculated by LAI based on production costs; farmers obtain a 20% margin. Therefore, farmers' profits can increase beyond expectations if producers reduce production costs and increase yields. The current yield is about 9.3 tons/ha.

Harvested sweet corn is classified into three (3) grades: (1) Grade A, (2) Grade B, and (3) Grade C. The purchase price of Grade A is 1,250 Kip/kg, 1,150 Kip/kg for B, and 850 Kip/kg for B. Nonstandard produce is also purchased, but its price is 500 Kip/kg. Three pieces of Grade A weigh 1kg; for Grade B, 1 kg comprises 4 pieces, and, for C, 5 pieces weigh 1kg. Thus, Grade A sweet corn

[49] Interview with the Department of Planning of MAF (August 8, 2011).
[50] The number of contract farmers increased from 200 in 4 groups in 2008 to 419 in 7 groups in 2011.
[51] When farmers bring produce from remote areas, LAI adds a small amount to the contract price as a gratuity. In the dry season, a small amount is also added for irrigation work when purchasing.
[52] Interview with LAI (October 27, 2011).
[53] A technical staff provides training for 3 months before the start of work. There are 10 members on staff.

is grown thick and long. Laos Agro Industry Ltd checks the quality of the produce by removing the skin off the ears; then, 3 to 7 days after receiving the produce, LAI transfers money to the farmers' bank after deducting the cost of the seeds and fertilizer. According to LAI, the proportion of Grade A produce ranges between 30 and 50%; it would like to achieve a constant 50%.

Canned sweet corn

Sweet corn grown in a farmer's field

Figure 6-8 LAI Produce and Sweet Corn Grown in a Farmer's Field in Vientiane Province

As discussed, three (3) factors contribute to implementing and maintaining successful contract farming in Laos: (1) contracting firms have a market for their products; (2) they advise the farmers on technical issues; and (3) firms are attentive to their farmers' needs. It should be noted that LAI received financial support at low interest to start its sweet corn cultivation and processing business.

(3) Vegetable Production by Advance Agriculture Co., Ltd

Advance Agriculture Co., Ltd (AA) is a Japanese-owned firm that produces green beans, asparagus, peppers, and okra on Bolaven Plateau in Sekong province for shipment to Thailand and Japan. Today, AA produces the vegetables on its own, but it plans to contract cultivation out to Laotian farmers.

Advance Agriculture is the subsidiary of a Japanese firm that has been contract farming in Thailand for many years and sells its produce on the Japanese market. Frozen green beans and okra are shipped to Japan from AA's farm through the parent company in Thailand.[54]

There are two (2) Japanese management staff members, four (4) Thai management members, and twenty-five (25) Laotian members; between 160 and 170 laborers work in AA's office, on its farms, and in its processing facilities. The firm's total area is 100 ha, of which 60 ha are used for actual production; many small plots of 1,000m^2 are allocated within those 60 ha. Green beans are cultivated on 6.0 ha, asparagus on 3.9 ha, and peppers on 3.96 ha, with another 20 kinds of vegetable being cultivated experimentally.

[54] The freezing process is performed in Chan Mai in Thailand.

Right-up style cultivation for green beans

Harvested green beans

Figure 6-9 Cultivation of Green Beans and Harvested Produce

Through trial and error, Advance Agriculture made the soil fertile when it started its land reclamation and cultivation on virgin land. It used green manure like jack-bean (*Canavalia gladiate*), rattlepods, (*Crotalaria*), and sudangrass (*Drummondii*) on its farms, and the effect of that is now apparent.

Green beans and asparagus can be grown in both the dry and rainy seasons on Bolaven Plateau. The optimum temperature of between 23 and 25 degrees Celsius can be maintained between November and March in the dry season, so that target yields can be achieved. However, in the rainy season, the solar radiation is not sufficient, and rainfall is sometimes constant; thus the yield comes under the target even when fertilizer and agro-chemicals are applied.

According to AA's Managing Director,[55] the firm produces its vegetables while conducting research and development in order to establish the appropriate cultivation technology in Sekong province. It would eventually like to practice contract farming with area farmers while also pursuing its own production.

The company must cope with (1) the low yield during the rainy season, (2) the rising production scale (3) introducing a processing business, and (4) human resource development for its Laotian staff.

The firm is searching for an alternative crop to replace green beans during the rainy season and will build a facility in which to grow crops that can also be grown during the dry season. Advance Agriculture would also like to invest in expanding cultivation areas and enhancing soil fertility so that the production volume grows large enough to allow the transport of between 20 and 25 tons at once by truck, which will reduce transportation costs.

Processing technology, especially for drying the vegetables, has been introduced to AA through a business opportunity offered by a Japanese food giant, and processing vegetables into pickles represents another business opportunity. The firm thus plans to start a processing business as well.

The firm needed to educate its Laotian staff members after hiring them, as they were not familiar with agriculture or farm work even though some had graduated from agriculture and forestry schools. Meanwhile, the Managing Director has a good impression of his Laotian employees, who work earnestly and diligently despite the stereotype that Laotians do not work hard.

[55] Interview with the Managing Director of AA (August 16, 2011)

Box 6-1 Organic Vegetables

Neither fertilizer nor agro-chemicals are manufactured in the Lao PDR, so they are all imported. In some cases, organic agriculture proceeds without fertilizer or pest control because producers try to avoid expensive agro-inputs in order to reduce production costs. An example of the organic farming of vegetables practiced by a farmers' group in Vientiane is described in this box.

The Vientiane organic farmers' group was established by 16 farmers in 2004 and now has 200 farmers in 6 districts in Vientiane province. Its total organic vegetable farming area is 150 ha, with an average farming size of 0.7 ha per farmer. It grows around 50 different kinds of vegetables. The farmers sell their produce at a market in Vientiane open between 6:00 and 11:00 on Wednesdays and Saturdays. The average sales per farmer are from 500,000 to 1,000,000 Kip on Wednesdays and from 1,000,000 to 2,500,000 Kip on Saturdays. According to a group representative,[56] production costs have been reduced by 50% through organic farming (as an alternative to using chemical fertilizers and agro-chemicals), and profits have thus increased. In addition, his selling price has become stable because he sells his produce himself and keeps what he had to pay to middlemen and brokers. However, there are some problems with the dissemination of organic agriculture: (1) farmers lack knowledge about organic agriculture and cannot understand its true nature; and (2) it takes a long time for farmers to be certified[57] as organic cultivators (12 months for leaf vegetables and 18 months for orchards).

Figure 6-10 The Farmers' Group Selling Organic Vegetables in Vientiane

Lao PDR vegetables are cultivated mainly through the manual labor of family members; therefore, when the organic farming scale is small (like in the above example), it is technically and economically feasible. However, when supplying raw materials to processing factories, farmers have to cultivate and ship a certain volume of produce at regular intervals; therefore, these producers will find it difficult to supply the produce if they cultivate through organic farming. Farmers might be able to manage the supply of vegetables with shorter growth periods, like leaf vegetables, but sophisticated organic farming techniques are required to provide a stable supply of fruit and root vegetables, which are easily damaged by pests and diseases.

6.2.3 Processing

Any company that wishes to sell even fresh vegetables to the Japanese market is forced to spend a lot of effort washing, grading, and binding or packing vegetables of the same weight to meet the rigid standards of the Japanese market. This activity may not be called "processing," but it has a strong impact on the final quality of products and demands similar processing equipment, machines, and facilities, all of which need to meet hygiene requirements. Thus, when we discuss vegetable processing, we need take this aspect into account.

The entire procedure of vegetable processing, above and after the preliminary processing discussed

[56] Interviewing the representative of the farmers' group (10th August 2011)

[57] Organic Agriculture Standard is drafted by MAF based on Agriculture Certification Thailand (ACT) of International Federation of Organic Agriculture Movement (IFOAM). Laos Certificate Body (JCB) under Clean Agriculture Development Center is an authorized organization to accredit organic agriculture.

above, includes (1) drying, (2) freezing, and (3) pickling. Because there are limited actual examples of the above in Laos, with the exception of pickling, the explanation of drying and freezing below refers to cases in neighboring countries and in Japan.

A. Dried Vegetables

Vegetables are traditionally dried in the sun. However, to dry them uniformly and prevent contamination in order to meet the Japanese hygiene requirements, many processors adopt indoor drying methods involving machines. To dry vegetables that contain high levels of water, two methods are used after washing and cutting. The first is freeze-drying, in which vegetables are frozen once, and ice crystals are sublimated in vacuo. The second method is air-drying, in which water is evaporated using hot air. The final quality of freeze-dried vegetables, including aspects such as color, taste, scent, and nutrition, is better than that of the air-dried ones, but the initial cost of freeze-drying machines is higher. Dried vegetables are in demand for instant-noodle products in Japan, Thailand, and Vietnam. Japanese companies produce dried vegetables in Thailand and Vietnam, not in Laos.

B. Frozen Vegetables

The manufacture of frozen vegetables involves the following steps: (1) washing, (2) cutting, (3) blanching, (4) cooling, and (5) quick freezing. Blanching involves soaking vegetables for few minutes in hot water of 80 to 90˚C and cooking them up to 70% or 80%. This is done in order to (1) prevent quality change or color change by deactivating enzymes by adding heat, and (2) make plant tissues soft to minimize tissue breakage in freezing. Quick freezing should be done at a temperature between -30˚C and -60˚C. The shorter the freezing time the smaller is the size of the ice crystals, and this leads to less tissue breakage. Various frozen vegetables are sold in Japan, such as frozen pumpkin, spinach, asparagus, green soybean, and green beans, all of which are produced in Thailand and Vietnam. When frozen vegetables begin to be produced in Laos in the near future, cold-tolerant plastic bags for packing, which are not available in Laos, should be imported. In addition, because most frozen vegetables are packed as final products to be sold as is done in Japanese supermarkets, it should be noted that they should meet the Japanese food standards.

C. Pickled vegetables

Cucumbers are pickled in high level of salt in Laos for being exported to Japan, where they will undergo secondary processing. After being made less salty in Japan, they are seasoned to finalize the process. Pickled cucumbers produced in Laos contain 25% salt. As bacteria cannot survive in such a high-salt environment, picked cucumbers can be transported to Japan at normal temperature by a shipping firm. Processing facilities include simple buildings containing pickling tanks made of

Figure 6-11 Pickling Tanks for Cucumbers (left; Khammuane Province) and Cut Pickled Cucumber (Hai Duong Province, Vietnam)

concrete. Washing and cutting after pickling may require some machines, but pickling itself does not demand any machinery. Naturally, initial investment is lower than that for other type of processed vegetables. Pickled cucumber has already been produced in Laos. According to a Laotian company that is producing pickled cucumber, there is no problem in the quality of processing labor.

6.2.4 Market

This section describes information on markets, especially the Japanese market, for potential food items: frozen vegetables, particularly green beans, asparagus, and okra; and salted vegetables, particularly cucumber.

A. Market Trend

(1) Frozen Vegetables

Export and import of frozen vegetables in the world is summarized in Table 6-14. The total volume of the export and import in the world is about 4 million tons. Belgium is the biggest exporting country, with a 2009 export volume of 1.04 million tons, representing 25% of the total volume. China is the second biggest, with an export volume of 0.74 million tons, or 18% of the total volume. Thailand, which is ahead of Laos in terms of frozen vegetables, exports a comparatively small volume: 50 thousand tons[58]. As for imports, the United States is the top importer (2.48 million tons in 2009), ahead of Germany (0.59 million tons in 2009) and France (0.49 million tons in 2009). The Japanese market, the potential market for Laotian frozen vegetables, is the fourth-biggest importer. Its import volume was 0.32 million tons in 2009 and has remained steady at around 0.3 million tons for the last 10 years. The imported frozen vegetable market in Europe is large, as Europe's imports represent about 60% of all the imports in the world. Thailand imports only 4 thousand tons of frozen vegetables, so there is not a large market for frozen vegetables in Thailand at present.

Table 6-14 World Export and Import of Frozen Vegetables

(Unit: 1,000 tons)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Export										
World	2,805	2,916	2,876	3,162	3,328	3,409	3,673	3,924	4,040	4,023
Europe	1,622	1,885	1,881	2,121	2,041	2,133	2,281	2,363	2,427	2,484
Belgium	776	808	836	879	889	936	1,032	1,022	1,034	1,040
China	342	409	366	383	506	565	681	767	767	742
Poland	166	231	217	285	328	344	323	329	351	342
Mexico	440	229	229	210	262	198	245	269	314	286
Thailand	29	26	29	33	40	36	35	36	54	53
Import										
World	2,698	2,799	2,891	3,123	3,353	3,452	3,617	3,899	4,057	3,938
Europe	1,798	1,857	1,944	2,083	2,132	2,223	2,298	2,418	2,540	2,484
United States	346	347	379	425	501	503	505	592	653	592
Germany	396	505	465	473	442	428	446	450	464	493
France	298	302	324	364	380	384	404	442	447	431
Japan	325	342	297	285	325	337	351	336	306	329
Belgium	199	211	250	231	224	240	279	295	338	328
England	174	220	234	303	358	360	296	274	318	271
South Korea	11	23	32	82	124	114	149	192	194	201
Thailand	1	1	1	1	1	1	4	3	4	4

Source: FAO (http://faostat.fao.org/, retrieved on Nov. 21, 2011)

The opinions of concerned persons in the frozen vegetable market are as follows: A frozen vegetable manufacturing company in Vietnam mentioned that frozen vegetable markets in Thailand and Vietnam will expand in next five years. In fact, a Dutch company has launched operations in

[58] Thailand's exports are small, but are listed in the table for reference.

vegetable cultivation and processing in Dalat, Vietnam and is shipping its products to Southeast Asia[59]. The manufacturing company also mentioned that the market in South Korea will expand. In fact, expansion of South Korea's imports is already indicated in the statistics. The amount of South Korea's imports was only 10 thousand tons in 2000, but 200 thousand tons in 2009. As lifestyle is changing as a result of the economic growth in South Korea, its demand for frozen vegetables, which are easy to cook, may be increasing.

The following deepens discussion on the potential Japanese market. Table 6-15 shows the amount of frozen vegetables imported to Japan. Green soybeans are the most imported into Japan—approximately 60 to 70 thousand tons per year. The major countries from which Japan imports frozen vegetables are China and Taiwan, while Japan also imports a considerable amount from Thailand, and packed frozen vegetables labeled as made in Thailand are sold at supermarkets in Japan. Approximately 24 thousand tons of frozen green beans, one of the potential frozen vegetables of Laos, was imported by Japan in 2010; this amount was less than that exported in the first half of the 2000s. The amount of imported frozen asparagus cannot be known from statistics because frozen asparagus is not allotted a statistical code. However, a concerned person guesses that about 10 thousand tons of asparagus are imported annually. It is imported mainly from China and South American countries such as Peru. Asparagus does not have a peculiar taste and can be enjoyed in any country; therefore, demand for it is increasing in countries where income level is rising. In particular, as the demand in China has increased, it is difficult to procure asparagus from China; as a result, many companies are looking for new places from which to procure it globally. For example, Japan replaced China's asparagus with imports from Peru, but Australia had imported asparagus from Peru, so Australia is now looking for asparagus in Southeast Asia. The situation is similar for okra. It is becoming difficult to import okra from China.

Table 6-15 Japan's Import of Frozen Vegetables

(Unit: 1,000 tons)

Variety	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Green beans[1]	32	32	29	29	31	30	30	28	25	20	24
Green soybeans	75	77	70	61	70	69	67	59	56	59	67
Spinach	45	51	23	8	15	22	22	24	23	22	27
Broccoli	14	17	17	19	21	23	25	24	23	23	27
Potatoes	9	8	6	6	6	7	7	7	15	17	18
Peas	19	18	18	18	16	17	17	16	15	14	13
Mixed vegetables	36	35	30	29	33	32	33	30	23	22	23

Source: Trade statistics of Ministry of Finance (http://www.customs.go.jp/toukei/info/, retrieved on 21 Nov 2011)
Note 1: Including cow-pea *Phaseolus vulgaris* and *Vigna Sinensis*.

Regarding countries from which Japan imports frozen green beans, almost all are from China and Thailand, as shown in Table 6-16. China is the top supplier, providing 58% of Japan's total import of frozen vegetables, and Thailand is in the second spot, supplying 39%.

Table 6-16 Countries from which Japan Imports Frozen Green Beans

(Unit: tons)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
China	22,215	23,927	20,463	19,124	20,512	20,582	20,081	19,147	15,604	12,004	14,170
Thailand	8,352	7,089	7,151	8,272	9,239	7,855	8,417	7,695	8,814	7,673	9,636
United States	1,088	835	1,622	1,728	871	1,130	941	939	661	304	606
Vietnam	1			3			16	31	93	41	35
New Zealand	145	115	132	86	65	66	94	84	69	47	21
Indonesia										17	14
France	11	10	12	8	16	11	16	13	11	11	9
Total	31,908	32,056	29,472	29,233	30,835	29,743	29,795	27,968	25,284	20,098	24,491

Source: Trade statistics of Ministry of Finance (http://www.customs.go.jp/toukei/info/, retrieved on 21 Nov 2011)
Note 1: Including cow-pea *Phaseolus vulgaris* and *Vigna Sinensis*.

[59] Including not only frozen but also fresh vegetables

Cost, Insurance, and Freight (CIF) Prices of frozen vegetables for the Japanese market are as follows: Asparagus is 2.7 dollars/kg; green beans are 1.5 dollars/kg; green soybeans from China are 1.9 dollars/kg, and green soybeans from Thailand and Taiwan are 2.4 dollars/kg. A Japanese frozen vegetable processing company based in Thailand mentioned that the average CIF price of frozen vegetables is about 2 dollars/kg. Prices of frozen vegetables are steady, while prices of fresh vegetables fluctuate.

The frozen vegetable market in Thailand is discussed in this paragraph. As shown in Table 6-14, Thailand imports only four tons of frozen vegetables annually. Concerned persons said that the market in Thailand is small, and frozen vegetables for business use are dominant, while those for retailing are limited. At a mid-level supermarket in Bangkok that the JICA survey team visited, frozen vegetables from Belgium and France were sold in a refrigerator that was 75 centimeters long. The visit was held in the evening of a weekday, so there were not crowds of customers. No customer looked at the frozen vegetable during the 30 minutes of the team's visit. The frozen vegetables sold at the supermarket were potatoes (which occupied 50% of the refrigerator), green peas (10%), green beans (10%), spinach (10%), sprouts (5%), and mixed vegetables (5%). The price of green beans was 180 to 260 baht, and that of organic green beans was 300 to 320 baht, which seemed to be expensive.

(2) Salted vegetables

The total volume of trade in the world of vegetables preserved with SO_2, brine, etc., including salted vegetables, amounts to 400 to 500 thousand tons, as shown in Table 6-17. The top exporting country is China, which makes up of half of the total exports in the world. Exports from Thailand amount to about five thousand tons and exports from Vietnam amount to about 10 thousand tones. Japan is the top importing country. The amount of imports to Japan has decreased: Imports in 2009—89 thousand tons—were less than half the imports in 2000. Salted vegetables imported to Japan are used as raw materials for pickled vegetables.

Table 6-17 World Export and Import of Salted Vegetables

(Unit: 1,000 tons)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Export										
World	453	468	432	474	494	525	517	472	529	443
China	262	263	234	266	282	254	250	224	244	174
India	33	38	48	42	46	100	92	64	112	93
Netherlands	19	23	20	20	25	23	29	25	26	27
Spain	18	11	12	13	11	10	11	13	14	17
Mexico	15	23	16	23	16	20	9	15	12	15
Vietnam	18	20	18	13	12	11	12	9	7	8
Thailand	3	4	2	3	5	6	6	5	5	6
Export										
World	492	452	422	435	431	431	452	453	438	413
Japan	186	192	173	168	160	150	136	121	103	89
South Korea	35	19	18	39	49	30	43	40	59	34
Italy	22	23	25	28	28	31	33	36	34	33
United States	39	25	20	24	20	29	28	25	18	31
France	17	20	21	22	22	26	31	24	24	25
Russia	4	0	1	2	2	9	12	6	13	18

Source: FAO (http://faostat.fao.org/, retrieved on Nov. 21, 2011)
Note: These statistics are for vegetables preserved with SO_2, brine, etc., but which are unsuitable for consumption in that state.

Table 6-18 demonstrates the import of salted or preserved cucumber, eggplant, and Chinese scallion to Japan. Cucumber is imported more than the others, but is declining. The amount of import in 2010—25 thousand tons—was 60% of the amount in 2000.

Table 6-18 Import of Salted or Preserved Vegetables to Japan by Variety

(Unit: 1,000 tons)

Variety	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cucumber[1] *	43	48	41	38	37	36	31	29	26	23	25
Eggplant*	14	14	12	11	11	11	9	8	7	5	5
Chinese scallion*	17	17	14	14	10	8	7	5	4	3	2
Total**	186	192	173	168	160	150	136	121	103	89	-

Source: * Trade statistics of Ministry of Finance (http://www.customs.go.jp/toukei/info/, retrieved on 21 Nov 2011) ** FAO (http://faostat.fao.org/, retrieved on 21 Nov 2011)
Note 1. Including gherkin.

Table 6-19 presents the amount of import of salted or preserved cucumber to Japan by exporting country. Imports from China overwhelm imports from the other countries, making up 89% of all the imports. The rest of the imported salted or preserved cucumber comes from Vietnam, Sri Lanka, etc. Imports from Laos were nil until 2008, then rose to 36 tons in 2009 and 122 tons in 2010. Almost all of the imports from Laos are shipped to a Japanese company[60]. This company wants to increase its imports. Cucumbers that do not meet Japanese standards are shipped to Taiwan, as mentioned by manufacturers of salted cucumbers for Japan.

Table 6-19 Import of Salted or Preserved Cucumber to Japan by Exporting Country

(Unit: tons)

Exporting country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
China	37,742	40,995	36,070	34,825	33,364	32,007	27,587	25,691	22,766	19,839	21,746
Vietnam	4,207	5,361	3,964	2,931	2,667	3,254	2,863	2,771	2,673	1,988	1,298
Sri Lanka	815	1,058	1,084	399	299	374	539	520	557	748	865
India	91	158	62	56	70	98	85	140	312	437	437
Laos										36	122
Thailand	230	124	31	132	45	30	103	30	3	30	30
Indonesia	66	82	49	58	58	28	14	45	44	4	28
Total	43,210	47,855	41,298	38,401	36,518	35,793	31,209	29,215	26,354	23,082	24,526

Source: Trade statistics of Ministry of Finance (http://www.customs.go.jp/toukei/info/, retrieved on 21 Nov 2011)
Note. Including gherkin.

B. Distribution

Frozen vegetables are shipped to Japan after being cut, packaged individually, and made in the form of final products. Salted vegetables are not processed into the form of final products because they are to be used as raw materials for pickled vegetables in Japan, but they are cut into small and long pieces or thin and round pieces depending on the needs of the Japanese manufacturers of pickled vegetables. Salted vegetables soaked in highly concentrated brines are processed in Japan after the salt is removed.

It is true for both frozen and salted vegetables destined for Japan that involvement of users is necessary for local processors of salted vegetables to manufacture products that meet the standards and quality required by users and to obtain channels for sale. A Japanese company that sells imported frozen vegetables in Japan said that when it looks for a new partner from which to procure frozen vegetables, it first finds a local processor capable of satisfying its requirements, then gives the necessary technical assistance, and finally starts to procure frozen vegetables from the local processor. It is effective for Laotian processors to gain technical cooperation from Japanese users and to gain assistance from processors in Thailand that export processed vegetables to Japan and have a full understanding of Japanese standards and quality in order for Laotian processors to export frozen and salted vegetables to Japan.

[60] The salted cucumber imported from Vietnam is mostly distributed to this Japanese company.

C. Potential and Challenges of Potential Food Item in the Japanese Market

Marketability of the potential food items—frozen vegetables such as green bean, asparagus, and okra; and salted vegetables such as cucumber and ginger—in the Japanese market is considered high. This is because the green beans produced by Advance Agriculture Ltd. are processed in Thailand, exported to Japan, and accepted in the Japanese market. This suggests that frozen green bean satisfying Japanese quality can be produced in Laos if appropriate technology is applied. As for salted vegetables, the quality can be judged to be acceptable because Laos already exports salted vegetables to Japan.

The size of the potential market is considered promising. For frozen vegetables, there will be more and more demand for Laotian frozen vegetables, because frozen vegetables imported from China may decrease as Chinese domestic demand rises, and because those from Thailand may become more expensive as labor costs rise. For salted vegetables, pickled vegetable manufacturers in Japan have strong demand for salted vegetables from Laos, although the total import volume is on a downward trend.

A challenge in terms of marketability is price. The cost for processed vegetables is currently high. It is difficult to produce the amount of raw materials for processed vegetables at a cost suppressed enough to make a profit. Furthermore, since the technical level of farmers and workers is not high, management cost tends to be high.

6.2.5 Distribution

A. Conditions of Distribution

Distribution of frozen vegetables requires attention to temperature control. Even short exposure to normal-temperature air can melt frozen vegetables and deteriorate them. Since the Japanese market requires high quality, this exposure is fatal. If refrigerated containers are used for transporting frozen vegetables, there is no risk of exposure.

Distribution of salted vegetables does not require special attention. Since they are soaked in brine, damage is not problematic. An example of transport of salted vegetables by a Vietnamese manufacturer is as follows: 25 kg of salted vegetables are put into a polyethylene bag, and 20 bags are put into one wooden case and shipped.

B. Routes, Carriers, and Cost

(1) Frozen Vegetables

Frozen vegetables are shipped in considerable volume, because they can be stored in a cold storage warehouse at a factory until the amount of stored volume is enough to reduce transportation cost. The carrier is a refrigerated container. The route from Bolaven plateau to Japan is via Vang Tao border gate in Champasack and via Bangkok or Laem Chabang seaport. The routes via Thailand are more convenient for vessels and for arranging containers, and have better road accessibility than routes via Vietnam. Container trailers from Thailand can enter Laos without any trouble. Since frozen vegetables are kept in the same containers until they reach Japan, the vegetables need not be taken out of the containers; this means that cold storage warehouses are not necessary at border gates. The weight of a 40-foot container full of frozen vegetables is about 20 tons.[61]

The cost of transportation of about 20 tons of frozen vegetables using a 40-foot refrigerated container

[61] Due to vehicle weight limits, some container trailers are not allowed to be heavier than 20 tons. In cases where trailers cannot use a 40-foot container due to the limit, it is cost-efficient to connect two 20-foot containers and transport the two containers using one trailer head at the same time.

from Bolaven plateau to Japan arranged by a freight forwarder based in Bangkok is as follows: Transport from Bolaven Plateau to Bangkok seaport costs 3,350 dollars;[62] fare from Bangkok seaport to Yokohama seaport is 1,520 dollars.[63] In short, transporting about 20 tons of frozen vegetables from southern Laos to Japan costs 4,870 dollars in total.[64] In other words, 0.24 dollars/kg is necessary. This transportation cost amounts to 12% of the average CIF price of frozen vegetables, 2 dollars/kg.

(2) Salted Vegetables

Since salted vegetables are soaked in brine in tanks, they are suitable to ship in a considerable amount, and it is cost-efficient to transport them in containers. A 20-foot container full of salted vegetables weighs about 18 tons. A 40-foot container weighs 36 tons, and only a few types of container trailers are allowed to load 36 tons of cargo. Therefore, it is an economic choice to transport salted vegetables by connecting two 20-foot containers.

The route from Khammuane province to Japan is via Thakhek border gate and via Bangkok or Laem Chabang seaport. The cost of moving two 20-foot containers from Thakhek to Bangkok seaport is about 2,450 dollars, and the cost from Bangkok seaport to Yokohama seaport is 1,130 dollars. The total cost is 3,580 dollars for about 36 tons of salted vegetables, which means that the cost per kg is 0.10 dollars.

6.3 Rice

6.3.1 Activities of Japanese Businesses and Potential of the Product

The rice traditionally consumed in Laos is of the glutinous type, but, recently, non-glutinous rice consumption has also been increasing. Government policy and private-sector investment in non-glutinous rice production, primarily for exporting, can currently be observed, perhaps owing to an increase in world rice consumption. Japanese businesses can profitably involve themselves in the growth of the rice market as suppliers of rice-related machinery such as milling machines. In Asian rice-production areas such as Thailand, rice-related agricultural machines of Japanese origin such as walking tractors and milling machines are already well-established as locally manufactured products. In Laos, if rice production expands more, Japanese machine suppliers in the modality of SLP will be able to contribute to increasing Laotian rice production.

Processed rice products such as rice noodles were not shortlisted because no Japanese businesses dealing in processed rice were operating in Laos and indicated any possibility to operate in Laos in the near future.

6.3.2 Raw Material Production

A. Production

There are three production systems for rice in the Lao PDR: (1) rain-fed lowland paddy production, (2) irrigated paddy production, and (3) upland paddy production. The three systems are summarized in Table 6-1.

Government statistics acknowledge three paddy-farming systems: (1) rainy season rain-fed paddy farming, (2) dry season irrigated paddy farming, and (3) rain-fed upland paddy farming.

[62] Inclusive of charge for customs procedures and traffic license in Laos.
[63] Inclusive of charge for customs procedures and seaport handling.
[64] Exclusive of insurance for sea transport.

Table 6-20 Three Rice Production Systems in Lao PDR

System	Definition
Rain-fed lowland rice	The paddy is cultivated in fields separated by levees and in which rainwater is stored and flooded to grow the paddy during its growing stage.
Irrigated paddy production	The paddy is cultivated in fields separated by levees and in which irrigation water is introduced, stored, and flooded to grow the paddy during its growing stage.
Upland paddy production	The paddy is cultivated in fields that are not separated by levees so that rain water is not caught but utilized. This system is normally seen on hillsides.

Source: International Rice Research Institute (2006)

In August 2011, during the study, the latest production data for 2010 had not yet been published by the Agricultural Statistics of the Ministry of Agriculture and Forestry; however, the Department of Statistics of the Ministry of Planning and Investment had disclosed the latest data for 2010, as shown in Table 6-21. According to the data, the total harvested paddy area in the Lao PDR was 851,145 ha, and the total paddy production was 3,070,640 tons. Rainy season rain-fed paddy accounted for about 75.9% of the total harvested area; the dry season irrigated paddy accounted for 16.7%, and upland paddy for 7.4%.

As shown in Figure 6-12, the harvested paddy area cultivated under rainy season rain-fed paddy farming had increased about 40% over the last 10 years since 2000. The area of dry season irrigated paddy farming had increased by about 14,000 ha since 1995 to 100,000 ha in early 2000, with the area showing slight increases and decreases after 2000. Although upland paddy's harvested area decreased, satellite images reportedly show an increase in slash and burn farming of upland paddy.[65]

In the country, both glutinous and non-glutinous rice are produced. The former is Laotians' staple food; therefore, between 80 and 85% of the rice produced in the country is glutinous although there is no official statistical division between glutinous and non-glutinous rice. Meanwhile, the consumption of non-glutinous rice is limited, largely restricted to minorities such as the Mong and Yao as well as city people, tourists, and foreigners. Non-glutinous rice is produced mainly for uses such as sweets, traditional Lao noodles, rice noodles, and as a raw material in beer factories.[66]

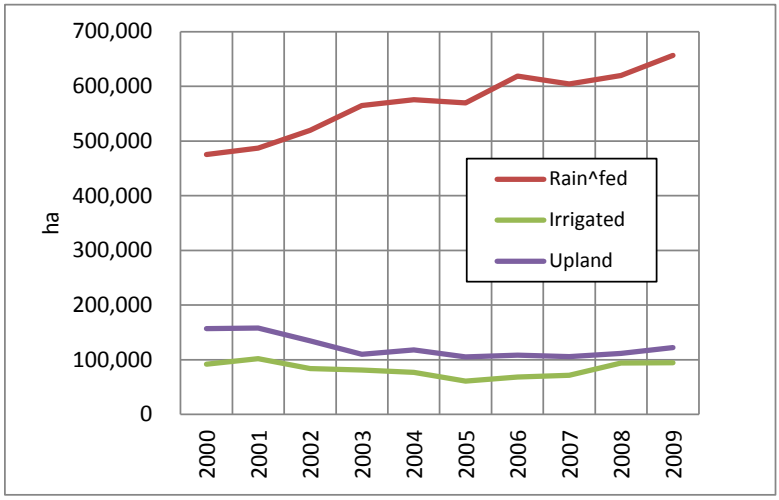
Glutinous rice is produced even in the rain-fed lowland. Although a clear differentiation between non-glutinous and glutinous rice is not indicated in any official statistics, 80% of the paddy produced under both rainy season rain-fed farming and upland farming is glutinous, and 20 % is non-glutinous. In dry season irrigated farming, 20% of the rice is glutinous, and 80% is non-glutinous.[67]

Table 6-21 Paddy Production Status in Lao PDR (2010)

Paddy farming system	Harvested area (ha)	Paddy production (tons)	Proportion of production to total (%)
Rainy season rain-fed lowland paddy farming	627,865	2,331,330	75.9
Dry season irrigated lowland paddy farming	108,410	512,430	16.7
Upland paddy farming	118,839	226,880	7.4

Source: Ministry of Planning and Investment (2011)
Note: Statistical data for 2010 had not yet been published in 2011; however, MPI provided the study team with the latest statistical 2010 data on paddy production.

[65] International Rice Research Institute (2006)
[66] International Institute for Trade and Development (2010)
[67] Interview with the Department of Planning, the Ministry of Agriculture and Forestry (August 8, 2011)



Source: the study team, drawing from the International Institute for Trade and Development (2010) and Ministry of Agriculture and Forestry (2007 and 2009)

Figure 6-12 Change in Harvested Paddy Areas under Different Farming Systems

Table 6-22, Table 6-23, and Table 6-24 show the changes in harvested paddy areas and production under rain-fed lowland farming, irrigated farming, and upland farming in all provinces.

According to Table 6-22, central production of rain-fed paddy accounted for 57% of total 2009 production in the Lao PDR; the south followed with 26%, and the north had 17%. Savannakhet province had the highest share of harvested area (42%) and of production (40%) among the central provinces, where paddy production is practiced mainly along the Mekong River corridor. Moreover, the production for Vientiane and Vientiane province, 452,150 tons, was also high.

Table 6-22 Harvested Areas and Production of Rainy Season Rain-Fed Lowland Paddy in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	9,015	6,055	6,253	5,922	6,476	33,500	26,455	27,910	23,560	28,680
	Luangnamtha	12,695	10,740	11,484	11,221	11,370	47,600	41,645	44,575	43,730	44,150
	Oudomxay	11,705	11,640	11,465	12,341	12,740	47,000	40,050	47,895	52,860	60,200
	Bokeo	12,765	13,455	13,747	14,258	14,425	52,700	56,260	58,490	65,050	63,300
	Luang Prabang	13,800	12,115	12,570	12,578	12,850	52,000	46,080	50,290	48,205	55,050
	Huaphanh	11,485	11,800	10,851	11,815	11,860	53,100	54,280	44,400	49,210	58,850
	Xayabury	25,035	24,995	25,784	27,370	27,774	108,600	97,060	101,515	117,480	113,050
	Total for north	96,500	90,800	92,154	95,505	97,495	394,500	361,830	375,075	400,095	423,280
Central	Vientiane Capital	52,150	52,640	53,380	39,280	54,335	210,600	200,075	219,685	161,315	225,150
	Xiengkhuang	16,820	18,895	20,021	20,506	20,617	64,000	68,775	68,435	79,675	82,220
	Vientiane	47,250	49,335	48,985	45,338	52,163	187,300	192,410	202,580	196,160	227,000
	Borikhamxay	27,800	32,275	31,855	24,346	34,063	112,200	119,985	119,190	81,615	132,850
	Khammuane	30,370	51,515	48,784	50,780	57,575	104,000	157,820	157,855	163,520	180,250
	Savannakhet	128,075	150,540	135,449	161,354	160,030	424,600	498,065	466,875	563,125	565,550
	Xaisomboun	3,840					12,100				
	Total for central	306,305	355,200	338,474	341,604	378,783	1,105,800	1,237,130	1,234,620	1,245,410	1,413,020
South	Saravan	59,575	58,810	55,154	65,424	64,682	214,500	202,240	209,585	231,500	224,700
	Sekong	6,260	6,760	5,980	6,652	7,576	22,000	22,880	20,470	25,720	25,350
	Champasack	85,540	92,080	93,504	92,160	97,280	292,600	299,770	297,360	318,705	358,250
	Attapeu	15,570	15,170	18,881	18,289	10,655	52,700	27,550	56,290	55,280	24,150
	Total for south	166,945	172,820	173,519	182,525	180,193	581,800	562,440	583,705	631,205	632,450
	Grand total	569,750	618,820	604,147	619,634	656,471	2,082,100	2,161,400	2,193,400	2,276,710	2,468,750

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

In the south, Champasack province had the highest harvested area, accounting for 54% of the south's total, and the largest production (57%) as well. The northern provinces (apart from Phongsaly) accounted for more than 10% each of the total northern production; Xayabury had the highest, with 27%.

Regarding increases in harvested area from 2005 to 2009, the central region had the highest, with 24%. The south increased by 8% and the north by only about 1%. The central region's increase over the last 5 years, 72,478 ha, represents 84% of the total increase (86,721 ha) for the country.

Table 6-23 shows the harvested paddy areas and production under dry season irrigated paddy; a production tendency similar to that of rain-fed lowland paddy can be seen in it, as the table shows. Thus, central production of irrigated paddy accounted for 75% of the total 2009 national production. The south and north follow with a 15% and 10% share, respectively. Savannakhet province was the leading producer of irrigated paddy among the central provinces, its harvested area accounting for 41% of the total central area and 40% of the total production. Therefore, Savannakhet's paddy production contributed to both the rainy and dry seasons' production. The production area next to Savannakhet is Vientiane, which produced 108,025 tons in 2009.

In the south, Champasack and Saravan provinces account for 48% and 46% (respectively) of the total southern production of dry season irrigated paddy. The two provinces produce most of the southern paddy. Xayabury province produces most of the north's dry season irrigated paddy, with a 29% share of total northern production. Luang Prabang and Bokeo provinces follow, with 26% and 20% shares, respectively.

The country's total harvested area of irrigated paddy farming increased by 33,297 ha; 4,643 ha were contributed by the north, 21,839 ha by the central region, and 6,797 ha by the south; thus, their proportional contributions were 14%, 66%, and 20%, respectively.

Table 6-23 Harvested Areas and Production of Dry Season Irrigated Paddy in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	131	200	210	210	274	525	900	850	905	1,305
	Luangnamtha	683	800	630	1,882	350	2,990	3,690	2,520	7,920	1,345
	Oudomxay	152	300	430	395	611	660	1,200	1,710	1,515	3,230
	Bokeo	600	900	1,215	1,688	1,924	1,970	3,600	5,100	6,980	8,565
	Luang Prabang	1,507	1,400	1,445	2,176	2,458	6,790	6,000	6,500	9,270	11,150
	Huaphanh	1,268	1,500	1,490	1,227	1,419	4,850	5,410	5,100	3,990	4,830
	Xayabury	793	1,230	1,965	2,238	2,741	3,315	5,170	8,520	9,090	12,665
	Total for north	5,134	6,330	7,385	9,816	9,777	21,100	25,970	30,300	39,670	43,090
Central	Vientiane Capital	21,656	21,100	20,125	21,049	22,176	98,600	97,100	96,000	99,825	108,025
	Xiengkhuang	80	170	160	47	150	250	580	570	165	550
	Vientiane	3,607	6,700	7,820	9,638	7,901	15,940	29,430	35,550	44,275	35,520
	Borikhamxay	3,265	3,000	2,720	3,561	4,306	14,140	12,900	13,160	16,310	23,080
	Khammuane	4,066	5,000	4,255	6,108	6,977	20,600	27,700	21,400	32,205	36,670
	Savannakhet	15,245	19,500	21,100	25,999	28,256	66,500	85,200	97,520	118,035	136,000
	Xaisomboun	8					30				
	Total for central	47,927	55,470	56,180	66,402	69,766	216,060	252,910	264,200	310,815	339,845
South	Saravan	4,126	3,400	3,410	8,592	7,100	17,760	17,100	15,350	42,790	31,835
	Sekong	368	400	495	870	535	1,470	1,470	2,100	3,810	2,205
	Champasack	3,100	2,400	3,520	7,720	6,614	13,390	10,600	15,500	39,290	33,200
	Attapeu	375	500	410	672	517	1,320	1,950	1,750	2,825	1,875
	Total for south	7,969	6,700	7,835	17,854	14,766	33,940	31,120	34,700	88,715	69,115
	Grand total	61,030	68,500	71,400	94,072	94,309	271,100	310,000	329,200	439,200	452,050

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

Table 6-24 shows the harvested areas and production of upland paddy. The north recorded the highest production of upland paddy in 2009, accounting for 71% of the national total. The central region

followed with 23%, and the south had 6%. Each province in the north contributed between 12 to 20% to the northern total (apart from Luangnamtha province, which accounted for 7%). The production of Xiengkhuang and Vientiane province accounted for 63% of the total central production; some sloping areas in Vientiane province are suitable for upland paddy farming.

The harvested area of upland paddy increased by 16,876 ha between 2005 and 2009, attributable to the increase in the north's harvested area (5,135 ha) and the central region's (14,600 ha). Meanwhile, the south suffered a 2,859 ha decrease, and no upland paddy was produced in the southern Champasack province.

Table 6-24 Harvested Areas and Production of Upland Paddy in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	5,530	7,700	5,110	12,743	12,355	10,700	14,575	8,655	31,275	22,475
	Luangnamtha	6,650	6,675	6,031	5,141	6,215	12,800	11,495	10,733	9,505	11,060
	Oudomxay	15,310	15,125	9,005	7,460	12,570	35,100	25,850	15,313	12,805	19,245
	Bokeo	3,870	7,755	9,254	8,677	7,020	8,600	13,900	18,365	20,390	19,170
	Luang Prabang	20,550	20,060	16,645	15,779	19,000	39,600	32,100	24,135	21,820	27,640
	Huaphanh	13,570	12,035	12,120	12,040	14,025	25,200	22,700	26,035	26,985	31,985
	Xayabury	14,960	14,625	15,742	12,711	14,390	31,400	28,650	23,100	24,865	27,590
	Total for north	80,440	83,975	73,907	74,551	85,575	163,400	149,270	126,336	147,645	159,165
Central	Vientiane Capital	-	-	3,521	898	5,540	-	-	8,425	2,145	9,420
	Xiengkhuang	7,040	8,605	8,420	8,084	8,525	15,200	16,500	18,949	16,270	17,300
	Vientiane	1,270	1,715	1,200	12,009	9,470	2,800	3,260	1,525	19,650	15,475
	Borikhamxay	3,030	3,485	5,939	4,679	3,950	6,250	5,230	10,115	7,475	7,185
	Khammuane	-	800	1,143	860	710	-	1,330	2,135	1,630	1,275
	Savannakhet	2,050	1,570	1,050	570	735	3,600	2,370	1,575	855	1,110
	Xaisomboun	940					1,700				
	Total for central	14,330	16,175	21,273	27,100	28,930	29,550	28,690	42,724	48,025	51,765
South	Saravan	6,300	500	6,425	5,509	5,369	14,000	8,500	11,905	9,775	9,840
	Sekong	2,250	1,835	2,488	3,134	1,215	4,500	3,090	4,100	4,600	1,990
	Champasack	-	-	-	-	-	-	-	-	-	-
	Attapeu	1,920	1,240	1,603	1,350	1,000	3,350	2,750	2,385	1,185	1,240
	Total for south	10,470	8,075	10,516	9,993	7,611	21,850	14,340	18,390	15,560	13,070
	Grand total	105,240	108,225	105,696	111,644	122,116	214,800	192,300	187,450	211,230	224,000

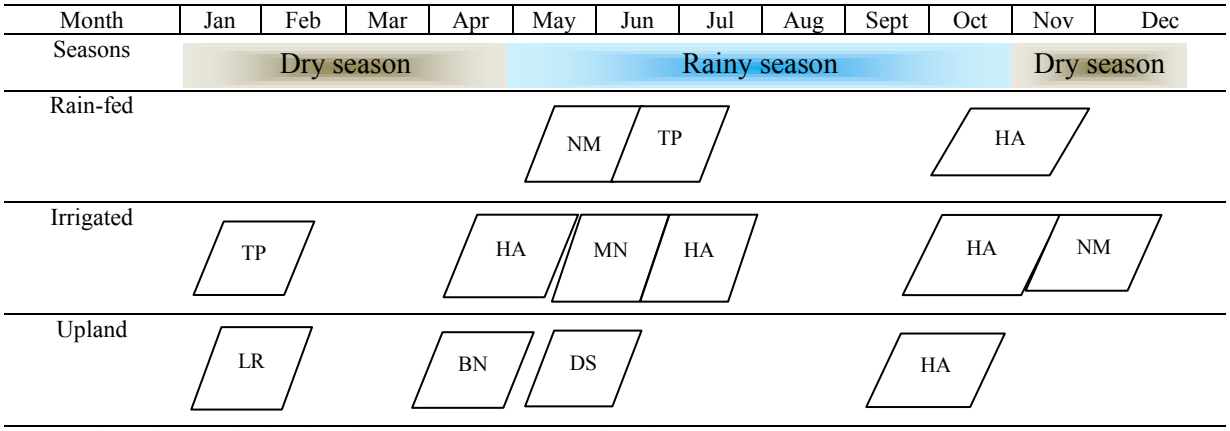
Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

B. Cultivation

This section reports on the cultivation situation and production costs of the three farming systems. There are two cultivation calendars for the rainy and dry seasons in upland farming, as shown in Figure 6-13.

As shown in Figure 6-13, single cropping is practiced for rain-fed lowland paddy and begins when the rainy season comes. The nursery is grown during the beginning of the rainy season in May and June; seedlings are transplanted in June and July, and the paddy is harvested in October and November. This practice is common in the lowlands of the central and southern regions of the country; however, in the highlands and the valley bottom areas, especially the mountainous areas of the north,[68] rice terrace is used to store rainwater so that the same kind of paddy cultivation can be performed as in rain-fed lowland paddy cultivation. In the dry season, extensive livestock grazing is seen in the paddy fields.

[68] Xayabury and Luangnamtha provinces in the north



Source: the study team, drawing from the International Rice Research Institute (2006).
Note: NM (Nursery making), TP (Transplanting), HA (Harvesting), LR (Land reclamation), BN (Burning), DS (Direct Sowing)

Figure 6-13 Cultivation Calendar of Three Paddy Cultivation Systems

Double cropping can be practiced in irrigation farming. In both rainy and dry seasons, paddy can be cultivated because irrigation water is introduced from water resources through irrigation facilities and structures. The cropping calendar is the same as in rain-fed lowland cultivation during the rainy season. In the dry season, nursery making is performed starting in the harvest season of rain-fed farming until December. Transplanting is done in January, and the paddy is finally harvested in April and May, when the dry season ends.

Upland paddy is cultivated mainly through shifting cultivation using slash and burn. Land reclamation is done during the dry season, and the virgin fields are burnt. The field is then cleared and prepared for direct sowing. Harvesting occurs in September and October. After a field has been cultivated continuously for two to three years, new virgin land is used for the next cropping, and the former field is fallowed for five to seven years. It is difficult to find new virgin lands, so the fallow period is becoming short, two to three years. The government of the Lao PDR promotes the reduction of slash and burn agriculture.

The farm work sequence of rain-fed paddy cultivation will be discussed, with an example of rain-fed lowland paddy cultivation from Champasack province. The climatic conditions for paddy production in Champasack province are shown in Figure 6-14. There are 2,341 yearly sunshine hours in Champasack province,[69] so the average daily sunlight hours can be simply calculated as 6.5 hours.

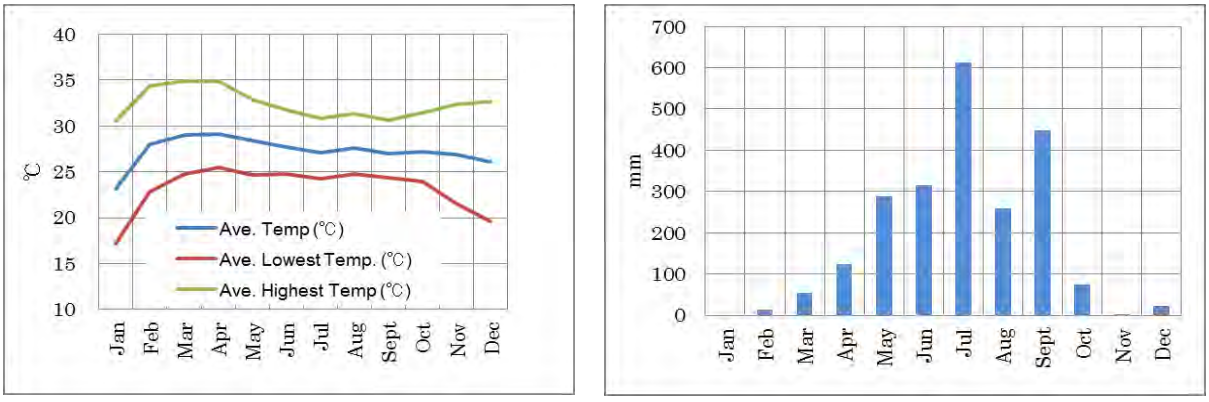


Figure 6-14 Monthly Temperature and Precipitation in Champasack Province

[69] Statistical Yearbook (2009), the Department of Planning, Ministry of Agriculture and Forestry

The soil typically found in South-East Asian countries, Acrisols, has an acid content slightly lower than pH 5.5. The soil is less fertile, and less than 2% of it is organic matter. It is 26% clay, 26% sand, and 48% silt; thus its water holding capacity is low.

Improvements in paddy variety have been pursued by the International Rice Research Institute (IRRI) and the government of the Lao PDR since the 1990s. The varieties selected by the farmers depend on location, altitude, and cultivation system. Table 6-25 and Table 6-26 list the varieties of paddy cultivated through rain-fed and irrigated farming. Most varieties are glutinous rice, apart from Jasmine from Thailand and CR 203 from Vietnam; CR 203 is a high yielding variety, but its quality is low and produces much broken rice; thus, it is used for rice noodles and brewing.

Producers practicing rain-fed paddy cultivation during the rainy season produce different varieties in small divided plots. This results in mixing different varieties, causing problems with the milled rice quality during distribution and marketing.[70] Moreover, according to millers, non-glutinous and glutinous paddies are mixed during cultivation, lowering the quality of milled rice.[71]

Table 6-25 Paddy Varieties Cultivated during the Rainy Season

Altitude	North	Central	South
Highland	Local varieties	TDK 1-6 TSN 1-3 PNG 1-6	TDK 1-6 PNG1, 3, 5
Middle mountainous	Tiny chicken TDK 5 NTH 1	Jasmine Hom Nang Nuan TDK 1, 6 TSN 3	Jasmine TDK 1 RD 6 PNG 1-6
Lowland	not available	RD 6, 8 TDK 10	RD 6 TDK 10

Source: International Institute for Trade and Development (2010)
Note: varieties are named after the names of the research institutions that developed them. They are TDK (Thadokkham Agriculture Study Institution), TSN (Thasano Experiment Station), PNG (Phone Ngam Experiment Station), NTH (Namtha Experiment Station), and RD (Rice Department of the Thai government).

Table 6-26 Paddy Varieties Cultivated during the Dry Season

North	Central	South
TDK 1, 5, 6 (50%) NTN 1 (30%) NTH 1(20%)	TDK 1-6 (40%) TSN2, 3 (30%) PNG 1-6 (20%) NTN 1 (5%)	PNG 1, 3, 5, 6 (50%) TDK 1, 5, 6 (45%) CR 203 (5%)

Source: International Institute for Trade and Development (2010)
Note: Figures in parentheses show the proportion of the variety cultivated relative to total production. NTN is the Namthane variety.

The farm work sequence of typical rain-fed lowland paddy cultivation is provided in Table 6-27. Table 6-28 summarizes the production cost of typical rain-fed lowland paddy cultivation. As shown in Table 6-28, the production cost per hectare is 4,020,000 Kip. If the farm gate price is between 2,000 and 3,500 Kip/kg, as shown in Table 6-27, the total sale is between 5,060,000 and 8,860,000 Kip/ha, the gross margin is between 1,040,000 and 4,840,000 Kip/kg, and the profitability is between 21 and 55%, based on the given data by which the production cost is 4,020,000 Kip/ha and productivity is 2,532 kg/ha, as shown in Table 6-28.

Table 6-29 reports the calculated results of the sale, gross margin, and profitability for glutinous and non-glutinous paddy under different cultivation systems. According to the results, the margin and profitability of dry season irrigated non-glutinous paddy has the highest gross margin and the second

[70] International Institute for Trade and Development (2010)
[71] Interviews with millers in Champasack province (August 11, 2011)

highest profitability. The lowest gross margin was recorded for rainy season rain-fed non-glutinous paddy, followed by rainy season irrigated non-glutinous paddy.

Table 6-27 Typical Farm Work Sequence for Rain-Fed Lowland Paddy Cultivation in Champasack Province

Farm work	Detailed information
Seeds	Main varieties: PNG 1-11 (glutinous), TDK (glutinous), and Jasmine (Non-glutinous). Price: 5,000 Kip/kg for PNG 1-11 (glutinous) and TDK (glutinous)
Nursery making	Period: 30 days grown in part of main paddy field. Sowing quantity: 60 to 70 kg/ha
Land preparation	Plowing and puddling: 2 to 4 weeks before transplanting. Methods: (1) implement drawn by water buffalo; (2) power tillers; and (3) custom hiring by power tillers or tractors. Purchase price of power tiller (5 to 8.5 PS): 15,000,000 Kip/unit. Custom hiring charge rate: 1,200,000 Kip/ha once (2,400,000 Kip/ha twice).
Transplanting	Row distance (20 cm) x hill distance (15 cm); 3 to 5 seedlings in a hill.
Fertilization	Basal doze: nitrogen input 73kg/ha. Price of NPK 15-15-15: 225,000 Kip/50kg. Price of urea: 225,000 Kip/50kg.
Agro-chemical	Agro-chemical is not used very much.
Weed control	Methods: manually.
Harvesting	Methods: manually, with sickle. Labor cost per ha: 35,000 Kip/ha-man-day x 30 to 35 days.
Drying	Methods: sun drying on paddy fields after harvesting.
Threshing	Methods: peddle type thresher or power thresher. Purchase price of power thresher: 30,000,000 to 50,000,000 Kip/unit. Custom hiring charge: paid by paddy.
Storage	Methods: traditional platform storage.
Milling	Methods: pastel and mortar by farmers or custom milling. Milling charge: 300 to 400 Kip/kg of milled rice or by husk and bran.
Shipping and selling	Selling: directly to commercial millers or agents of millers. Farm gate price: 2000 to 3500 Kip/kg (glutinous paddy).

Source: Interview with the Agriculture and Forestry Office of Champasack province (August 10, 2011) and the International Rice Research Institute (2006)

Table 6-28 Production Cost of Rain-Fed Lowland Paddy Cultivation

Items	Cost (kip)	Proportion (%)
Variable cost (kip/ha)	3,074,633	76.5
Labor cost	2,101,070	52.26
Land preparation	379,703	9.44
Nursery making and transplanting	674,088	16.77
Field management	72,788	1.81
Harvesting	589,621	14.66
Drying	316,100	7.86
Storing	68,770	1.71
Inputs	768,325	19.11
Paddy seeds	229,591	5.71
Fertilizer	471,402	11.72
Agro-chemicals	9,736	0.24
Repairing of equipment	56,792	1.41
Water fee	804	0.02
Interest	205,238	5.10
Fixed cost (kip/ha)	946,097	23.5
Land	833,643	20.7
Depreciation	112,454	2.8
Total Production cost (kip/ha)	4,020,730	100.0
Total production cost (kip/ kg of paddy)	1,588	
Variable cost (kip/kg of paddy)	1,214	
Fixed cost (kip/kg of paddy)	373	
Productivity (kg/ha)	2,532	

Source: Agriculture and Forestry Office, Champasack province (2011)
Note: sample size is 120.

Table 6-29 Comparison of Sale, Gross Margin, and Profitability of Glutinous and Non-Glutinous Paddy under Different Cultivation Systems

Paddy cultivation system and kinds of paddy	Cost (kip/ha)	Yield (kg/ha)	Sale[72] (kip/ha)	Gross margin (kip/ha)	Profitability (%)
Rain-fed lowland glutinous paddy	4,020,730	2,532	5,064,000	1,043,270	21
Rain-fed irrigated glutinous paddy	4,453,497	2,798	5,596,000	1,142,503	20
Dry season irrigated glutinous paddy	5,021,134	3,453	6,906,000	1,884,866	27
Rain-fed non-glutinous paddy	3,585,544	2,066	4,132,000	546,456	13
Rainy season irrigated non-glutinous paddy	3,402,793	2,159	4,318,000	815,207	19
Dry season irrigated non-glutinous paddy (practiced in and around Vientiane)	5,574,052	4,302	8,604,000	3,029,948	35
Upland paddy in mountainous (Bokeo and Luangnamtha provinces)	2,124,666	1,744	3,488,000	1,363,334	39

Source: the study team, based on data obtained from the Agriculture and Forestry Office of Champasack province.

C. Relevant Information

According to the Ministry of Agriculture and Forestry,[73] its policy is to increase paddy production to 4,200,000 tons by 2015, of which 1,000,000 tons will be for export. Rice markets in Thailand are to be targeted if non-glutinous or glutinous rice is exported.[74] Table 6-30 presents the forecasts for the demand and production of rice in the country, suggesting that the government will maintain its rice promotion policy.

It is estimated that the post-harvest loss of paddy and rice grains is 20% and that milled rice is not uniform in appearance (with many broken grains); therefore, the Department of Planning of the MAF considers the post-harvest as needing improvement in order to reach the set target.[75] Moreover, according to the Department, the potential for paddy production is high in some of the major plains, for example, seven (7) plains in and around Vientiane and twenty-three (23) plains in the rural areas of the country. Those areas represent a development potential of 2,000,000 ha, of which 1,000,000 ha show potential for rainy season rain-fed paddy cultivation.

Table 6-30 Forecasting of Demand for and Production of Rice, 2007–2020 (Paddy)

Year	Population forecast (x 1,000)	Demand from consumption (tons of paddy)	Other demand (tons of paddy)	Demand (tons of paddy)	Production (tons of paddy)	Surplus (tons of paddy)
2007	5,863	2,052,050	473,519	2,525,569	2,785,404	259,835
2008	5,980	2,093,000	493,772	2,586,772	2,904,541	317,769
2009	6,100	2,135,000	515,271	2,650,271	3,031,004	380,733
2010	6,222	2,177,700	536,911	2,714,611	3,158,300	443,689
2011	6,346	2,221,100	551,579	2,772,679	3,244,585	471,906
2012	6,473	2,265,550	567,372	2,832,922	3,337,480	504,558
2013	6,602	2,310,700	583,579	2,894,279	3,432,820	538,541
2014	6,734	2,356,900	599,774	2,956,674	3,528,080	571,406
2015	6,869	2,404,150	616,399	3,020,549	3,625,875	605,326
2016	7,006	2,452,100	634,199	3,086,299	3,730,580	644,281
2017	7,146	2,501,100	651,255	3,152,355	3,830,910	678,555
2018	7,289	2,551,150	669,543	3,220,693	3,938,490	717,797
2019	7,435	2,602,250	686,930	3,289,180	4,040,765	751,585
2020	7,584	2,654,400	706,044	3,360,444	4,153,200	792,756

Source: International Institute for Trade and Development (2010)
Note: the annual rate of population increase is 2%; the per capita daily consumption of rice is 575g, and other demand is 17% of the estimated yearly production.

[72] Farm gate price of paddy is set at 2,000 Kip/kg for this calculation.
[73] Interview with the Department of Planning, MAF (August 8, 2011)
[74] Interview with the Department of Planning, MAF (August 8, 2011)
[75] According to the Department of Planning, MAF, China will establish a new rice mill at Dong Dok, near Vientiane.

6.3.3 Processing

A. Milling

Milling is a process that produces rice from the raw material, paddy; it is a part of post-harvest processing, before the rice reaches consumers' tables. During the milling process, the husk of the raw material is peeled off, and the pericarp and embryo are removed from brown rice.[76]

Normally, a miller is a processor who buys paddy from farmers or traders, processes the paddy into rice, and sells it to the next link in the chain, such as wholesalers and retailers. Rice millers in the Lao PDR are divided into three categories: (1) large scale millers, (2) medium scale millers, and (3) small scale custom millers. A large-scale miller's processing capacity is 4 to 5 tons of paddy per hour, and a medium scale miller's is 1 to 3 tons. The milling capacity of a small-scale mill is less than 1,000kg of paddy per hour. Most small-scale millers in villages practice custom milling. Table 6-31 shows that there are about 12,700 millers in the country and 18,531 milling operators and employees. Thus, the average number of operators and employees per mill is 1.46.[77] According to a Thai milling machinery manufacturer, 80% of the millers in the country do small-scale village-level custom milling, 15% are medium scale millers, and 5% are large scale.[78] Moreover, the number of large, medium, and small-scale mills in Vientiane and surrounding areas are 3 to 5, 50, and 300, respectively.[79] Many millers operate in Savannakhet in central and Champasack in southern Laos.

Table 6-31 Number of Millers Operating and Number of Operators and Employees in Laos (2005)

Province	Number of millers	Number of operators and employees	Remarks
Vientiane capital	389	687	
Phongsaly	-	-	Data not available.
Luangnamtha	9	26	
Oudomxay	-	-	Data not available.
Bokeo	362	-	
Luang Prabang	12	55	
Huaphanh	124	125	
Xayabury	1,407	1,703	
Xiengkhuang	1,760	-	
Vientiane	1,334	1,779	
Borikhamxay	-	-	Data not available.
Khammuane	1,613	3,831	
Savannakhet	1,993	2,593	
Saravan	1,135	418	
Sekong	96	145	
Champasack	1,981	4,251	
Attapeu	505	918	
Total	12,700	18,531	

Source: International Institute for Trade and Development (2010)
Note: the total is not exactly the same as the actual calculation; however, it is reported as having coincided with the original document.

Large and medium scale millers in and around Pakse in Champasack province and in Vientiane province are reported as examples in Table 6-32.

In general, millers purchase paddy as raw material, mill the material into rice, and sell the milled rice; therefore, the total profit greatly depends on the unit price and sales quantity of the milled rice.

[76] Pericarp is the so-called "bran" layer.
[77] International Institute for Trade and Development, Export Mechanism of Laos Rice, 2010
[78] Interview with Thai milling machinery manufacturing and sales firm operating in Vientiane (October 26, 2011).
[79] Interview with a medium scale miller operating in Vientiane province (October 17, 2011).

Table 6-32 Examples of Large and Medium Scale Millers

Name of firm	Sengarthi Development Co., Ltd.	Ang Kham Rice Mill	Not available
Province	Champasack	Champasack	Vientiane
Scale	Large	Medium	Medium
Annual quantity of paddy received	3,000 tons (glutinous 80%; non-glutinous 20%)	1,000 tons (glutinous 50%; non-glutinous 50%)	Glutinous 7,000 tons; non-glutinous 1,000 tons
Buying price of paddy (kip/kg)	2,000－3,500	2,500－3,000	2,500－3,000
Total shipping quantity milled rice (tons)	1,800	600	約 4800
Milling recovery (%)	60	60	62.5
Head rice recovery (%)	31－33%	42%	30.5-31.5%
Shipping price of milled rice (kip/kg)	Grade 1 (broken 5%): 7,000 Grade 2 (broken 15-20%): 5,000	Glutinous: 6,000 Non-glutinous: 7,000 Whole grain: 6,500 Large & medium broken: 5,200 Small & fine broken: 3,500 Bran: 1,200	Non-glutinous: 8,000
Markets	Champasack province	Army: 50% Champasack: 30% Neighboring 3 provinces: 20% Viet Nam	Selling to the government
Milling capacity	3.0 tons of milled rice/h	1.0 tons of milled rice/h	2.5 tons of paddy/h
Proportion of wholegrain and broken rice out of milled rice	Whole grain: 52－55% Large broken (2/3 grain): 25% Medium broken (1/2 grain): 5% Small broken (1/3 grain): 5%	Whole grain: 70% Large & medium broken: 25% Small broken: 5%	Whole grain: 50% Broken: 50%
Manufacturer	Thai	Thai	Thai
Character of plant	Equipped to blend wholegrain into broken. Color sorter removes off-colored or damaged grain. Therefore, bland rice is produced.	Combination of Husker, Engelberg type steel huller, and length grader	Combination of Husker, Engelberg type steel huller, and length grader

Source: the study team, based on interviews with millers in Champasack province (August 11 and 27, 2011) and a miller in Vientiane province (October 17, 2011).
Note: Milling and head rice recovery were calculated by the study team.

Receiving paddy from a farmer

Milling facilities

Figure 6-15 A Medium-Scale Miller in Champasack Province

The prices of whole grain or head rice and broken rice are different. Therefore, a miller is interested in (1) maximizing milling recovery during the process of turning paddy into rice, and (2) maximizing the proportion of head rice in order to increase the unit price of the milled rice.

A seventy percent (70%) milling recovery is common for short grain, or Japonica, in Japan; a milling recovery of between 60 and 62.5%, as shown in Table 6-26, is comparatively low. Moreover, the head rice recovery is calculated at 30 to 40%, an extremely low figure. The Indica variety cultivated in the Lao PDR, a so-called "long grain," is more easily broken than Japonica, and cracks in the paddy might be created during post-harvesting before the miller receives it through an improper drying process. The condition of the raw material can therefore hinder milling and head rice recovery. An example of the milling process flow of a miller operating in Champasack province is shown in Figure 6-16.

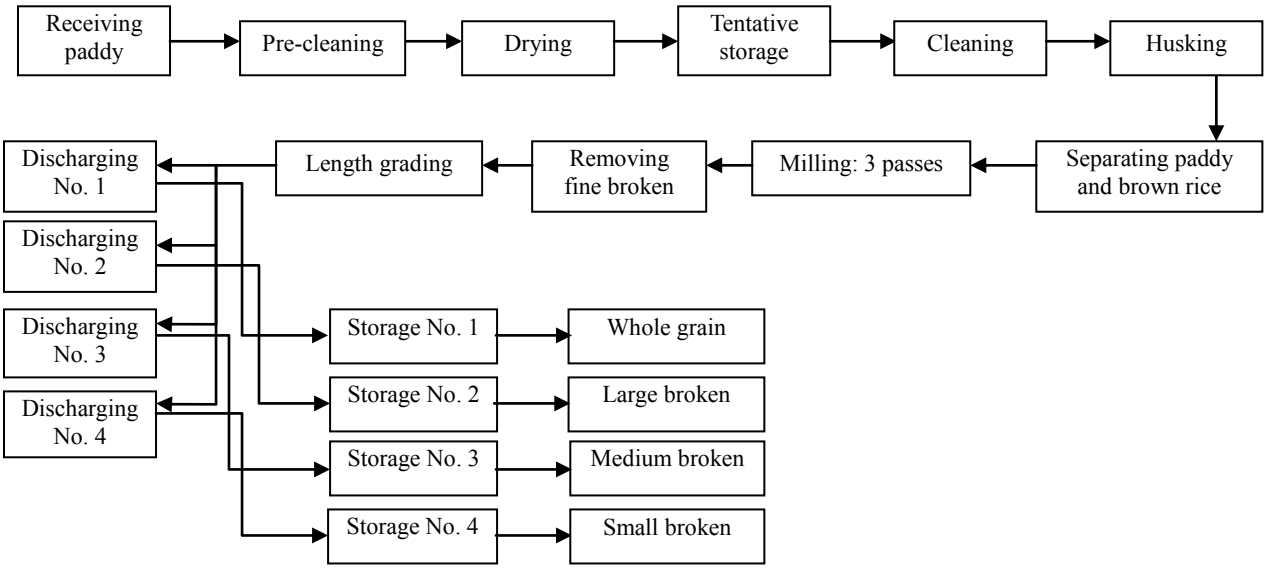


Figure 6-16 Milling Process Flow of a Large-Scale Miller in Champasack Province

Figure 6-16 explains the diagram of the large-scale miller's milling process introduced in Table 6-26. This plant classifies milled rice into whole grain, large broken rice, medium broken, and small broken with a length grader, blends them at certain ratios, and packs them. Moreover, the plant is equipped with a color sensor so that colored and damaged grains are extracted from the milled rice to produce the uniform appearance of white rice.

Some millers invest in machinery and equipment to produce quality rice to meet market demand; meanwhile, they face problems:[80] (1) farmers are not likely to sell paddy when its price is low; (2) millers lack the financing to purchase paddy at the comparatively high farm gate price due to the scarcity of production; (3) raw materials are mixed with other varieties when millers receive the paddy;(4) glutinous and non-glutinous paddy are mixed when millers receive it, resulting in mixed milled rice; and (5) interest rates are high so that millers cannot borrow to purchase the quantities of paddy they want to purchase.[81] The value of non-glutinous rice is lowered when glutinous rice is mixed in with it, and selling the product is difficult. Causes for the mixture are many: cultivation technique, use of small plots for both types of rice in the paddy field, and cultivation of different varieties in the same field. On the other hand, black glutinous rice is intentionally mixed with non-glutinous rice to sell as a marketing strategy.

[80] Interviews with millers operating in Champasack province (August 11, 2011)
[81] The annual interest rate on a loan provided by governmental financial institutions is 10% according to a miller in Vientiane province (October 17, 2011).

B. Relevant Information

Some large scale Lao PDR milling plants use milling machinery produced by Thai firms under license from Japanese manufacturers. Medium and small-scale millers use milling machines made by Thai and Vietnamese firms. Demand for efficient milling machinery and peripheral equipment to produce high quality milled rice with high head rice recovery for medium scale millers will soon increase, as rice production is increasing and the export of milled rice is being promoted. In order to facilitate export, not only must broken rice be reduced, but the grain surface must also be polished and the bran removed, as well as all foreign materials and insects.

According to a Thai trader who examined a sample of milled rice produced in the Lao PDR during the study, the sample was not of sufficient quality for export due to the large amount of broken rice and the mixture with other varieties.[82] The broken rice problem occurs not only during the milling process but also because of the quality of the paddy. Therefore, the quality of milled rice should be enhanced from both perspectives: the cultivation and post-harvest processing and the milling process. If non-glutinous milled rice is to be exported, most of the grain should be head rice without any mixture of different varieties; thus, a polishing machine and grader are minimum requirements for millers.

In most developing countries, governmental or state companies used to handle staple food commodities like rice and other cereals; however, their management was inefficient. Therefore, the privatization of those processing companies enhances production, and the Laotian milling-processing factory is no exception. Consequently, the private sector handles advanced milling processing facilities and manages the rice sector. Some Laotian firms have grasped the trend in the milling business. Box 6-2 introduces a company in Vientiane that had planned to start investing in a milling business and exporting non-glutinous rice.

The above business plan coincides with the irrigation agriculture development plan,[83] which includes not only irrigation facility construction but also post-harvest facilities. The firm's plan will be a model for the government's development project in support of food security improvement and the promotion of non-glutinous rice. Eventually, it will have a much stronger impact on the Lao PDR's economy and society than any other agricultural commodity.

[82] Interview with Century Industries Co. Ltd. of Thailand, an exporter of milled rice (August 31, 2011).

[83] According to the Deputy Director of the MAF's Department of Irrigation (October 17, 2011), the MAF promotes not only the establishment and rehabilitation of the main irrigation facilities but also agricultural mechanization and private sector investment in post-harvest machinery and facilities. Some development project documents describe these facilities: (1) land reclamation and establishment of irrigation facilities; (2) mechanical drying facilities for paddy; (3) silo and storage facilities; (4) sophisticated milling machinery; and (5) relevant offices. The total construction cost is 10,000,000 US dollars.

Box 6-2 Plans for a Milling and Export Business of a Laotian Firm in Vientiane

A company located in Vientiane planned to start contract farming with rice farmers, buying raw material from them, milling it into milled rice, and shipping the high quality milled rice to domestic and international markets.

Double cropping is possible in the farmers' target area. They produce the Hom-Savanh non-glutinous rice, an improved variety of Jasmine rice from Thailand. This improved variety is of a higher quality than pure Jasmine rice.[84] Its aroma is faint; however, the company believes that rice can be accepted in the international market if the quality meets market demand. The detailed plan is summarized below.

Project title	Capital Vientiane Rice Production and Export Project
Target areas	Irrigation areas in nine districts in Vientiane capital
Period of project	5 years (2011–2016)
Project contents	Non-glutinous and glutinous rice are cultivated on 25,000 ha. The proportion of the former is 90% and is Hom-Savanh. Sophisticated milling and storage facilities and machinery are installed, and paddy is bought to the mill to produce quality rice. Forty percent (40%) of the milled rice is supplied to the domestic market and 60 % to overseas markets like Europe, Thailand, and Vietnam.
Target	During the first two years, 22,000 tons of milled rice were produced and marketed. By 2015, the annual production of milled and solid rice will be 40,000 tons.
Investment	The total investment is USD 31,554,244, USD 5,975,000 of which is fixed assets and USD 25,579,244 is operating costs.
Milling capacity	The daily milling capacity is 200 tons of milled rice (a two-unit milling line with a capacity of 5 tons of milled rice operates 20 hours a day)

The milling facilities are all made in Thailand, apart from some critical parts manufactured in Japan and Germany. The milling capacity of the plant is 5 tons of white rice. The cost of a milling machine is USD 500,000. In addition to the milling facilities, silo and storage facilities are required; thus, the total investment in machinery and facilities is USD 3,000,000. The firm estimates its milling recovery at 60%, of which 85% is head rice; thus, total head rice recovery is 51%. Therefore, the facilities deserved their investment. Moreover, the import tariff on the machinery from Thailand is nil because it is being utilized to produce an export commodity, which is attractive to investors

The firm plans to implement its milling business; meanwhile, it is creating a model for the export of non-glutinous rice by using a rice grade and packaging the product with a bland name; thus, the company could establish its own marketing channels. In addition, it is setting up a Laos Rice Association to influence other millers to produce high quality milled rice; it considers that 300,000 tons of milled white rice can be exported from the country.

[84] According to the MAF's Department of Extension Service, the yield of the improved variety is more than 5 tons of paddy (October 18, 2011).

6.3.4 Market

This section outlines the world market for rice at first and then discusses ordinary rice, which Laos will deal with strategically in the future.

A. Market Trend

The total production of milled rice in the world is 450 million tons in 2011, as shown in Table 6-33. China constitutes 31% of the total production, India 21%, and Indonesia 8%. These countries have large populations, so their production is mainly for domestic consumption. Laotian production of unhulled rice was only 3.14 million tons in 2009, which is more or less satisfactory for self-sufficiency.

Table 6-33 World Rice Production

(Unit: 1,000 tons, in the form of milled rice)

	2005	2006	2007	2008	2009	2010	2011
World	401,435	418,487	420,651	432,654	447,498	440,329	451,185
China	125,363	126,414	127,200	130,224	134,330	136,570	137,000
India	83,130	91,790	93,350	96,690	99,180	89,090	95,300
Indonesia	34,830	34,959	35,300	37,000	38,310	36,370	37,060
Bangladesh	25,600	28,758	29,000	28,800	31,000	31,000	32,900
Vietnam	22,716	22,772	22,922	24,375	24,393	24,993	25,899
Thailand	17,360	18,200	18,250	19,800	19,850	20,260	20,262
Myanmar	9,570	10,440	10,600	10,730	10,150	10,550	10,750
Philippines	9,425	9,821	9,775	10,479	10,755	9,772	10,539
Brazil	8,996	7,874	7,695	8,199	8,570	7,929	9,257
Japan	7,944	8,257	7,786	7,930	8,029	7,711	7,720
United States	7,462	7,105	6,267	6,288	6,546	7,133	7,593
Cambodia	2,630	3,771	3,946	4,238	4,520	4,780	5,200
Pakistan	5,025	5,547	5,450	5,700	6,900	6,800	4,700
South Korea	5,000	4,768	4,680	4,408	4,843	4,916	4,295
Egypt	4,128	4,135	4,383	4,385	4,402	4,300	3,100

Source: JICA survey team based on USDA (2011) and USDA (2009)

Total world exports amount to 33.19 million tons in 2011, 30% of which is from Thailand, 11% from India, 10% from the United States, and 8% from Pakistan (Table 6-34).

Table 6-34 World Rice Exports

(Unit: 1,000 tons)

	2005	2006	2007	2008	2009	2010	2011
World	29,195	29,489	32,008	29,763	29,335	31,607	33,194
Thailand	7,274	7,376	9,557	10,011	8,570	9,047	10,000
Vietnam	5,174	4,705	4,522	4,649	5,950	6,734	7,000
India	4,687	4,537	6,301	3,383	2,123	2,052	3,500
United States	3,863	3,307	3,029	3,267	3,017	3,868	3,250
Pakistan	3,032	3,579	2,696	3,050	3,187	4,000	2,800
Cambodia	200	350	450	500	800	1,000	1,000
Uruguay	762	812	734	742	926	808	925
Myanmar	190	47	31	541	1,052	445	800
Brazil	272	291	201	511	591	430	750
Argentina	348	487	436	408	594	468	600
China	656	1,216	1,340	969	783	619	600

Source: JICA survey team based on USDA (2011) and USDA (2009)

Table 6-35 shows world imports of rice. The top importing countries are Southeast and South Asian countries, Western African countries, etc. Even the biggest importing country, Indonesia, imports only 7% of the total amount. Importing countries are spread all over the world.

Table 6-35 World Rice Imports

(Unit: 1,000 tons)

	2005	2006	2007	2008	2009	2010	2011
World	29,195	29,489	32,008	29,763	29,335	31,607	33,194
Indonesia	500	539	2,000	350	250	1,150	2,200
Nigeria	1,777	1,600	1,550	1,800	2,000	2,000	1,900
Iran	983	1,251	1,144	1,430	1,470	1,000	1,400
Bangladesh	785	531	1,570	1,658	150	660	1,400
Philippines	1,890	1,791	1,900	2,500	2,000	2,400	1,200
Iraq	786	1,306	613	975	1,089	1,140	1,150
EU	1,058	1,083	1,342	1,520	1,383	1,216	1,150
Saudi Arabia	1,357	958	961	1,166	1,072	1,069	1,100
Malaysia	751	886	799	1,039	1,086	907	1,040
Cote d'Ivoire	850	750	1,100	800	800	840	900
South Africa	764	832	914	650	745	733	760
Senegal	518	1,113	850	860	715	685	700
Japan	787	681	642	533	750	649	700
Mexico	553	586	609	578	610	598	655
United States	419	633	695	651	682	562	635
Cuba	736	594	574	558	457	498	600
China	609	654	472	295	337	366	600

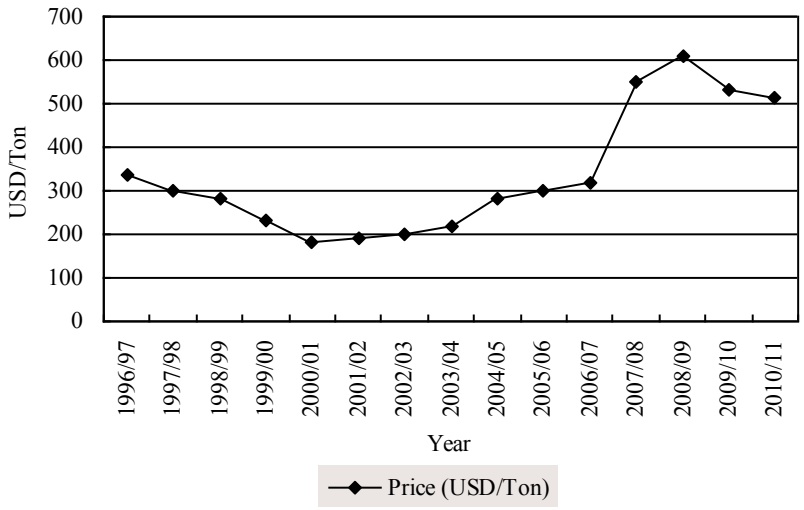
Source: JICA survey team based on USDA (2011) and USDA (2009)

The price transition of Thai rice is illustrated in Table 6-36 and Figure 6-17. The price in 2010/11 is lower than the peak in 2008/09, but comparatively high for the last 15 years.

Table 6-36 Rice Price

Year	Price (USD/Ton)
1996/97	338
1997/98	302
1998/99	284
1999/00	230
2000/01	184
2001/02	192
2002/03	199
2003/04	220
2004/05	280
2005/06	301
2006/07	320
2007/08	551
2008/09	609
2009/10	533
2010/11	515

Source: Website of USDA (http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1229, retrieved on Sep. 21, 2011)
Note: FOB price of Thai Grade B whole rice grain



Source: JICA survey team based on USDA website (http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1229, retrieved Sep. 21, 2011)

Figure 6-17 Rice Price Transition

Grades and other information on ordinary rice are explained in the following.

It is usual to grade ordinary rice in the international market. Thai rice is graded on the basis of variety, ratio of whole grain rice, new or old rice, and so forth. The top variety is Thai Jasmine rice (or Thai Hom Mali rice), the second is Thai Pathumthani Fragrant rice, and the next is normal white rice. The first two are fragrant rice varieties. Ratios of whole grain rice and broken rice determine grade as well. According to Thai trading companies, high-grade Thai rice is exported to North America, Europe, China, the Middle East, Singapore, and Hong Kong, whereas low-grade rice is exported to the Philippines, Indonesia, and West African countries. The FOB price per ton is 1,000 dollars for Thai Jasmine rice, 850 dollars for Thai Pathumthani Fragrant rice, and 600 dollars for normal white

rice.

Thailand has been a major exporting country of fragrant rice. However, Vietnam and China recently started to export fragrant rice similar to Thai Pathumthani Fragrant rice, and Cambodia started pilot cultivation of fragrant rice. Fragrant rice similar to Thai Pathumthani Fragrant rice, called medium premium rice or medium-grade fragrant rice, will be supplied not only by Thailand but also by Vietnam, China, and Cambodia, while the best premium rice, such as Thai Jasmine rice will continue to dominate the market for premium rice. The medium premium rice produced in Vietnam and China is 750 dollars per ton on average, which is 100 dollars cheaper than Thai Pathumthani Fragrant rice.

B. Distribution

Japanese enterprises' possible involvement in the Laotian rice industry is as suppliers for local food producers. More specifically, Japanese enterprises supply rice milling machines to rice millers in Laos. Therefore, this section describes unhulled and milled rice collection and distribution in Laos, rather than rice distribution in countries to which Laotian rice is exported.

Unhulled rice brought to rice millers is usually milled by the millers, but sometimes unhulled rice is traded between rice millers. When rice millers lack unhulled rice, they buy it from other millers. When rice millers get more unhulled rice than they are able to process, they sell spare rice to others. The same is true for milled rice.

Not all rice companies are able to export rice. Companies capable of exporting rice buy milled rice from millers and mill the rice again. Then, they polish, select, grade, and export the rice. This structure is the same as in Thailand, where large-scale millers and companies specialized in the final processing purchase milled rice from small- and medium-scale millers and export it. It is one of the critical challenges for exporting Laotian rice that there are few companies capable of processing rice at a high enough quality for export in Laos.

C. Potential and Challenges of Potential Food Item in the Japanese Market

Quality of rice milling and rice selection are challenges for export of Laotian rice from the viewpoint of marketability. When the JICA survey team showed ordinary Laotian rice to rice-exporting companies based in Bangkok, they said that the rice was impossible to export because it was mixed with sticky rice and the ratio of broken rice was high. A rice miller in Laos mentioned that when it tried to export its milled rice to France, it failed due to the high ratio of broken rice. It is obvious that selecting machines are necessary in order to export Laotian rice.

Apart from the level of rice milling and selecting quality, the quality of unhulled rice can be judged to be acceptable. The JICA survey team gave a rice-exporting company a sample of Hom-Savanh rice, a variety modified for Laos from Thai Jasmine rice, that was grown and harvested as a trial, and the company evaluated it. The evaluation was that the intrinsic quality of the rice was similar to medium premium fragrant rice, such as Thai Pathumthani Fragrant rice, and that the rice would be given a similar price to medium premium rice if appropriate milling and selecting were applied.

6.3.5 Distribution

A. Conditions of Distribution

Transportation of rice does not require any special attention.

B. Routes, Carriers, and Cost

The production areas of rice spread along the Mekong River in central and southern Laos. Routes

from these areas to overseas are via Bangkok, although the route from the east of Savannakhet province can be via Da Nang, Vietnam.

Containers are used as containers. Using two 20-foot containers linked to each other to meet the vehicle weight limit is the most cost-efficient. Since production areas spread across central and southern Laos, the routes are not explained here. For specific information, please refer to 3.4.

6.4 Sesame

6.4.1 Activities of Japanese Businesses and Potential of the Product

When Japanese businesses are involved in sesame promotion in Laos, they work as BLPs. Japanese sesame buyers operate in various countries in the world. They do not stick to specific production areas, but go to any place that yields sesame of adequate quality. As explained in the section on the market, world sesame demand is going up, influenced by rapidly increasing demand in China. As a result, the price of sesame is growing. Japanese buyers are influenced by this trend.

Current sesame production in Laos is limited from the world point of view, but if Laos produces more and better-quality sesame, Japanese buyers will be keen to buy it, as made clear by their expressed interest.

6.4.2 Raw Material

A. Production Situation

The sesame produced in the Lao PDR is not black sesame but mostly white sesame for oil extraction. As shown in Table 6-37, the major sesame production area is the northern part of the country. In 2009, it accounted for 98% of the total production of 150,000 tons in the country. Luang Prabang province

Table 6-37 Harvested Area and Production of Sesame in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	-	1,050	500	550	330	-	1,200	450	665	395
	Luangnamtha	-	300	230	280	-	-	300	215	270	-
	Oudomxay	1,330	855	1,250	1,465	1,465	950	740	1,010	1,050	1,050
	Bokeo	1,120	1,515	1,595	1,715	495	850	1,800	1,800	3,745	665
	Luang Prabang	6,915	8,905	8,440	7,015	8,190	4,650	8,500	9,500	13,920	10,560
	Huaphanh	510	220	460	310	140	360	200	370	300	130
	Xayabury	1,515	1,695	1,360	1,470	1,935	1,170	1,540	1,550	1,450	1,640
	Total of North	11,390	14,540	13,835	12,805	12,555	7,980	14,280	14,895	21,400	14,440
Central	Vientiane Capital	30	-	55	-	-	20	-	45	-	-
	Xiengkhuang	-	95	110	55	75	-	100	130	90	110
	Vientiane	880	650	325	35	170	620	330	260	25	150
	Borikhamxay	60	100	45	20	20	40	100	45	25	25
	Khammuane	-	-	10	10	15	-	-	10	10	20
	Savannakhet	-	-	15	-	-	-	-	10	-	-
	Xaisomboun	-	-	-	-	-	-	-	-	-	-
	Total of Central	970	845	560	120	280	680	530	500	150	305
South	Saravan	50	10	-	-	-	40	10	-	-	-
	Sekong	15	25	95	-	-	10	20	70	-	-
	Champasack	-	-	-	-	-	-	-	-	-	-
	Attapeu	-	-	-	-	-	-	-	-	-	-
	Total of South	65	35	95	-	-	50	30	70	-	-
	Ground total	12,425	15,420	14,490	12,925	12,835	8,710	14,840	15,465	21,550	14,745

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

in the North is the largest producer, accounting for 73.1% of the total production in the North and 71.6% of the national production. Xayabury and Oudomxay provinces are the next largest, producing 1,000 – 1,500 tons.

According to the production statistics of districts in Luang Prabang province shown in Table 6-38, the total production in the province in 2010 is 9,814 tons, mostly from Nam Bark, Pak Ou, Pak Xerg, Jorm Phet, and Ngoi districts.

Table 6-38 Sesame Production in Luang Prabang Province (2011)

Districts	Harvested area (ha)	Productivity (tons/ha)	Production (tons)
Luang Prabang	56.20	1.50	234.30
Xieng Ngern	638.00	0.80	510.40
Nan	191.60	1.00	191.60
Pak Ou	1,055.14	1.71	1,804.29
Nam Bark	1,984.80	1.20	2,381.76
Ngoi	717.15	1.20	860.58
Pak Xerg	1,125.08	1.44	1,620.12
Phone Xay	453.51	1.00	453.51
Jorm Phet	864.43	1.30	1,123.76
Vieng Kham	325.00	1.30	422.50
Phou Khoun	145.50	0.60	87.30
Phone Thong	124.70	1.00	124.70
Total	7,781.11	1.26 (Average)	9,814.81

Source: Agriculture and Forestry Office, Luang Prabang province (2011)

B. Cultivation

Sesame is an annual crop that has originated in the savanna areas in Africa. Records show that sesame was cultivated in such ancient civilizations as Mesopotamia and Egypt.

Warm and dry conditions are the most suitable for sesame cultivation. However, sesame can be grown in locations with a less warm and more humid climate such as Japan as it is highly adaptable.

Sesame is harvested manually in most production areas while it is mechanically harvested in limited areas. Sesame production is seen mostly in developing countries where the labor cost is relatively low.[85]

Cultivated Sesame

Pods Containing Seeds

Figure 6-18 Sesame Cultivated in Luang Prabang Province

[85] Interview with a Japanese trading company on 28 July 2011

This section discusses cultivation of white sesame in Luang Prabang province. According to the Agriculture and Forestry Office of Luang Prabang province,[86] the average farm size in the province is 1 ha. Sesame in the province is mostly grown in home gardens. It is sometimes cultivated with other crops like rice and Job's tears. Rice is glutinous rice for home consumption and Job's tears is a cash crop.

With regard to the growth period, two types of sesame are cultivated in Luang Prabang province. One type has the growth period of 135 days; and the other, 120 days. Seeds are obtained from harvested products. The sowing method is either broadcasting or dibbling with the raw distance of 70 cm and the hill distance of 30 cm. The total sowing quantity of seeds is about 1 kg/ha. Weeding is done manually because no fertilizer or agro-chemical is applied. As for harvesting, the top edge of 40 - 50 cm of the stem, which has pods containing sesame seeds, is cut with a sickle. The harvested part is then tied to the original stem or some harvested stems are gathered and heaped upright in the drying process. Pods are then beaten with sticks so that seeds in the pods drop and can be gathered in the threshing process.[87]

The cultivation method of the sesame discussed above is very simple. However, no recommended method to gain a high yield exists. The production cost is minimal. Provincial officials and extension officers of the districts of Luang Prabang province guide producers only with what they know. They recommend rotation cropping to prevent diseases and replant failure.

Most of the time, dried sesame is brought to buyers in the capital of Luang Prabang province. However, some agents buy it directly from farmers. The product is then shipped to Vietnam, Thailand, and China through the traders. Farm gate prices in Luang Prabang province vary from 6,000 Kip/kg to 12,000 Kip/kg.

As discussed above, sesame cultivation in the Lao PDR is very simple. Thus the standard cultivation method in Japan and an example of a farmer producing so-called "Gold Sesame" in Nishiwaki city of Hyougo prefecture in Japan are discussed below as references.[88] The standard cultivation method is explained in Table 6-39.

Farmers in Nishiwaki city of Hyougo prefecture practice some improvement on sesame cultivation. Since sesame should be cultivated in a dry condition, farmland has to be slightly sloped to easily drain rain water flowing on the surface of the field. Insects that damage the stems or roots of sesame can only be caught manually because no agro-chemical or insecticide has been developed for sesame. Moreover, according to the Agriculture and Food Industry Technology Research Institute of the Ministry of Agriculture, Forestry and Fisheries of Japan,[89] there are two critical diseases: (1) soil-borne disease that wilts plants after the flowering stage; and (2) bacterial blight disease that starts from spots in the bottom part of a stem and eventually causes defoliation. The only way to protect sesame from the diseases is to avoid continuous cropping.

The farmers of Nishiwaki city practice selective harvesting by checking a pod located at the bottom among pods of the stem and find one splitting which is a sign for harvest. Harvesting of sesame must be done at the right time; yield decreases otherwise. After harvesting, the harvested parts with pods are sun dried by hanging. A wooden box is placed right under the hung plant to receive sesame seeds dropping naturally from spited pods. It takes a week to complete drying. Seeds drop while the farmer beat the hung plant with a stick. Then gathered sesame seeds are put on a sieve to remove foreign matters and winnowed to remove immature seeds. The selected seeds are again sun dried for 3 days. The end product is high quality sesame.

[86] Interviews with the Agriculture and Forestry Office of Luang Prabang province on 19 August 2011 and 20 October 2011
[87] A pod has 2-4 chambers that contain seeds.
[88] TV program of Nippon Hoso Kyokai (NHK) on Golden Sesame of Nishiwaki city of Hyougo prefecture aired on 6 November 2011
[89] tokusanshubyo.sakura.ne.jp/jouhoushi05/j05-09.pdf

Table 6-39 Standard Recommended Cultivation Method[90]

Farm work	Contents
Seeds selection	Seeds are selected by winnowing.
Land preparation	Lime is applied on farm. Soil is plowed to 12 – 15 cm deep and leveled. Sowing furrow at distance of 60 cm on flat soil bed. Drainage furrow is also provided.
Sowing	Sowing period is between the end of May and the beginning of June. Fertilizer is applied in the sowing furrow and a little soil is placed on it and then 5-10 seeds are sown at 12-15 cm hill distance. Seeds are covered by soil. In case of drilling, seeds are mixed with fine soil which is sieved. One liter of the mixture is then drilled.
Fertilization	Fertilizer quantity (kg/0.1ha)

Fertilizer	Total	Basal doze	Top dressing	Components		
				N	P	K
Manure	50.0	50.0	0.0			
Ammonium sulfate	1.2	1.2	0.0	0.25		
Phosphorus	1.5	1.5	0.0		0.30	
Potassium	0/6	0.6	0.0			0.36
Lime	4.0	4.0	0.0			

Thinning Cultivation & Weeding	Thinning is conducted 7 days and 10 days after sprouting. Finally, one plant is grown in a hill. Cultivation as weeding is done three times from the end of June to middle of July.
Harvesting and threshing	Top edge is harvested 3-4 days after a pod begins to split. The harvested parts are gathered and tied in small bundles. They are placed upright for natural drying and beaten with a stick every 1-2 days on tapoline so that sesame seeds drop from dried pods. After threshing, sesame is sieved and winnowed to remove foreign matters.

Source: Standard cultivation method recommended by Yamaguchi prefecture

Plant Damaged by an Insect　　An Insect

Figure 6-19 Sesame Plant Damaged by an Insect

C. Relevant Information

According to the Agriculture and Forestry Office of Luang Prabang province, farmers can produce black sesame and increase its productivity by providing them with technical advice. Meanwhile, it is also important that black sesame has stable markets. If there were high demand of black sesame from Japan, farmers would be motivated to grow and ship black sesame.[91] Thus the Study team consulted with the Office to specify target areas for model development of black sesame production and summarized the results in Table 6-40.

[90] This is recommended by Yamaguchi prefecture in Japan.
[91] Interviewing the Agriculture and Forestry Office of Luang Prabang province (20th October 2011).

Table 6-40 Village Cluster with Development Potential of Black Sesame Production

District and village cluster	Information
Donengeune of Ngoi district	Donengeune village cluster is composed of 9-11 villages and number of household is 60-700.
Sen Kha Ror of Luang Prabang district	Sen Kha Ror consists of 7 villages. Current farming scale of sesame is 23 ha. It is difficult to access the villages in the rainy season because the access roads are unpaved. It takes an hour for a 4-wheel-drive car from provincial capital to reach there.
Luang Prabang district	There are 15 villages with more than 1,000 households. 40% of the households produce sesame. Total farming scale of sesame is 100-200 ha. There is a leading farmer. The villages are accessible by car even in the rainy season because the access roads are paved. It takes half an hour for a 4-wheel car to reach the villages.

Source: Interview with the Agriculture and Forestry Office of Luang Prabang province on 20 October 2011

Although sesame cultivation is widely done in some districts, the listed areas in Table 6-40 have production development potential because of the suitable natural environment for sesame. Today, farmers produce not only sesame but also other crops by inter cropping or mixed cropping. Therefore, farmers' income is expected to grow by increasing production of other crops as well. For sesame production development, it is necessary to provide technical instructions to the personnel of the Agriculture and Forestry Offices of both the province and districts. Hence production technology of sesame will be disseminated in the following ways: (1) from provincial staff to district staff; (2) district staff to village cluster; and (3) to whole districts by use of the current extension organization and system.[92] However, in the Lao PDR, there is no specialist on sesame production technology.

6.4.3 Processing

Sesame is seed in a pod. When the pod matures, it splits open naturally and the seeds fall out. According to the Provincial Agriculture and Forestry Office in Luang Prabang province, farmers put small containers under dried pods in the field and beat the pods manually or cut the stems, bind them and dry them for a while, then beat them to extract the seeds. If the drying is insufficient, white sesame becomes blackish.

Sesame seeds, after being dried and taken out of their pods by the farmers, are collected and graded by processor-traders. Machines using gravity sorters or sets of screens of different gauges provide sesame of similar size with less foreign matter intermixed. The figure below shows a sesame screening plant owned by a cereal trader in Luang Prabang, on the left, and sesame purchased without screening, on the right. There are many impurities among the seeds. The steps of screening are (1) pre-cleaning by the screens, (2) the first gravity sorting, (3) the second gravity sorting, (4) storage, and (5) packing. Moisture content is not checked, because there is no moisture analyzer. Capacity is 10 t per eight-hour day. Other traders, who do not have access to this kind of screening plant, use a vacuum cleaner to blow out the dust.

In Luang Prabang, five sesame processor-traders purchase, screen, and sell sesame. According to the Provincial Agriculture and Forestry Office, the five traders are licensed by area, but this is not necessarily strictly observed. One trader said that he does not refuse any sesame that is brought into his factory.

[92] Interviewing the Agriculture and Forestry Office of Luang Prabang province (20th October 2011).

Sesame screening plant

Sesame before screening

Figure 6-20 Sesame Screening Plant and Sesame before Screening in Luang Prabang Province

6.4.4 Market

This section presents information on the international market for sesame and trends in the import of sesame to Japan.

A. Market Trend

Table 6-41 shows world sesame production. Total world production was 3.98 million tons in 2009, 22% of which was produced in Myanmar; 17%, in India; and 16%, in China. Production in Laos is only 0.19% of total production, and less than 1% of the production of Myanmar. World production increased 40% from 2000 to 2009. The increase from 2000 to 2009 by country is 570 thousand tons in Myanmar, 250 thousand tons in Ethiopia, 140 thousand tons in India, 81 thousand tons in Uganda, 38 thousand tons in Nigeria, and 36 thousand tons in Sudan. On the other hand, production in China decreased by 180 thousand tons.

Table 6-41 World Sesame Production

(Unit: 1,000 tons)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
World	2,788	3,152	2,760	3,196	3,512	3,431	3,674	3,646	3,827	3,977
Myanmar	296	376	399	501	542	504	690	781	853	868
India	518	698	441	782	674	641	618	757	640	657
China	812	805	896	594	704	626	663	558	586	623
Sudan	282	296	122	325	399	277	400	242	350	318
Ethiopia	16	19	39	61	115	149	160	149	187	261
Uganda	97	102	106	113	125	161	166	168	173	178
Nigeria	72	74	73	80	78	100	100	118	122	110
Laos	5	3	4	3	6	7	8	9	9	8

Source: FAO (http://faostat.fao.org/)

World sesame exports are shown in Table 6-42. Total world exports increased to 940 thousand tons in 2008. In 2008, India accounted for 21% of total exports, Ethiopia 14%, Sudan 11%, and Myanmar 10%. Laos accounted for only 0.15%. China was the third-highest exporting nation in 2000, but dropped to the sixth in 2008. Its exports declined by 60 thousand tons.

Table 6-42 World Sesame Exports

(Unit: 1,000 tons)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
World	762	743	707	746	776	1,020	1,046	1,029	938
India	183	219	118	189	157	200	233	317	194
Ethiopia	27	15	64	69	70	219	190	140	131
Sudan	210	176	172	114	168	133	194	105	106
Myanmar	34	13	4	42	42	30	32	61	96
Nigeria	30	43	42	36	48	60	89	80	85
China	103	68	98	104	42	51	45	42	43
Laos	0.5	0.4	0.2	0.7	1.5	1.3	2.1	2.1	1.4

Source: FAO (http://faostat.fao.org/)

Sesame imports are shown in Table 6-43. Total world imports in 2008 were 1.03 million tons, 23% of which was exported to China and 18% to Japan. Total imports have increased. It is remarkable that China's imports have increased. In 2000 China imported only 37 thousand tons of sesame and was the fourth largest importer in the world, but the amount in 2008 reached 230 thousand tons, making China the largest importer. Interviews with companies dealing with sesame confirmed the striking impact of the Chinese increase in imports. It is getting more important for Japanese companies to find sources for importing sesame, as China exports less sesame and imports more sesame.

Table 6-43 World Sesame Imports

(Unit: 1,000 tons)

	2000	2001	2002	2003	2004	2005	2006	2007	2008
World	734	752	752	810	933	973	1,117	1,032	1,029
China	37	39	41	98	139	192	297	226	234
Japan	165	148	153	149	155	163	159	170	185
Turkey	23	38	70	66	79	86	95	108	80
South Korea	70	77	63	81	79	53	86	60	64
United States	49	49	46	37	43	43	43	40	38
Israel	19	29	32	26	33	34	36	36	37

Source: FAO (http://faostat.fao.org/, retrieved on 20 Sep 2011)

Table 6-44 shows the average price of sesame in the world trading market. The price is on an upward trend. In particular, the price has leaped up since 2007, and the price in 2008 was double the price in 2000. Although statistics on the price after 2009 are not available, the purchasing price of a Japanese trading company was outstandingly high in 2008. The purchasing prices in 2009 and 2010 were lower than in 2008 but hovered at a high level. The fact that the price of sesame is rising as world production is increasing implies that world demand for sesame is expanding, especially being buoyed by Chinese strong demand.

Table 6-44 Price Transition of Sesame

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Price (USD/kg)	0.72	0.63	0.57	0.75	0.86	0.83	0.84	1.01	1.48

Source: FAO (http://faostat.fao.org/, retrieved on 20 Sep 2011)
Note: Price is calculated by dividing import value in dollars by import amount in tons.

The top countries from which Japan imports sesame are Nigeria, Tanzania, and Burkina Faso. Japan also imports a considerable amount of sesame from Paraguay, Guatemala, and Bolivia. China was the country exporting the most sesame to Japan from 2000 to 2003, but was the eighth-highest exporter in 2010. As for kinds of sesame imported to Japan, generally speaking, sesame from Africa is mainly for oil extraction, and sesame from Asia and Latin America is mainly for food, as explained by a concerned person. Out of 160 thousand tons of sesame imported to Japan, 90 thousand tons are for oil extraction and the other 70 thousand tons are for food. Out of the 70 thousand tons of sesame for food, 40 thousand tons are white sesame, 20 thousand tons are black sesame, and the other 10 thousand tons are golden sesame and others, according to the concerned person.

Table 6-45 Imports of Sesame to Japan

(Unit: 1,000 tons)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Nigeria	23	35	29	17	19	36	45	30	47	19	49
Tanzania	13	13	15	15	18	19	18	22	19	28	27
Burkina Faso	7	9	18	15	14	11	13	19	19	17	24
Paraguay	2	7	12	8	12	19	22	33	32	31	16
Guatemala	9	11	8	5	9	10	7	9	5	7	13
Myanmar	16	8	1	16	12	6	16	25	13	11	12
Bolivia	0	0	2	3	5	14	10	6	3	6	6
China	52	33	42	42	10	20	9	8	11	2	3
Total	165	148	153	149	155	163	159	170	185	129	161

Source: Trade statistics of the Ministry of Finance (http://www.customs.go.jp/toukei/info/, retrieved on Nov. 22, 2011)

The review of sesame market trends reveals that the market for sesame is huge for Laos; the market is on a growth trend, and strong demand from China is causing the price of sesame to be high. These facts mean that it will not be difficult to sell sesame when Laos produces more sesame.

B. Distribution

It is common for sesame to be imported by Japanese trading companies and distributed to food manufacturers in Japan. Therefore, it is necessary to sell sesame produced in Laos to Japanese trading companies in order to export the sesame to Japan.

C. Potential and Challenges of Potential Food Item in the Japanese Market

Most of the sesame produced in Laos is the small, white sesame that Japanese companies call “flea sesame.” This small, white sesame has no potential in the Japanese market. There is little demand for this sesame for special usage, so the sesame does not attract Japanese companies. In other words, if Laos continues to produce only this white sesame, there is no possibility that Japanese companies will expand their business to include Laotian sesame, and the white sesame will continue to be exported to Thailand and China.

The sesame that has potential in terms of marketability in Japan is black sesame, which is now produced in and exported from Myanmar and Paraguay. Japanese companies are looking for black sesame. If Laos produces black sesame, Japanese companies will probably purchase the sesame. Since the current amount of black sesame imported to Japan is 20 thousand tons per year, the size of the imported black sesame market in Japan is big enough for Laos.

Black sesame has potential in terms of price. Since black sesame is used for food, its price is high. Its CIF price per kilogram is 1,900 dollars for first grade, 1,600 dollars for second grade, and 1,100 dollars for sesame for oil. If Laos produces black sesame of the first and second grade, Laos can gain 1,777 dollars from the first-grade sesame and 1,477 dollars from the second-grade sesame after deduction of transportation costs, calculated as 123 dollars. These prices are much higher than the price, 35,000 to 36,000 baht, paid for white sesame by Thai importers at the Laos–Thailand border. Therefore, if black sesame can be produced with a similar cost to white sesame, farmers and collectors of sesame will benefit.

6.4.5 Distribution

A. Conditions of Distribution

There are no special conditions for sesame transport.

B. Routes, Carriers, and Cost

In Laos, sesame is produced in Luang Prabang, Xayabury, and Oudomxay provinces in northern Laos. Routes from these production areas to Japan are via Bangkok or Laem Chabang seaport. Routes from these production areas to the seaports depend on the production area. The route from Oudomxay province is via Route 2 and crosses the Nam Ngeun border gate. The routes from Xayabury province are (1) via Route 2 and across the Nam Ngeun border gate, or (2) via Route 4 or Mekong River and across the Namleuang Friendship bridge border gate. The routes from Luang Prabang province are (1) via Route 13 and across the Thanaleng border gate, or (2) via Route 4 or Mekong River and across the Namleuang Friendship bridge border gate. It should be noted that Route 4 is impossible to use in rainy season and that the maximum volume of cargo transported by the Mekong River is small because the water level of the river declines.

For the route from Luang Prabang province via Route 13 to Yokohama seaport, Japan, it is most cost-effective to use two 20-foot containers connected to each other. If the services of a freight forwarder in Bangkok are used, the cost from Luang Prabang province to Bangkok seaport is USD 3,250,[93] and the cost from Bangkok seaport to Yokohama seaport is USD 1,170.[94] Since two 20-foot containers can be loaded with about 36 tons of sesame, the total transportation cost from Luang Prabang province to Yokohama seaport per kilogram is USD 0.12.

6.5 Tea

6.5.1 Activities of Japanese Businesses and Potential of the Product

As explained later, tea processed in Laos includes Chinese-style tea and red tea, not Japanese-style tea. The Japanese tea market mostly sells Japanese-style tea, and the consumption of Chinese green tea and oolong tea has long been limited. As tea beverages in a can or bottle have become popular, consumption of Chinese green tea and oolong tea has increased gradually.

Beverage manufacturers that produce canned and bottled tea are always looking for better, cheaper tea leaves, including leaves of Chinese green tea and oolong tea. Most of these tea leaves are produced in China, but Japanese beverage companies have shown an interest in quality and a human story in tea production, regardless of the country. As shown in the Box below, Northern Laos is suitable for tea production, as wild tea and ancient tea still grow there. As Lao tea has hitherto been unknown at least in the Japanese market, Laos can be regarded a “hidden” production center. Japanese businesses might be attracted owing to this factor and purchase Lao tea as a result.

[93] Inclusive of charge for customs procedures at Laos–Thailand border, USD 400.
[94] Inclusive of port handling charge, USD 180, and charge for customs procedures at Bangkok seaport, USD 150. Exclusive of insurance for sea transportation.

Box 6-3 Forest Tea

There are many hilly areas at 1000 m elevation in Northern Laos. Kormen village in Phongsaly province, near Yunnan province in China, is also located in a mountainous area.

It is seven o'clock in the morning. Phunoi women from the village are going up to the foggy hills to pick young tea leaves. The places where they pick tea have considerably different scenery than that in ordinary tea gardens in China and Japan, where the plantations are shortened to waist height. The tea-harvesting places in Kormen village look like the forest. Tea trees reach 5–6 m high. These trees are more than 400 years old and are called "ancient tea." Hanging sacks to their shoulders, women carefully pick "one bud, two leaves." There are many newly cultivated tea trees in the village as well, but tea from the ancient tea trees in the forest garners three or four times higher prices than does newly cultivated tea, because of its quality and the limited amount produced. According to a tea specialist, Kormen village is known as a tea production area, and the tea grown there has become a popular brand.

In Kormen village, raw leaves of ancient tea were once processed into traditional bamboo tea. Raw leaves were packed into bamboo pipes, which were put on the fire to heat them in order to deactivate the enzymes and transfer the scent of the bamboo to the tea leaves. Bamboo tea was not sold commercially at that time but was only available as a special souvenir.

According to Phongsaly Provincial Agriculture and Forestry Office, it was in 1970 that people in Kormen village started selling their tea on a significant scale. At first, they sold tea to Vietnamese companies; then they began to sell to companies in Yunnan and Guangxi provinces in China.

It is said that Kormen village was founded by people moving in from Yunnan. The region of which they are a part includes Northern Laos, Yunnan, Northern Vietnam, and Northern Myanmar. It is the original home of tea, where wild tea and ancient tea still grow. People in the habit of drinking forest tea might have moved gradually throughout the era when there was no border.

6.5.2 Raw Material Production

A. Production Situation

According to Table 6-46, the total area in Laos given to the production of tea is 2,145 ha: the total yield from this area was 1,165 tons in 2009. The main tea growing area, which is in the northern part of the country, is divided between three main provinces: Phongsaly, Luangnamtha, and Huaphanh. Production in the north was 1,090 tons in 2009. No production is recorded in the central region and only 100 tons of production was recorded in Bolaven Plateau and the southern part.

Table 6-46 Harvested Area and Production of Tea in All Provinces

Location	Province	Harvested area (ha)					Production (tons)				
		2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
North	Phongsaly	625	280	555	555	620	240	550	970	530	185
	Luangnamtha	-	-	-	-	-	-	-	-	-	-
	Oudomxay	-	-	-	-	-	-	-	-	-	-
	Bokeo	-	-	-	-	-	-	-	-	-	-
	Luang Prabang	-	-	-	475	1,300	-	-	-	700	895
	Huaphanh	10	10	20	70	15	-	10	20	120	10
	Xayabury	-	-	-	-	-	-	-	-	-	-
	Total of north	635	290	575	1,100	1,935	240	560	990	1,350	1,090
Central	Vientiane Capital	-	-	-	-	-	-	-	-	-	-
	Xiengkhuang	-	-	-	-	-	-	-	-	-	-
	Vientiane	-	-	-	-	-	-	-	-	-	-
	Borikhamxay	-	-	-	-	-	-	-	-	-	-
	Khammuane	-	-	-	-	-	-	-	-	-	-
	Savannakhet	-	-	-	-	-	-	-	-	-	-
	Xaisomboun	-	-	-	-	-	-	-	-	-	-
	Total of central	-	-	-	-	-	-	-	-	-	-
South	Saravan	-	-	-	-	-	-	-	-	-	-
	Sekong	-	-	-	-	-	-	-	-	-	-
	Champasack	200	200	165	150	210	60	50	50	45	75
	Attapeu	-	-	-	-	-	-	-	-	-	-
	Total of south	200	200	165	150	210	60	50	50	45	75
	Ground total	835	490	740	1,250	2,145	300	610	1,040	1,395	1,165

Source: Ministry of Agriculture and Forestry (2007 and 2009)
Note: Xaisomboun province was dissolved in 2006 and became part of Vientiane and Xiengkhuang provinces.

B. Cultivation

Wild tea/ancient tea trees are particularly found in Yunnan, Guizhou, Sichuan, Hunan, Guangdong, and Hainan provinces, as well as in Zhuang Autonomous Region located in Southern China, Taiwan, Northern Viet Nam, and Northern Laos: thus, these areas are suitable for tea growth. Some of the tea grown in Northern Laos is shipped to China and processed into Pu-Erh tea, which is a special product in China's Yunnan province. In order to understand Laotian tea, it is useful to refer to information on tea grown in Southern China. Therefore, first, wild tea and cultivated tea are discussed in this section in order to provide an understanding of tea cultivation in Laos

As can be seen from Table 6-47, there are two kinds of tea plants: wild tea and cultivated tea. Wild tea plants are taller than those that are cultivated. Tea plants were originally tall, but they were modified by human beings into comparatively low and horizontally wide plants in order to make them more convenient for farm work. On the other hand, wild tea plants retain their original form in mountainous areas where they grow naturally. Accordingly, although wild tea and cultivated tea are both classified as broad-leafed plants, the wild plants are larger than their cultivated counterparts. Moreover, it is said that wild tea leaves contain much more catechin.

Wild tea is classified into two types: wild tea and semi-wild tea. Semi-wild tea is divided tree from the root of a wild tree. There are also two types of cultivated tea: natural tea and field or garden tea. Natural tea is abundant in tea fields and develops like natural tea trees.

Wild tea is a rare species. It contains more of the constituents that make for good tea than cultivated varieties, and gives a distinctive aroma due to its maturity. Moreover, the wild ones are grown without any chemical fertilizers or agrichemicals, in which respect they are grown organically. The tea leaves may thus be sold as organic commodities.

Table 6-47 Classification of Tea Plant

Classification of tea plant		Characteristics
Wild	Wild tea	Wild tea trees grow naturally in forests and plains. Trees are aged more than 100 years, and there are some that are at least 1000 years old. The mature trees contain many tea components and their leaves produce a good flavor: therefore, tea trees are protected.
	Semi-wild tea	Semi-wild tea is divided from the root of a wild tree. There is no cultivation method so semi-wild trees are left to grow naturally. These trees are more than 50 years old. The older the tree, the better the quality of the tea it will yield.
Cultivated	Natural tea	Natural tea is the one with abundant tea fields and becomes natural-like tea. It has not been tended to by human beings for a long time: therefore, the price of tea leaves is more expensive than that of leaves from tea fields. These trees are relatively tall, which makes plucking the leaves hard work.
	Field tea	Tea trees in tea fields grow faster than natural ones and are bred to grow lower than wild trees so that they can be harvested more efficiently. Production from tea fields is predominantly seen in the world market as compared with wild and natural tea.

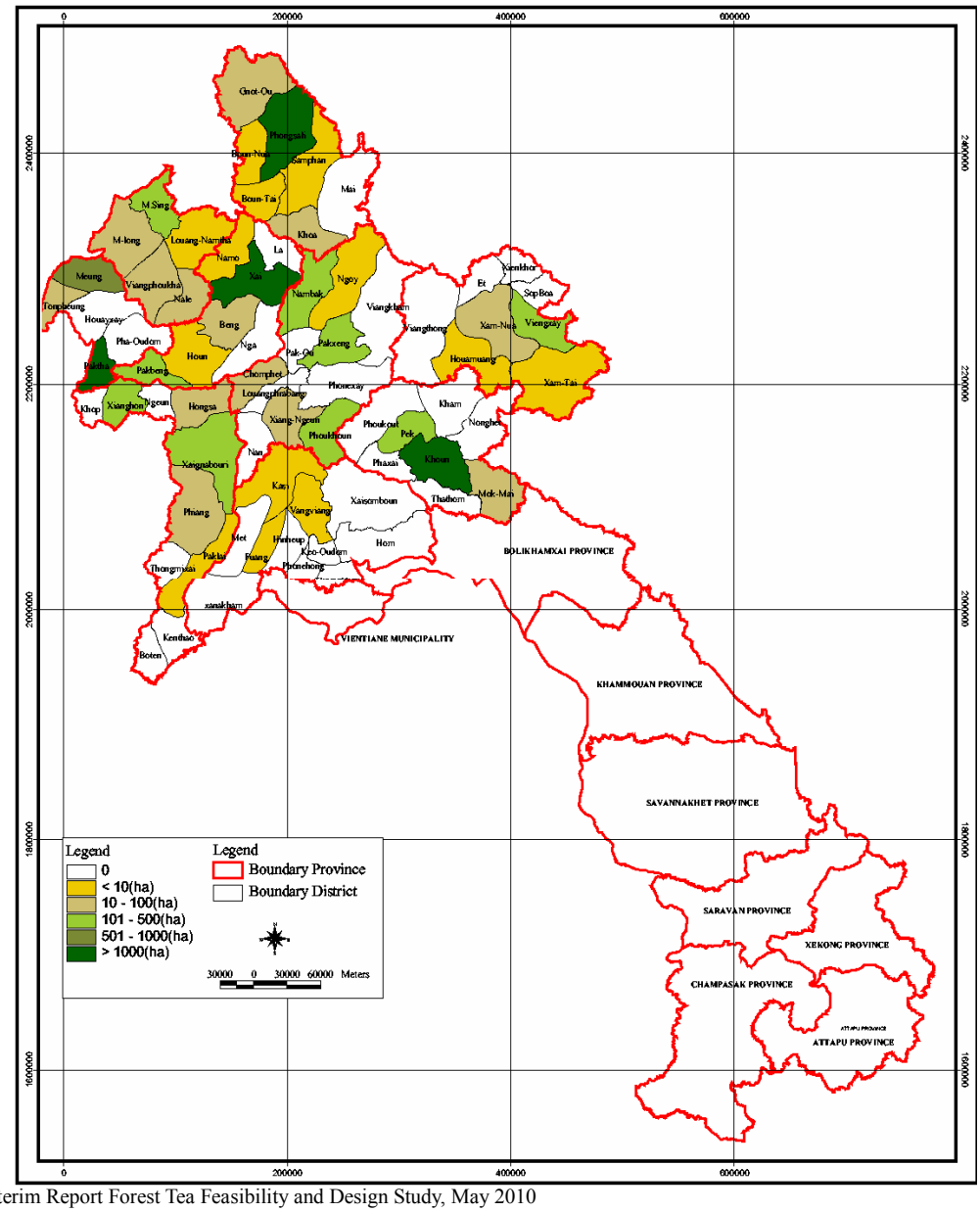
Source: The Study team

(1) Wild tea

Wild tea grows in the northern part of Laos as shown in Figure 6-21. Cultivated tea and wild tea forests can be observed in 40 districts of 9 provinces in the north and central regions of the country, as reported in Table 6-48 and Table 6-49. Furthermore, these Tables show that wild tea trees grow in approximately 9,800 ha, of which plots of wild tea tree forest vary from a few ha up to 2,000 ha. Leaves have traditionally been harvested from these trees by a population of around 92,000 people belonging to numerous minority groups, namely the Khmu, Lao Loum, Prai, Akha, Hmong, Tai Lue, and Hor, residing in 262 villages. Traditionally harvested tea leaves are primarily processed into so-called Mao Cha (rough tea) and shipped to China, where they are then processed into a final product like Pu-Erh.[95]

Although the productivity of wild tea is clearly known, the productivity of fresh tea leaves in Phongsaly province is about 1,500 kg/ha and that of dried tea leaves is about 300 kg/ha. It has been estimated that approximately 1,000 wild tea trees can be grown in every hectare.[96]

[95] Forest Tea, Policy Brief, Tea's of Northern Laos
[96] Interviewing Dr. Thiphavong Boupha, tea specialist in Lao PDR (October 19, 2011).



Source: Interim Report Forest Tea Feasibility and Design Study, May 2010

Figure 6-21 Distribution of Ancient Wild Tea Trees (Districts with Colors)

Table 6-48 Distribution of Wild Tea Forests

Provinces	Districts	Villages	Farm households	Population	Wild tea forest (ha)	Cultivated forest tea (ha)	Commercially cultivated tea (ha)	Total (ha)
Phongsaly	6	79	3,983	17,603	955	3	1,053	2,011
Huaphanh	4	11	908	5,219	172	7	0	179
Luangnamtha	5	37	936	4,250	423	7	17	447
Oudomxay	5	45	3,727	22,327	3,441	73	10	3,524
Bokeo	3	12	1,132	6,434	2,265	0	0	2,265
Xayabury	5	25	3,245	15,810	414	5	84	503
Luang Prabang	6	33	2,041	10,977	401	0	434	835
Xiengkhuang	3	11	652	3,748	1,729	0	5	1,734
Vientiane	3	9	1,155	6,293	10	0	0	10
Total	40	262	17,779	92,661	9,808	94	1,603	11,506

Source: Interim Report Forest Tea Feasibility and Design Study, May 2010

Table 6-49 Districts with Wild Tea Forest

Province	Districts
Phongsaly	Phongsaly, Nhot Ou, Khoua, Boun Neua, Bountai
Huaphanh	Xamneua, Xieng Khor, Houa Meuang, Xam Tai, Vieng Xai, Vieng Thong
Luangnamtha	Nam Tha, Sing, Long, Vieng Phou Kha, Nalae
Oudomxay	Pakbeng, Houn, Beng, Xay, Namor
Bokeo	Meung, Paktha, Tongpheung
Xayabury	Saysathan, Hongsa, Xienghon, Phieng, Paklai
Luang Prabang	Xieng Ngeun, Pak Xeuang, Nambark, Ngoy, Chomphet, Phot Khoune
Xiengkhuang	Paek, Khoun, Mork
Vientiane	Kasi, Vang Vieng, Feuang, Xaysomboum

Source: Interim Report Forest Tea Feasibility and Design Study, May 2010

(2) Cultivated Tea

Tea has two scientific names: *Camellia sinensis var sinensis* and *Camellia sinensis var assamica*. The former is mostly grown in Japan and China. The latter is cultivated in India, China's Yunnan province, and Laos.

The general practices, methods, and environment of tea cultivation are explained in this section. As shown in Table 6-50, tea trees cannot be grown in cold climates because they are subtropical crops. An average annual temperature of 12.5–13.0 degrees Celsius, ranging from 14 to 16 degrees, is needed. Annual rainfall during growth should be more than 1,000 mm and rainfall of between 1,300mm and 1,400mm is preferable. Hail and frost should be avoided. The physical condition of the soil is most important: there should not be too much clay or gravel, but permeability for water drainage must also be high. A PH of between 4.5 and 5.0 is preferable.[97]

Table 6-50 Optimum Environment for Cultivation of Tea

Environment	Contents
Climate	Sub-tropics
Temperature	Average temperature: 14–16 degree Celsius
Rainfall	Annual precipitation: more than 1,300mm
Altitude	Though growth is slow at a 1,500m altitude, the aroma of the tea leaves is excellent.
Soil	The plowing layer should be deep, and fertility and permeability are also required. Slight acidity is preferable.

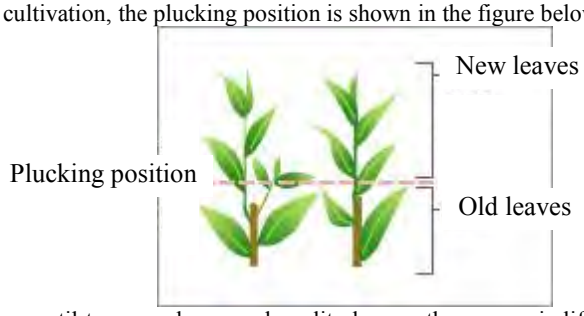
Source: The Study team made based on http://ocha.tv/index.html.

Table 6-51 gives a summary of intensive tea cultivation methods. It takes 4–8 years from the planting of a seedling before it is ready to be plucked for the first time. Quality and stable production are

[97] http://ocha.tv/production/cultivation/

assured from the fifth year onwards. Cutting is used for the multiplication of tea seedlings, which are left for two years before they are planted. Two years after planting, especially in Japan, pruning is performed to control the growth of the main trunks of trees while also enhancing the growth of lateral branches so that the area for plucking is suitable for mechanized harvesting. Weeds are controlled by paddy straw placed under the trees and sometimes by cultivation. Tea leaves are plucked between one to four times a year; however, sometimes plucking happens only once a year.[98]

Table 6-51 Tea Cultivation in General

Farm work	Contents
Seedlings	Multiplication by cutting
Planting	Planting of 2-year-old seedling
Management at initial growth stage	From the second year after planting, pruning starts to re-shape tea trees for easy mechanical plucking.
Period until plucking	First plucking is done 4–5 years after transplantation.
Plucking	Tea leaves are generally harvested by taking one branch stem and two leaves. In the case of Japanese tea cultivation, the plucking position is shown in the figure below. 
Economic age of tree	It takes 5 years until trees produce good quality leaves: the economic life span of tea trees ranges from 30 to 50 years.

Source: The Study team made based on http://ocha.tv/index.html.

Next, the tea cultivation method practiced in the Northern Laos is explained hereafter with examples practiced in Phongsaly province. As noted above, minority ethnic groups cultivate tea in foggy mountainous areas in Northern Laos. Thus, the scenery of tea cultivation is different from that seen in Japan and China. Figure 6-22 shows the mixing of tea with other crops on mountain slopes in the North.

Phongsaly province is located at an altitude of between 1200m and 1500m sea above level, and is frequently foggy. Although 70% of the population relies on tea production, the poverty rate is high: more than 50%. Malaysian, Chinese, and Laotian private firms are engaged in tea production in the area. Apart from tea, no other lucrative commodities are produced in the province; hence, its economy and the lives of its people are dependent on tea production.

Private processing firms recommend that farmers grow tea with a high planting density: for example, Phoufa, a Laotian firm, recommends a density of 49,800 trees per hectare, while another Malaysian firm instructs farmers to plant 38,000–40,000 trees per hectare. However, according to the Agriculture and Forestry Office of Phongsaly province, high density planting results in smaller leaves and lower tea quality. Today, appropriate planting density is reckoned to be around 25,000–30,000 trees.

The price of a tea seedling is around 500–1,000 Kip. It takes 3–4 years after planting before the tea leaves are ready to be plucked. During the first and second years after planting, the trees are low enough to be intercropped with upland paddy and watermelons. There is very little field management and no fertilizers or agrichemicals are used. Tea leaves are plucked during the rainy season, between March and October. Laborers are sometimes hired to help with harvests and are paid 25,000–30,000

[98] http://ocha.tv/production/cultivation/nurturing/）

Kip per person a day.[99] Thus, apart from the cost of buying seedlings in the first year and paying laborers to help with harvests, there are very few expenses involved in tea cultivation.

Tea intercropped with rubber and bloom grass in Oudomxay province

Tea cultivated on a sloping area in Phongsaly province

Figure 6-22 Tea Trees Cultivation in Northern Laos

The productivity of fresh tea leaves is 3.5–5.0 tons/ha, which can be converted into 700–1,000 tons of dried tea leaves. The price of dried tea leaves varies from 3,000 Kip–5,000 Kip/kg.

According to the Agriculture and Forestry Office of Phongsaly province, since there are no specialists in tea cultivation, tea farmers rely on instructions from the aforesaid private processing companies. As a result, appropriate cultivation technology has not been disseminated; for example, farmers do not apply contour line planting even though the technique is conveyed from China. Additionally, farmers used to apply cattle manure as a natural fertilizer, but the number of cattle has decreased so this practice is now uncommon. Meanwhile, application of chemical fertilizers is prohibited. Therefore, the fertility of tea fields has become an issue. Due to the low fertility of the soil, tea growth is now slow and the quality of tea leaves is inferior. Farmers try to use tea leaves as green manure to improve soil fertility.[100]

6.5.3 Processing

The different processing methods used for tea can produce Japanese-style and Chinese-style green tea; semi-fermented oolong tea; and fermented red tea. Tea processed in Laos today mainly becomes Chinese green tea and red tea.

The processing methods of Chinese-style green tea, which are quite different than those for Japanese-style green tea, are discussed here. With Japanese green tea, harvested tea leaves are first steamed to deactivate enzymes in order to prevent change in quality. Then, the steamed leaves are kneaded. In contrast, Chinese green teas are cooked in a pot without steaming. Then they are kneaded and dried. These basic steps—heating, kneading, and drying—are similar, but with Japanese green tea, the steamed leaves have become soft with moisture before they are kneaded. As a result, the leaves are prone to breakage and the essence easily seeps out of them. In the case of Chinese tea, the leaves lose moisture as they are cooked in a pot or an oven, and the essence does not come out during kneading. As a result, when Japanese tea is served, it becomes strong with the first or second infusion, while Chinese tea takes time to become strong. The third or fourth infusion may be the peak of the tea's strength, but the strength lasts even to the sixth or seventh infusion.

[99] Interviewing Dr. Thiphavong Boupha, Technical Advisor / Specialist on Tea, The Agro-Biodiversity Initiative (TABI) and Small Agricultural Market Development in Uplands of Lao PDR (SADU) (October 19, 2011).
[100] Interviewing the Agriculture and Forestry Office of Phongsaly province (October 31, 2011).

Mao-cha, which is primary-processed green tea, is processed into finished tea through additional steps such as further drying, adding the scent of flowers, or further grading leaves. Many tea processors in Laos produce *mao-cha* and export it to Yunnan, where *mao-cha* is processed into *pu-erh tea*. The steps in making *mao-cha* are as follows.

1. Cooking in a pot or oven
   Add heat to raw leaves to deactivate the enzymes. In large factories, a rotary cooking oven is frequently used to cook leaves at 160–180˚C. Cooking time is a couple of minutes. Farmers use a simple *wok* for cooking.

2. Cooling
   If cooked leaves are left at a hot temperature for a long time, freshness and taste will be spoilt. It is necessary to cool cooked leaves immediately with a fan.

3. Kneading
   To remove moisture from the leaves and to help the essence seep out easily, knead leaves with a kneading machine. High-quality tea is kneaded by hand.

4. Drying
   Remove remaining moisture down to 14–15% to prevent change in quality.

5. Grading
   Remove impurities and grade leaves by length.

6. Drying
   Dry leaves down to 4%–5% moisture. Some factories use hot air to dry leaves.

7. Cooling
   Cool leaves with a fan. Then, the *mao-cha* is complete.

Figure 6-23 Steps in Processing Mao-Cha into Chinese-Style Tea

Figure 6-24 Cooking Oven (left) and Kneaders (Phongsaly province)

Chinese tea comes in various types with diverse processing methods. Terminology in this area does not seem to be strictly consistent. Some call *mao-cha* "green tea," but others use the term "green tea" for tea that has been finished by drying at a low temperature. However, both green tea and *mao-cha* have the same characteristic: the enzymes have been deactivated by heating at the initial stage.

Semi-fermented teas such as oolong tea, in contrast, are produced by preserving enzyme activity (producing tea without heating). The steps are (1) partially drying leaves under the sun or in the shade; (2) rubbing leaves together to bruise their peripheral parts in order to help the essence seep out and ferment; (3) cooking leaves, the peripheral parts of which have become red but the remainder of which is still green, to deactivate the enzymes; (4) kneading; and (5) drying.

Red tea has recently begun to be produced in Laos. The steps of red tea production are (1) partial drying under the sun or in the shade, (2) kneading, to help the essence seep out and fermenting for a longer time than semi-fermented tea, and (3) drying the leaves, which are no longer green but now totally brown, at high temperature to deactivate the enzymes.

According to one tea specialist, farmers and processors do not necessarily completely standardize Chinese-style tea-processing techniques. When farmers use a small *wok* for cooking leaves, time and temperature vary widely. Even when machines are introduced, temperature control, heating time, kneading time, timing of cooling, and drying temperature can affect its taste and aroma significantly.

The distance between the harvesting site and the processing point is another issue. As raw leaves start fermentation immediately after harvesting, they should be cooked on the same day. Tea gardens, however, are located in mountainous areas, and the distance farmers can transport leaves in a day is not much. Thus, they need small- and medium-scale processing points in every production area. The processing at these places is done by farmers. How to train them is a significant challenge for ensuring the stable production of high-quality tea through improving the quality of labor.

6.5.4 Market

This section first looks at the world market trend of tea and then explains the Japanese market that Laotian tea is recommended to target.

A. Market Trend

The world production and export of roughly processed tea is shown in Table 6-52. Total world production in 2009 was 3.95 million dollars. In 2009, China represented 35% of total production, and India 20%. It is obvious that China and India are the top production countries. Laos constituted only 0.01% of the total production in 2009. Total production increased by 0.99 million dollars from 2000 to 2009. In particular, China, Vietnam, Turkey, and Kenya recorded high growth in production.

As for exports, the major exporting countries are Kenya, China, and India. Kenya has produced mainly red tea, but recently began to export green tea (Muroya, 2008).

Consumption and import of roughly processed tea are presented in Table 6-53. Total world consumption of tea was 3.74 million tons in 2009. China accounts for 29% of total consumption, and India 17%. Each of the other countries represents less than 5%. Growth in consumption is outstanding in China, Vietnam, and Turkey. The fact that the neighboring countries, China and Vietnam, have growing tea consumption is good news for Laos, which wants to increase production of tea. The consumption in Japan remains steady at 130 to 150 thousand tons and has gradually declined from the peak amount in 2004—156 thousand tons.As for imports, Japan and China imported 43 thousand tons and 31 thousand tons, respectively, in 2009, which has not much changed since 2000.

Table 6-52 Production and Export of Roughly Processed Tea

(Unit: 1,000 tons)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Production										
World	2,960	3,068	3,171	3,226	3,422	3,625	3,668	3,948	3,892	3,950
China	704	722	766	789	855	954	1,047	1,183	1,275	1,376
India	826	847	854	838	878	893	928	949	805	800
Kenya	236	295	287	294	325	329	311	370	346	314
Sri Lanka	306	295	310	303	308	317	311	305	319	290
Turkey	139	143	135	154	202	218	202	206	198	199
Vietnam	70	76	94	104	120	133	151	164	174	186
Indonesia	163	163	162	170	171	178	147	150	151	160
Japan	85	85	84	92	101	100	92	94	97	86
Laos	0.31	0.16	0.17	0.23	0.32	0.3	0.15	0.26	0.56	0.47
Export										
World	1,464	1,450	1,580	1,530	1,635	1,719	1,629	1,711	1,896	1,775
Kenya	217	207	288	294	284	348	325	374	397	332
China	231	252	255	263	283	289	289	292	300	305
Sri Lanka	287	294	291	297	299	308	204	190	318	289
India	201	178	182	174	175	159	181	193	203	204
Indonesia	106	100	100	88	99	102	95	84	96	92
Vietnam	56	68	77	59	104	88	105	114	105	82
Argentina	50	58	58	59	68	68	72	76	77	70

Source: FAO (http://faostat.fao.org/default.aspx, retrieved Nov. 5, 2011)

Table 6-53 World Consumption and Import of Roughly Processed Tea

(Unit: 1,000 tons)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Consumption										
World	2839	3006	3042	3082	3219	3358	3509	3784	3682	3743
China	488	486	530	548	595	688	786	919	985	1101
India	632	680	696	674	734	753	770	775	627	630
Turkey	137	143	132	150	199	215	203	206	199	202
Russia	158	155	165	167	168	174	165	172	171	173
Japan	142	145	135	138	156	150	138	140	138	127
England	133	137	134	119	128	128	136	132	130	118
Vietnam	14	8	17	46	16	45	46	50	69	103
United States	82	91	87	87	94	95	104	101	108	102
Pakistan	111	107	99	108	116	134	127	112	100	96
Import										
World	1,343	1,387	1,452	1,386	1,432	1,451	1,469	1,547	1,686	1,568
Russia	158	154	165	169	172	180	173	182	182	182
England	156	164	164	157	156	153	162	157	158	146
United States	88	97	93	94	99	100	108	109	117	111
Pakistan	111	107	99	108	116	135	127	112	100	97
Egypt	72	56	79	38	3	9	9	22	108	80
Japan	58	60	52	47	56	51	48	47	43	43
China	15	17	19	21	22	24	28	28	9	31

Source: FAO (http://faostat.fao.org/default.aspx, retrieved on 5 Nov 2011)
Note. Assuming that consumption = production + import - export.

The abovementioned explanation of the statistics for production, export, consumption, and import reveals that the tea industry in Laos is very small compared to the world market, and that the markets in Japan and China are huge for Laos.

The price of tea produced in Kenya for international trade is difficult to discuss because the price of tea in genera; hinges on various factors, such as variety and production area, and because there is no indicator or index reflecting the international price of tea. As shown in Table 6-54, the price of Kenyan tea has risen since 2008. This may be because the quality of the tea has increased and because world demand for tea as a whole has grown.

Table 6-54 International Price of Red Tea

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Price of read tea (USD/kg)	2.48	1.98	1.79	1.94	1.98	2.16	2.42	2.12	2.70	3.14	3.17	3.46

Source: IMF Primary Commodity Prices (http://www.imf.org/external/np/res/commod/index.aspx, retrieved Nov. 7, 2011)
Note. Auction price of tea produced in Kenya. The 2011 price is the average from January to September.

The consumer price index of tea and the whole consumer price index in China are shown in Table 6-55. Growth in the consumer price index of tea is weaker than that of the whole consumer price index. Therefore, tea is becoming comparatively cheaper.

Table 6-55 Consumer Price Index of Tea in China

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Consumer price index of tea (year 2000 = 100)	100.00	101.00	101.91	101.59	102.71	103.52	104.80	108.23	110.66	112.23
Consumer price index (year 2000 = 100)	100.00	100.70	99.89	101.09	105.04	106.93	108.53	113.74	120.45	119.61

Source: National Bureau of Statistics of China (http://www.stats.gov.cn/english/statisticaldata/yearlydata/, retrieved Nov. 6, 2011)

The rest of this section describes market for tea in Japan.

The composition of tea consumption by kinds has been steady (Table 6-56). Green tea has made up 70 to 75%, red tea 10 to 15%, and half-fermented tea around 15%. Most of the tea consumed in Japan is green tea.

Table 6-56 Consumption of Tea by Kind in Japan

(Unit: tons)

	2004	2005	2006	2007	2008	2009	2010
Green tea	116,966	113,954	101,575	102,012	101,147	89,957	88,682
Red tea	16,299	15,445	17,128	16,603	17,858	17,400	19,757
Half-fermented tea	22,903	20,730	19,714	21,110	17,922	16,844	17,620
Total	156,168	150,129	138,417	139,725	136,927	124,201	126,059

Source: Crop statistics of the Ministry of Agriculture, Forestry and Fisheries, Japan, Trade statistics of the Ministry of Finance (http://www.customs.go.jp/toukei/info/, retrieved Nov. 6, 2011)
Note: It is assumed that all production in Japan is green tea, that consumption of green tea = production + import - export, and that consumption of red tea and half-fermented tea = import.

Nearly 100% of the tea produced in Japan is green tea. The production of red tea is 15 tons, according to the crop statistics of the Ministry of Agriculture, Forestry and Fisheries of Japan (Table 6-57). Red tea produced in Japan is merely for local consumption, and consumption of red tea in Japan relies on imports. Oolong tea is hardly produced at all in Japan, and, furthermore, produced in the world only to a limited extent. It is produced in limited areas, such as Fujian and Guangdong provinces, in China and Taiwan.[101] Ninety-five percent of Japan's imports of oolong tea is produced in China. It can be understood that almost all the green tea consumed in Japan is produced in Japan and all the red tea and oolong tea are imported, while oven-cooked green tea, called Chinese-style green tea, is of foreign make.

[101] Production of oolong tea in China constitutes only 5% of total production of all kinds of tea in China.

Table 6-57 Production of Roughly Processed Tea in Japan by Kind

(Unit: tons)

	2004	2005	2006	2007	2008	2009	2010
Shaded tea	5,443	5,897	5,522	5,857	6,412	5,970	5,840
Ordinary green tea	70,800	70,200	64,900	65,400	65,300	58,600	54,400
Gunpowder tea	3,930	3,720	3,410	3,200	2,930	2,560	2,310
Coarse tea	19,300	18,200	16,400	17,600	19,100	17,600	21,000
Others	1,370	1,846	1,665	1,990	1,780	1,320	1,460
(Green tea)	(1,350)	(1,830)	(1,650)	-	-	-	-
(Red tea)	(20)	(16)	(15)	-	-	-	-
Total	100,843	99,863	91,897	94,047	95,522	86,050	85,010

Source: Crop statistics of Ministry of Agriculture, Forestry and Fisheries, Japan (http://www.maff.go.jp/j/tokei/kouhyou/sakumotu/sakkyou_kome/index.html, retrieved on Nov. 6, 2011)

The authors would like to introduce the styles of tea-drinking by kind. In the case of green tea, packed tea leaves, including tea bags, make up about 75% of all consumption, and industrial usage for bottled, canned, and paper-packed tea constitutes about 25% (Muroya, 2008). Industrial usage is increasing (Japan ASEAN center, 2007). In the case of red tea, industrial usage is 50%, mass-merchandise usage is 40%, business usage is 8%, and gift usage is 2% (Japan ASEAN center, 2007). The tea merchandise market is dominated by national brands such as Lipton, Twinings, Nittoh, and Brooke Bond (Japan ASEAN center, 2007). Oolong tea was mainly for business usage at the beginning when it spread in Japan, but since oolong tea's slimming effect has become known, household usage has expanded.

Table 6-58 Production of Tea Beverages

(Unit: million liters)

Kind	2001	2002	2003	2004	2005
Green tea	1,421	1,568	1,783	2,365	2,648
Oolong tea	1,398	1,217	1,174	1,089	1,030
Blended tea	804	776	854	876	743
Red tea	781	743	795	789	850
Barley tea	257	232	219	238	204
Others	167	262	134	154	110
Total	4,828	4,798	4,959	5,511	5,585

Source: Japan ASEAN center, 2007

One remarkable fact about the styles of drinking tea is the increase in tea soft drinks, especially bottled tea. After tea soft drinks started to be sold in 1990, their share of the soft drink market has risen because of their healthy image. The production amount of tea soft drinks in 2007 was 5.7 million kiloliters, and constituted 30.7% of all production of soft drinks (Kataoka, 2008). The composition of the tea soft drink market in 2005 was as follows: 47% was green tea, 15% red tea, 18% oolong tea, 13% blended tea, 13% barley tea, and 2% other tea (Table 6-58). Another remarkable feature of tea soft drinks is that new products are actively released. In 2004 and 2005, so many new products were put out that a tea war occurred. Beverage companies have considerable concerns about new product development, as beverage companies outsource the manufacturing of tea beverages (Japan ASEAN center, 2007).

Represented by "Healthya" of Kao and "Kuro-Oolong Tea" of Suntory, tea beverages with appealing functionality, called functional tea beverages, have been released. A famous functional ingredient is catechin, which has the effect of reducing blood cholesterol and body fat, and has an antioxidant effect, cavity prevention effect, and antibacterial effect. "Healthya" of Kao and "Kuro-oolong Tea" are marketed based on the functionality of catechin. Other functional ingredients are theanine, caffeine, and Vitamin C.

B. Distribution

As for distribution of tea in the Japanese market, trading companies import tea leaves and distribute them to users such as beverage companies. It is rare for beverage companies to import tea leaves directly, although this sometimes occurs, as mentioned by beverage companies and trading companies. Strictly speaking, since beverage companies outsource manufacturing of tea drinks to manufacturing companies, called packers, tea leaves imported by trading companies are distributed not to beverage companies but to packers. Beverage companies concentrate on product development and marketing as brand owners.

C. Potential and Challenges of Potential Food Item in the Japanese Market

From the point of view of marketability, Laotian tea has potential in the Japanese market for the following five reasons.

First, Laotian tea can provide storylines, concepts, and images that can be used to create new tea beverages. Laotian tea may have mystique and a sense of a hidden and unexplored thing because the tea is cultivated by farmers who follow traditional culture and customs in undeveloped mountainous areas, because Laos itself is not well known in Japan, and because production areas in Laos also have wild tea trees and 400-year-old tea trees. In fact, a Japanese beverage company highly evaluates these features of Laotian tea.

Second, Laotian tea has good intrinsic quality. A cupping test by several experienced foreigners evaluated that 27 out of 77 samples of Laotian tea had commercial potential and that 10 of the 27 had high potential. This JICA survey asked a Japanese beverage company to carry out a cupping test of five samples collected in this survey. The result was that three of the five samples received positive evaluations.

Table 6-59 Result of Laotian Tea Cupping by Japanese Beverage Company

Sample tea	Comments by Japanese beverage company
Roughly processed green tea, wild tea, Oudomxay province	Bright or glamorous aroma like a flower, taste of fermentation
Roughly processed green tea, ancient tea, Phongsaly province	Smells fishy
Green tea, cultivated tea, Phongsaly province	Smells fishy
Roughly processed green tea, cultivated tea (natural tea), Luang Prabang province	Honey-sweet flavor
Red tea, cultivated tea, Huaphanh province	Red tea aroma, easy to drink

Third, Laotian tea has functional ingredients. An ingredient analysis of Laotian tea conducted in this survey demonstrated that tea from Luang Prabang province has 50% more catechin than average. The functionality of catechin is highly valued. Marketing Laotian tea by promoting its functionality is recommended.

Fourth, Laotian tea is organic. Tea farmers in northern Laos are small and unable to input fertilizers or agricultural chemicals for tea or other crops. Therefore, their farming is organic. As areas where neither fertilizer nor chemicals are used spread, Laotian tea can be certified as organic by proving that the tea grows in certain areas.

Fifth, Laos has tea processing companies in the north that are capable of producing hundreds of tons of tea leaves. As 500 mL of bottled tea requires about 5 grams of tea leaves, 20 million bottles can be produced from 100 tons of Laotian tea leaves. This amount is enough to realize a new product, which was confirmed by a Japanese beverage company.

Laotian tea has the following challenges.

The first challenge is about marketing. Tea processing companies do not engage in marketing activities, and have connections only to Chinese companies based near the Laos–China border that deal in roughly processed tea as raw materials for Puer tea. They do not know about tea markets other than the Puer tea market, or about market needs for tea leaves, or business chances. Processing companies in Laos are unable to develop processing measures that match market needs and are discouraged from investing for the tea processing business.

The second challenge relates to processing. Although the intrinsic quality of fresh tea leaves is acceptable, processed tea leaves have limited marketability due to poor processing. This was pointed out by the cupping test that was conducted by experienced foreigners, and was also confirmed by a cupping test that was conducted by a Japanese beverage company in this survey.[102]

The third challenge involves traceability and quality control. Japanese trading companies dealing in tea leaves mentioned that the requirement for traceability and quality control is strict and that this requirement will confront Laotian tea, which has no reputation. In fact, when the JICA survey team showed the samples of tea leaves to a Japanese beverage company, the company commented that the samples were contaminated with extraneous substances such as hair and with the smell of smoke, and that quality had to be improved significantly. Attention to traceability and quality control in Laos are weak and need improvement.

The fourth challenge is about price. When Laotian tea is promoted as a material for new tea beverage products, price is not a big issue. However, when it is promoted as a substitute for cheap leaves that are utilized by blending with other leaves, price is the most important issue. A Japanese trading company told the survey team that tea leaves from emerging tea producing countries such as Vietnam and Indonesia should be 2 to 3 dollars; otherwise, they are difficult to sell. Roughly processed tea from Laos is sold to Chinese companies for 20 Chinese yuan, equivalent to about 3.13 dollars. This price is higher than the prices of Vietnamese and Indonesian tea, although Laotian tea should be at the 2-dollar level so as to be competitive. Since fresh leaves cost 120 to 150 Japanese yen per kilogram of processed tea leaves, the price of the processed tea leaves can be reduced to the 2-dollar level.

Just for reference, the results of an ingredient analysis of Laotian tea are reported here. As for Sample 1, roughly processed tea from Phoukhoun district, Luang Prabang province, it is revealed that the sample has the following characteristics: (1) Moisture is high. This may be because of finishing processing or storing. (2) Vitamin C is low. This may be because of intrinsic characteristics or processing or storing. (3) Tannin is high. This may be because of intrinsic characteristics. Tannin contained in tea leaves consists mainly of catechin, which means that sample 1 has more catechin than ordinary tea leaves. (4) Caffeine is slightly high. This may be because of intrinsic characteristics.

[102] The Japanese beverage company that conducted this cupping test is different from the one mentioned in Table 6-59. As a result of the cupping test, the company commented that the samples of black and red tea leaves exhibited only some characteristics of black and read tea. None of the samples of green tea leaves, however, had the taste, balance between bitterness and astringency, or peculiar flavor of green tea. The samples had a slight smell specific to oldness.

Table 6-60 Ingredient Analysis of Laotian Tea Leaves

Analyzed ingredient	Unit	Sample 1 Roughly processed green tea, Phoukhoun district, Luang Prabang province	Sample 2 Green tea, wild tea, Oudomxay province (spring picked in 2011)	Sample 3 Green tea, cultivated tea, Oudomxay province (rainy season picked in 2011)	Sample 4 Green tea, ancient tea, Phongsaly province (autumn picked in 2011)	Sample 5 Green tea, cultivated tea, Phongsaly province (autumn picked in 2011)	Sample 6 Phoufa red tea, Phongsaly province
Moisture	g/100g	5.6	9.7	9.9	10.3	8.9	8.6
Dietary fiber	g/100g	31.1	27.9	29.0	27.8	27.5	45.1
Total ascorbic acid (total vitamin C)	mg/100g	31	not detected	not detected	not detected	not detected	2
Free amino acid							
Free arginine	mg/100g	14	11	29	11	34	20
Free lysine	mg/100g	18	9	15	15	27	14
Free histidine	mg/100g	6	3	5	4	9	5
Free phenylalanine	mg/100g	74	22	32	45	60	66
Free tyrosine	mg/100g	18	16	22	12	19	26
Free leucine	mg/100g	22	13	15	13	21	19
Free isoleucine	mg/100g	21	8	14	12	22	21
Free methionine	mg/100g	not detected	not detected	not detected	not detected	not detected	not detected
Free valine	mg/100g	31	12	21	21	36	36
Free alanine	mg/100g	29	29	25	19	16	26
Free glycine	mg/100g	3	not detected	not detected	not detected	not detected	not detected
Free proline	mg/100g	21	9	15	12	19	20
Fee Glutamate acid	mg/100g	109	130	120	108	164	113
Free serine	mg/100g	44	25	36	29	43	54
Free threonine	mg/100g	21	19	15	15	21	21
Free asparagine acid	mg/100g	126	51	92	71	197	95
Free tryptophan	mg/100g	19	18	16	16	27	19
Free cystine	mg/100g	not detected	not detected	not detected	not detected	not detected	not detected
Theanine	mg/100g	655	1020	1120	783	927	701
Tannin	%	21.1	20.2	18.1	21.9	19.5	9.56
Anhydrous caffeine	g/100g	3.1	3.7	2.9	3.2	3.2	2.4
Total nitrogen	g/100g	3.87	4.39	4.16	3.77	4.42	3.48

Source: Result of ingredient analysis by Japan Food Research Laboratories

6.5.5 Distribution

A. Conditions of Distribution

Distribution of tea requires special care against smell and humidity.

B. Routes, Carriers, and Cost

Routes from Oudomxay, Luang Prabang, and Phongsaly provinces, which are tea production areas, are explained below.

The route from Oudomxay province is via Route 2 and across the Nam Ngeun border gate to reach Bangkok or the Laem Chabang seaport. Route 2 is paved and convenient to drive. A bridge crossing the Mekong River along Route 2 is being constructed with the support of China, and a ferry is necessary to cross the Mekong River at present.

As for a route from Luang Prabang province, please refer to the routes for transporting sesame. (See 6.4.5.)

The route from Phongsaly province is via Routes 19 and 1B and reaches Oudomxay province, after which the route is the same as that from Oudomxay province. As for road conditions, Route 19 is okay, but Route 1B has a long section running through mountainous areas that is unpaved and hard to drive, though not impossible, in rainy season. Container trailers probably cannot run Route 1B in rainy season.