Phou San Wild Tea

Xieng Khouang Province
LAO PDR

From Early Days
to
Current Production and Market Development

Agro-biodiversity Project, September 2016

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by

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Front page: Mr. Phasi, the leading wild tea farmer of Ngot Phae village

List of Abbreviations

ABP	Agro-biodiversity Project
DAFO	District Agriculture and Forestry Office
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GI	Geographic Indication
LFP	Lao Farmers Products
MAF	Ministry of Agriculture and Forestry
MOIC	Ministry of Industry and Commerce
m.a.s.l.	Meters above sea level
MoST	Ministry of Science and Technology
PAFO	Provincial Agriculture and Forestry Office
PoNRE	Provincial Office of Natural Resources and Environment
TABI	The Agrobiodiversity Initiative
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

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Executive Summary

Phou San Wild Tea is named after Phou San Mountain (2,218 m.a.s.l.) which is located in an area of unique biodiversity in the upland areas of Paek district, northern Xieng Khouang Province. The tea is famously mentioned in legends of the ancient Imperial Household of China for its excellent flavour.

Although the trade in wild tea dates back to the Lan Xang Kingdom (1354 to 1707), the first known attempt at commercial tea production in Xieng Khouang Province was started during the Indochina period by M. du Pasquier, a French agronomist. In 1928-31, he collected samples and planted wild tea at a research station, probably located close to the Ngot Phieng village in Paek district. His studies confirmed that Phou San Wild Tea was the same variety as the legendary Shan tea grown in northern Myanmar.

As part of this study, two Chinese tea taxonomists identified wild tea in Xieng Khouang Province as *Camellia sinensis* var. *assamica*, also known as the Assam tea or the Shan tea variety. The survey also identified a previously unknown tea species in the area and in Laos, *Camellia kissi* var.*confusa,* from which kissi tea oil can be produced.

Provincial stakeholders are well aware of the value of this unique and ancient wild tea. The area of cultivation for Phou San Wild Tea in Xieng Khouang Province is estimated by this study at approximately 300 hectares, equal to 7% of the total area of Lao PDR of 4,160 hectares (2015). The authorities are currently labeling more than 1,600 individual tea trees in the Phou San area.

Typically, wild tea is grown within conservation areas and community forests, as well as in upland fields among trees and crops and in monoculture tea gardens. Previously, seedlings from natural growth were transplanted, but for larger scale cultivation seeds are collected from wild tea stands in the forest and germinated in nurseries before transplanting.

Phou San Wild Tea cultivation in Xieng Khouang Province began ten years ago at Ngot Phieng and Oh Anh villages, where all households are engaged in tea cultivation today. Since then, an increasing number of villages have taken up wild tea cultivation and presently 12 villages are growing tea, ten of which are located at the foot or close to Phou San Mountain in Paek (9), Kham (1) and Phoukout (1) districts. One village is situated in the southern part of the province in Khoun district, and one village is located in the northern part of Kham district.

A large amount of the wild tea is sold as fresh tea or semi-dried tea, mainly Chinese traders. Only Ngot Phieng, Oh Anh and Ngot Phae villages have started to process their own tea.

More than half (175 hectares) of Phou San Wild Tea is cultivated inside forests of various densities and particularly by farmers in Oh Anh, Suan, Ta and Nguang Thong villages. The combined area of tea gardens amounts to 128 hectares with Ngot Phieng, Ngot Phae, Phone and Perp villages taking the biggest share.

Assisted by the Agro-biodiversity Project, Ngot Phae village in Phoukout district has increased its area of cultivation from 3 hectares in 2014 to 88 hectares in 2016, of which 53 hectares are planted in tea gardens.

Steadily, and particularly during the past decade, the natural characteristics of Phou San Wild Tea have become highly valued by the tea markets, especially in China, but also in Laos and overseas. The official tea production of Xieng Khouang Province is 245 tons, equal to 4% of total production in Lao PDR, of which 80% to 90% is believed to be purchased by Chinese traders who demand a variety of specialty teas for the Chinese market.

In 2015, Phou San Wild Tea obtained a farm gate at a price of 8,000 to 50,000 kip or USD 1.0 to 5.5 per kg fresh and 75,000 to 230,000 kip or USD 9 to 28 per kg processed. These prices are double that of other teas from Laos and 10 to 20 times higher than low-end imported teas.

This study pays special attention to three villages i.e. the Ngot Phae in Phoukout district and Ngot Phieng and Oh Anh villages both located in Paek district. In Ngot Phae village in 2015 and 2016, a total of 63 families transplanted an additional 93,000 Phou San Wild Tea seedlings to their upland fields with harvest expected from 2018 onwards. From the existing 3.5 hectares of tea gardens planted in 2008, the 2015 income of two families amounted to 73 million kip, equal to USD 9,100. In Ngot Phieng village in 2015, 20 families earned a total income of 450 million kip (USD 55,000), whereas the 73 families in Oh Anh village earned roughly one billion kip, equal to USD 125,000.

Tourists often express interest in Phou San Wild Tea, but since there are no well-known sale points or market channels sales are sporadic and supplies are often limited.

The key to continued success in tea production is improved cultivation practices and better processing, storage and marketing of fresh and processed teas. Certification of teas as Organic Phou San Wild Tea and pursuing Geographic Indication and other trademarks would contribute to better quality and sales. A few growers in Ngot Phieng village are experimenting with various processing techniques, although detailed knowledge of making green, oolong, black teas and others, is uncommon.

A strong provincial body to better coordinate and advise stakeholders in promoting Phou San Tea Wild Tea would benefit the sector. The private sector also has an important role in advising on improvements in tea cultivation, processing, branding, advertising, and product labeling with possible reference to Chinese legends and the culture associated with the Plain of Jars, an area of upland valleys and lower foothills in Xieng Khouang Province scattered with huge ancient stone jars.

Although the domestic and non-Chinese market is still small, there seems to be potential for coordinated efforts to add value through improvement in quality and better marketing of organic teas. The tea market would pay a premium for Phou San Wild Tea with Geographical Indication certification.

This study offers a range of detailed recommendations for expanding and improving tea production in Xieng Khouang Province, most of which are applicable to other tea cultivation areas in Laos. The recommendations include steps for protection of wild tea stands, seed collection, cultivation, harvesting, processing, storage, packaging, logos, marketing, and coordinated local support. Improved quality by more careful post-harvest handling of the various types of tea is particularly emphasized as it would create timely benefits for farmers and add value to their wild tea products.

Above all, the villagers' affinity and love for the natural forests and their pride in Phou Wild San Tea are positive factors for both the conservation and expansion of tea growing in Xieng Khouang Province.

1 Background

1.1 Definition of tea

Tea is the most consumed aromatic beverage in the world. It is prepared by pouring hot or boiling water over cured leaves of *Camellia sinensis*[1] plants, whereas herbal tea[2] usually refers to brews of fruit or herbs made without the Camellia tea plant. Scented tea is Camellia tea flavoured with the addition of flowers and leaves such as jasmine and chrysanthemum.

The wild tea in this report refers to tea grown from wild tea seeds, either within the natural forests or cultivated in upland fields where it is mixed with other crops or transplanted to tea gardens. Ancient tea is harvested from tea trees known to be more than 100 years old.

1.2 History of tea

The Camellia tea plant is believed to originate from a large area covering north-east India, northern Myanmar, Tibet, and south-west China. Others narrow the birthplace of tea to Fengqing County in Yunnan Province, southwest China, where the world's oldest tea tree is said to grow at an age of 3,200 years (Heiss and Heiss, 2007), and is now a tourist attraction.

Tea drinking dates back to the Chinese Shang Dynasty (1556-1046 BC), when it was mainly consumed as a medicinal drink. Gradually, tea drinking spread to other Asian countries, the Middle East and Europe. During the 16th century, Portuguese priests and merchants introduced tea to the West. From the 17th century, tea drinking became fashionable among the British aristocracy who then established large-scale tea plantations in India to bypass the Chinese monopoly.

Today, tea drinking is still associated with health benefits such as cancer prevention, the reduction of cholesterol, lower blood pressure, weight loss, and so on, although not all

[1] In this context C. sinensis covers other and less known Camellia tea species

[2] Tea made using extracts from mulberry leaves are consumed by many Lao people and Asian visitors to Laos. The drink is probably the most common Lao herbal tea served in restaurants and hotels in Laos. However, as a retail product, mulberry tea is not widely known outside Laos, except in Thailand and Vietnam, which produce mulberry tea for silk production.

have been medically proven. There are 20 mg of caffeine in the average 100 g of brewed tea compared to 40 mg in the same amount of black filter coffee. But the type of tea, as well as the brewing time makes a difference.

1.3 Growth requirements and yield

Wild tea is an evergreen forest tree. It grows in areas of semi-shade reaching a height of 15 to 20 meters, taking more than ten years to bear its characteristic brown fruits. The tea plant pollinates easily with other species and varieties which result in hybrids. Agro-climatic conditions influence the yield and quality of tea and trees typically require moist conditions with a minimum of 1,250 mm annual rainfall and temperatures between 10^{o} C and 30^{o} C. Tea prefers acid soils (pH 4.5 to 5) and respond well on 5 to 10 degree slopes and well-drained soils (FAO, 2015). The yield in tea gardens also depends on the variety, plant density, regular applications of manure and/or chemical fertilizers, rainfall and irrigation. The average yield in China is approximately one ton per hectare, in Sri Lanka it is about 1.5 tons per hectare, and in Kenya about two tons per hectare (refer to Annex 1).

1.4 Tea species and varieties

The main variety in East Asia is *Camellia sinensis* var. *sinensis* (the sinensis variety) whereas the *Camellia sinensis* var. *assamica* (the Assam variety) is the most common tea variety in Laos. The Assam variety, which has longer buds and leaves, is also cultivated in northern India for the production Darjeeling black tea, and in China where it is mainly used for Pu-erh tea. The Cambodian variety has medium sized leaves and is taxonomically referred to as *Camellia sinensis* var. *laciocalyx* (Mondal et al. 2003).

Leaf, flower and seed of Lao wild

In larger tea producing countries, many clones are cultivated in tea gardens with numerous local and commercial names. There are believed to be more than 1,000 clones in China alone (see RateTea.com), where single premium quality tea plants are carefully selected for their growth, performance and unique taste and subsequently propagated by cutting off small branches. Some plants in tea gardens are up to 100 years old, but are

Wild tea flower

normally replaced after 10 to 20 years, depending on the variety, location and cultivation method. Other wild tea species[3] and members of Camellia section Thea include *Camellia taliensis*, a rare but valuable tea species for making, a Pu-erh tea. It grows in southern Yunnan, northern Myanmar and Thailand, and perhaps in northern Laos (Liu et al. 2012; Zhao et al. 2014). Other wild species and varieties growing in southern China include *C. kwangsiensis, C. gymnogyna*[4], *C. crassicoluma, C. tachangensis, C. kwangnanica, C. ptilophylla, C. costata, C. fangchengensis, C. sinensis* var. *pubilimba, C. sinensis* var. *dehungensis, etc.* (Chang 1998; Ming et Bartholomew 2007). Only a few of these are used in tea production. In the Phou San area, another *Camellia* species, *Camellia kissi* var. *confusa,* was identified during the survey from which kissi tea oil is produced in China for use in the cosmetic and health industry (see Annex 4).

Compared to the commonly cultivated tea *Camellia sinensis* var. *sinensis*, the wild tea tree is more erect and has larger leaves (see Annex 5).

1.5 Cultivation

Transplanting seedlings in tea gardens normally allows for 50 cm between plants and 150 cm between rows, with a plant density of at least 10,000 per hectare, without making hand picking too difficult. Harvest normally takes place when the tea plant has reached a height of 0.5 to 0.7 m and is done during the early morning or under cloudy conditions. Only the top 2.5 to 5 cm of new shoots containing two leaves and a bud is plucked. New young leaves and buds normally emerge within 15 days. It is important that freshly harvested leaves are kept in shaded places. Pruning is an important operation to stimulate new and fresh foliage and should be done every five years (Kumar et al. 2015).

Pests are not regarded as a serious problem, though occasional attacks of leafhoppers, plant bugs, mites, aphids, thrips, and leaf- folding and leaf-rolling caterpillars do occur. Tea trees also suffer from fungal diseases such as leaf blight, grey blight, brown blight, brown round spot, and green leaf spot, but these are normally easily controlled by regular harvesting (IPGRI 1997; Zee et al 2003). Tea bushes also become

Temporary infestation by aphids

[3] The forest tea report (NAFRI 2011) mentions *Camellia sealyama*, identified in Laos 1999, but this tea species is not widely referred to and does not appear in the updated Lao Flora of 2009.

[4] *C. gymnogyna* and *C. crassicolluma* are regarded as the most primitive species

more resistant to pest and diseases if they are well fertilized with organic fertilizers which should be applied several times during the growing season.

In some countries, tea growers irrigate, thereby extending the harvesting season and yield. However, tea leaves that develop slowly during the dry season normally produce more flavourful tea and fetch higher prices.

The natural growth and cultivation of wild tea in forests occurs where space and soil conditions allow. Naturally germinated tea seedlings are either nursed at the original location or moved to other shaded or semi-shaded areas within the forest, including fields used in a rotational shifting cultivation system. Nowadays, it is more common for seeds, from wild tea stands to be raised in nurseries and then transplanted in the forests or new tea gardens. Due to the larger spacing required between tea plants in a forest, they are raised to a larger size than those grown in rows in tea gardens.

1.6 Tea categories and processing

In addition to raising good tea plants, the key to producing quality tea is controlled drying. From harvest to the finished product, the extent to which the fresh leaves are exposed to air/oxidation[5] will have an effect on the tea. Harvested tea is processed in various tea categories/types, i.e. black[6], white, oolong, green, yellow, and Pu-erh, which often require different tea varieties and processing techniques. After harvesting, fresh leaves quickly start the oxidation process, facilitated by enzymes in the leaves. When making green tea, the oxidization process is swiftly stopped by destroying the enzymes through a heating process known as panning. For black tea, oxidation is controlled with low a temperature and the exchange of air to produce dark leaves, whereas with oolong tea the oxidation process is stopped half way by increasing the temperature. Pu-erh[7] tea is a specialty tea made from rolled large leaves which are pressed in blocks of different forms and then wrapped in paper. Teas such as Pu-erh Mao Cha can be stored for up to ten years. Storage time may be shortened by several years through an accelerated fermentation process to produce Pu-erh Mao Shoon tea. Various pressed products similar to Pu-erh teas are popular in the Chinese market and can also be found at San Jiang Market in Vientiane. Genuine Pu-erh tea is GI registered in China, and indigenous to Yunnan Province. The key processing steps for most common tea types are provided in Annex 6 and 7.

[5] Oxidation is often mistakenly called fermentation

[6] In China, black tea is called red tea due to its red colour when brewed

[7] Pu-erh is a name of a town in Yunnan Province from which the cultivation originates

1.7 World tea production and trade

During the last decade, world production of tea has increased annually by 4.2%, reaching 5.1 million tons from an area of 3.5 million hectares in 2012 (see Annex 1). The world's biggest tea producer by far is China (38%) followed by India (24%), Sri Lanka (9%) and Kenya (7%). In 2014, the annual world trade in tea was 1.7 million tons, with an average yearly increase of 3.4% during the last decade. Green tea contributed to the greatest growth in trade with an average increase of 6.4%, compared to black tea with an average increase of 1.2%. India, China, Sri Lanka and Vietnam are the largest exporters (see Annex 1). The next 10-year projection of yearly exports forecasts an increase to 3.7% for all teas and 8.9% for green tea (FAO 2016c).

Green tea is mainly produced in China and in Japan, where nearly everybody drinks it. Organic tea has recently seen a significant increase in production with India and Sri Lanka being the world's largest producers of certified organic tea. In Sri Lanka, organic tea is estimated to reach 10,000 hectares and fetch two-to-three-fold premium prices on the international market (FAO, 2016a).

During the last decade, China has shown the largest increase in tea consumption at an average of 11% per year. Whereas tea consumption in Europe has declined during the same period, in UK and Germany it has actually increased (see Annex 1).

Vietnamese tea production has been steadily expanding since the 1930s. The majority is grown in the country's northern provinces and the central highlands (Pong et al. 200x). In 2012, areas under cultivation reached 117,000 hectares (see Annex 1). A significant amount of the harvest is processed as green tea.

2 Development of the tea sector in Lao PDR

2.1 Lao tea history

The history of tea production and trading in Laos dates back to the Lan Xang Kingdom (1353 - 1707) where tea, together with other non-timber forest products were traded among feudal states in mainland Southeast Asia.

Tea cultivation in Laos began during the French colonial period (1893 - 1953), when in 1920 tea trees were brought from central Vietnam to the fertile volcanic soils of the Bolaven Plateau in Champasak Province, southern Laos.

The French administration in Hanoi recognized the unique quality of the wild[8] forest teas of northern Laos. In 1928, they commissioned a study by agronomist and tea expert, M. du Pasquier, to identify and assess wild tea in Xieng Khouang Province for its economic value and in particular to find tea plants similar to the famous Shan tea from northern Myanmar (A. J. E Marseille, 1990). The study confirmed the great potential of Xieng Khouang tea grown at higher altitudes in the Phou San area, from which the tea was noted to be identical to the Shan variety and with the same remarkable aroma. The commission resulted in the establishment of a French tea research station in Xieng Khouang Province[9] with tea plots and experimental processing of high quality green and black teas. The existence of the research station is still known about in the province.

However, as a result of the prolonged dispute and subsequent agreement between the British and French colonial powers, French tea cultivation in southern Laos, as well as the tea cultivation experiments in Xieng Khouang Province, suddenly stopped in 1932. To reduce competition on the world market, and to protect British tea plantations in Assam in India, the British demanded the French cease tea cultivation in Laos in exchange for a 10-year preferential reduced tariff agreement for oil supplies to France. In the short-term the agreement had a limited domestic impact as the Lao people did not drink much tea and the ethnic Chinese and Vietnamese favoured tea from China or Vietnam.

[8] In this report the wild tea is defined as non-vegetative propagated tea collected from the forest floor either in the form of seeds or seedlings and transplanted inside the forest or in current or previously "slash and burn" fields.

[9] Exact location has been difficult to trace, but it believed by local people to be in the area between Phou San and Phou San Noi in Paek District.

However, some harvesting of wild tea in northern Laos continued as the drinking of tea and its consumption as a vegetable had a long tradition among the many upland ethnic groups such as the Tai Dam, Yao or Mien, Khmu, Akha, and the Haw or Yunnan Han Chinese. Wild tea is also used as offerings to ancestral spirits or in other religious ceremonies.

The expansion of tea cultivation was facilitated by the adoption of the New Economic Mechanism in 1985 and private companies including Ai Savanh, Lao Coffee, Dao Huang and Lao Mountain Coffee companies gradually expanded into tea processing and trading as well as commercial tea production. However, it was at the start of this century that Lao began to experience increased demand for its tea from the China. This resulted in a ten-fold expansion of tea cultivation, from 545 hectares in 2006 to 4,140 hectares in 2015. Total tea production in 2015 was nearly 6,300 tons with an average yield of 1.5 tons per hectare. Today, Phongsaly Province in the far north of Laos has a significant 2,800 hectares under cultivation or 63% of the total planted tea area of Laos. This is followed by Luang Prabang (15%), Champasak (9%), Oudomxay (9%), Xieng Khouang (3%) and Hua Phan (2%), see Annex 2. A number of other provinces such as Luang Namtha, Salavan, Bokeo and Sayabouly are known to cultivate tea but are yet to appear in national statistics.

2.2 Market development

Chinese tea companies entered the Lao tea sector in 2005. They mainly provided Lao farmers in Phongsaly and perhaps Luang Namtha provinces with cloned tea seedlings from adjacent Yunnan Province in southwest China. Most of these companies were also involved in the rubber, vegetable and banana sub-sectors and soon realized that tea from wild tea stands in Laos'northern provinces were valuable and favoured in the Chinese market for its reputation as organic, natural and good tasting tea. In other words, the Chinese consumers were willing to pay a premium for Lao organic and natural tea while advertising its health benefits. The increasing demand of Lao tea from China was confirmed in a recent assessment of the Yunnan market for Lao wild tea

High quality packing and price of Lao wild tea for Chinese

(Smith, 2009), and stressed that Lao wild teas were priced at medium level with a potential for even higher prices, particularly for tea processed as Pu-erh tea.

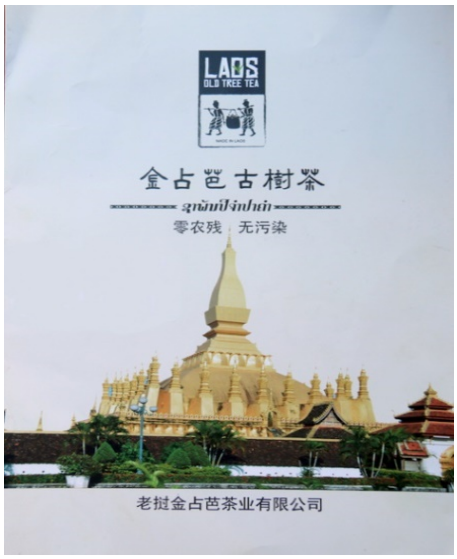
Also, around 2005, the Lao Farmer Products company became involved in the organic tea sector by working directly with organic tea growers in Champasak and Salavan provinces. They provided tea cultivation and processing services, often in close collaboration with provincial and district agriculture and forestry offices. The sales showed a promising market for Lao organic or natural teas, conforming to a global trend for tea marketed as health beverages and not just a substitute for coffee.

The most widely consumed lower end and lower priced tea in Laos is probably not Lao tea, but a cheap tea produced in Vietnam and sold at 1 to 2,000 kip for a 100 g pack.

A small percentage of the domestic market is moderately priced tea, mainly consumed by Chinese, Japanese, Vietnamese and Korean residents or workers. Furthermore, national and international tourists tend to buy medium-high quality teas.

2.3 Lao tea export

Official data on tea export is difficult to obtain. Assuming that 80% to 90% of a total harvest of 6,300 tons (MAF, 2016) are dried with factor 5 and exported, the yearly export could be in the region of 1,200 tons, representing an export value of USD 6 to 10 million or USD 6 to 10 per kg), of which nearly all is bought in bulk and shipped to China, where there are growing demands for organic and wild tea (pers. comm. with traders). Little is known about the end use, but a significant part of the tea is probably used as or mixed with other Chinese teas. One example, however, shows Lao branded Ancient Tea marketed in attractive packages with Lao landmarks such as the That Luang stupa being sold in shops in Nanning, Guangxi Province at premium prices from USD10 to 1,000 per kg. The tea types include Pu-erh tea. The Lao Farmers Product company currently sells Lao branded teas in Belgium and France where the products are



Brochure of 1,000-year Lao tea

well received, and possibly amounts to several tons per year. Additional small quantities are also sold in Germany, Russia and USA and nearby countries (Earth Systems, 2016).

2.4 Tea imports

The exact amounts of tea imported into Lao each year is unknown but foreign teas such as Lipton and Twinings (British), Ranong (Thai) and Dilmah (Malaysian) teas are widely available in larger hotels, restaurants, shops and guesthouses.

2.5 Knowledge of and training in tea cultivation and processing

Teaching and research in tea cultivation and processing is limited to non-existent in Laos. As a result very few technicians and farmers have been systematically trained or have any solid experience in commercial tea cultivation and processing. Tea subjects are not taught at the Northern Agricultural and Forestry Collage in Luang Prabang and the Faculty of Agriculture of the National University of Laos or other technical colleges. Furthermore, systematic tea cultivation research has yet to take place at the National Agriculture and Forestry Research Institute and official cultivation and processing guidelines have not been developed.

A Lao Tea Alliance was established a few years ago with representatives from donors, non-profit organizations, government and farmers, but this body has been inactive since 2014, and suggestions have been made to establish a Tea Dialogue Platform (Earth Systems, 2016).

Currently, there is no question that the private sector and tea farmers have the best knowledge about tea cultivation and processing, not the government officers. Nevertheless, the local government offices in the provinces and districts are showing increasing interest in tea production and market development.

2.6 Policy support to the tea sector

At national level, various plans, strategies and laws support the development of the tea sector. These include the 8th Socio-Economic Development Plan and the new Agricultural and Development Strategy, both of which emphasize the quantitative and qualitative improvement of tea products for domestic and international markets.

At local level, Phongsaly Province is in the process of drafting their own Tea Development Strategy to address cultivation, processing and market issues, as well as institutional capacity development. The strategy is an important step towards a possible national tea strategy.

2.7 Tea processors

There are approximately 20 Lao and foreign-owned commercial tea processors in Laos[10] which produce partly or fully processed tea, and nearly all for the export market. Among the larger tea processors are the Suyen Company and the Green Tea Company in Phongsaly Province and the San Jiang (Golden Champa) Company which operates tea processing facilities in Sayaboury and Xieng Khouang provinces.

Generally, the Lao processors are producing low-end quality teas and selling at low prices to Lao consumers, who are more price sensitive and less taste sensitive than other consumer groups.

[10] Estimate based on informal information

3 Wild tea in Xieng Khouang Province

3.1 Wild tea stands

Xieng Khouang tea, or Phou San Wild Tea, is associated with various legends told for generations among the Tai Phuan people. One key legend tells how Phou San Wild Tea reached the Emperor of China 200 years ago and he liked it so much that he requested regular shipments to Beijing. A second legend says that many years ago the Emperor of China sent the original tea seeds to Xieng Khouang as a gift for planting and cultivation, while a third and a more recent legend states that a French tea trader sent a sample of the tea to the Dowager Empress of China in the early twentieth century as a gift and that she then requested regular supplies of Phou San Wild Tea.

Wild tea grows in the forest area (217,000 hectares) of Phou San Mountain (2,218 m), located in the northern part of Paek district. However, in the hills on the western side of the peak, a number of wild tea stands can also be found at Ngot Phae village in Phoukout district where for generations farmers have been eating fresh wild tea leaves with their traditional food. Furthermore, there are wild tea stands within the Ngaan/Phou Hai Mieng Provincial Protection Forest in Khoun district and probably some in Kham district, as well other remote areas.

Large wild tea in Phou San

Since 2015, the TABI project has assisted local authorities with the marking of 1,600 wild tea trees in Phou San Conservation Forest.

Likewise, the Agro-biodiversity project currently supports the Phoukout district in mapping and marking wild tea at Ngot Phae village, thereby ensuring an ongoing initiative to protect wild tea stands.

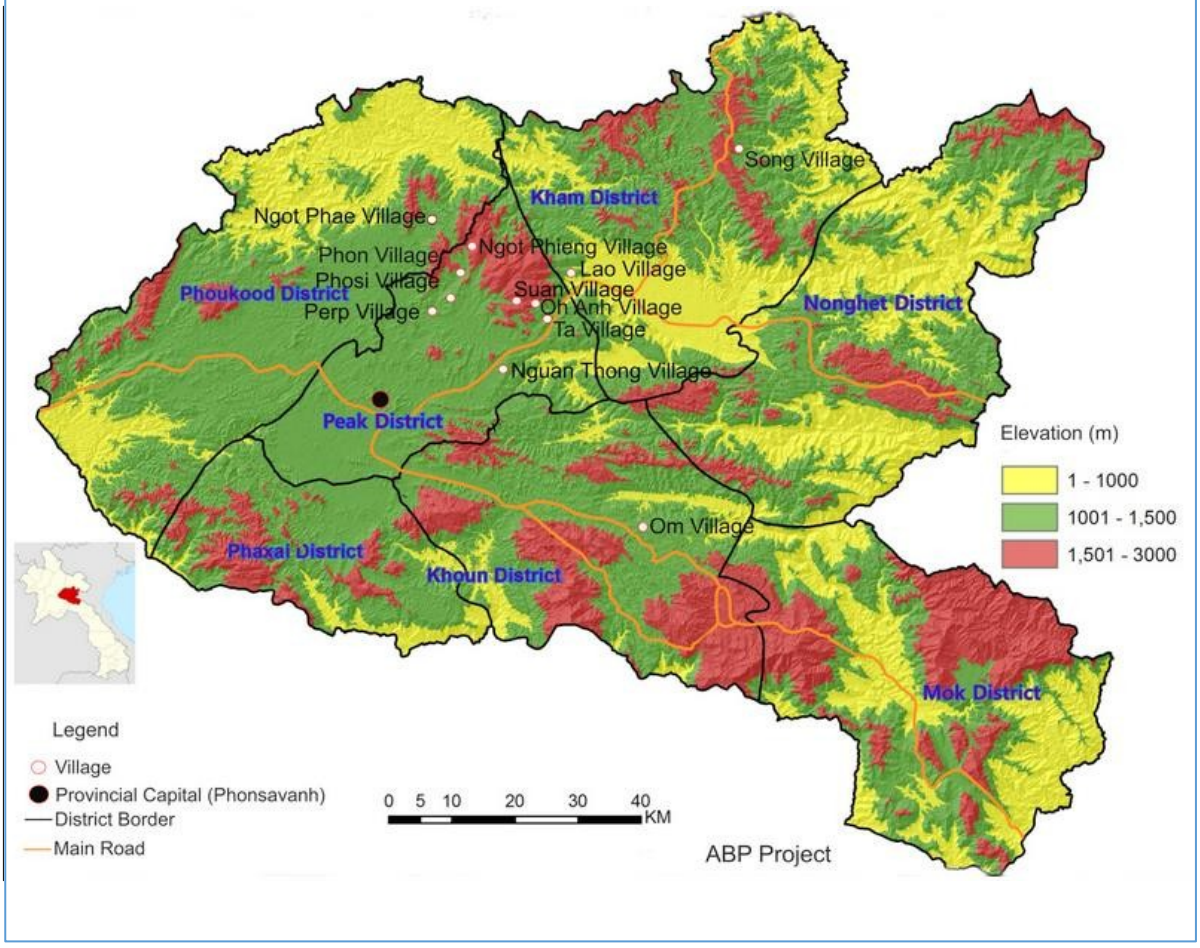
The earlier mentioned tea trials of M. du Pasquier in the early 1930s are not visible, but presumably he only experimented on wild tea at Phou San Noi Mountain, close to Ngot Phieng village.

3.2 Wild tea cultivation and processing

The survey confirms that wild tea in Xieng Khouang Province belongs to the variety *Camellia sinensis* var. *assamica* (see Annex 4), though the survey team of two Chinese taxonomists did not visit all known wild tea growing areas, including those in Ngot Phieng village.

The commercial wild tea cultivation in the province is only 10 years old and, according to the MAF statistical yearbook of 2016, covers an area of only 135 hectares (see Annex 2), equal to almost 3% percent of the total cultivated tea in Lao PDR. However, informal information from villagers indicates that the planted area, including the tea planted and harvested in the forests, is significantly larger and amounts to some 300 hectares, of which less than half is planted in tea gardens (see Table 2). Often wild tea is thinly planted or grows as part of a rotational shifting cultivation system, thus it is

Map 1: Wild tea growing villages in Xieng Khouang Province



difficult to estimate the exact area under cultivation. Bigger tea plants, if slashed, can re-grow, but seedlings are normally transplanted and intercropped at a density of 50 to 600 plants per hectare, whereas tea gardens have a much higher plant density of 5 to10,000 plants per hectare (Phouyavong et all, 2011).

The survey revealed that there are currently at least 12 wild tea growing villages. This includes eight villages in Paek district, two villages in Khoun district and one village each in Phoukout and Kham districts with a total of 225 growers (see Table 2 and the map below).

In Paek district, Ngot Phieng and Oh Anh villages are well known for Phou San Wild Tea cultivation of 45 and 104 hectares respectively. Ta, Phone and Suan villages also cultivate wild tea in a significant area of around 20 hectares each, whereas Phosi, Nguan Thong and Perp only cultivate 4, 2 and 1 hectares, respectively.

In Phoukout district, 63 families at Ngot Phae village recently started tea production on a significant scale of 88 hectares. In the last few years, a few farmers in Om village in Khoun district and Lao and Song villages in Kham district have also started tea cultivation (see Table 1).

Wild tea planted inside Phou San forest

Ngot Phieng and Phone villages have prioritized tea planting in rows in tea gardens whereas Oh Anh, Ta, Phone, Suan, and Nguan Thong villages, currently only cultivate tea within the forest. In Ngot Phae village, both systems are applied. On average, the villages cultivate an area of roughly between 1 and 2 hectares per family, and in the oldest tea growing villages of Oh Anh and Ngot Phieng all households are engaged in tea cultivation.

Additional villages are probably in the process of starting the cultivation of wild tea, and numerous villagers harvest small amounts of wild tea for their own consumption.

This study pays special attention to three villages, i.e. Ngot Phieng and Oh Anh in Pek district and Ngot Phae in Xieng Khouang Province.

Table 1. Wild tea area and growers, Xieng Khouang Province, by village 2016

District Village/hamlet	Household		Cultivated area*) (ha)		
	Total	Tea grower	Tea garden***)	Forest**)	Total
Paek Ngot Phieng	21	21	42.0	3.0	45.0
Oh Anh	50	50	9.0	95.0	104.0
Ta	33	16	-	19.0	19.0
Phone	34	26	18.0	0	18.0
Phosi	28	6	4.0	0	4.0
Suan	38	18	-	20.0	20.0
Nguan Thong	78	8	-	2.0	2.0
Perp	42	6	1.0		1.0
Phoukout Ngot Phae	176	63	53.0	35.0	88.0
Khoun Om	97	3	1.0	0.8	1.8
Kham Lao	204	2	-	0.2	0.2
Song	64	6	1.0	-	1.0
Total	**865**	**225**	**128.0**	**175.0**	**303.0**

*): Informal data from villages and DAFOs **): Not planted in rows. ***) Includes minor plots densely planted within forest

3.2.1 Ngot Phieng village

Ngot Phieng village in Paek district was resettled in 1975 by the Phuan Tai ethnic group and has 21 households, all of which are engaged in tea cultivation. The village sits in a valley at the base of Phou San Noi Mountain at an altitude of 1,200 metres, 40 km northwest of Road No. 7. The village is probably the area where M. du Pasquier carried out his tea research in the early 1930s, but unfortunately it came to a sudden halt in 1931-32 by order of the French Administration.

Supported by Oxfam, large scale wild tea cultivation is said to have started in 2007/08 by transplanting naturally occurring wild tea plants. At the same time, wild tea seeds were collected, a nursery was established, and 40,000 seedlings transplanted in various densities (from tea gardens to thinly intercropped in upland fields) by 21 families (Phouyavong et all, 2011).

In 2008, the Lao Farmers Product (LFP) company facilitated 10 days training for four farmers in Champasak Province. The group also provided processing equipment including frying pans and a roller. The wild tea is harvested from 42 hectares of tea gardens and three hectares within the forests.

Table 2: Farm gate price during dry and wet seasons, by village, 2015

Village	Fresh tea[1)] (kip/kg)		Processed tea[1)] (kip/kg)	
	Dry season[2)]	Wet season[3)]	Dry season	Wet season
Ngot Phieng	18 - 22,000	8 - 10,000	100 - 120,000	80 - 100,000
Oh Anh	30 - 50,000	20 - 30,000	180 - 230,000	80 - 100,000
Ngot Phae	18 - 22,000	8 - 10,000	80 - 100,000	75 - 80,000

[1)] Interviews with grower representatives, [2)] *Feb - May,* [3)]*June - October*

The majority of the tea is sold as fresh tea, though square-shaped pans provided by LFP in 2009 are increasingly used and several growers are now experimenting in making black and oolong teas. One grower in the village is buying fresh tea from other villagers. After processing, he uses a simple tea packing machine, where processed wild tea is packed in 500 g sealed plastic bags with a Phou San logo, the name of the processor, Mr. Khamphan, and his telephone number. The packing machine enables direct sales and increased profits.

Table 3: Income intervals and total income of three villages in Xieng Khouang Province, 2015

`Village	Income grouping of growers (million kip)					Estimated village income (million kip)
	2-3	4-5	20-30	40-50	60-80	
Ngot Phieng		7	6	6		452
Oh Anh		15	26		5	1,067
Ngot Phae	1				1	73
Total	1	22	32	6	6	1,592

In the wet season of 2015, the fresh tea price ranged from 8,000 to 10,000 kip or USD 1.0 to 1.2 per kg but fetched double this price during the dry season (see Table 2). The yearly income for the growers ranged from 5 to 6 million kip or USD 625 to 750, up to 40 to 50 million kip or USD 5,000 to 6,250 for the smallest income group of seven families and the biggest income group of six families, respectively. The total annual income for the 19 sampled growers in Ngot Phieng is estimated at 450 million kip or USD 55,000 (see Table 3).

3.2.2 Oh Anh village

Oh Anh village was resettled by a Hmong ethnic group in 1974. It is located about 8 km northwest of Road No. 7 and enjoys easy access for traders. Since 2009, 46 families have been cultivating wild tea, planted in various small plots and between forest trees within the Phou San National Protection Forest, some up to 5 km from the village. The exact area of planted wild tea in the forest is unknown but probably in the neighbourhood of 100 hectares. Another 9 hectares of wild tea are cultivated in tea gardens.

Pan drier provided by buyer

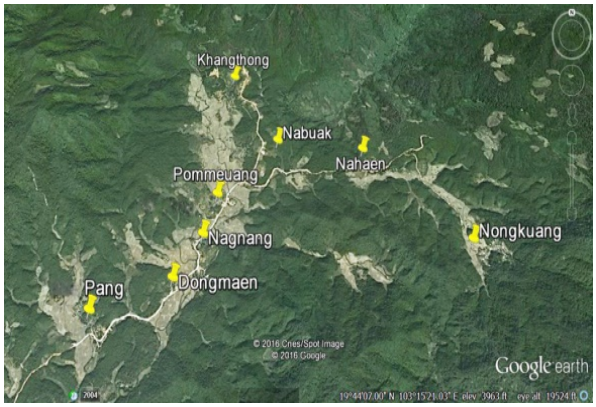
Nearly all wild tea in Oh Anh village is sold as fresh tea at a price of 20,000 to 50,000 kip with the remaining processed at a price 80,000 to 230,000 kip. This price is usually much higher than the processed tea in Ngot Phieng and Oh Anh villages, mainly due to the fact that better-off and more experienced growers are continually improving their harvesting and processing technique.

The majority of growers from the 26 families earn a yearly income of 20 to 30 million kip or USD 2,500 to 3,150. The total annual income for the 46 growers is estimated to be more than 1,000 million kip or USD 110,000, providing an average annual income of 23 million kip or USD 3,000 per farm family (see Table 3).

3.2.3 Ngot Phae village

Ngot Phae village[11] is located at an altitude of 1,200 meters in the northeastern part of Phoukout district, 35 km from Phonsavanh. In 2016, under an initiative of the former district governor, two families started to cultivate a few hundred wild tea plants, but their attempt failed as moved to Vientiane.In 2008, partly encouraged by relatives in Ngot Phieng village, a 3-hour walk over a

Map 2: Hamlets of Ngodphae village



[11] Ngot Phae village has eight hamlets of which 70% of households belong to the Phuan ethnic group.

mountain range known as Phou San Noi, Mr. Phasi, collected wild tea seeds from Phou San Mountain. That year, he prepared 800 seedlings, gradually covering an area of 3 hectares and increasing to 10,000 tea bushes by end of 2015. He started harvesting wild tea in 2010.

At the village, there are community forests covering 35 hectares containing wild tea plants. Since 2014, the wild tea growing areas have been formally assigned as Village Conservation forests to protect the wild tea and seed collection with strict regulations.

Mr. Phasi gained his knowledge and skills mainly from his relatives and traders. In 2010, he constructed a wok. From 2014, the GEF/ UNDP/FAO supported Agro- biodiversity (ABP) Project has assisted existing and potential new wild tea growers in the village by organizing farmer-to-farmer visits to Phongsaly Province, carrying out forest surveys, funding wild tea nurseries for expanding growing areas, etc. As a result, during 2014 and 2015, a total of 96,000 wild tea seedlings have been produced from seeds in the Phou San area by 63 families from six hamlets[12].

Bo1: Mr. Phasi, Ngodphae - leading tea grower

Mr. Phasi, together with his wife and children, is the leading tea producing family in Ngot Phae village. He has been harvesting Phou San Wild Tea for the last five years in an area of three hectares, the biggest tea garden in the village. He is very interested in tea production, a passion he shares with his sister's family in Ngot Phieng village. He has received valuable advice and has actively participated in local study tours. Today, Mr. Phasi is also leader of the five newly established sub-groups totaling 63 wild tea growing families. Often the new growers visit the family's well-kept tea garden and seeking advice from him.

At the beginning of the 2016 rainy season, the seedlings were transplanted to 88 hectares of upland fields, some of which were planted in young forests between trees in their slash and burn farming systems, while others were planted in rows as tea gardens. In 2017/18, Ngot Phae village is expected to produce 10 tons of tea.

In 2015, the leading tea family sold 666 kg of fresh tea and 654 kg of processed tea, earning them a total income of approximately 70 million kip or USD 9,000. Compared to Ngot Phieng village, the 2015 price for fresh tea is at the same level i.e. processed t e a fetched prices of 8,000 to 22,000 kip or USD 1 to 2.7 per kg whereas the processed tea only fetched 75,000 to

First tea garden, Phommeuang,Ngodphae

[12] Pommeuang, Khangthong, Nabuak, Nangnang, Dongmaen, and Pang.

100,000 kip or USD 9.4 to 12.5 per kg, 20,000 kip or USD 2.5 less per kg than in Ngot Phieng (see Table 3).

Currently, Ngot Phae village tea growers are gaining valuable experience and are ambitiously and enthusiastically expanding tea production. Mr. Phasi's family is the leading tea farming family and his wife and adult children assist in the tea cultivation near their village (see Box 1).

3.3 Current trade of Phou San Wild Tea

The trading of whole trees as well as wild tea leaves in Xiang Khouang Province began with the arrival of Chinese merchants in 2005. Thereafter, the brand name Phou San Wild Tea became increasingly popular among local people in Laos and throughout the region, particularly in China. Hence, today, the market value of Phou San Wild Tea has improved and it enjoys a premium price more than double of any other teas in Laos, including Phongsaly Province. This is attributed to the legend associated with the tea, its taste, and geographic location.

The total trade in Phou San Wild Tea is estimated to be 50 to 100 tons. Currently, the largest buyer and processor is the San Jiang Company, (see Annex 8) which purchases and processes Lao ancient teas from Xieng Khouang and Sayaboury provinces. In 2015, the company produced 15.3 tons of processed teas in more than 20 products, including green and black teas as loose leaves or in tea bags, as well as pressed tea blocks similar to Pu-erh tea. Each year, the Saengsavang family in Phonsavanh buys about 2 tons of Phou San Wild Tea from Ngot Phieng and Ban Ta villages and packages it in 500 g plastic bags.

Non-airtight and wrongly packed tea

The Saengsavang Company (see Annex 8) is a significant local tea trader selling to tourists at a gesthouse and the main market. The company also retails some tea for markets in Nong Khai, Thailand.

During 2011and 2012, Lao Farmers Products (LFP) exported Phou San Wild Tea to France and Belgium, but stopped due to the higher prices offered by Chinese buyers. LFP was only able to offer 60,000 kip for processed teas whereas in 2012 prices offered

by Chinese companies were often more than 100,000 kip. Today, using old stocks, the LFP has continued domestic sales of Phou San Wild Tea as its best seller at the LFP retail shop in Vientiane.

Furthermore, there has been some test marketing of the various products of Phou San Wild Tea in the United States and in China by several companies, but no new buyers are known to have entered the market at this time. However, minor Chinese and Vietnamese buyers seem to be regularly entering and exiting the Phou San Wild Tea market.

3.4 Market opportunities for Phou San Wild Tea

As mentioned earlier, the greatest market demand and highest tea prices are for quality fresh or semi-processed tea leaves from Phou San Forest, which is processed by mainly Chinese tea companies such as the San Jiang Company or on a smaller scale by Saengphet Company, both located in Phonsavanh.

Increased sales of higher quality tea are possible. However, a grading system has not yet been put in place to encourage growers to ensure higher quality tea, free of twigs and non-tea material. Sales could also be expedited if villagers had bank accounts with e-banking opportunities, are able to take telephone orders and send tea by bus or truck to their regular tea buyers. Having to wait for tea traders to make a long drive up a difficult mountain road is not a good business model. Better organization of tea growers will also improve their bargaining power and help the small scale growers. Currently, growers in Ngot Phieng and Oh Anh villages enjoy a better reputation for processed tea among buyers than those in Ngot Phae village, but with time and more focus on quality, this can and will probably change.

A general added value potentially lies with the Geographical Indication certification[13] , which was a success for Pu-erh tea in Yunnan Province in southwest China (Smith, 2009). Another option is to seek trade mark certification.

The market segments of Phou San Wild Tea can be divided into a) the general domestic market, b) the general tourist market, c) the tourist market in Xieng Khouang Province, d) the Chinese market, and e) the overseas market.

[13] Ministry of Science and Technology (MoST) and MAF are responsible for Geographic Indications (GI) including detailed regulations for certification

a) Domestic market

The key domestic consumer tea market is in Vientiane. It is very crowded, competitive, and based mainly on price. The market for Phou San tea is small, but generally sells at higher prices than tea from other northern provinces and southern Laos. Hence, currently the domestic market for Phou San Wild Tea is limited. Furthermore, the packaging by most traders and processors tends to be unattractive and poorly marked. LFP has the most attractive packaging with a Plain of Jars logo. San Jiang Tea Company also has very appealing packaging for around 20 tea products, but they are aimed at the Chinese market. The labels have been translated into Lao and English but the text is mostly confusing, whereas the Chinese text is much more detailed and precise.

Example of labeling by LFP

b) General tourist market

Foreign visitors to Laos are less price sensitive than Lao consumers and respond well to reasonable prices and attractive, durable packaging for possible gifts of familiar oolong, black and green teas. They are more demanding in terms of taste and quality, and react positively to "organic" or "natural" and an eye-catching story. This is an important target market for Phou San Wild Tea as no other Lao teas have the same compelling legends related to the Imperial Household of China.

c) Tourist market in Xieng Khouang

Tourists visiting Xieng Khouang Province are currently the most attractive market segment for Phou San Wild Tea. In connection with visits to the Plain of Jars (soon to be a designated UNESCO World Heritage Site) both foreign and domestic tourists will be happy to purchase Phou San Wild Tea, provided it is much better packaged, beautifully labeled as organic or natural tea, and possibly certified with the Geographic Indication mark. Thus, there is a growing and promising market of high priced Phou San Wild Tea in Phonsavanh at the town's central markets, the Plain of Jars visitor center, at tea tasting events, and sales in connection with tea garden visits showing well managed tea gardens and processing techniques. As in China, tea tourism has a great potential for Xieng Khouang Province, provided that good quality products can be offered for oversees and Chinese tourists. Tour packages, offered by local travel agencies would gain value with visits to tea growers and wild tea stands in the forests.

d) Chinese market

The Chinese market for more expensive specialized organic wild teas from Laos is growing and consequently a number of Chinese companies such as the Chinese San Jiang Tea Company is increasingly purchasing fresh or semi-processed Phou San Wild Tea both from the from the forest and cultivated tea using seeds from wild tea trees. Lao wild tea is now well known in China as organic and natural tea from forests of the mountainous north and is offered in attractive gift packs. In China, Phou Wild San Tea is also known as the "pure water" coming from high hills (pers. comm.).

e) Overseas markets

Beyond China, there is a record of good but small scale sales of Phou San Wild Tea and other Lao teas by Lao Farmers Products in Europe, including Belgium and France. Some market testing has been done in the United States, mainly among Lao immigrant communities. In 2016, there have been at least two orders of small quantities of processed black teas from Ngot Phieng village, a 5 kg order from a German buyer and a 3 kg order from an American buyer. With local government and market support, foreign markets could expand further.

3.5 Self-financing and access to credit

It is not clear to what extent growers are self-financing or receiving informal credit from relatives and advances from buyers, or receiving formal credit from banks. Currently, in the Phou San area, growers typically using family labour for clearing land, tending nurseries, planting, pruning, weeding, harvesting, and so on. This gives the impression that they can easily finance their needs for minor equipment such as pruners/scissors, simple processing equipment such as roasters, pans and stoves, and simple packaging materials of air-tight plastic bags, storage baskets, and so on.

In the future, however, formal credit may be needed, depending on size of fields, if there is a need for extra labour during peak times, and when more advanced processing equipment is required. Anoby Bank and the Agriculture Development Bank are keen to make low interest loans to tea farmers. Both banks prefer group loans with Anoby Bank providing the best services and lowest interest rates, but only to poor districts including Khoun, Kham and Phoukout districts (see Annex 7).

Furthermore, there is anecdotal evidence that some companies provide production credit - advance payment in exchange for an exclusive right to purchase the harvest at a specified price, although this practice has not been reported during this field study.

3.6 Expansion and improvement of Phou San Wild Tea

The upland areas of Xieng Khouang Province favours tea cultivation, provided it is grown on good non-alkaline soils with sufficient rainfall and soil moisture. Hence, there seems to be good potential for expanding cultivation areas as an integral part of current upland cropping systems. It would also be an excellent way to reduce slash and burn practices. Dedication to and interest in tea production, as well as availability of labour for weeding, plucking and processing, are equally important issues that must be taken into consideration before starting up. If organic production is preferred, manure must be easily available to maintain soil fertility. Prior farmer-to-farmer visits to successful villages would also help potential tea growers make the right decisions.

Regarding the many new tea growers in Ngot Phae village, it is important they prepare well for the 2018 season, when the first plucking of more than 90,000 tea bushes is expected to take place. A dual strategy of selling fresh, partly processed and fully processed tea (e.g. green, oolong, and black) would make them more competitive. For the short term, simple-low-cost technologies currently being used by Mr. Phasi are appropriate. Continued exchange of experiences with Ngot Phieng would help improve cultivation, harvesting, processing, and storage. This includes improved post-harvest technologies and packaging of the processed tea. For example, the tea at Ngot Phieng is stored in air-tight plastic bags or double bags to maintain quality. New logos and packaging plans have also been introduced.

For the non-Chinese market, it is important to understand what appeals to consumers. Assistance from professionals on how to improve quality, advertising, price fluctuations, and market mechanisms should be considered.

Furthermore, buyers are attracted to reliable sellers, with sufficient volume to justify transportation costs and quality.

With respect to climate change, including prolonged drought and unpredictable rain, tea gardens seem to be more resilient than most other crops and can withstand a higher degree of weather fluctuations.

3.7 Local institutional support for Phou San Wild Tea

In Xieng Khouang Province, there is widespread acknowledgement of the importance of wild tea cultivation in the upland areas, as well as limited planting of wild tea cultivation inside protected forests. Provincial agencies generally regard the planting of tea in conservation areas as a way of protecting the forests. Provided that no logging takes place, they accept that villagers receive economic benefits from the limited and controlled plots.

The Xieng Khouang Social and Economic Development Plan (2010-20) promotes cultivation and processing of wild teas by small farm holders. It assigns the Provincial Office of Agriculture and Forestry (PAFO)[14] and the Department of Natural Resources and Environment (PoNRE) and their district offices to support wild tea production, both inside and outside the Protection and Conservation forests, covering total area of 25,000 hectares.

The PAFO's Development Plan for 2010-30 notes that tea is an important product for the province and describes Paek district as the key area of cultivation. Phoukout district is not mentioned, as the plan may have been written before tea cultivation at Ngot Phae village started in 2008.

The Provincial Biodiversity Strategy and Action Plan (PBSAP) 2012-20 also highlights tea production by promoting the expansion of wild tea in Paek and Khoun districts (Action Plan1.3.2.1.k).

The DAFO in Phoukout district now considers tea cultivation to be a priority for diversification of agriculture and notes that the previous extraction of wild tea trees by Chinese companies was unfortunate and has stopped.

Continued technical support from local government agencies will ensure that new tea farmers use improved methods and that lessons are learned from growers in other areas. The coordinated efforts of multiple agencies in obtaining Geographical Indication (GI) certification for Phou San Wild Tea is one of several tasks ahead. The Ministry of Science and Technology, Department of Intellectual Property, Trademark and Geographical Indication Division is mandated to assist with GI and a trademark registration for Phou San Wild Tea.

[14] From 2016 PAFO is (again) responsible for all forest categories

“A rising sea will lift all ships” and certification for all wild tea producing areas of Xieng Khouang Province will be an important step in promoting the Phou San Wild Tea brand and attracting more buyers.

Collaboration among local stakeholders in marketing Phou San Wild Tea will benefit all, including the tourist sector with sales at tourist and market venues. A well-produced booklet of the French tea study of 1931 could also be part of the marketing strategy, together with the Plain of Jars.

4 Recommendations

Based on discussions with a number of stakeholders in Xieng Khouang Province and in Vientiane, the following detailed recommendations are provided for the Phou San Wild Tea sector.

1. Protection of Phou San Wild Tea

- Ancient wild tea trees in the forest should be effectively protected from being felled and harvested
- Forest areas containing wild tea should be designated as regulated conservation areas with signboards, agreed to by village and district authorities
- Official protection labels should be put on valuable wild tea stands for stating the plants are protected and for seed collection only

2. Collection of seeds

- Collection of seeds from the forests should be done in October when trees provide the most seeds, not in August as done in the past

3. Selection of tea plants

- The specific origin of tea seeds and the seedlings of cultivated tea should be recorded
- Growth performance notes (e.g. response to stress and disease resistance) of individual and groups of plants should be made for later selection of new plants, either from the seeds of wild plants or cuttings from branches
- The selection of good tea plants should also be based on cup tea quality (aroma and taste) by submitting tea samples to blind tasting events

4. Tea cultivation

a) Collection of seeds and care in the nursery

- Shortly after seed collection, the seeds should be placed in water for 24 hours and sinkers should be separated from floaters
- Plastic planting bags should be 10 cm in diameter, which are larger than previously used
- Prior to transplanting, shading should gradually be adjusted to give the same amount sun exposure at the transplanting area

- Transplanting should take place when seedlings are about 30 cm high

b) Shading in tea gardens

- Bigger trees should be left to protect young tea seedlings from the sun and to increase tea quality. The aim is 30 to 50% shade
- Suitable fruit trees and leguminous trees should also be planted

c) Fertilization and mulching

- Soil analysis (P, K & pH) should be carried out to assess if the soils need plant nutrients
- Depending on production type and preferred number of harvests, organic fertilizers should be applied several times
- Weed mulch should be applied at the base of the tea bushes
- Simple fertilizer and mulching demonstrations should be carried out by the growers to study results and make decisions on larger areas

d) Transplanting to tea gardens

- The spacing of tea plants in the tea garden should aim at 150 cm between rows and 50 cm between plants. This will optimize plant coverage and yield and reduce weeds
- Prior to transplanting, furrows should be made that follow the contours

e) Pruning

- Tea plants should be pruned, allowing a yearly growth of 15 to 20 cm and ending with a height of 1.0 to 1.2 m
- Thinly planted tea plants should also be pruned, though they should be allowed to become taller

5. Harvesting fresh leaves

- Fresh tea leaves should be plucked in cloudy weather or during the early morning before the sun becomes too strong
- Two or three young leaves plus the bud should be plucked from each shooting branch
- Fresh plucked tea leaves should be transported in local bamboo or rattan baskets to ensure air can flow freely. The leaves should kept in a shady area

to avoid direct sun, otherwise leaves and stem may turn red and tea may become bitter.

6. Processing – fixation, drying and grading

- After plucking, leaves should be processed into the preferred tea type (green, black, etc.) and to the buyers' preference
- Careful planning of pan and/or sun drying and/or frying and/or rolling should be considered for required tea type and taste
- Before final drying the tea leaves should ideally be rolled by hand or using a roller machine with a barrel diameter 25 to 35 cm, which will improve appearance and quality
- Depending on the market/buyer preference, tea leaves should be carefully cleaned of dirt, twigs and other material. Later, as tea production improves, tea can be graded to add value for buyers requiring better quality products

7. Storage

- To maintain good tea quality, the final tea should be dried to less than 6% water content and must be stored in air tight plastic bags with a tight seal or be double bagged

8. Organization, sales and marketing

- Growers should formally familiarise themselves with local bylaws, and in the longer term form a Phou San Wild Tea Growers Association
- Growers should learn how to access the price of local and specialised teas, either through the media and internet or by making use of trusted persons
- Growers should consider marketing their own products with high quality labeling and information about their area
- Growers should collaborate with tourist companies to promote their villages as producers of unique tea. The tea should be sold in the villages in attractive bags with standard weights and consistent quality

9. Record keeping

- Growers should be trained in simple record keeping, including the origin of tea seeds and plants, resistance to stress and diseases, yields, prices, sales and names of buyers

10. Manual in Lao and English

- Growing, post-harvest and market information materials with easy to understand illustrations and photos should be developed for extension workers and growers

11. Expanding the tea area

- Provincial authorities should carry out a study for the possible expansion of wild tea production, taking into account improved quality products and market demands
- Villages with suitable agro-ecology should be encouraged to consider wild tea production, facilitated by farmer visits to experienced growers

12. Lao Tea Strategy

- A Lao Tea Strategy should be prepared to guide the government in further developing the tea sector in Lao PDR

13. Coordinated local support

- Provincial authorities should take the lead in establishing a permanent forum with the aim of bringing together all stakeholders, including grower representatives, with the view of improving cultivation, quality and the market
- Central and local authorities should consider promotional events and pursue Phou San Wild Tea with GI, organic, and other certifications.

5 Conclusion

Wild tea production in Xieng Khouang Province is a viable economic crop for smallholder farmers. It has the potential to be a major income earner for the province with the added advantage of protecting natural resources and a rich biodiversity.

The study confirms that Phou San Wild Tea belongs to the famous *Camellia sinensis var. assamica*, the variety most likely referred to in century old Chinese legends, and characterized by a unique flavour and taste.

In terms of volume, wild tea from Xieng Khouang Province is only 245 tons annually, equal to 4% of the total production in Lao PDR. A total of 12 villages have been identified for wild tea cultivation, and all except for two are close to Phou San Mountain. Consumer markets in Laos, and especially in China, value Phou San Wild Tea and more than 90% is purchased by Chinese tea traders who prefer to buy fresh tea and export it in bulk to China. In 2015, Phou San Wild Tea obtained a farm gate price of up to 8,000 to 50,000 kip or USD 1.0 to 5.5 per kg for fresh tea and 75,000 to 230,000 kip or USD 9 to 28 per kg of processed tea. These prices are double the value of other natural or cultivated teas in Laos and 10 to 20 times higher than low end imported teas.

Together with several other villages in the province, Ngot Phae village in Phou Kout district is a new growing area where 63 families in 2015 and 2016 transplanted 93,000 Phou San Wild Tea seedlings in upland fields with an expected harvest from 2018 onward. From the existing 3.5 hectares of tea gardens planted in 2008, the 2015 income of two families amounted to 73 million kip, equal to USD 9,100. In two other surveyed villages, all households were engaged in tea cultivation. In 2015, the 20 families in Ngot Phien village earned a total of 450 million kip or USD 55,000 from their tea gardens, whereas the 73 families in Oh Anh village received roughly 1 billion kip, equal to USD 125,000, from wild tea mainly cultivated tea inside Phou San Forest.

The key to continued success in tea production is improved tea cultivation practices and better processing and storage of fresh and processed teas. Certification of teas as organic Phou San Wild Tea and pursuing Geographic Indication and other trademarks would contribute to better quality and sales. A strong provincial body to better coordinate and advise stakeholders in promoting Phou San Wild Tea would also benefit the sector.

Tourists often express interest in Phou San teas but since there are no well-known sale points or market channels for these teas, sales are sporadic and supplies often limited.

The private sector has an important role to play. It can provide advice for improvements in tea cultivation and processing, and not least in the branding, advertising and product labeling, including an association with Xieng Khouang and the symbol of the Plain of Jars.

Annex 1. World tea cultivation, production, yield, export and consumption, 2000, 2005, 2010 and 2012

Region/country	Cultivation ('000 ha)				Harvested ('000 tons)				Yield (tons/ha)				Export ('000 tons)				Consumption ('000 tons)*			
	2000	2005	2010	2012	2000	2005	2010	2012	2000	2005	2010	2012	2000*	2005#	2010^	2012^	2000	2005	2010	2012
World	**2,368**	**2,686**	**3,150**	**3,517**	**2,980**	**3,526**	**4,365**	**5,064**					**1,337**	**1,531**	**1,683**	**1,769**		**3,362**	**4,180**	**4,627**
Far East					**2,155**	**2,573**	**3,280**	**3966**						**995**	**1,036**	**1,078**				
China	998	1,059	1,420	1,513	704	953	1,487	1,714	0.78	0.90	1.03	1.13	288	287	302	330		675	1,482	1,614
India	490	521	579	605	826	907	991	1,000	1.69	1.74	1.71	1.65	194	188	182	209		757	839	1,001
Sri Lanka	189	213	222	222	306	317	331	330	1.62	1.49	1.49	1.49	277	299	306	311				
Indonesia	121	143	125	123	163	167	150	150	1.34	1.17	1.21	1.23	101	102	87	71			60	65
Vietnam	70	98	113	116	70	133	198	217	0.99	1.36	1.75	1.87		89	138	134			28	32
Others					143	110	155	160						31	20	24				
Africa					**412**	**506**	**616**	**650**						**448**	**543**	**596**				
Kenya	120	141	172	191	236	328	399	369	1.96	2.32	2.32	1.93	239	309	362	416			19	27
Uganda	16	20	27	27	29	38	49	51	1.86	1.87	1.82	1.89	26	33	54	57				
Malawi	18	18	23	25	42	38	52	54	2.14	2.11	2.30	2.14	40	43	49	41				
Tanzania	19	21	11	4	24	30	33	33	1.23	1.45	2.90	na		23	27	26				
Latin Am/Carrb.					**67**	**89**	**107**	**95**						**71.2**	**89**	**76**				
Argentina	39	36	37	38	54	73	91	100	1.9	1.87	2.38	2.63		66						
East						**233**	**262**	**254**												
Turkey	77	77	76	76	139	205	235	225	1.80	2.83	3.09	2.97							242	228
Egypt																			69	99
Pakistan																		134	120	127
Iran	32	34	19	24	50	59	166	158	1.55	3.09	2.97	na							90	83
Morocco																			54	57
Japan	50	49	47	46	85	85	100	86	1.69	2.05	1.81	1.87						150	124	119
EU																			**230**	**242**
UK																		128	120	116
Germany																			25	29
Others																			86	97
Russia																		**180**	**178**	**159**
USA																		**100**	**124**	**127**

Source: FAOSTAT. *: FAO, 2015a

Annex 2. Tea cultivation in Lao PDR, 2006 - 2015

Year	Planted area (ha)	Harvested area (ha)	Production (ton)	Yield (t/ha)
2006	545	490	610	1.24
2007	740	740	1,040	1.41
2008	1,270	1,250	1,395	1.12
2009	2,155	2,145	2,165	1.01
2010	3,795	2,415	2,600	1.08
2011	3,660	2,665	3,410	1.28
2012	3,395	2,705	3,975	1.47
2013	3,895	3,440	6,105	1.77
2014	4,970	3,990	7,935	1.99
2015	5,140	4,180	6,295*	1.51

Source: Statistical Center, MAF. 2016

*) Production in Luang Prabang corrected from 3,610 t in 2014 (yield 5.0 t/ha) to 1,180 t in 2015 (1.5 t/ha)

Annex 3. Tea production in Lao PDR by province, 2015

Province	Planted area (ha)	Harvested area (ha)	Production (ton)	Yield (t/ha)
Phongsaly	3,235	2,275	4,100	1.80
Oudomsay	445	445	480	2.00
Luang Prabang	785	785	1,180	1.50
Huaphan	80	80	100	1.25
Xieng Khouang	135	135	245	1.81
Champasak	460	460	190	0.41
Total	**5,140**	**4,180**	**6,295**	**1.51**

Source: Statistical Center, MAF 2016

Annex 4. Tea species and their location in three areas of Xieng Khouang Province, December 2015

Taxon	Locality	Altitude (m.a.s.l.)	GPS	Habitat
Camellia sinensis var. assamica	Khoun district, Nalan village Phou Hai area	1,545	19°8′22.3″N 103°40′35.3″E	Secondary forest
Camellia sinensis var. assamica	Khoun district, Nalan village Phou Hai area	1,530	19°8′23.6″N 103°40′36.0″E	Secondary forest
Camellia sinensis var. assamica	Khoun district, Nalan village Phou Hai area	1,570	19°8′23.8″N 103°40′36.3″E	Secondary forest
Camellia sinensis var. assamica	Khoun district, Nalan village Phou Hai area	1,530	19°8′23.7″N 103°40′35.7″E	Secondary forest
Camellia sinensis var. assamica	Khoun district, Nalan village Phou Hai area	1,580	19°8′23.5″N 103°40′36.0″E	Secondary forest
Camellia sinensis var. assamica	Khoun district, Nalan village Phou Hai area	1,580	19°8′23.5″N 103°40′36.0″E	Secondary forest
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1,151	19°44′10.7″N 103°14′32.8″E	Introduced
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1154	19°44′6.0″N 103°14′50.2″E	Introduced
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1,150	19°44′19.6″N 103°15′3.0″E	Remnant forest near village
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1,150	19°44′19.8″N 103°15′1.2″E	Remnant forest near village
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1,150	19°44′20.3″N 103°15′1.7″E	Remnant forest near village
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1,155	19°44′22.0″N 103°15′4.1″E	Remnant community forest near village
Camellia sinensis var. assamica	Phoukout district Ngot Phae village	1,155	19°44′22.0″N 103°15′4.1″E	Remnant community Forest near village
Camellia sinensis var. assamica	Paek District Phou San	1,843	19°39′0.1″N 103°23′10.5″E	Natural forest
Camellia kissi var. Confuse	Paek District Phou San	1,868	19°38'41.75"N 103°23'25.40"E	Shrubs in natural forest

Survey collectors: Shi Xiong Yang, Dong Wei Zhao, and Ole S. Pedersen

Annex 5. Key morphological differences between wild tea and modern Chinese clones

Characteri-stics	**Wild tea** (mainly *C. sinensis* var. *asamicca*)	**"Modern Chinese clones"** (mainly *C. sinensis* var. *sinensis*)
Tree shape	Arbor and semi-arbor, mostly erect	Arbor and semi-arbor, mostly erect semi-arbor and shrub, mostly semi-spreading and spreading
Leaf	Middle or large**, 10 to 25 cm** in size**;** surface cuticle thicker, crisp; **vein unclear**; surface smooth or slightly elevated; spare and **obtuse serrulate margin**	Middle or small, **6 to15 cm** in size; soft and thick texture; **vein clear**; surface smooth or slightly elevated; **acute serrulate margin**
Shoot	**3 to 5 scales on overwintering bud**; green or yellow green, without or with slight pubescence	**2 to 3 scales on overwintering bud;** yellow green or greenish, with or slight pubescence
Corolla	**4 to 8 cm in diameter**, **8 to15 petals**, white and thick Mostly >0.7	**2 to 4 cm in diameter, 5 to 8 petals**, white, greenish or reddish
Male part	70 to 250 filaments, thick and long; large anther with Odors	110-300 filaments, thin and long; small anther with Fragrance
Female part	Ovary with or without pubescence, (3) 4 to 5 splitting Style	Ovary with or without pubescence, 2 to 5, mostly 3 splitting style
Capsules	Diameter 3 to 5 cm, 0.2 to1.2 cm hard pericarp, thick and long central axis	Diameter 2 to 4 cm, 0.1 to 0.2 cm soft pericarp, short and thin central axis
Seeds	**2 cm in diameter,** scabrous, brown or deep brown, globose, **reniform or sub-globose, seed ridge angular**	1-2 cm in diameter, smooth, brown or deep brown, **mostly globose**, **seed ridge unclear**
Leaf structure	Thick cuticle, upper surface cell larger, palisade tissue one layer, stomata density lower, sclereide big with starry branches	Thin cuticle, upper surface cell small and closely arranged, palisade tissue 2 to 3 layers, stomata small, sclereide rare and small usually reniform

Source: Extracts from Yu F. and Chen L.: Indigenous Wild Tea Camellias in China, Tea Research Institute, CAAS, China

Annex 6. Key tea processing steps of main tea types

Process/Type	Pu'-erh	White	Oolong	Black	Green	Yellow
Withering	X	X	X	X	(x)	
Heating to stop oxidation	X				X	X
Rolling	X		X		X	X
Oxidation	(x)	(8 - 15%)	(18% - 80%)	100%		
Drying	X	X	X	X	X	X
Fermentation	X					
Grading	X	X	X	X	X	X
Re-dried	X					
Aged	X					

Withering: Initial drying of bruised or torn leaves to evaporate that makes the leaf soft
Fixation: Stop oxidation by heating
Rolling: Forming leaves in desired shape. Sometimes called squeezing.
Oxidation: The most crucial step. Leaf enzymes control the process that can be accelerated by rolling, cutting or cruising
Drying: Sun, pan/wok, baked, air-dried
Fermentation: Microbiological process taking place in Pu'erh tea, but with low water content

Annex 7. Tea types

Green tea may initially be uniformly sundried (withered) for few hours or indoor with good air circulation. Green tea lacks the oxidation processes, which is immediately stopped (fixation) to avoid enzymes breaking down the polyphenols in the tea leaves e.g. by using pans or hot air. After this process, the leaves are still dull green, and slightly sticky and fragrant with a water content of about 60%. Rolling helps the tea to improve appearance, but still retain its fragrance. Drying down to 6% water content should be done in several stages (e.g. with a horizontal drier with forced air), and without the tea gets too sticky. The final stage is drying on a pan.

Oolong tea is a traditional semi-fermented aromatic tea, originating from Taiwan and Fuijan in eastern China. It undergoes a unique process of withering under sun and/or shadow evaporation to promote oxidation, and shaking to promote the damage of leaf margins before panning at high temperature to stop enzymatic oxidation process. Curling/ twisting/bruising and the final drying is to less than 4% water content. Particular tea varieties are grown with specific flavours. High quality oolong can be steeped several times from the same leaves and, unlike other teas, it improves with re-brewing up to five times.

Black tea is allowed to oxidize before final drying. After withering, the continued oxidation process allows enzymatic changes in leaves with the result that the final brew becomes reddish or brownish. Orthodox processed black tea leaves are heavily rolled either by hand or mechanically on a cylindrical rolling table or a rotorvane. The rolling table consists of a ridged tabletop moving in an eccentric manner to a large hopper of tea leaves.

White tea has been slightly oxidized by a short withering period before halting the oxidative processes in a pan. In China, white tea is fully oxidized by letting the tea dry out naturally in sunlight without rolling or curling, as done in black tea.

Yellow tea is processed in a similar manner to green tea, but instead of immediate drying after fixation, it is stacked, covered, and gently heated in a humid environment which gives a yellowish or greenish-yellow colour.

Pu-erh tea comprises of two kinds; an ancient traditional method, Pu-erh Sheng or Mao Cha, and a quick aging ripe Pu-erh version, the Pu-erh Shou.

a) Mao Cha, also called rough tea or Pu-erh Sheng is light green in colour. It requires large tea leaves(such as Lao Wild Tea). The big dark green colored leaves are briefly sundried, before the oxidation process is nearly stopped by heating on pans or in a large wok. It is then packed into traditional round cakes or other forms and stored for up to ten years in rooms with good air circulation and humidity of less than 80% . Compressing the tea slows down the microbiological fermentation process. This tea, normally has a very mild flavour and reddish-brown colour. Alternatively, the tea can be left uncompressed and the maturing process (fermentation) will be significantly shortened.

b) Pu-erh Shou is also called raw or ripe Pu-erh and treated much like composting with regular piling, wetting and mixing. The process is difficult and needs a lot of attention. The process is normally completed within 45 days.

Source: Extracts from Wikipedia and others

Annex 8. Buying and processing companies of Phou San Wild Tea

1. San Jiang (Golden Champa) Company, Vientiane
Manager: Mr. Zhou, San Jiang Market and Grand Hotel, Ban Dong Pa Sack, Vientiane.
This Chinese owned and Lao registered company is the largest single buyer and processor of teas from Xieng Khouang Province. Their labels are also in English and traded under three different names including the Yunnan Tea Company. Often inconsistent labeling in English and Lao.

2. Champa Kham Tea Xieng Khouang Lao Co. Ltd.

Owner: Mr. Ting Kuajanng (Chinese), Ban Thongmixay, Pek District

3. Xannou Natural Tea Xieng Khouang Lao Co. Ltd.

Owner: Mr. Han Sion (Chinese), Ban Phonsavanhxay, Paek District

4. Keo Paththana Chaleune Co. Ltd.

Owner: Mr. Keo Tasamak (Lao), Address: Ban Nakon, Mok District

5. Hatthakham Pounteng Kheangdeum Co. Ltd.

Owner: Mr. Sengphet Phoutthavanh, (Lao), Ban Ngeoy, Paek District

6. Lao Farmer Products Inc.
Manager: CEO, Dr. Sisaliao Svengsuksa, Address: 158 Mittaphab Lao Thai Road, Vientiane
Lao Farmers Products (LFP) is a registered cooperative that started the commercial tea production of the Phou San Wild Tea in Xieng Khouang Province. From 2010 to 2012, LFP purchased about 3 tons of Phou San teas annually, mainly wild tea from two larger tea producer group areas covering Oh Anh and Ngot Phieng villages, and some tea from Ngot Phae village in 2012. However, since 2012, LFP has not purchased processed tea from these villages as prices have exceeded 60,000 kip/kg. LFP continues to sell Phou San Tea at its sales office and at markets in Vientiane from the tea stock purchased several years ago.

6. Intermittent or occasional buyers
Chinese companies from Luang Namtha occasionally buy processed tea, in addition to some buyers from Vietnam. Some of the Chinese companies provided tea roasters and other drying facilities to villages in or near Ngot Nam Ngum, either as a gift or purchased by the villagers. However, this information is sketchy as farmers are not keen to discuss it.

7. Lao retailer
Owner: Ms. Bouvan Saengsavang (Lao), Saengthavang Guesthouse, Phonesavanh, Paek District
Multi-product food processor and handicraft company repacking Phou San Tea in 500 g packs. Currently, the company buys about 2 tons per year of processed tea from the larger tea farmers and better tea processors such as Mr. Tong Zer Moua at Oh Anh village and Mr. Khampanh at Ngot Phieng village. The Saengthavang Company is not registered with the DoIC official as a tea trader. Nevertheless, it is a significant local tea trader selling to local tourists in the main market near the bus station, at their guest house and even exporting to markets in Nong Khai, Thailand.

8. Smaller Chinese companies
From 2012 to 15, some smaller Chinese companies and the larger San Jiang Company have provided some technical assistance and/or donated fryers and roasting buildings and equipment to some villagers or villages. This information has been difficult to document as they appear to be gifts to encourage the goodwill of the villagers towards the companies and to instill customer loyalty.

Annex 9. Main formal credit institutions

a) Anoby Bank

Anoby Bank is a poverty alleviation, rural development and agriculture focused bank financed directly by the Bank of Lao PDR. It has no capital of its own and confines its work to the 46 poorest districts in the country. In Xieng Khouang Province, the poor districts are Phou Kout, Kham and Khoun. Kham and Khoun districts already have branches and a branch in Phou Kout is scheduled to open in 2017. Preferences are given to groups of 5 to 50 million kip per family and not exceeding 200 million per group. Interest rates are 5% p.a. but less with 2 to 5 year loans and no collaterals are needed. The strong point of the bank is "joint solidarity groups" whereby each member of the group guarantees the loan repayments of each member of the group. The bank also has a training component. So far, no loans have been taken out for tea growers in Xieng Khouang Province, but Anoby Bank seems very interested in the tea sector and Phou Kout District in particular.

b) Agriculture Promotion Bank

The Agriculture Promotion Bank (APB) provides loans for agricultural production, small business and related sectors. In Xieng Khouang Province, the APB mainly supports maize, livestock and fish production activities. Loans may be given to individuals or groups of 5 to 6 households of a period of 1to 5 years with a ceiling of 10 to 50 million.

If income from the loan activities do not accrue until several years (as can be the case in tea production), the borrowers can just repay the loan interests and not the principle until production revenues begin. Compound interest rates are set at 12 to15% per year. As regards required documentation for loan applications, borrowers must have a set of standard Lao ID cards, family books, land use titles or property which can serve as loan collateral. The APB Credit Department is interested in the tea sector for Xieng Khouang Province, but so far the bank has not made any loans in this sector. The APB has branch offices in all districts of the province and welcomes viable agriculture proposals.

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