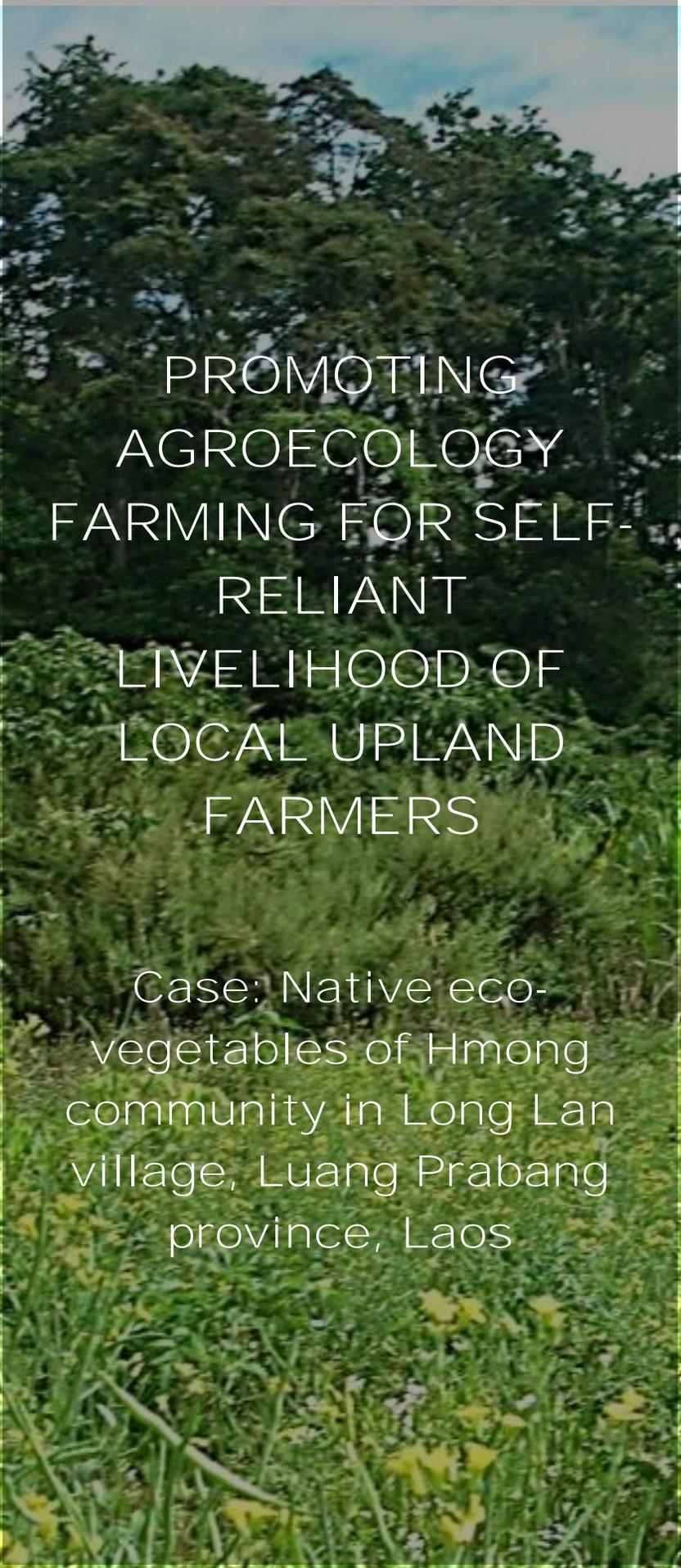


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**SOCIAL POLICY RESEARCH
INSTITUTE - SPERI**

PROMOTING
AGROECOLOGY
FARMING FOR SELF-
RELIANT
LIVELIHOOD OF
LOCAL UPLAND
FARMERS

Case: Native eco-
vegetables of Hmong
community in Long Lan
village, Luang Prabang
province, Laos





"Promoting agroecology farming for self-reliant livelihood of local upland farmers through documenting the case of native eco-vegetables of the Hmong community of Long Lan village, Luang Prabang district, Luang Prabang province"

Organizations to financially support the production of this document



This document contains the **local and ethnic knowledge** of the Hmong people of Long Lan village, Luang Prabang district, Luang Prabang province, Lao PDR. It relates to community institutions in the management of natural resources, agricultural practices, and animal husbandry, as well as the behavior of the people towards natural ecosystems.

The document has been developed based on the lessons learned by the CHESH Lao Program (hereafter called CHESH Lao) of the Center for Human Ecology Studies of Highlands (CHESH), one of the predecessor organizations of the Social Policy Ecology Research Institute (SPERI), and relevant partners involved in research, experimental application and support for the sustainable development of the Long Lan community based on their cultural identity, ethnic knowledge and natural resources of Phou Sung from 1999 to present. These activities have been financially supported by ICCO - the Netherlands, and later Brot/BMZ-Germany, CCFD-France, and NLI-Germany.

The below information was collected, analyzed and summarized on the basis of CHESH Lao / SPERI's approach to promoting stakeholders participation, such as among Long Lan key farmers, village heads of Long Lan and communities in the Kuang Si watershed area, members of YIELD-AGREE, the Offices of Plantation, Planning of the Luang Prabang Provincial Agriculture and Forestry Office (PAFO), the Luang Prabang and Xieng Nguen District Agriculture and Forestry Office (DAFO), Pak Xuong College, Suphanuvong University, CHESH Lao and experts.

The fieldwork, analysis and synthesis of research findings for this document was financially supported by AliSEA/AFD/GRET through the project on *"Promoting agroecology farming for self-reliant livelihood of local upland farmers through documenting the case of native eco-vegetables of the Hmong community of Long Lan village, Luang Prabang district, Luang Prabang province"*.

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ACRONYM

AFD: Agence Française de Développement

ALiSEA: Agroecology Learning Alliance in Southeast Asia

BMZ: Federal Ministry for Economic Cooperation and Development

Brot: Bread for the World

CBO: Community Based Organization

CCFD: Comité Catholique contre la Faim et pour le Développement

CHESH: Center for Human Ecology Studies of Highlands

DAFO: District Agriculture and Forestry Office

GRET: Professionnels du développement solidaire

ICCO: Inter-church Organization for Development Cooperation

MAF: Ministry of Agriculture and Forestry

NLI: Nature Life-International

PAFO: Provincial Agriculture and Forestry Office

PRDFA: Project for Rural Development of Focus Area

SPERI: Social Policy Ecology Research Institute

I. INTRODUCTION



Figure 1: Entire Long Lan village territory (Photo by CHESH Lao/SPERI, 2017)

The traditional livelihoods of the Hmong families in Long Lan village, and many other communities in the upland areas of Luang Prabang, rely mainly on shifting and rotational cultivation, livestock raising and the harvesting of natural products. Before the year 2000, the Hmong families in Long Lan also grew opium for sale. Since then, the economy of Long Lan has gradually shifted from subsistence to semi-subsistence. Now, in addition to subsistence activities to ensuring adequate food supply, villagers undertake a variety of additional activities to earn income to cover family costs and to invest in production expansion.

In Long Lan, forests and forestlands are associated not only with material life, but are seen also as spaces for inspiration and repositories of an enormous treasure of knowledge related to the cultivation, production and harvest of forest products. Moreover, religious and cultural values, maintained through traditional institutions and customary laws, such as 'Tong Xenh' and 'Thu Ti' rituals for the worship the Nature's Spirit, have continued to be developed and transferred across the generations.

When one visits Long Lan today, it is hard to imagine the tough lives of the villagers 20 years ago. The people of Long Lan have experienced many ups and downs as a consequence of external impacts, such as the American War, government policies banning opium growing and shifting cultivation (without any alternatives being offered), and the growing influence of the market economy since the 1990s. As a result of these impacts, the main source of livelihood for the Hmong people of Long Lan, rotational shifting cultivation and opium growing, was severely affected. From a position of being self-reliant on their own production materials - land, crop varieties, farming techniques and cultivation methods - households were forced to look for new means of livelihood.

Since 1999, CHESH Lao has collaborated with various Lao partners, including the Project for Rural Development of Focus Area (PRDFA) of the Lao Ministry of Agriculture and Forestry (MAF), the Luang Prabang Province Forestry and Agriculture Office (PAFO) and the District Agriculture and Forestry Office (DAFO) of Luang Prabang, Nam Bac, Nan and Xieng Nguen districts, with the financial support of ICCO, Brot / BMZ, CCFD and NLI, in order to implement applied development researches on rights of access to natural resources, and the maintenance of cultural identities and local indigenous knowledge in agricultural cultivation and community management toward ensuring the self-reliance of livelihoods in Long Lan. This process has been implemented through three main phases, based on the changing capacity and needs of the community.

In the first phase, from 1999 to 2002, CHESH Lao focused on studying the dialectic relationship between the ecosystem and the traditional social structure of the Long Lan community. Specifically, the relationship between land and forest and the seven Hmong clans living in the Phou Sung area, as expressed via the 'No Song' ceremony, the spiritual relationship of humans toward nature, and their local knowledge of sustainable natural resource use planning. From this research, CHESH Lao drew the lesson that, for sustainable natural resource management, it is necessary to study these relationships in their interaction with the formal statutory law system. The overall objective for this period was to set up a pilot model of community development based on the cultural identity of the Hmong in Long Lan village. Accordingly, activities were implemented aimed at: i) improving the capacity of Lao government staff in sustainable community development and natural resource management; ii) improving the capacity of key-farmers in implementing community development activities in their own localities, and iii) establishing community development pilot models which could be replicated in other rural areas of Laos.

In the period of 2003-2005, CHESH Lao concentrated on studying the relationship between: a) the formal power system, b) the traditional power system, and c) the ecological relationship of the ethnic group to their land, via land allocation and land-use planning.

From this, CHESH Lao drew the lesson that the dialectic relationship between the human and ecological system would be damaged if outside interventions and supports were not compatible with it, and this would result in conflicts over natural resources among the actors. Therefore, in order to achieve a sustainable system of natural resource management in Long Lan, it would be necessary to manage these conflicts in accordance with both formal and customary systems of law. The overall objectives during this period were: i) strengthening the capacity of the key-farmer network for sustainable community development based on cultural identity. This included activities in three villages of three different ethnic peoples; Long Lan village (Hmong) in Luang Prabang district, Xiang Da (Lao Lum) and Nam Kha (Khmu) in Nam Bak district, Luang Prabang province; ii) strengthening the capacity of Nam Bac and Luang Prabang district staff in coordinating community development activities in accordance with both the government's policies and the ethnic groups' own cultural identities; and iii) setting up a practical training centre for biodiversity preservation and sustainable community development in Luang Prabang province.

Since 2006, CHESH Lao has focused on a series of applied studies regarding the human-ecology-policy-economic relationship. This has been reflected in the approach to ecological agricultural systems - particularly ecological vegetable cultivation in Long Lan village. From this research, CHESH Lao drew the lesson that the results of forest and land allocation would not be sustainable, due to the increased impacts of the market economy. The fear was that the market would promote consumerism among people, which would put pressure on natural resources as a source of cash income, and if there was no alternative strategy for income raising, then the balance of the ecosystems would be disturbed due to its abuse by humans in order to meet their increasing demand for cash. Therefore, the overall objective during this period was to promote the network on customary law for sustainable natural resources management in the watershed areas of the Phou Sung Mountain, including Long Lan. In order to achieve this objective, several strategies were implemented including: i) facilitating a human ecology village in Long Lan, to provide practical training curricula for sharing experiences with concerned stakeholders both within and outside the province; ii) facilitating pilot models of sustainable land and forest management and use, based on traditional customary laws and local knowledge of Lao Loum, Kho Mu and Hmong, in order to implement a strategy for the development of regional networking for sustainable natural resource protection and development; iii) strengthening the community herbal medicine network of the targeted villages in connection with other communities in the Mekong region; and iv) enhancing the skills and knowledge of villagers in order to ensure their livelihood sovereignty via community based organizations, such as interest groups for farming, livestock raising, and savings and credit.

Over this period, Long Lan livelihoods have grown more stable, prosperous and sustainable, with ownership of its territory of over 8,439 hectares of land and natural forest, and its customary laws of natural resource management, being recognized by local governments in 2005. Through a community-based forest land right program supported by Luang Prabang PAFO, Luang Prabang DAFO, Luang Prabang District People's Committee, with the assistance of CHESH Lao with financial support of ICCO-Netherlands, Long Lan territory has now been classified according to various unique ecological categories, such as 'watershed forest land', 'spirit forest land', 'herbal forest land', 'protected forest land', 'use forest land', 'grazing land', 'agricultural land'. These newly categorised natural resources of Long Lan are now being sustainably managed and used on the basis of local indigenous knowledge and community organization, with the ongoing advice of CHESH Lao, with financial support from ICCO-Netherlands, Brot/BMZ-Germany, CCFD-France and NLI-Germany.

Sovereignty over livelihood and cultural spaces is the foundation and motivation for the Long Lan community to untie barriers, overcome challenges to enable initiatives based on specific landscapes, ecosystems, ethnic knowledge, local knowledge, and native species, to protect and enrich their land and forest resources and native vegetable farms. Up to now, the 'nature life' of villagers in Long Lan has confirmed its sustainability and self-autonomy. Elder Xay Khu Zang stated: *"our villagers could find everything essential for their lives from our natural forest and land areas. In contrast, because of depleted land and forest, people's lives in Long Lan's neighbouring villages are very challenging and must be dependent on the outside."*

Up to now, nature-based farming, or ecological cultivation, in Long Lan village has shown strong indicators of effectiveness and sustainability in relation to livelihoods, the environmental and social ecology created by the three core activities that make up a solid 'tripod' of values supporting the sustainable livelihoods of its families: Households still maintain their rotational farming; ecological vegetable cultivation, despite its small size, providing additional nutrition and a major source of income for the vast majority of households; and besides, ecological vegetable production and upland rice cultivation, community-based cattle grazing in Long Lan providing a vital source of accumulated assets for the majority of households in the village.

As a result, Long Lan has become a destination for a wide variety of stakeholders, such as farmers, students, researchers, university lecturers, and policy makers at all levels, from both within and outside the country for knowledge exchange and study for practical application. The Luang Prabang Provincial Government and the Lao Ministry of Agriculture and Forestry have adopted Long Lan as a special case for policy studies related to sustainable management of natural resources and agriculture and rural economic

development. Long Lan's agroforestry products have now officially been recognized as safe forest-based products by both the Lao Ministry of Agriculture and Forestry and NatureLife-International.

The livelihoods of many upland communities, in Luang Prabang province in particular and in Northern Laos generally, are facing serious challenges due to the increasingly negative impacts of the market economy, commercial plantations (such as rubber), the application of high technologies, and the overuse of chemical fertilizers. Land loss, natural resource depletion, deeper dependence on the outside, and other adverse social-environmental consequences are pushing these communities toward a livelihood crisis.

There are other communities, however, who are maintaining their livelihoods through the practice of agroecological farming in its diverse forms. These practices have showed their effectiveness in contributing sustainable, self-reliant livelihoods for local farmers. However, these best practices have not yet been documented. Therefore, the documentation and sharing of the success stories of Long Lan in growing native vegetables with local techniques in connection with local markets will contribute to the raising of public awareness of sustainable agroecological practices, particularly among young farmers, officials and functional government bodies, not only in Luang Prabang but also elsewhere, for them to learn from and apply in their own farms, as well as in policy formulation.

The project on “Promoting agroecology farming for self-reliant livelihood of local upland farmers through documenting the case of native eco-vegetables of the Hmong community of Long Lan village, Luang Prabang district, Luang Prabang province” supported by ALiSEA, is amongst the above efforts of CHESH Lao / SPERI to achieve this result.

The first activity of this project was a participatory study with the aim of enhancing the research capacity and fostering the exchange of information and knowledge of relevant actors: key farmers, knowledgeable people, elders and leaders of Long Lan, and villages in the Kuangsi Watershed region of Luang Prabang district; representatives of the Young Farmers Network, namely the Young Indigenous Ethnic Minority Leadership Development Strategy - Agroecology Enterprising (YIELD-AGREE); the Offices of Plantation and Planning of the Luang Prabang Provincial Agriculture and Forestry Office (PAFO), the District Agriculture and Forestry Offices (DAFO) of Luang Prabang and Xieng Nguen districts; Pak Xuong Vocational College; Suphanuvong University; CHESH Lao/ SPERI; and experts. The field information and data collected were analyzed and summarized into different types of document to be used in workshops and shared widely with farmers in other localities, both within and outside the province, as well as with the media, in order to raise public awareness and advocate for the wider recognition and application of agroecology.

II. OVERALL INTRODUCTION TO LONG LAN VILLAGE

2.1. Village history



Figure 2: Elder and village chief sharing Long Lan territory and its history of village establishment (Photo by CHESH Lao, 2015)

The Hmong people of Long Lan village have lived in the Phou Sung Mountain in Luang Prabang district, Luang Prabang province, Laos for a long time. According to the elders, the first Hmong families who came to Phou Sung Mountain originated in Tibetan China. Due to various events, especially civil war, they had to move along the mountains north of central Vietnam to Xieng Khouang province, Laos, and to Luang Prabang province. The second route was along the Mekong River, to the northern provinces of Laos, including Luang Prabang, and then they spreaded to different locations. One of the hallmarks of the Hmong's movement is that it is based on the entire community or a specific clan. As a result, the cultural characteristics of ethnic group and clan are preserved and gradually enriched via the process of experimentation and adaptation to new the natural conditions on their arrival.

With the practice of shifting cultivation, the villages are often located close to their swidden fields. When the first group of Hmong families, mainly of the Zang, Lao and Trong clans

settled in the Phou Sung Mountain, they established a village named Phou Sung. They lived there for several years, but due to a water shortage, had to move to Ca Xia and Po Phay villages. Lower down the mountain, where the current Long Lan village is located was the home of about 20 Kho Mu families, with their land stretching to Bo He village at the foot of the mountain.

During this time, Hmong families lived in the Phou Sung area where the land was flat with fine soil and fog-covered all year round to grow upland rice, maize, and opium. Due to the large area of fertile land and rich natural forests, the livelihoods of families during this time were relatively sufficient.

During the war against America, the Phou Sung Mountain was one of the fierce battlefields. Many American bombs were dropped there, and the Hmong and Kho Mu families had to evacuate to other places. The Hmong families evacuated to Tin Pha village located to the east of Phou Sung Mountain, while the Kho Mu people moved down to settle at the foot of the Phou Sung Mountain where they later established their own village of Bo He.

In 1975, after the end of the war, the Kho Mu families remained settled in Be He where they still are today. The Hmong households did not return to their former villages as the land had been destroyed by bombs, and 15 families, mainly from the Zang clan and the few other of the Ly and Mua clans, moved to live in the current Long Lan village. Upon their arrival, they saw a flat area of land where there was a lot of bamboo, the material used to make the Hmong Khen, one of the traditional musical instruments. Therefore, they named their village “Long Lan”, meaning in Lao language "the land of bamboo used to make the Khen". The remaining families of the Tho clan moved to live in other parts of Phou Sung Mountain, namely Ca Xia and Nam Bo villages.

In 1979, Long Lan received an additional 10 Hmong families of the Ly and Tho clans who came from Chong village. In 1983, another two Hmong families of the Ho clan from Pha Tup village moved to live in Long Lan. By 2004, the village had 61 households of seven different clans, including Zang, Ly, Ho, Tho, Mua, Song and Vang. Among them, the Zang clan was the most populous with 29 households (47.6% of the village population) and the smallest were the Song and Vang clans, each with only one household (1.6% of the total village population).

In early 2000, the Lao government introduced a policy of merging small villages into a large ones, so if any village had fewer than 50 households, its population had to join other villages. This policy was aimed not only to increase the effectiveness of administration, but also at the ambition to develop rural livelihoods in the mountainous areas, to reduce and stop deforestation, and eliminate the cultivation of opium. By the year 2004, 35 families in Ca Xia village had to relocate and merge with Long Lan village. But only 4

households agreed to stay in Long Lan, the rest moved to Khoc Va and Don May villages nearer to Luang Prabang city.

At present, Long Lan village is home to Hmong families belonging to 7 clans, including Zang, Ly, Ho, Tho, Mua, Song and Vang. In October 2017, Long Lan had 74 households with 511 inhabitants (260 females). Among them, the Zang clan, the first group of families set foot in Long Lan, has the majority (47.6%). This clan has made great contributions to the development of the Hmong community living here.

2.2. Geography

Long Lan village is 45 kilometers north-east of the UNESCO Cultural World Heritage City

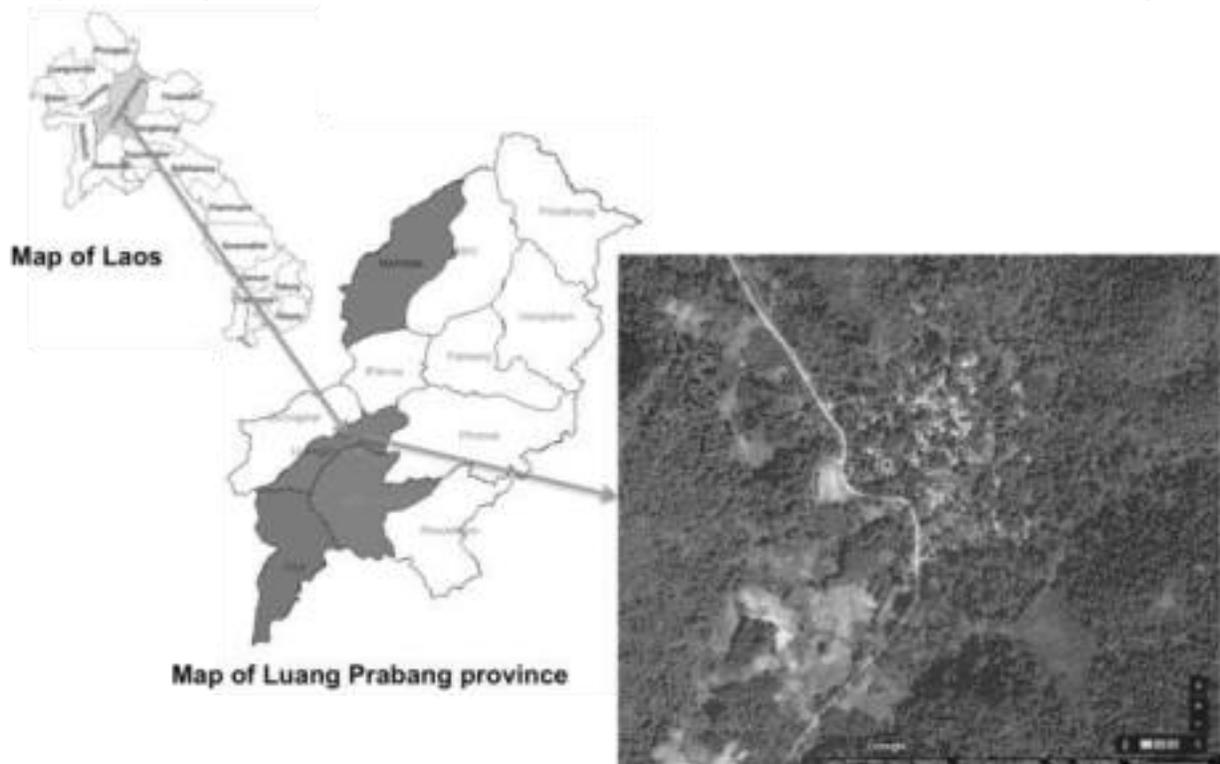


Figure 3: Long Lan village (source : google map)

of Luang Prabang. Long Lan is bordered by 12 neighbouring villages of different ethnic groups such as Lao Loum, Kho Mu, Hmong and Lu located around the foot of Phou Sung Mountain. Specifically, the village is bordered by Kok Van, Bo He, Huoi Luc, Tha Ui, Pha Deng (Luang Prabang district) to the north; Pha Vieng village (Luang Prabang district), Huou Man and Nam Bo villages (Phonxay district) to the east; Phu Khuang, Huoi Xa La village (Phon Xay district) to the south; and Na Don Khun, Na Tan, Densavang and Phonsavat village (Luang Prabang district) to the west).

Long Lan is situated in the watershed of Phou Sung mountain, at approximately 1,200 meters above sea level. This is a limestone and metamorphic rock mountainous area, which

includes small valleys with flat land. The climate in this area is quite harmonious and cool, with fog cover all year round, and an average temperature of 22°C. In places, interspersed with rocks, the soil is crimson (brown), porous due to the accumulation of much decomposed biomass, and with a cultivative layer greater than 50 cm. In the areas with reddish-brown and porous soils, due to the weathered limestone, the cultivative layer is thicker than 70 cm. These are suitable conditions for the growth and development of many crops, especially vegetables.

2.3. Community governance

According to the administrative system of Laos, the village is the lowest level of administration. The higher levels are the district, provincial and central governments. The village leadership system includes three positions, village chief and two deputy heads, and village socio-political organizations such as Fatherland and Nation Construction, Youth Association, Women Union, Militia and Security Team, and Forest Protection Group.

Families in the village are organized into four main population clusters. Each cluster is considered a self-governing unit. Accordingly, the common activities of each cluster, especially relationships among families and clans, are discussed and agreed upon before being jointly implemented. All obstacles should first be reconciled and resolved within the population clusters and political organizations. If these problems are still not resolved, then they will be sent to the village government at the higher level.



Figure 4: Traditional village leader, elder Xay Khu Zang preparing offerings to worship 'Thu Ti' - Land Spirit (Photo by CHESH Lao, 2016)

Community governance in Long Lan involves the integration of the traditional and formal systems. Accordingly, all decisions and actions at the community level are discussed and agreed to between the village's prestigious elders, clan heads and village chief. In many

cases, the decisive role of the traditional management systems has greater value than the formal one. This integration is also reflected in the village socio-political organizations. Accordingly, heads of these organizations, such as the Village Fatherfront for Nation Construction, are prestigious people, elders and clan heads. Their main role is to educate the people about traditional culture as well as reconcile conflicts on the basis of customary law and mutuality. Basically, community relations and cultural customs, e.g., in funerals, marriages and festivals, and especially disputes, are regulated first by the customary law, then later come before the formal law. The highest punishment for violators of the community norms is 'expulsion' from the village. Up to the present time however no household has suffered this judgement. This is perhaps due to this form of punishment being an effective deterrence measure.

The daily behavior and commitment of villagers toward natural resources has become the norm and identity of the entire community. These norms are governed and protected by a system of unwritten rules or community-based customary law which is accepted and voluntarily implemented by community members. With the support of the CHESH Lao under the Center for Human Ecology Research in Highlands (CHESH) - one of the precursors of the Social Policy Research Institute (SPERI) - from late 1999 to 2005 these unwritten rules, especially for natural resources governance, were recorded as the basis for the formation of customary and statutory law-based community regulations. These community regulations were then approved by the district authorities and integrated within the local management system to monitor development activities, particularly in relation to agricultural production and natural resources management in Long Lan.

In 2009, due to the increased pressure over natural resources from 12 neighboring villages in the Phou Sung Mountain and the Hmong people in the villages near Luang Prabang City, Long Lan village leaders and elders requested that the Luang Prabang district government extend the scope of Long Lan's community regulation. At this time, the natural resources of the villages surrounding Long Lan were seriously depleted, and due to the need for cultivation land and forest products for livelihood, villagers from these village often entered the management area of Long Lan to exploit natural resources, especially for timber for house construction. In addition, Hmong families who used to live in Tin Pha and Ca Xia at the top of Phou Sung mountain, but who due to the sedentarization policy of the government during the period from 2000 to 2005 were relocated to nearby villages of Luang Prabang city, returned to their former places to cut trees, slash and burn for cultivation, and raise livestock. They had to return because of their precarious life in the city as wage-labouers. However, while the community rules of Long Lan could be well applied to people within the village, they were less effective for outsiders. Therefore, with the support and advice of CHESH Lao, on December 31, 2009, Long Lan in collaboration

with the Hmong Association of Luang Prabang District and local governments, organized a traditional 'No Song' ceremony in order to consolidate its regulations.

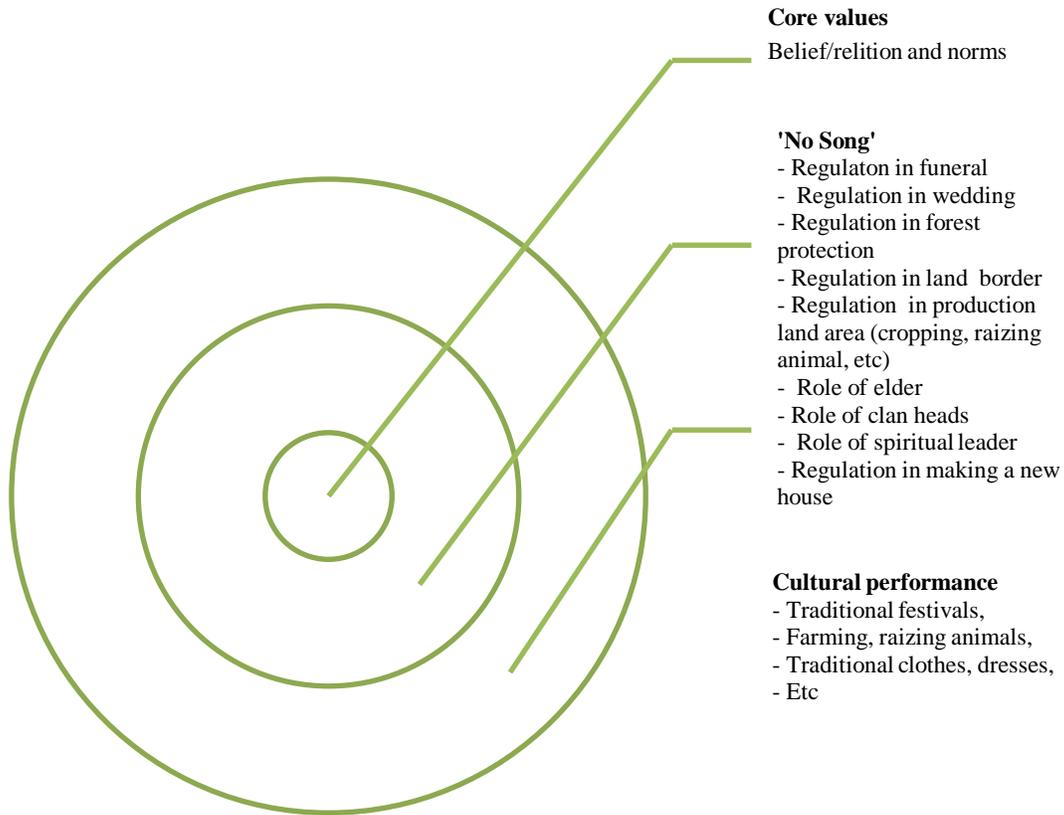


Figure 5: The customary law of Long Lan in community and natural resources governance

'No Song' is a customary law institution that maintains the traditional values and social structure of Hmong people, not only in Long Lan village, but also in many locations in Laos. 'No Song' means a ceremony of promises between different clans, families or communities living in a certain geographical area sharing the same borders and having close relationships, in order to consolidate the traditional culture, customary law and community structure of the Hmong. Topics discussed in the 'No Song' ceremony in 2009 related to funerals, marriages, festivals, natural resources management, cultivation, livestock, security, moral norms and mutual help amongst Hmong people.

Traditionally, prestigious people such as elders, clan heads, village chiefs and representatives of community based organizations (CBOs) in a certain geographical region come together in the 'No Song' ceremony. Nowadays, the ceremony also includes representatives from local authorities, Fatherland for Nation Construction, Women Union and Youth Union, etc. The main purpose of this ceremony is to increase the scope of application of the customary laws, not only on a wider scale, but also in the formal system.



Figure 6: 'No Song' ceremony organized in 2009 in the forest of Long Lan (Photo by CHESH Lao, 2009)

There is no fixed time for organizing the 'Nong Song' ceremony. The ceremony will be organized if the contents in the existing 'No Song' institution are inadequate and need updating. The leader of the 'No Song' institution then organizes the representatives from different Hmong communities and clan heads in the region to decide the proper time for organizing the event. The 'No Song' ceremony may take one or a few days depending on number of issues that need to be discussed. Then, every participant joins the ceremony of commitment and promises to follow the newly agreed regulations. This ceremony is often held in combination with the ritual to worship 'Zo Sau' - the spirit who gives birth to everything, 'Xu Ca' - the saint of Hmong, and 'Da Che, Te Lau'- the ancestors of the Hmong, and other spirits like 'Da Ha Zong' - the forest spirit, who support community solidarity, human health, peaceful weather, and good crops, etc. This ceremony of integration has the effect of increasing the seriousness and sanctity of the regulations that were agreed to and the commitment among the representatives participating in the 'No Nong' ceremony to follow them.

No single party is able to change the regulations, but has to follow them as agreed by the 'No Song' assembly. Changes are accepted only if they are in line with the agreement and

promise made by relevant parties to the 'No Song' ceremony. If any community or individual violates the ceremony's promises or agreement, they will be fined. They have to compensate twice as much as the offerings used in the ceremony. For instance, if the ceremony used one cow, the violator has to compensate two cows. The leader of the 'No Song' institution is responsible for this decision.

The leader of the 'No Song' institution is often a prestigious elder, who is a respected, persuasive person who understands well the traditions of the Hmong and government policies as well. He also plays a role in resolving disputes between families, clans and communities that share the 'No Song' institution. Vital events of the community should be informed to and advised by this person. This person is also the head of the community elders' council whose members are prestigious people, normally clan heads or elders from different clans. The term of the 'No Song' institution leader is normally decided after each 'No Song' ceremony.

The clan head is a decent person, who is reputable and well educated. He is in charge of leading clan members in maintaining the customs of the Hmong in general and each clan in particular. This person is entitled to gather clan members for consultation to resolve any dispute that arises. Moreover, the clan head is responsible for informing clan members of the agreement and promises set up in the 'No Song' ceremony. He is responsible, on behalf of the clan, for reporting to the 'No Song' ceremony any changes, including recommendations, regarding socio-cultural and economic aspects within his clan.

The 'No Song' ceremony was held in the community herbal forest of Long Lan in 2009. This ceremony was held after almost 20 years since the last one. As a result, in addition to the customary contents, such as funeral, wedding, and festival regulations, the 2009 'No Song' ceremony also acknowledged the regulations of Long Lan as applying to all 22 Hmong villages in Luang Prabang district, with a total population of approximately 10,000 people.

2.4. Customary law based natural resources management

Before 2001, there were three villages of Hmong in Phou Sung Mountain, including Long Lan, Tin Pha and Ca Xia. However, with the Lao policies on merging villages with less than 50 households into larger ones and eliminating opium cultivation, households in Tin Pha and Ca Xia had to move to other places, mainly to villages near Luang Prabang City. The land area of these villages was then officially handed over to Long Lan to manage.

In the subsequent years, in addition to pressure on forest resources from neighboring villages, the land of Long Lan was also at risk of being taken over by some private companies to invest in industrial plantations such as rubber and coffee. Given such challenges, village leaders and elders of Long Lan proposed that Luang Prabang authorities

officially allocate the forest and land to the households and community of Long Lan to manage and use.

Based on this, the program of community based forest and land allocation in Long Lan was carried out in the period from 2004 to 2005. Accordingly, the 66 households and community of Long Lan were officially entitled by the district authorities to manage, protect and use in the long-term over 8,439.19 ha of land and forest resources on the basis of the customary law of the Hmong. Following this, Long Lan developed its customary law based community regulation to guide and manage all acts of families related to forest and land resources in sustainable ways. This regulation was timely adjusted through the 'No Song' ceremony to worship the Nature's Spirit and elicit promises among villagers to respect and implement these customary rules. Regarding the natural resources of Long Lan, the community regulation is reflected in three main aspects.

Firstly, the customary law defines land boundaries. Previously, the Hmong people in Phou Sung Mountain did not have specific regulations on the land boundaries between villages, but only for the land fields of families. Normally, where the swidden is, there also is the boundary of the village. Later, when the villages were named, the boundaries between the villages were also determined. However, the cultivation areas had not yet been defined. With the support of CHESH Lao, via the community based forest and land allocation and the 'No Song' ceremony, elders and village leaders from different communities in the Phou Sung Mountain defined the land boundaries of each village. These boundaries were then recognized by the district government and integrated into the local land administration system.

Secondly, the customary law defines different landscape-based functional areas. In order to manage and use natural resources sustainably, Long Lan has set up various landscape based functional areas, such as cultural areas (e.g. sacred forest and cemetery), water protection forest, production areas, and animal husbandry areas (see table 1). Each area is managed in accordance with specific provisions defining the rights and responsibilities of villagers, from both within and outside the community, to access, use and protect natural resources.

Table 1: Distribution of land and forest of Long Lan according to the use purposes

<i>No</i>	<i>Zones</i>	<i>Area (ha)</i>	<i>Percentage</i>
1	<i>Residential zone</i>	26.25	0.3
1.1	Housing	5.0	
1.2	Community area for raising pigs	21.25	

<i>No</i>	<i>Zones</i>	<i>Area (ha)</i>	<i>Percentage</i>
2	<i>Forest zone</i>	<i>6,600.54</i>	<i>78.21</i>
2.1	Sacred forest	1,132.49	
2.2	Water protection forest	2,888.61	
2.3	Community use forest	1,009.37	
2.4	Cemetery forest	4.37	
2.5	Community forest for grazing cattle	1,565.7	
3	<i>Production zone</i>	<i>1,812.4</i>	<i>21.49</i>
3.1	Vegetable cultivation	88.75	
3.2	Upland rice	1,723.65	
	Total area	8,439.19	

Thirdly, the customary law regulates the distribution and use of land and forest resources. In general, the forest and land resources of Long Lan are managed, used and distributed on the basis of Lao government policy and the customary law of the Hmong. These two systems are integrated and unified through a community regulation based on customary law as well as consensus among villagers, and recognized by Luang Prabang district authorities. Accordingly, the entire area of forest land was allocated by the government to Long Lan to manage. The area of natural forest, community use forest and pasture are not allocated to households but are managed by the entire community. Households have now been granted permanent use rights to and benefits from their traditional upland fields. Not every family, however, can easily be allocated land for production. Unlike families who have lived in Long Lan for a long time, newly arrived families must comply with all community regulations for at least three years before being granted land for production. During this time, these families can borrow land from relatives and friends. While the forest and land area allocated to Long Lan is quite large, it is bordered by 12 other villages which are home to Kho Mu, Lao Loum and other Hmong families. Forest and land resources in these adjacent areas are often subject to illegally exploitation by outsiders. Therefore, these areas are given priority by Long Lan to allocate to households in the village. This is seen as a way of preventing violations by outsiders, not only of the land but also of the forest resources of Long Lan.

In addition to the strictly prohibited forests, Long Lan also set up community use forests where villagers are allowed to collect and use forest products for their daily life as well as for making houses. Previously, newly formed families were allowed to cut enough timber

to make their houses. Currently, in combination with state law, each family is allowed to cut only 5 cubic meters of logs to make a house if such family has fulfilled the requirements in accordance to the Long Lan regulations. Such family must live in Long Lan for at least 10 years before they are allowed to cut timber for house construction. The provisions also state that villagers collect non-timber forest products only for use within their families, not for sale.

The regulations of Long Lan are applied not only to families in the village, but also to outsiders who have production land located in the Long Lan territory. The fact is, given the invasive nature of slash and burn shifting cultivation, it is common for people living in one village to be cultivating the land of another. At present, many households from other villages, especially Bo He, are cultivating within the Long Lan territory. This is recognized as the traditional land of these families. Therefore, Long Lan allows these families to cultivate there, but they have to fully follow the regulations of Long Lan.

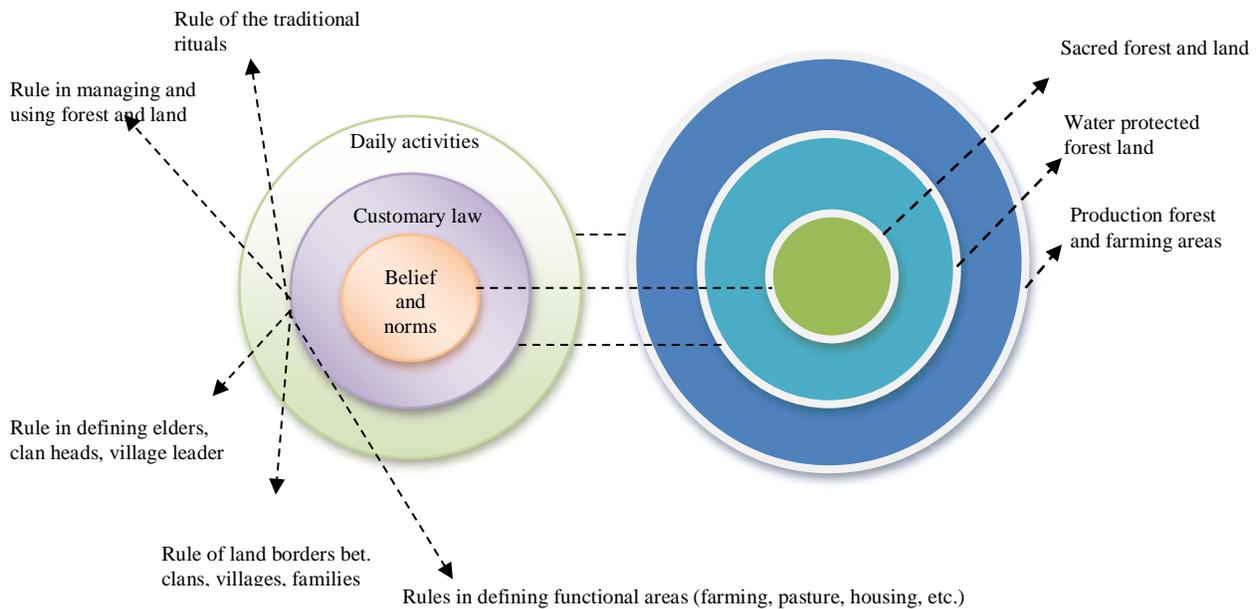


Figure 7: Human ecology relations in natural resources management in Long Lan

Up to now, the model of community based forest land allocation, and integrated customary and statutory law based natural resources management in Long Lan has been assessed by the local authorities and the Ministry of Agriculture and Forestry as a success, and taken as a learning example for replication in other locations in districts such as Nam Bak, Luang Prabang, Muong Nan and Xieng Nguen. The success of this program is based on the following prerequisites:

Firstly, that community based decentralization of natural resources management, use and protection via land allocation proceed through a process of learning and adaptation between the Hmong traditional values, local knowledge, government and policy. This means ensuring the right to self-discussion, self-decision and self-implementation of the solutions initiated by each village, household, clan and community during the decentralization of natural resource management.

Secondly, decentralization of natural resources be seen as the process of recognition of the customary law, indigenous knowledge systems and the notion of ownership and development of local peoples, community based organizations, clans and the entire community.

Thirdly, decentralization of natural resources to individuals, families, clans and communities should be accompanied by a process of capacity building and people's awareness raising regarding their rights and responsibilities, especially in land use planning after allocation. However, from the lessons learned in Long Lan, this step needs to be taken before implementation of forest land allocation. At that time, people have sufficient time to prepare as well as gain the confidence and ability to use the allocated land effectively.

Fourthly, with regard to disputes over land and traditional boundaries amongst actors such as families, clans and communities, the core task in forest land allocation is not just to satisfy the needs for economic development, but also to resolve differences regarding the perceptions of values, ownership and interests of relevant actors involved in the management and use of natural resources.

Fifthly, in the face of new challenges related to market mechanisms, e.g. land market, expansion of commercial plantations by domestic and transnational corporations, the customary law or statutory law alone makes it hard to effectively prevent negative impacts on the sustainability of natural resources, safety of livelihoods and the cultural identities of communities living in the watershed areas. Therefore, customary law should be recognized and integrated with the formal statutory law system in a system of natural resources decentralization and co-management.

Sixthly, in many watershed areas where there is often a mixture of several ethnic groups, each group has its own perception, value and practice regarding ownership, distribution, management and use of natural resources. That being the case, decentralization of natural resources in such areas may bring about conflicts among the communities if it lacks thorough careful study and flexible methodologies. Lessons learnt from Long Lan on community based land allocation and customary law based natural resources management shows that the application of the official administrative procedures alone for solving land border disputes might escalate the conflicts to a higher level, or convert former disputes

into new ones. Shifting cultivation among ethnic groups in the Phou Sung Mountain had existed for a long time. That meant that the overlapping of cultivation systems and land borders among different actors (e.g. families and communities) were unavoidable. This being so, resolving land border disputes involved the arrangement of relationships between relevant actors including households, clans, communities and ethnic groups. In Long Lan, the participation of such actors, especially the advice of the Elders' Council via the 'No Song' institution, and clan relationships of the Hmong, provided an effective means of resolving such land border disputes. On the other hand, although each community has its own forest and land that are governed by customary laws, these resources are used not only by peoples within the village but also by neighboring groups. Therefore, it would be hard to achieve the values and goal of the decentralization of natural resources if this process brought about the exclusion of others. Hence, it is essential and effective to promote the concept and practice of natural resources co-management and benefit sharing in accordance with inter-community regulations that are officially recognized by the government.

III. ECOLOGICAL VEGETABLE CULTIVATION IN LONG LAN

3.1. Transition from traditional rotational shifting cultivation to growing ecological vegetables



Figure 8: Rotational and intercropping in upland fields of Hmong families in Long Lan (Photo: CHESH Lao, July 2017)

"*Xong Pi Ham, Xam Pi Khop*" meaning "two years of fallow, one year of cultivation", is the traditional mode of rotational cultivation of the Hmong people in Long Lan village in particular, and other ethnic groups in the North and East of Laos generally. With this method of cultivation, the soil is not exhausted because the ecosystem, including soil fertility, forest trees and other natural conditions, is recovered after the period of fallow. During this time, forest trees, especially pioneer species with a nitrogen fixing function are re-generated according to the natural cycle. Humus from the natural forest is continuously created to nourish the soil, while legumes accumulate the amount of nitrogen needed from nature to add into the soil after the cultivation period. With the ecosystems in the monsoonal tropical climate, the soil, after cultivation, is quickly covered by pioneer species, thus the topsoil is protected from erosion caused by rainfall.

However, since the 1970s and 1980s, the government of Laos has issued many policies aimed at limiting and discontinuing shifting cultivation, in order to protect forest resources and stabilize people's lives, beginning with the policy of resettlement of groups who practice shifting cultivation for the purpose of integrating swidden cultivation with forest protection, improving productivity, and the conversion of shifting cultivation to permanent settled agriculture. This is followed by the limitation on slash-and-burn rotational farming through policies such as the Decree 169 issued in 1993 on Forest Land Allocation, and the Forest Law in 1995. Accordingly, unused areas, or regenerating forests in the fallow, are

defined as forest land which it is prohibited to cultivate. In addition, Long Lan was affected by the ban on poppy cultivation in early 2000. This was due to the stereotypical viewpoint of the mainstream modern education, communication and monetary systems, etc. that cultivation of swidden is the main cause of 'deforestation', 'backwardness', 'unsustainability', 'low productivity', 'instability', etc. Since then, policies relating to the prohibition of shifting cultivation, land rights, and promotion of the conversion of native varieties to commercial plantations, e.g. rubber, have been planned and applied nationwide.

For these reasons, groups are less likely to choose to maintain their traditional farming practices. The deprivations of poverty, dependence and its consequences, are the result of the implementation of these policies, as people, after being banned from shifting cultivation, or relocated to new places, were not timely or properly supported by the government. They were left confused in finding suitable alternatives to ensure their livelihoods.

CHESH Lao came to Long Lan village at the end of 1999 through the project of community development based on cultural identity of the Hmong. Through a series of trainings and exchanges of experience with people in other localities in Laos and Vietnam, key villagers, including elders, prestigious peoples and the village leadership of Long Lan realized the one invaluable thing that was given by nature - that they were rich in natural resources, fertile soil and cool weather all year round because they were located on the top of the Phou Sung Mountain. They also realized the need to be self-determining in their use of their existing natural resources, e.g., land and forest and traditional cultivation methods, otherwise they would be like the Dzao and Hmong people in Sa Pa district, Lao Cai province, Vietnam. These groups, after losing their forest, and lacking of land for production, have had to follow the tourists to sell their most valuable things in order to get enough money for their daily life. But how and where to start were questions that needed to be answered by Long Lan key villagers after their two visits to the Hmong in Nonghed district, Xieng Khouang Province, Laos, in the middle of 2003 to learn about growing vegetables and fruits.

The visit was organized with the participation of key villagers, including village leader, Za Zi Zang, elder Xay Khu Zang, and key farmer Cho Xy Zang - cadre in charge of Phou Sung development zone, and Si Zy and Za Nu Ly - resource village cadre. During this time, these key villagers saw the self-reliant livelihood of Hmong families in Nonghed which was the result of the transition from the shifting cultivation to growing asparagus and plums for sale. They also drew the lesson after the trip that, *"we have already found the things necessary for life in the forest of Long Lan. Where is rice from? From the forest, from growing vegetables for selling to earn money and then using the money to buy rice instead of growing rice."* With this confidence, they proposed to CHESH Lao and the district

authorities that they provide support for 18 other villagers of Long Lan to join another trip to Nonghed to learn the techniques of growing asparagus and plums. In addition to the experience and techniques gained, the delegation also purchased 1 kg of asparagus seeds and some plum seedlings to distribute to families in Long Lan to grow on their farms.

After one year, the key villagers who trialed the planting of asparagus and plums together with CHESH Lao staff, DAFO and PAFO technicians evaluated the suitability of these varieties for replication. The Long Lan villagers had come to a surprising conclusion, however, that they would not continue to grow and expand these crops in Long Lan. Due to the all year round mist and less sunlight, plums were not growing well. Some had grown, but their fruits were small and very sour. Asparagus had grown well as it is suited to the climate and soil conditions in Long Lan, and in addition, the price of asparagus was high, and in line with the needs of travelers in Luang Prabang. But, to have good enough quality, and meet customer requirements such as harvest time, size, etc., it required high techniques and intensive work. This caused many difficulties for the villagers because many habits and practices, especially traditional farming practice which had been ingrained through the life of the Hmong in Long Lan, were forced to change.

Following the experiment of growing asparagus and plums, Long Lan village leaders asked CHESH Lao and the local government to provide practical training for villagers in growing other types of vegetable, such as tomato and cucumber in the off season. Tomatoes have a lifespan of 90 days, harvested in 30 days, while cucumbers have a life cycle of 45 days and a harvest time of 15 days. Thus, in the same period of time, villagers could grow one crop of tomatoes and two of cucumber. Villagers hoped that in the off-season, they could earn more income from the higher prices of these vegetables. However, after one year of trial, they came to the same conclusion as with asparagus, that the off-season tomatoes and cucumbers can be adapted to soil and weather conditions but that they would not continue with these crops because they required intensive cultivation with high techniques and complex farming practices. These were laborious and unsuited to the people's habits, as well as the existing organization of farming.

At the end of 2004, elder Xay Khu Zang held a meeting with Long Lan village leaders and some key farmers to discuss suitable cultivation methods after 2 years of experimentation. The meeting agreed that local varieties with traditional methods and techniques of the Hmong, notably rotational farming, should be the priority in developing their cultivation in the new context. However, instead of rotating in several plots of land in different locations as before, a variety of crops would now be rotationally intercropped on the same piece of land. This meant that one piece of land would now be divided into several smaller ones and different varieties would be grown rotationally on these plots. These varieties are now usually combined with upland rice, cucumber, maize and pumpkin in the first season,

then coriander for one crop, dill for two crops, and finally yellow flower mustard is grown in the next season. Then, it will be about 3-4 years of fallow for the soil to rest and recover its fertility. The second plot of land will be planted the same in order to ensure the principle of rotational cultivation as '*Xong Pi Ham, Xam Pi Khop*'. After the success of some of the first pilot families in growing several varieties of vegetables, such as chayote, green mustard, Hmong / Meo mustard, green mustard, beans and dill, other families in the village followed.

As discovered by villagers in Long Lan, this method of cultivation could produce a variety of products and gain more revenue while reducing the need to clear forest for cultivation, as had been done before. At the same time, in the same plot of land, villagers could harvest a variety of food products, e.g., rice for household consumption, or other products such as maize, squash, etc. to feed cattle and poultry. Moreover, families could earn a regular and stable income from selling various types of vegetables.

In mid-2005, the high quality of vegetables from Long Lan began to be known by the market and consumers in Luang Prabang. Today, Long Lan vegetables have become well known not only for their quality but also for their origin, technical process of planting, tending and harvesting as well as the ecological places where they are grown. Due to their history of shifting cultivation, from one mountain to another, most varieties of vegetables of Long Lan have been cultivated and preserved by the Hmong through many generations. These varieties are mainly grown on the former upland rice and opium fields. Due to the high altitude, the surrounding natural forests and fertile soil, it is not necessary to use fertilizers and water for growing vegetables. The vegetables are irrigated by the dew after each night, as well as by the natural humidity regulated by the forest. In 2009, the Planting Department of the Lao Ministry of Agriculture and Forestry officially recognized the vegetables of Lan as 'absolutely' safe because of them being free of chemicals. The cultivation techniques used for these varieties are those inherited from traditional farming practices. There is no need to plow the soil. Instead simple tools such as sticks are used to make holes, or hoes are used to dig the soil. Moreover, vegetables are often intercropped with a number of other varieties such as maize and rice in order to diversify production while reducing the risk of pests and diseases.

To date, the cultivation of local ecological vegetables is the main source of income for 74 households in Long Lan. The growing and selling of vegetables takes place continuously for most months of the year. Because of this success, the ecological vegetable cultivation of Long Lan was researched by the Luang Prabang Agriculture and Forestry Department to develop as a replication strategy for other locations in the province.

3.2. Zoning of ecological vegetables cultivation in Long Lan

According to the land use plan of Long Lan, the total area of ecological vegetable production by households in the village is 88.75 ha. This area is mainly distributed in four main production areas, including May (Phou Sung), Ca Xia, Po Phay and Long Lan.

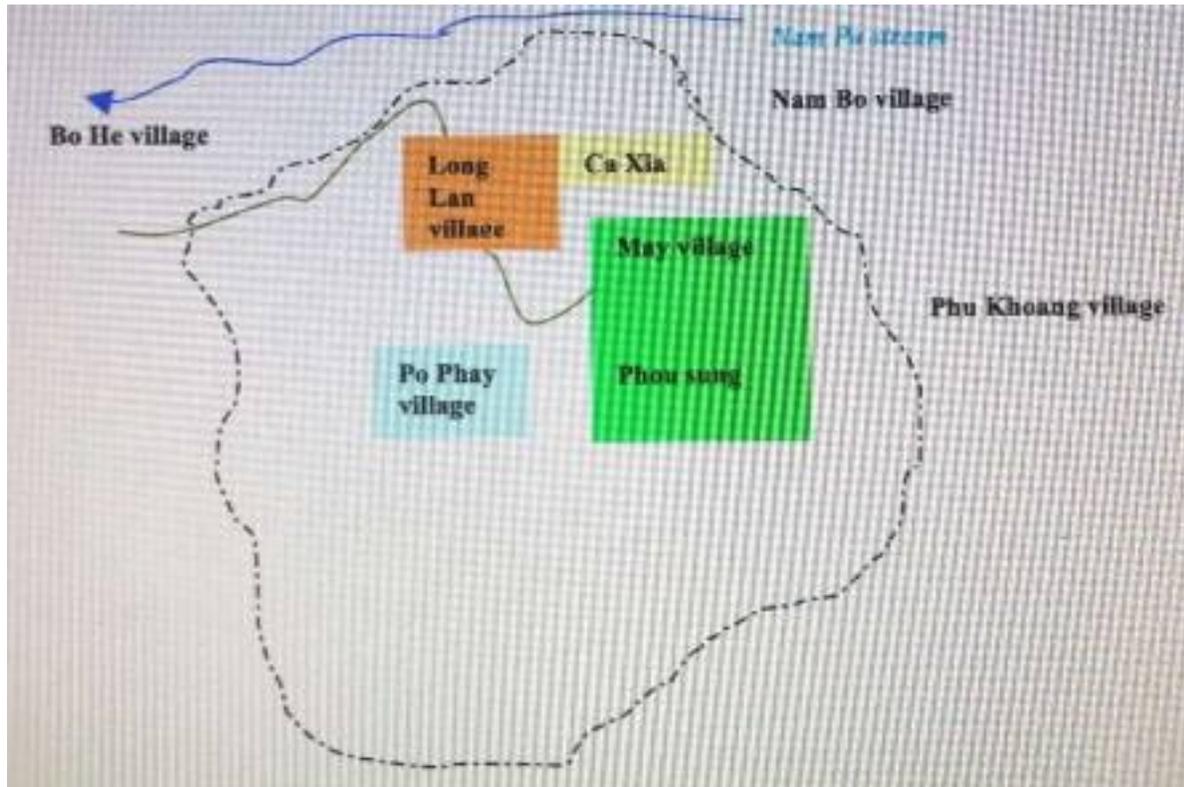


Figure 9: Areas growing ecological vegetables in combination with swidden cultivation in Long Lan

May – Phou Sung area

Phou Sung is located in the northeast of the Long Lan residential area with a total area of about 2,500 ha. The distance from the village to the Phou Sung cultivation area is around 2.5 to 3 hours walk. This is an area of karst and metamorphic rocks interspersed with many small valleys with relative flat land. The climate is harmonious and cool with an average annual temperature of 22°C. The soil is quite fertile, composed mainly of basaltic red soil with a relatively high iron content. The cultivative layer is thick, from about 50 to 70 centimeters, which is suitable for growing diverse types of vegetables.

Due to the suitable natural conditions, before 2000, the Phou Sung area was used for growing opium, intercropping with rice and several types of local vegetables, such as

pumpkin, Hmong/Meo mustard, and beans. These fields belonged to Hmong families, not only in Long Lan, but in other nearby villages such as Ca Xia and Tin Pha.

After the allocation of forest land supported by CHESH Lao in 2004-2005, 20 households who had traditional upland fields were granted permanent land use rights by the local government. With the appropriate transition from traditional shifting cultivation to integrated upland agriculture, these families began to grow local ecological vegetables for sale to earn income. The vegetables grown are various, including chayote, green mustard, Hmong/Meo mustard and other secondary crops, such as pumpkin, Hmong cucumber and beans.

Ca Xia area



Figure 10: Ca Xia area where villagers in Long Lan cultivate upland rice mixing with ecological vegetable growing and cow raising (Photo by CHESH Lao / SPERI, 2017)

Ca Xia takes its name taken from the founder of Ca Xia village, elder Ca Xia. After the end of the war against the United States in 1975, elder Ca Xia led some Hmong households of the Thao clan from Tin Pha village to this area to live and cultivate. Gradually, due to population increase, the village in this area was formed, with the name Ca Xia. At the end of 2004, due to the government policy on merging small villages into the larger ones, 35 households of Ca Xia were removed to other places. This land was then assigned by the

district authorities to Long Lan. The traditional land areas of the families who were moved to other villages were then transferred to their relatives and friends living in Long Lan. Some families leased their land to people in Long Lan to grow vegetables and graze cattle.

Ca Xia is a small valley of fairly flat land located to the northeast of the Long Lan residential area, about 1.5 hours walk away. At the foot of Ca Xia Mountain, there is a pond about 500 m² with abundant water almost all year round. This is the only source of water for people's daily drinking, cultivation and livestock. The area is situated in a valley surrounded by the natural forest where families graze their cattle. Hence, the soil there is relatively fertile due to the continuous replenishment of cattle dung and humus created in the forest. At the same time, because of the high humidity of the soil and the cool climate, the area is suitable for growing diverse kinds of vegetables throughout the year.

At present, in the small valleys of Ca Xia where there is flat land, 35 households are cultivating vegetables for sale. Here, people are growing a variety of different vegetables, mainly beans, Hmong/Meo mustard, green mustard, yellow flower mustard, rapeseed, dill, coriander, pumpkin, etc. Often, villagers intercrop maize with these varieties in order to feed their herds of cattle and poultry. At the higher altitudes, where there are natural forests with abundant food sources (grasses), families graze cattle, e.g., cows and horses.

Po Phay area

This is production land where families specialize in growing vegetables. The area is located in a valley shaped by the Po Phay Mountain, about 1.5 hours walk to the southwest of the residential area. This is also the only area in Long Lan where a small stream with abundant water flows across it year round. The main drinking water for households in Long Lan is currently taken from this stream.

Like some other areas within Long Lan's territory, Po Phay has relatively good soil with a thick cultivative layer, with high humidity which is regulated by the stream and natural forests. Therefore, villagers can grow a diversity of vegetables here continuously over a period of 10 months of the year.

At present, 30 households of Long Lan village, mainly from the Ly clan, are growing vegetables in this area. On average, each household has 1-2 pieces of land for cultivating vegetables using intercropping or rotational methods. Besides vegetable varieties such as yellow flower mustard, green mustard and beans, villagers have also intercropped with maize to feed their herds of cattle and poultry.

Long Lan area

The locations for growing vegetables in the Long Lan area are mainly along both sides of the road to Ca Xia village, and some near the residential area. Compared to the above three areas, this is the smallest area of land for vegetable cultivation. However, the number of families who have land there is largest (50/74), so the area per household is relatively small. At the beginning, chayote was the main crop chosen to be grown in places near the houses with fine soil and shaded by forest trees, in order to provide its fruits for the daily meals of families. Gradually, in the farer locations, families in the village began to expand the area of chayote, along with other types of vegetables such as beans, squash, banana, papaya, etc., in combination with maize for the daily food of people and poultry. These locations used to be the swidden fields of families. In the past few years, some families have begun to plant more economically valuable vegetables, such as coriander and dill on these fields to earn cash.

3.3. Main principles in ecological vegetables cultivation in Long Lan



Figure 11: Hmong women and men are harvesting radish (Photo by CHESH Lao / SPERI, 2016)

Ecological cultivation, or production based on natural ecosystems is not a new method, it has been formed and developed along with the course of human adaptation. However, a

long process of production based on natural extraction, the use of chemicals, high technologies, and hybrid species has led this system to become less resistant due to environment and landscape degradation. Moreover, it has pushed human into a situation of increased risks, such as diseases, precarious livelihoods, poverty and dependency.

In this context, ecological farming plays multiple roles as a driving force, means and goal that requires humans to think for themselves, change and move forward towards a more sustainable development system, minimizing risks, not only for farming, but also for household livelihoods. At the same time, it contributes to the harmonious and sustainable management and use of natural resources for the benefit of following generations.

Experiencing many changes due to external factors, the Hmong people in Long Lan village have been searching, learning and experimenting to draw on their experiences in cultivation as well as harmonious behavior toward nature. These values are being practiced by farmers on the basis of nature-based production, without, or minimizing, negative impacts on existing natural ecosystems. Despite the increasing pressures of the market economy, population density, and the heavy demand on materials for the daily living, Long Lan still maintains a method of cultivation which is relatively unique and in harmony with the natural conditions of the Phou Sung watershed area.

Notably, as villagers shared, they do nothing from soil preparation and sowing until harvesting. They do not have to fertilize because of the abundant forest. When the leaves fall, after a while they become humus which make the soil richer. Because the vegetable farms are located on high mountains and next to the forest, so the soil and air are always moist. In the morning, dew on the vegetable leaves drops onto the soil and is absorbed by the roots, so they do not need to water the crops. The forest has various trees which provide a favorable habitat for good insects which control the development and spread of pests, so villagers do not need to use pesticides. In addition, Long Lan villagers have chosen a variety of vegetables that can be planted once, but harvested multiple times. After each cut of the sprout, it sprouts again. Because of that, Long Lan can produce vegetables throughout 10 months of the year, from February to November, with a very stable yield.

This is the result of seven principles developed by Long Lan in accordance with their belief in nurturing nature, their traditional customary law, e.g., ‘Tong Xenh’, and their ethnic knowledge in farming, livestock raising and natural resources management.

First principle: Maintaining the largest areas of land covered by natural forest to ensure the stability and sustainability of the production components.

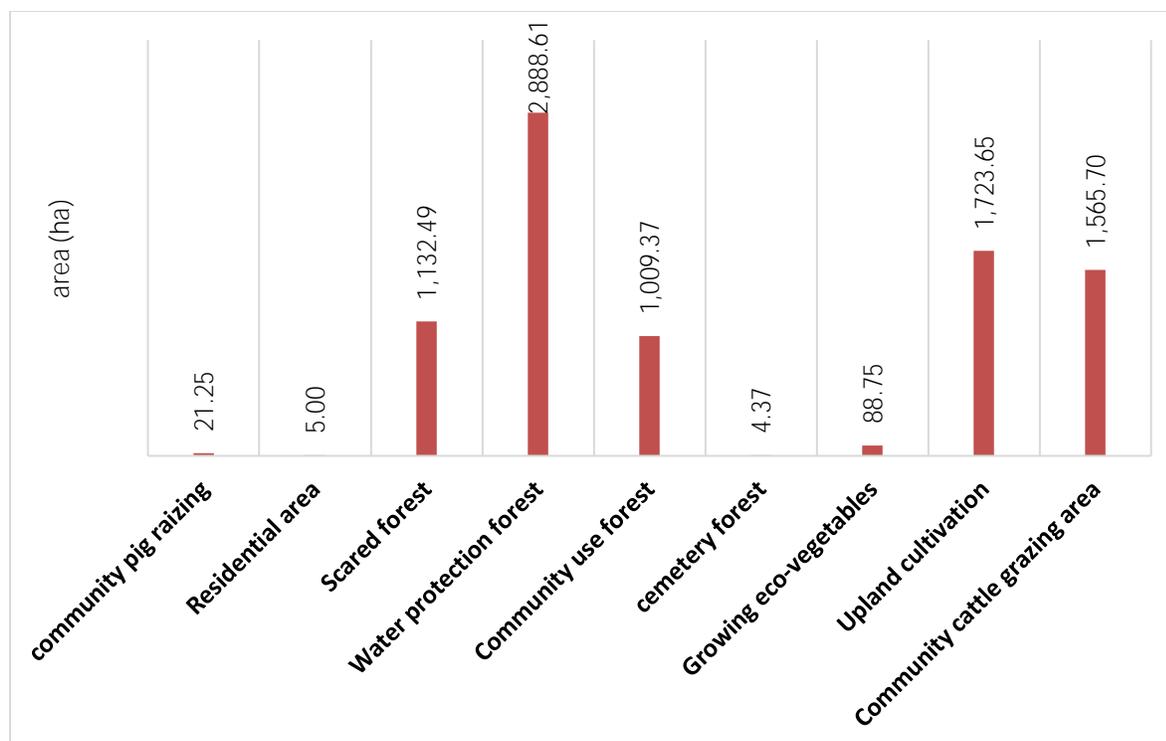


Figure 12: Categories of natural resources in Long Lan village

In 2005, after the community-based forest and land allocation supported by CHESH Lao, Long Lan set up its land use plans. Accordingly, the entire natural area of the village was planned into specific functional areas, including residential area, forest area, cultivated area, livestock raising and vegetable growing areas. This plan was agreed upon by the people based on the actual need for family livelihoods, the traditional institutions and customary laws of the community, and the legal framework of the Lao government.

One of the strengths of land use planning in Long Lan is the harmonization of resource use to meet the need for livelihood security with the need for preservation of the natural ecosystems. In order to achieve this, the community has relied on their experience and understanding of the natural conditions, such as weather, soil, landscapes and plants in order to make appropriate functional subdivisions that do not harm the components of the whole watershed ecosystem. Accordingly, the area for agricultural production accounts for 21.58% of the total area. The remaining 78.42% is natural forest. Although the population of the village has increased, this plan has been maintained since the forest and land allocation in 2005.

The area of cultivation is divided into two major categories. The ecological cultivation of different sorts of vegetable in accordance with the seasons of the year occupies only 1% of the total cultivated area of the village. The remaining area is reserved for the rotational upland rice farming. With the rotational method of 1 year of cultivation, 3 years of fallow,

the land covered by re-growth forest after swidden cultivation is 3 times that of the total area under cultivation. It can be said that both farming methods (regular and fallow) have had little impact on the forest as a whole.

According to many studies, it is common for the forest ecosystems to be significantly affected if cultivation is concentrated in one large area. In Long Lan, the cultivation area is scattered in different locations. These are valleys formed by the mountains. In each area, villagers are allowed to cultivate only from the foot of the mountain down to the lowest point of the valley. At the top, the natural forest is strictly protected. Moreover, at the foot of the mountains, the slash-burn rotational fields of families are often small and scattered. This mode of land uses is seen as the best way to minimizing negative impacts on the natural forests.

Second principle: Eco-vegetable cultivation areas are located in the most favorable soil and climate conditions.

One of the most prominent features of the cultivated areas, especially in the ecological vegetable fields of Long Lan village, is that these are usually situated in valleys. This feature is quite different from many other sites in Luang Prabang province where the upland fields are often located from the middle to high altitude positions on steep slopes. In Long Lan, cultivation areas are often surrounded by natural forests where people often combine farming and grazing. The location of the cultivated areas in the lowest terrain helps to maintain the soil moisture and fertility for the growth and development of the crops, as they regularly receive, and are replenished by, nutrients and humus flowing down from the forests.

The production areas of Long Lan are scattered in valleys in several locations, such as Phou Sung, Ca Xia, Long Lan and Pho May. This planning is based on the characteristics of the topography, soil, climate, and plants in each location. This maximizes the advantages of each production area while minimizing negative impacts on the natural ecosystem in the watershed area.

Third principle: Selecting the most suitable vegetable varieties for the climatic conditions and soil conditions in each production area.

From a long process of living on Phou Sung Mountain, the people of Long Lan understand very well the natural conditions of each landscape. Hence, they have selected varieties of crops most suitable to each location. Currently, families are planting 15 different types of vegetables in combination with other agricultural crops in different areas. These are suitable areas for growing vegetables because of cool climate, high humidity, and fertile soil with a thick cultivation layer.

Table 2: Some types of vegetables grown in Long Lan

No	Vegetable varieties	Hmong language	Note
1	Chayote	Chi Thai	Mainly for harvesting shoots and fruits
2	Yellow flower mustard	Zaub Zùà	Mainly for selling
3	Dill	Zaub Chr	Mainly for selling
4	Coriander	Zaub Txhub	Mainly for selling
5	Green mustard	Zaub Zua	Mainly for selling
6	Green bean	Tauz	Mainly for selling
7	Radish	Zaub Zua	Mainly for selling
8	Bok choy (<i>Brassica rapa chinensis</i>)	Zaub nTsuab	Not much growing
9	Bamboo	Ntsuag	Planted in upland fields, forests and near the residential area
10	Green squash	Txiv lus	Planted in upland fields for family meals
11	Green onion	Dos	Mainly for selling
12	Cabbage	Zaub Nom	Not much growing
13	Long bean	Taun Tev	Not much growing
14	Chili	Rua Txab	Not much growing
15	Hmong cucumber	Dib	Planted in upland fields for family meals

Among the most commonly grown vegetables are chayote and yellow flower mustard, or Hmong/Meo mustard. They are either traditional Hmong breeds or locally adapted ones. These varieties are suited to the natural conditions in the upland area. In addition, due to the characteristic of naturally re-generating after harvesting, these varieties are planted once but can be harvested several times. Previously, these vegetables were grown mainly for daily family meals. Today, they are grown primarily for sale to earn income. These

varieties have become the main vegetables contributing to the formation and maintenance of the Long Lan brand of ecological vegetables in the Luang Prabang market.

In addition, Long Lan villagers have also tested, adapted and planted other newer types of vegetables suited to the local conditions and climate, such as coriander, dill, cabbage, green bean, etc., for sale. One of the salient characteristics of these vegetables is that they are easy to grow and produced several crops in the year. They do not require much investment and intensive work, but are very much preferred by the market in which there is high and stable demand. Especially, they can be grown in small areas so they are quite suitable for households who have small land plots near the residential area.

Fourth principle: Integrating farming and livestock.

Unlike many places where natural resources are exhausted due to intensive cultivation for high productivity and income, so far, families in Long Lan very much care about improving the soil so that the soil in return will nourish the crops. One example of this is the combination of livestock and cultivation, notably vegetables with cows and horses. Livestock are grazed in the community planned forest areas. These locations are situated at a higher elevation than the swidden fields. At the lower locations, normally in valleys, villagers often grow vegetables in combination with different types of agricultural crops.

According to 2017 statistics, there are currently 55 households raising cattle, including 380 cows and 75 horses. These cattle are grazed in four community-grazing locations adjacent to the four main cultivation areas of Phou Sung, Ca Xia, Tshav Twm and Chong Po Phai.

Livestock in the community forest areas far from the residential zone do not create environmental pollution, but provide a significant source of nutrients in the form of cow and horse dung for the natural ecosystem, particularly vegetables and upland rice. It is estimated that, on average, each animal produces about 6 kg of manure per day. As a result, the amount of manure collected from the entire village cattle herd is about 2,730 kg per day. If it is calculated for the whole year, the amount would be 982,800 kg.

Animal manure is seen as a significant source of nutrients for the growth and development of forest trees in the areas where cattle are raised. In return, this natural vegetation is a source of food for livestock. This is a special nutritional cycle used by the people in Long Lan village.

As the grazing areas are located at the highest elevation, this allows the livestock manure to flow down into the cultivation areas to supplement nutrients and humus in the soil. Therefore, these farming areas are continuously maintaining their fertility throughout the production cycles. In addition to the land and climate characteristics, maintaining the nutrients supplied from the grazing area is one of the key factors that contribute to sustaining the harmonious farming system of Long Lan.

Fifth principle: No using of chemicals in cultivation.

At present, in Luang Prabang in particular and in the northern provinces of Laos generally, in many places people have increased the usage of chemicals (e.g., insecticide, herbicides, stimulants ...) in agro-forestry production. Due to the interest in yield and income, they either do not know or care about the serious environmental and health consequences to humans, flora and fauna.

Aware of these effects, Long Lan has set up its regulations for prohibiting villagers from using chemicals in agricultural production. Instead, with knowledge and experience, villagers in Long Lan have developed cultivation methods and techniques that ensure both crop yields and pest and weed control while improving soil fertility.

For the control of weeds, villagers have applied a variety of farming methods, notably intercropping and crop rotation. Intercropping maize with pumpkin and cucumber with upland rice are examples. According to villagers' experiences, weeds grow and spread quickest when they have sufficient space for light and nutrients. This period is often right at the time when rice and maize are still small and the canopy is not yet closed. When conducting intercropping, the leaves of pumpkins or cucumbers help to cover the soil so grasses find it hard to grow and spread.

For pest control, people in Long Lan village have been applying: a) intercropping or rotating a variety of crops in an area, and b) preserving the forests around the cultivated areas. With the former, as there are diverse varieties, the pest finds it hard to find enough food to develop, spread and become epidemic. For the latter, as shared by villagers, the natural forest of Long Lan is still very good, so there are many birds, animals and natural enemies that eat the pest. In addition, if insects are found, especially on vegetables, villagers use their hands to catch them, instead of using chemicals as some places in Luang Prabang are still doing.

Sixth principle: Practice fallow to restore the ecosystem and nutrients to the soil.

Slash-burn rotational cultivation is the traditional method of cultivation for many communities in Luang Prabang province, including Long Lan village. This is explained in figure 7. This method is seen as effective for ensuring the quality of soil and vegetation through the period of the fallow. The natural vegetation will re-generate during this time and the soil will be restored its nutrients. In addition to the natural factors, the part or full restoration of the natural forest ecosystem and soil fertility depends on the duration of fallow. According to many studies, these natural conditions would be restored to the original states if the fallow period were at least seven years or more.

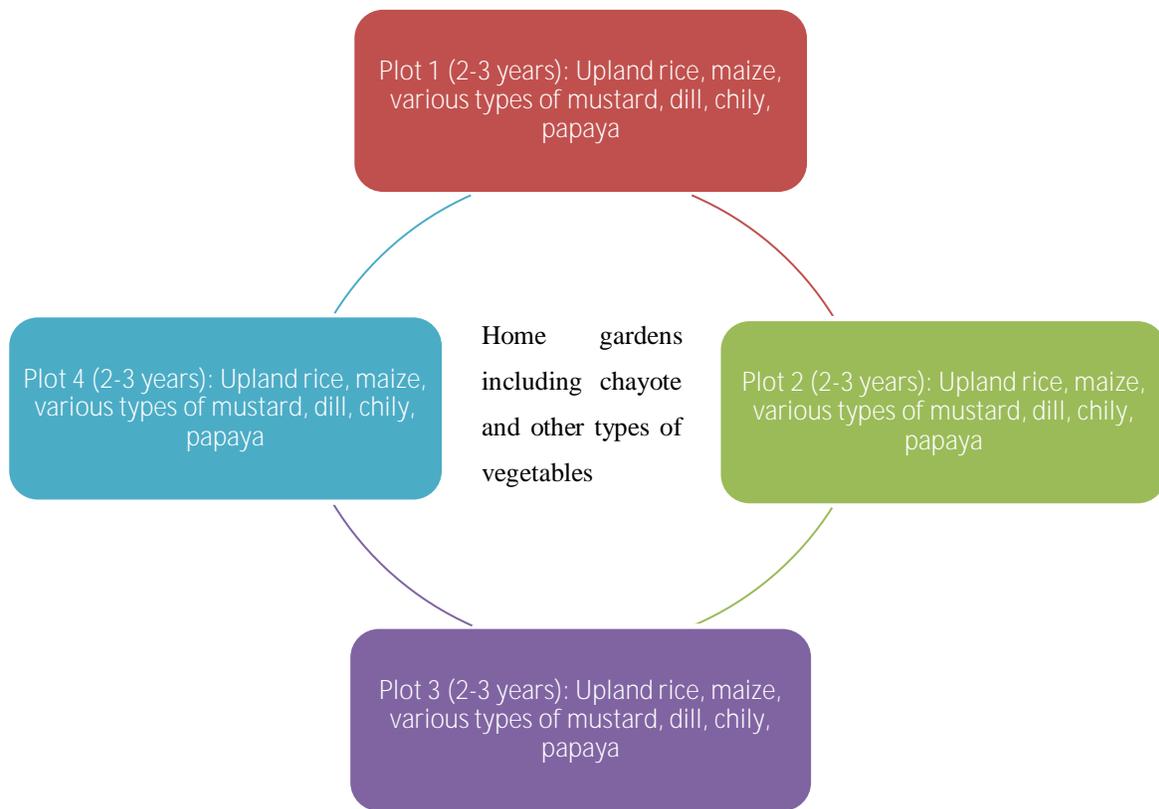


Figure 13: Cycle of the slash-burn-cultivation in Long Lan

In Long Lan village, each household usually has from 4 to 6 pieces of the upland field. Accordingly, farming activities are rotated between land plots, with the fallow period ranging from 6-7 years. In each of the slash-and-burn rotational fields, villagers often grow a variety of crops in one season in accordance with the recipes of intercropping between the main crops and secondary crops. The structure of the crops depends on the food needs, economic condition, and labor availability of each family. However, one of the common things in rotational cultivation in Long Lan is that families usually intercrop upland rice or maize with various types of vegetables, such as Hmong/Meo cucumber, squash, green mustard, etc. Yellow flower mustard, rapeseed, dill and coriander are often grown separately on smaller land plots according to the rotational method.

On the same piece of land, households usually arrange a variety of crops, according to the plot, intercropping or inter-seasonally. This is seen as a method for controlling the growth and spread of pests and weeds. This method allows villagers to harvest a variety of products at different time intervals while enhancing the effectiveness of soil protection, especially limiting soil erosion in the rainy season.

In addition, fallow in the rotational cultivation contributes to promoting natural regeneration of forest plants, creating a favorable living environment for wildlife, especially creating a source of feed for cows and horses. The reality is that many forest

trees such as bamboo, *Castanea sativa*, etc., regenerate well in the fallow fields. The 4-6 years' fallow is a suitable time for different types of bamboo to have the best harvest. In addition, many wildlife, such as pigs, snakes, mice, etc. prefer to live in the rotational cultivation habitats after about 3-5 years' fallow, because during this period, forest trees are quite shaggy with lots of shelter and food sources. In plots with 1-3 years of fallow there will often be many regenerated trees and grasses to feed cattle.

Seventh principle: Diversify species to ensure the safety of household income.

Income diversification in production is an important factor in enhancing household livelihood autonomy, reducing the risks caused by natural uncertainties such as pest, disease, and weather (flooding, drought), as well as unstable market prices. This principle is especially significant for mountainous communities living away from urban areas, with difficult access. In Long Lan village, this principle is clearly seen in the structure of annual crops and livestock production of the community.

Table 3: Sources of incomes of 15 interviewed families in Long Lan

<i>No</i>	<i>Sources of income</i>	<i>Time for harvesting</i>	<i>Income / hh (million kip)</i>	<i>Number of hhs</i>	<i>Note</i>
	Upland rice	From October to November	5.4	14/15	For human food
1	Maize	From June to October	1.1	13/15	For human food and feeding animals
2	Chayote	From June to December	13.5	9/15	For food and sale
3	Yellow flower mustard	From October to January	3.5	7/15	For food and sale
4	Dill	From June to October	7.9	2/15	For food and sale
5	Coriander	From June to October	6.1	6/15	For food and sale
6	Green mustard	From June to October	0.6	3/15	For food and sale
7	Other types of vegetables	From June to December	1.5	4/15	For food and sale

<i>No</i>	<i>Sources of income</i>	<i>Time for harvesting</i>	<i>Income / hh (million kip)</i>	<i>Number of hhs</i>	<i>Note</i>
8	Cows	All year	4.6	12/15	Accumulated asset, used in the traditional rituals and selling
9	Pigs	All year	1.2	3/15	Selling and used in the traditional rituals
10	Poultry (chicken and duck)	All year	1.8	14/15	Selling and used in the traditional rituals
11	Avocado and coffee		1.6	7/17	Selling
12	NTPFs in the fallow period	From May to September		15/15	Providing food, medicine, materials, products for sale (bamboo shoots, mushrooms, honey, etc.)

Finding from 15 interviewed families in Long Lan show that almost all families, except 1-2 young and newly formed households, have a clear pattern of diversity of agricultural products that they produce in the year. This provides families with a variety of income and food sources. The diversity of farming products and agriculture-based incomes of the households in Long Lan is illustrated by the following factors:

In terms of time, households can generate a stable source of income that is evenly distributed over 10 months of the year. This is clearly seen in the case of ecological vegetable cultivation, which is normally harvested from May to January. Among the vegetables, there is also a clear division of income. As vegetables like dill and coriander can be harvested within only 45 days of sowing, and they can be sown several times in a year. Vegetables like chayote produce about 8 months of harvest per year. This is the reason for this choice of vegetables for cultivation, to generate a stable income for household livelihoods.

Regarding income generation, table 3 shows that there is a clear diversity of income sources for households in Long Lan. If ecological vegetable cultivation generates the household's regular income, which is distributed evenly throughout the months of the year, then livestock are seen as a source of accumulating assets. In addition, households produce other products to generate income or ensure their food supply. Upland rice provides enough food for the families. In addition, surplus quantities are sold for income. Maize is mainly used to feed the livestock and poultry of households, without having to buy it. Moreover,

families are self-sufficient in forest products such as wild vegetables, herbs, timbers, etc. without having to buy them from outside. All these factors help the families to have self-sufficient livelihoods.

It can be said that the diversification of production types has contributed to the variety of direct and indirect income sources for households in Long Lan. This is one of the principles that has helped households move towards sustainable and self-reliant livelihoods in the context of an uncertain market economy.

3.4. Main modes of ecological vegetable cultivation in Long Lan

Growing chayote in valleys

Chayote, *Chi Thai* in Hmong language, is a temperate fruit species, climbing by tendrils, its stalk is divided into 3 to 5 branches. It is native to Mexico, North America and was introduced to tropical countries such as Laos and Vietnam by French missionaries. Although not native, Hmong people in Long Lan have grown this variety for a long time because the average temperature on the Phou Sung Mountain, ranging from 12-17°C, is suitable for the growth and development of this plant.

Prior to 2000, most families in Long Lan grew only one or two clumps of chayote close to their houses, or at the forest edge near the village for their daily meals. Later, after the government banned shifting cultivation and the growing opium, and Long Lan villagers with the support of CHESH Lao made study-exchange trips to visit other Hmong peoples in Laos and Vietnam, families in Long Lan started growing the chayote for earning cash. Chayote was selected to grow as a commodity because it is adapted to the climatic and soil conditions of the Phou Sung Mountain. Second, Long Lan people have long experience of growing and caring for the plant. Third, chayote vegetable products are very popular with consumers in Luang Prabang. Fourth, once planted, it can be harvested for many years. Its life cycle can last up to 10 years. Fifth, the harvesting period of chayote shoots and fruits can be continuous over 8 months of the year. Finally, due to quick growing, it is possible to harvest it four times per month.

In the early days, chayote was grown mainly in small areas near the houses and at the forest edge close to the village for selling its fruits and some young branches. These are shady areas covered by the forest canopy and have high humidity and nutrients because they are situated in concave terrain that is continuously filled with humus and nutrients from the flow of water from above. Moreover, since these places are located near the houses, it is very convenient for the people to collect household organic waste and animal dung to use as organic fertilizer for the chayote clumps. In order to facilitate natural pollination, as well as for convenience of harvesting, villagers have created frames made from natural

materials, e.g., small timbers and bamboo, for chayote to climb on. According to the villagers' experience, the chayote's frame must be made of natural materials, not cement or steel. This is because chayote is suited to cool conditions and if the materials are non-natural, like steel or cement, they would absorb heat from the sun, especially during the dry season. This would increase the temperature and affect the growth of the chayote.



Figure 14: Chayote farm in the valley of Long Lan (Photo by CHESH Lao / SPERI, 2017)

As demand for the products of the chayote in the Luang Prabang market increased, families in Long Lan gradually expanded the area of cultivation. This extension, however, was made selectively based on the experience and understanding of villagers about the growth and development characteristics of the plant, its appropriate climatic and soil conditions and community regulations for cultivating and managing forest resources. The average areas for growing chayote are usually not large, only about 500-3,000 square meters, and are often located in valleys or small ravines.

These valleys have soil, climate and humidity conditions favorable for the growth and development of the chayote. Firstly, they are located in the lowest points, so a large amount of cow dung and humus from vegetation of the natural forests, as well as remnants of slash

and burns, continuously add nutrition to the soil. As the ashes and natural biomass flow from above to accumulate in the valleys, the cultivated soil here is quite thick with high fertility so there is no need to use fertilizers. These conditions allow for continuous cultivation of the chayote on the same piece of land without having to move to new locations. This minimizes the impact on the natural forest and land resources that would otherwise be caused by cutting or burning for production. Secondly, as these fields are at the lowest positions, it allows underground and surface water accumulation, so the soil there is always kept moist, even in the dry season. Villagers therefore do not need to water the chayote. Thirdly, the climate there is relatively cool, with less variation in temperature during the day and night as well as between seasons. This is due to these locations being covered by the natural forest canopy. This could reduce the effect of direct sunshine in the afternoon that would affect the growth and development of chayote.

Unlike many other regions, in Long Lan people also grow chayote in the valleys by a natural method. They do not make frames for chayote to climb, but rather let its branches grow on the ground. This is a new cultivation method of the chayote in Long Lan. It was initiated by elder Xay Khu Zang. At first, he only experimented with some chayote in a small valley near his upland field. Interestingly, this chayote grew very fast with big branches and leaves. Then, he began to expand growing chayote in the entire valley. After one season, seeing the effectiveness, other families in Long Lan village replicated this method in their fields. After a period of experimentation and application, villagers in Long Lan have drawn a number of lessons from this new method of cultivating chayote. Firstly, in the past, villagers grew chayote mainly for its fruits, but now the main product from this plant are its leaves and shoots. Therefore, it is not necessary to make frames for the chayote to climb as they did before. By not doing this, it is more effective for picking up the leaves and shoots. Secondly, when the chayote grows on the ground, its branches and leaves develop faster with higher yield compared with when they climb on a frame. This is due to chayote being more often exposed to moisture and cool ground. This new method produces a yield that is twice that of the previous practice in the same area over the same time. Thirdly, the new method of cultivation saves time and labor due to not having to make frames for chayote to climb. Fourthly, when the chayote is covering the ground, it helps to control grass encroachment, so it also saves time and labor that would otherwise be spent weeding.

Arrangement of ecological vegetables on the upland fields

The Hmong people living in the Phou Sung Mountain have wonderful knowledge regarding the combination of crops on the same piece of land in the same landscape. This knowledge has been developed via the process of observing and learning from nature. They

have tested, applied and transferred this knowledge over the generations. They know very well where natural conditions such as soil and humidity are most suitable to specific crop. This method of cultivation has helped families in Long Lan to diversify products on the same plot of land while optimizing the natural conditions such as terrain, soil and climate for each crop in order to ensure its quality and productivity in a sustainable way.



Figure 15: Yellow flower mustard growing next to the swidden farm in Long Lan village (Photo by CHESH Lao / SPERI, 2017)

For example, on the same piece of upland field, villagers often intercrop maize and rice in high altitudes, and vegetables in the lowest places where there is concave terrain. As explained by villagers, this arrangement is because, normally, rice and maize do not need as much nutrient and moisture as vegetables. In the concave locations, the soil is usually better, and nutrients and minerals are often replenished with humus from the forest biomass, e.g., leaves, logs and ash (after slash-and-burn), flowing down. These places are also more humid because they are the places where surface and underground water flow from above to accumulate at the lowest point. On the flat fields, vegetables can be cultivated for only one to two crops per year. Then, villagers have to move to other places in the form of rotation to give the land a rest to recover its fertility. However, in concave places, villagers are able to grow vegetables for several years without having to move

elsewhere. In addition, with this arrangement vegetables are generally healthier with fewer pests, better quality, and higher and more stable yields.

With the traditional farming practices of the mountain dwellers in general, and the Hmong in Long Lan in particular, besides the main duties during the process of cultivation, people often undertake a lot of other work, collecting firewood, wild vegetables, herbs and other natural products of the forest, especially during rest times. Thus, the arrangement of growing vegetables on the same piece of upland rice field is considered an adaptation of the traditional cultivation methods to new conditions. It allows villagers to continue their system of work and labor organization that has been maintained from decades ago without having to convert to new forms of organization, such as specialized production. Moreover, besides the traditional farming products like rice and maize, villagers can now harvest different types of ecological vegetables to feed their families as well as sell for income. Thus, the efficiency of labor productivity can be judged as higher than that in the past. In the context of the market economy, families must have income for the newly occurring expenditures, such as for motorbikes, telephones, and other investments. Yet, traditional rotational cultivation can only meet the family demand for food. Hence, the shift to combining rice and vegetable production not only contributes to maintaining and promoting the value of subsistence production, but also provides relatively diverse and stable sources of income for families.

Intercropping of local cucumber of the Hmong with swidden rice

The Hmong people of Long Lan village in particular, and mountainous ethnic groups in northern Laos generally, are very rich in understanding of crops as well as techniques of intercropping. Intercropping ensures both a diversified food supply for families on the same area of land over a certain period, and promotes an interaction and complementarity between crops related to nutrition and light. This knowledge and understanding have been observed, tested, replicated and handed down over the generations.

Intercropping swidden rice with local cucumber of the Hmong is an example. Following the rotational cultivation practice, after the selection of land and slashing, burning and cleaning the land surface, when the rainy season begins, normally in April or May, villagers start to sow upland rice or maize. Often villagers mix rice seeds with some other varieties, including Hmong cucumber, in the same bag. After using a stick with a pointed end to poke holes on the ground, villagers take the mixture of seeds to drop into the holes and leave them until the rain comes. When the rain falls, the mixture of fertile soil, humus and ash, including different types of minerals, will flow down and cover the holes.



Figure 16: Intercropping swidden rice, local cucumber and maize in a farm in Long Lan village (Photo by CHESH Lao / SPERI, 2017)

As explained by the villagers, the Hmong cucumber is one of the intercropping species best suited to upland rice for the following reasons. Firstly, this kind of cucumber usually crawls on the ground, so they do not compete for light with the rice. It also does not climb on the rice like beans, cantaloupe, squash, etc., so it does not affect the growth and development of the rice. Secondly, the Hmong cucumber is often harvested earlier than rice, by about two months. Therefore, during the time when the rice is growing, there are open spaces, so the light and nutrients are still available for the development of cucumber. Thirdly, due to the developmental characteristics of the Hmong cucumber it does not need much sunlight. Therefore, during the first 1-2 months after sowing, the rice can partly shade the cucumber from direct sunlight and support its development and growth. Fourthly, when cucumber fruits are harvested, is also the time when villagers start to take care of the rice, mostly weeding, watching for wildlife damage, etc. Therefore, villagers can harvest cucumber fruits to supplement their own food and water while working hard in the fields. Fifthly, when crawling on the ground, the cucumber can help to control the growth of grass so it does not need time and labor for weeding.

Intercropping squash and maize



Figure 17: Intercropping between squash and maize in a farm in Long Lan village (Photo by CHESH Lao / SPERI, 2017)

According to the experience of villagers in Long Lan, squash is the most suitable plant for intercropping with maize. In Long Lan, maize is grown mainly for feeding pigs, chickens and ducks. Therefore, the area of maize cultivation is often small compared to other crops. Villagers often cultivate maize by two methods. The first method is to grow maize around the upland rice fields to act as green wind barriers to protect the rice. At the same time, it is also the boundary marker between neighboring fields. The second way is to grow maize in small parcels of land within the upland rice field. In this case, squash or soybean / yellow bean are selected for intercropping with maize. Following the rotational cultivation method, after selecting land and slashing, burning and cleaning, villagers start to grow maize in the rainy season, in late April and early May. Often, villagers mix maize seeds with some other varieties, such as squash and soybean, in the same cloth bag. Then, villagers take the seed mixtures to drop into holes that are poked in the ground with a wooden stick. When it rains, a mixture composed of fertile soil, humus and ash, including different types of mineral, flows down to cover the holes.

As explained by the people, squash is one of the most suitable crops to intercrop with maize for the following reasons. First, pumpkin has a longer growth and development cycle than maize. Therefore, when maize begins to stop growing, the leaves turn yellow. This is when squash begins to flower and fruit. Thus, at this time, squash does not need to compete for light and nutrition with the maize. Second, maize stalks (before and after harvesting) can be used for the pumpkin to climb. Third, when the squash spreads over the ground it can help to control the growth of grass, so people do not have to spend time on weeding.

Rotation of ecological vegetables on a piece of upland field



Figure 18: Cabbage grown in the swidden farm in Long Lan village (Photo by CHESH Lao / SPERI, 2017)

In addition to intercropping different crops on the same upland field according to their spatial arrangements and supportive relationships, villagers in Long Lan also make use of the right time to grow each type of vegetables. According to villagers' experience, this arrangement, apart from optimizing soil nutrients, light, water and other factors at different levels for each type of vegetable, also increases labor productivity and the diversity of products in the same space and time.

In places where it is possible to grow vegetables for the first and second crops after a fallow period of 6-7 years, villagers usually grow varieties, such as coriander (*Zaub Txhub* in Hmong language), that have high nutrient requirements, especially minerals from ash and

moisture. The coriander produced in this crop normally has the highest quality and yield. Its leaves and stems are larger and greener compared to that grown in other locations.

At present, some households in Long Lan village are intercropping upland rice and coriander instead of planting them separately as the first crop after the fallow. According to the initial assessments of villagers, the quality and yield of the coriander grown by this method are better than that from mono-cropping. Often, with this method, coriander grows quicker, and its leaves are bigger and greener. According to Chi Ly, a villager in Long Lan, coriander grown in this way has better conditions for growth and development. Even though the coriander is grown in the same natural conditions (soil fertility and humus), it has better quality and yield if it is intercropped with upland rice. This is because the coriander is partially shaded by rice so it is less affected by the direct sunlight. Therefore, the leaves of the coriander are always green, moisture is always maintained and this stimulates the growth of coriander.

On the same piece of land, after harvesting the coriander, villagers usually sow dill (*Zaub Chu* in Hmong language). This vegetable requires lesser soil quality and other natural conditions such as moisture compared with the coriander.

When soil nutrients and moisture are insufficient to ensure the quality and yield of coriander and dill, villagers turn to grow yellow flower mustard (*Zaub Zua* in Hmong language). Yellow flower mustard is grown in the last one to two crops before fallow according to the rotational cultivation cycle.

3.5. Seasonal calendar of Long Lan

In general, the production calendar of Long Lan village for one year is closely related to the two weather factors, rain and sunshine. Over a long period of living and cultivating in the Phou Sung Mountain, people in Long Lan village have observed, experimented and learned many productive experiences in accordance with weather, forest and soil conditions. This experience is reflected in the seasonal calendar, which includes periods of time for cropping and livestock activities as well as harvesting of natural products (see table 3).

Table 3: Seasonal calendar of Long Lan

Activities	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rain			x	xx	xx	xxx	xxxx x	xxxx xx	xxxx	xx	x	
Chayote		CB D	D	T	xx	xxx	xxxx x	xxxx x	xxxx x	x		
Rapeseed		CB D	D	T	CS	xxxx x	CBD	D	T	TH		
Dill		CB D	D+T	TH	T	TH	T	TH	T	TH		

Activities	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Green bean		Cb D	D+T	TH	TH			CBD	D	TH	xxxx xx	
Pumpkin				TT	CS	xxxxxx (harvesting shoots)					Fruits	
Green mustard		CB D	D+T	TT	T	TH		xxxx xx		TH		TH
Bamboo shoots				T								
Bitter melon						T		TH				
Corn				T	CS		TH				TH)	
Upland rice		CB D	D			T		CS			TH	
Coffee		CB D				T				TH		
Rubber		CB D	D	DH		T	TH					
Melon						T	TH					
Raising cow		CS; Giving births (mostly in March and September)										
Note	CBD	Soil preparation										
	D	Slashing										
	D+T	Slashing and sowing / planting										
	T	Sowing / planting										
	DH	Digging holes										
	CS	Taking care										
	TH	Harvesting										
	xxxx xx	Months for the most harvest										

Cultivation activities usually start from February to March (Lao calendar). This period is the end of the dry season. During this time, villagers conduct work such as seeking places for cultivation, slashing, drying and burning vegetation, and cleaning the land surface before sowing.

At the end of April or early May, when the rain comes, villagers start sowing seeds, mostly upland rice and maize and other secondary varieties such as chili, squash, etc. The following months are the time for taking care of the crops, mostly weeding.

For vegetables, the planting season starts in April to May. With vegetables like coriander and dill, it takes about 45 days from sowing to harvesting, so in a year they can be cultivated several times. For chayote, it is planted only one time, in April, and then it can regenerate by itself each year. The life cycle of chayote is normally about 10 years, and then it will be re-planted. Its leaves can be harvested after 30 to 45 days while its fruits can be harvested from the end of July, early August until November.

Generally, the rainy season, from May to September, is the time for most of the farming and livestock activities of families in Long Lan. At the beginning of the dry season, around October and November, villagers start to harvest upland rice and maize.

Community-based activities such as religious ceremonies or the making and renovation of houses are usually held in December and January. This is the period when most agricultural activities other than taking care of livestock are finished.

3.6. Division of labor



Figure 19: Hmong girl and woman in Long Lan village are harvesting yellow flower mustard (Photo by CHESH Lao / SPERI, 2017)

The research finding showed that the division of labor for a household in Long Lan village is usually arranged in a way that is consistent with the physical abilities of family members. Heavy work, such as cutting big trees and transporting farming products is usually done by men. Men are responsible for the care of cattle, mainly salt feeding and protection of the herds as the grazing areas are situated high on mountains with difficult and dangerous access, so women would not be able to manage.

Women, the elderly and girls are more likely to engage in the lighter tasks such as planting and tending and harvesting farming products such as upland rice, corn and vegetables, etc. They often combine the time spent on the swidden with harvesting forest products, e.g., bamboo shoots, herbs and wild vegetables to feed family members and livestock. This group of laborers is also responsible for housework, usually in the morning and in the

evening, such as preparing food for family members and animals, as well as taking care of their children. These activities, while not requiring a lot of energy, require ingenuity and carefulness.

3.7. Values of ecological vegetables to the family livelihood

At the time of not yet having converted to the ecological vegetable cultivation for sale, families in Long Lan had mainly intercropped local vegetables in the upland fields, opium gardens or around the houses and residential area to satisfy daily food requirements. Since 2000, due to the policy of banning opium cultivation and limiting shifting cultivation, these families have shifted to producing diverse types of ecological vegetables to supply to the Luang Prabang markets. Since this time, besides the nutritional value of daily meals, vegetables have a significant place in the income structure, as well as providing on-site employment opportunities for families in the village.

Regarding the indirect economic benefits of vegetables (i.e., the value of vegetables that are not sold but eaten, calculated in money terms), according to the self-assessment of villagers, vegetables and upland rice are the two groups of crops that are most highly valued by the community. On average, with two meals per day (breakfast and dinner) each consuming about 1 kg of vegetables, one family will eat about 720 kg of different types of vegetables per year; that is about 53,280 kg for 74 households in the village. If the average price of 1 kg of vegetables is about 4,000 Kip, then the money value of vegetable consumption for the whole village would be about 213,120,000 Kip.

Table 4: Income sources of the 15 interviewed families in Long Lan in 2016

No	Households	Vegetable cultivation	Upland farming	Cows	Income	%
1	Nhia Chia Ly	1,300,000	5,062,500	2,705,000	9,067,500	14.34
2	Tua Ly	9,200,000	5,775,000	2,722,000	17,697,000	51.99
3	Cu Tho	8,725,000	-	500,000	9,225,000	94.58
4	Chu Cong Ly	8,800,000	8,182,000	4,043,000	21,025,000	41.85
5	Va Senh	38,400,000	10,268,000	3,300,000	51,968,000	73.89
6	Giang Chong Tho	21,900,000	7,200,000	5,471,000	34,571,000	63.35
7	Ka Lau		11,797,500	6,354,900	18,152,400	-
8	Giong Senh Ho	10,080,000	-	4,364,000	14,444,000	69.79
9	Lenh Chi Ly	39,440,000	11,100,000	17,634,000	68,174,000	57.85
10	Senh Ly	30,366,000	12,072,000	420,000	42,858,000	70.85

<i>No</i>	<i>Households</i>	<i>Vegetable cultivation</i>	<i>Upland farming</i>	<i>Cows</i>	<i>Income</i>	<i>%</i>
11	Gia Sua Ly	4,500,000	8,775,000	4,335,600	17,610,600	25.55
12	Lenh Ho	6,480,000	9,600,000	8,012,000	24,092,000	26.90
13	Cong Chu Ly	3,000,000	8,605,000	3,660,000	15,265,000	19.65
14	Che Giang	21,150,000	300,000	7,624,000	29,074,000	72.75
15	Bay Tha	8,285,000	9,250,000	11,773,000	29,308,000	28.27
	Total	211,626,000	107,987,000	82,918,500	402,531,500	
	Average	14,108,400	7,199,133	5,527,900	26,835,433	<u>52.57</u>

(Source: Results of the field survey with families in Long Lan, July 2017)

Regarding the direct economic value, according to the assessment of villagers, vegetable production contributes the highest income, followed by livestock, upland rice and corn. At present, the cultivation and sale of ecological vegetables is considered the main source of income for 74 households in the village. The period of growing and selling vegetables takes place continuously over about 10 months of the year, with a total yield of about 450 tons. If the average price of 1 kg vegetables is 4,000 Kip, then the entire village can earn approximately 1.8 billion kip per year. Therefore, the average income per household is over 24 million kip annually.

Information from 15 interviewed households in Long Lan showed that the average annual income from different types of production is about 26,835,433 kip per family, with income from ecological vegetable cultivation ranging from 1.3 million kip to 39 million kip per year.

Table 5: Income sources of Lenh Chi Ly's family in 2016

<i>No</i>	<i>Types of products</i>	<i>Earning (kip)</i>	<i>Percentage</i>
1	Eco-vegetables	39,440,000	58
2	Cattle and poultry	17,634,000	26
3	Upland rice	7,200,000	11
4	Avocado	2,000,000	3
5	Maize	900,000	1
6	Coffee	1,000,000	1
	Total	68,174,000	100

(Source: Result of the field interview with families in Long Lan, July 2017)

The above table shows the significant role of ecological vegetable cultivation in the livelihoods of families in Long Lan village. Income from ecological vegetables cultivation contributes about 52.57% of total household income. Depending on the structure of household production activities, the level of contribution from vegetable production varies. For instance, in the case of Cu Tho who is a young farmer with a newly established family, his family mainly grew ecological vegetables and raised some pigs and chickens in 2016. Therefore, income earned from cultivating ecological vegetables accounted for 94.58% of total household revenue.

The case of Lenh Ho, a family with many members and economic difficulty, shows that ecological vegetables have an economic value equivalent to other crops and types of production, such as cattle and poultry. In 2016, this family earned 6,480,000 million kip from growing vegetables (23% of total income), 7 million kip from rice (25% of total income) and 8.5 million kip from livestock (30% of the total income).

Families with medium to better economic conditions often give their priority to ecological vegetable cultivation for earning income, rather than investment in other types of production. The case of Lenh Chi Ly's family is an example. His vegetable cultivation contributes the largest share of household income compared to other crops. In 2016, the total income for his family reached 68,174,000 kip, of which vegetable production accounted for 58% (39,440,000 kip), livestock production 26% (17,634,000 kip), and maize at 11% (900,000 kip), the rest was from other crops.

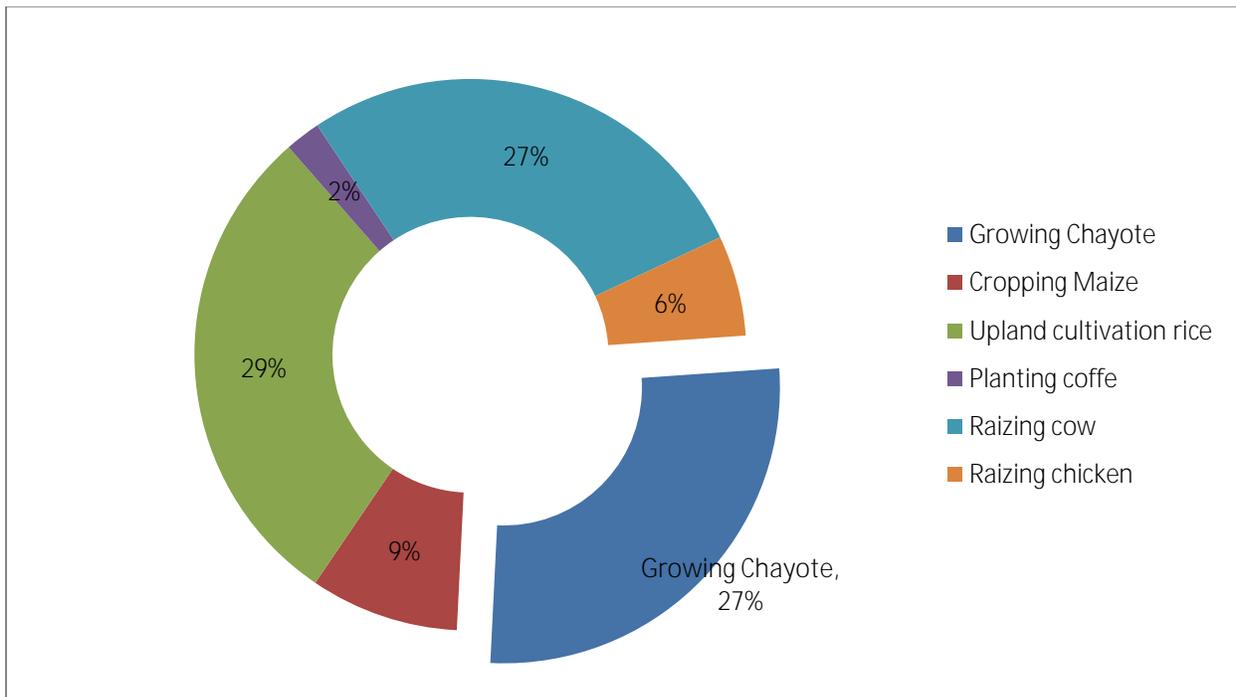


Figure 20: Income sources of Lenh Ho's family in Long Lan village

The above facts indicate that families who are not always well off, unlike those with medium and good economic conditions, often do not prioritize investment in a specific type of production such as vegetable cultivation. This is because they need to prioritize the safety of the household's livelihoods rather than producing income-generating commodities. If investing in only one type of production, such as vegetable cultivation, there would be high possibility of risk if it were not successful due to loss of crops, natural calamities, epidemics or low market prices. This could cause a major impact on the livelihoods of these families. At the same time, the restoration of economic conditions and livelihood of these families is also more difficult and slower than the well-off families because they have not had accumulation before.

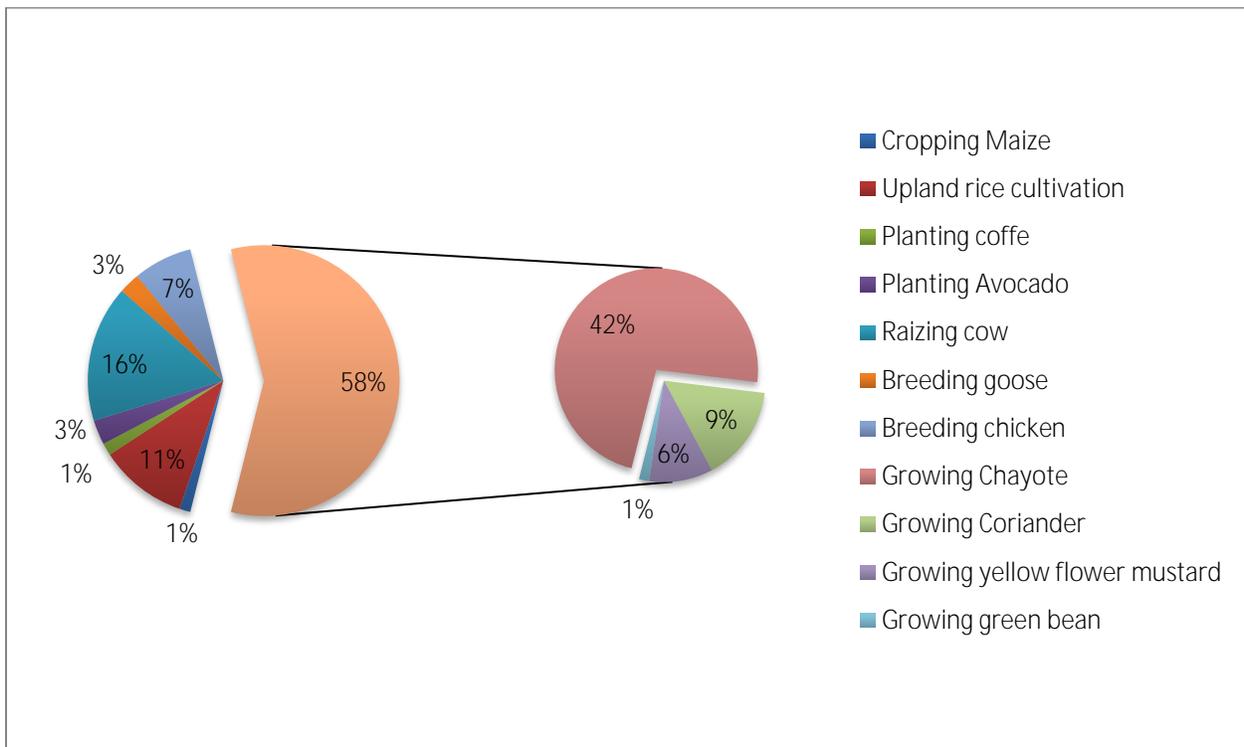


Figure 21: Proportion of income sources of Mr. Lenh Chi Ly family in Long Lan village

The study findings show that the proportion of income from ecological cultivation of different types of vegetables varies. Chayote contributes the highest income compared to other types of vegetable. This is reflected in the fact that most families in the village currently prioritize planting chayote in their cultivation areas. The main reasons for this priority include i) the market demand and prices for chayote leaf and fruit products being relatively stable; ii) the climate and soil of Long Lan being suitable for the growth and development of chayote; iii) techniques of growing chayote being relatively simple. Chayote is planted once, but it can be continuously harvested for at least 8 years, while the harvesting time is evenly distributed over several months of the year; iv) Long Lan villagers have a lot of experience in growing chayote. In the case of Chi Ly's family,

income from the chayote accounted for about 72 percent (28,800.00 kip) of the 58% total family yearly income derived from the cultivation of different types of vegetables.

About three years ago, the second most valuable vegetable was yellow flower mustard. However, this position is now being replaced by coriander and dill. Previously, these two varieties were mainly only intercropped with other vegetables, so their economic value was not significant. In recent years, due to demand in the Luang Prabang market, the price is relatively high (20,000 kip / kg on average) and stable, while the climate and land conditions in Long Lan are suitable. So, families have grown these two types of vegetables much more than yellow flower mustard. On average, one family can earn about 6,000,000 kip from growing coriander and dill. These vegetables contribute approximately 9% of the total family income, followed by rapeseed, about 6%.

Vegetable production not only provides a major source of income for households, but also contributes significantly to the creation of regular and stable jobs for the villagers. The survey in Long Lan showed that the time spent on growing vegetables accounts for 40-50% of total working days. At the same time, the cultivation of vegetables can take place continuously for 10 months of the year. In addition, this type of production does not require a lot of energy, it requires skill, so it is very suitable for women, aged people and children, mostly in supporting their parents to grow and harvest vegetables.

3.8. Comparison of the effectiveness of growing ecological vegetables versus rubber

In the past few years, some families with good economic conditions in Long Lan have bought land in neighboring villages to plant rubber trees. In addition to environmental impacts such as soil degradation, loss of the natural vegetation, etc., the economic efficiency of growing rubber trees is also much lower than that for ecological vegetables.

Specifically:

The initial investment in rubber plantations is relatively high, especially the purchase of land, seedlings, equipment and supplies. Rubber is a new species for villagers in Long Lan, so it requires new techniques and high technologies. The villagers have no experience with this tree, so they have to hire laborers to be involved in the entire cycle of production. In addition, the period from planting to harvesting is relatively long, about 7 to 10 years, and the area is relatively large. Moreover, the market price of rubber latex is often unstable. Therefore, it can be said that planting rubber trees is suitable only for families with better economic conditions, with available capital as well as the ability to cover other expenses in the period prior to and during the harvest.

On the other hand, families with medium economic conditions, especially poor households, can invest fully and autonomously in the cultivation of ecological vegetables to sell for income generation. The technical requirements and prerequisites for vegetable cultivation are not high compared to the planting of rubber trees. In particular, vegetable planting does not require large investments at the beginning, e.g., buying land, labor and materials, and a large area of land, while for vegetable planting villagers are fully self-sufficient in seeds, techniques and labor. At the same time, ecological vegetables are favored by the Luang Prabang market, so the purchased prices are relatively stable.

Table 6: Comparison of cost and income from growing eco-vegetables and rubber trees

<i>Types of production</i>	<i>Area (ha)</i>	<i>Cost (kip)</i>	<i>Revenue (Kip)</i>	<i>Net income (Kip)</i>
Vegetable	0.5	8,800,000	39,440,000	30,640,000
Rubber	1.3	13,400,000	24,000,000	10,600,000

(Source: Results from interview with Mr. Lenh Chi Ly, July 2017)

Table 6 shows that the family of Lenh Chi Ly currently owns 1.3 hectares of rubber trees and 0.5 hectares of ecological vegetables such as yellow flower mustard, coriander and chayote. For the rubber plantations, for one year, his family has to invest about 13.4 million kip for land purchase, labor hire for land preparation, hole digging, caring, and tapping. The gross income for this tree was 24 million kip per year. By comparison, the investment for growing ecological vegetables was only about 8,800,000 kip because the family does not have to buy land or hire labor. From this, the family gained about 39,440,000 kip of gross income. Subtracting the investment costs, for one year the family benefits by 10.6 million kip from rubber and 30.64 million kip from ecological vegetable cultivation.

3.9. Value chain of eco-vegetables of Long Lan

At present, ecological vegetables of families in Long Lan are mostly being sold to seven intermediate traders. These traders are mainly Hmong people in Long Lan and some living in villages near Luang Prabang city. The vegetables collected by the intermediate traders are then sold to small retailers in four main markets in Luang Prabang City, including Ma No Lak, Na Vieng, Kham and Pa Luang.

The table 7 shows that: First, there is a big difference in the value of vegetables from production to consumers. As shown in the table 7, the average difference for 10 types of vegetables is about 7,675 kip / kg. The average price for vegetables that the consumer has to pay in the Luang Prabang market is about 3,300 kip / kg higher than what retailers bought them for from the middleman. The price that the intermediate traders has to pay the

vegetable growers is about 2,875 kip / kg. If this is purchased in the fields, then the price is often dropped even further to about 1,500 kip / kg.

Table 7: Prices of some ecological vegetables of Long Lan

No	Types of vegetables	Intermediate traders (kip)		Retailers in Luang Prabang (kip)	Consumers (kip)	Note
		At the field	At village			
1	Green bean	1,000-4,000	2,000-5,000	5,000-7,000	7,000-9,000	Highest price: May; Lowest price: Sept-Dec; Day of selling most: 200 kg / village
2	Bamboo shoots	-	2,000-6,000	5,000-10,000	8,000-13,000	Highest price: July; Lowest price: Sept-Dec; Day of selling most: 20 bundles/village
3	Green mustard	2,000-4,000	3,000-5,000	5,000-7,000	7,000-9,000	Highest price: Dec; Lowest price: Jul; Day of selling most: 120 kg / village
4	Rapeseed	1,000 - 7,000	2,000-8,000	5,000-15,000	8,000-17,000	Highest price: Jul-Sept; Lowest price: Jan-Feb; Day of selling most: 600-700 kg / village; Day of selling least: 150 kg / village
5	Chayote shoots	2,000 - 5,000	3,000-6,000	5,000-9,000	8,000-12,000	Highest price: Apr-May; Lowest price: Sept-Oct; Day of selling most: 250 kg / village; Day of selling least: 60 kg / village
6	Coriander	3,000-19,000	4,000-20,000	8,000-25,000	10,000-28,000	Least season: Jul-Sept; day of selling most: 200 kg / village; day of selling least 100 kg / village.
7	Chayote fruits	-	1,000 – 5,000	3,000-7,000	5,000-9,000	Lowest price: Sept-Oct; highest price: May-Jun; day of selling most: 200 kg / village; day of selling least: 25 kg / village.
8	Cabbage	1,500-3,000	2,500-4,000	4,000-6,000	6,000-8,000	Highest price: Jul-Jan; Lowest price: Feb-Mar; day of selling most: 100 kg/village; day of selling least 40 kg/village
9	Pumpkin leaves	1,000	2,000	4,000	6,000	Most season: Jun-Jul: 20 kg/day/village
10	Radish	2,000	3,000	6,000	8,000	Highest price: Aug-Oct; Average: 60 kg/day/village

(Source: Field interview with families in Long Lan village, July 2017)



Figure 22: Hmong women in Long Lan transporting ecological vegetables from their farms to village (Photo by CHESH lao / SPERI, 2016)

Of all types of vegetables, yellow flower mustard has the largest difference, about 18,500 kip / kg. Cabbage has the least difference, about 4,750 kip / kg, followed by bamboo shoots, about 5,000 kip / kg.

From the above analysis, it is obvious that the greatest amount of value in the ecological vegetable production chain of Long Lan is gained by the intermediate trader and retail

marketers in Luang Prabang. This added value is not benefitting the growers, but is falling into the pockets of the middlemen and small traders.

Secondly, the determination of selling prices for each type of vegetable is made by the intermediate traders and sellers in the Luang Prabang markets. Although there is 'bargaining' between individual vegetable growers and intermediate traders, the final purchase price is agreed and established by the intermediate traders. Bargaining only makes sense for the best quality vegetables that have the good price. Conversely, low quality vegetables are normally sold at the lower prices. This is because the intermediate traders of vegetables and the retailers in the Luang Prabang markets have a close link with each other. They set up a consensus on the prices for buying vegetables. Amongst the intermediate traders, whoever buys more or less, at the end of the day they share with each other, so that all members in the group will have the same quantity and type of purchased vegetables.

By contrast, vegetable growers in Long Lan are working individually and do not have links to each other in the production and marketing chain. Consequently, they are often losers, especially of the added value in the vegetable consumption chain from the village to the markets in Luang Prabang.

IV. COMMUNITY LIVESTOCK IN LONG LAN

4.1. History of the herd of cows in Long Lan



Figure 23: A men in Long Lan on the way to monitor their cows in the community grazing area (Photo by CHESH Lao/SPERI, 2017)

For the Hmong people in Long Lan village, cows are not raised simply for the significant revenue or assets they provide families; they are also of cultural and religious value. On death, the soul of the deceased can return to his/her ancestors only when and if the soul of the sacrificed cow accompanies it. In the religious festivals of the Hmong people held annually, such as 'Tong Xenh' and 'Thu Ti', it is compulsory to have at least one cow to sacrifice to the gods of nature. The meaning of the ritual is to pray for the protection of the gods of nature to bless the peace and prosperity of the whole community. For that reason, from the early time when migrating to live in the Phou Sung Mountain, in addition to focusing on cultivation and raising pigs and poultry, Hmong households have also accumulated economic sources to invest in cattle, especially cows and horses.

Before the American war period, the Hmong in the Phou Sung Mountain had many cows, mainly raised in the forest near the upland fields of families for easy care and protection.

However, during the fiercest fighting time, due to the American bombs dropped in the Phou Sung mountain area, most of the cattle of the families died, and only some pigs and chickens were left.

At the end of the war in 1975, families continued to breed and expand their herds of cattle. Given the capital that was accumulated from the cultivation and sale of opium, after liberation, in 1975-1977, about 30 households in Long Lan village were able to buy cows, with an average number of 3-4 cows per family. At that time, these families mostly bought cows by exchanging one pair of silvers, about 8 million kip in current value, for one cow. Xay Khu Zang and Cho Si Zang were the first people to buy cows from Long Luc, Long Vay and Pha Thong villages. As a valuable livestock, during this time households mainly kept and released cows near their houses and around the residential village. Each household had to make fences around their house to keep animals away from the living areas to avoid problems of hygiene. This solution was implemented by households for some time, but it did not thoroughly solve the issue of environmental sanitation. After that, the whole community together made a fence around the village to keep out the animals. This solution was implemented and the problem of hygiene was solved. However, in 1980 the government opened a road crossing the village. This allowed cows to enter into the living area again and cause environmental and hygiene problems.

Given the above issues, some elderly and village leaders organized village meetings to agree on making two community grazing areas, far from the residential zone, Ca Xia and Bo He. Accordingly, in the rainy season, cows are now released in Ca Xia, and in the dry season, they are moved to the area of Bo He. Although having community-grazing areas, families still have to manage their own cattle. In addition, the community also planned a separate grazing area for pigs of the families in the village. This area is located near the residential zone, to be convenient for families to take care of their pigs.

Due to the abundant sources of grass and water as well as fresh environment, during the period from 1983 to 1989, the cattle of households increased significantly. However, the difficulty was the increase in conflicts among families related to cows. As the cows of families were released in the same place, when a young cow was born, villagers were confused as to which family the young cow should belong to. This led to the situation of different families recognizing the young cow as their own.

Around 2006-2009, after the program of community based land and forest allocation including local knowledge based land use planning, CHESH Lao continued supporting families in Long Lan via saving-credit revolving funds to invest in animal husbandry. As a result, the number of the cows of the families significantly increased. Then, Long Lan zoned different community grazing areas, mainly located on the top of Phou Sung Mountain, adjacent to the cultivation areas. Here, the cows of the families are grazed

according to the community regulations. The regulations were aimed at caring for, protecting and isolating the spread of the disease, and avoiding conflicts between families as well as damage to crops.

4.2. Planning community cattle raising areas



Figure 24: One of the community cows grazing areas in Long Lan (Photo by CHESH Lao / SPERI, 2017)

At present, Long Lan has 4 different areas of community cattle raising. Here the cattle of families in the village are rotationally grazed according to the grass growing cycle, as well as managed on the basis of community rules. These areas are i) Phu Sung - the largest area, located to east of the village; ii) Ca Xia located in the southeast of the village; iii) Tshav twm located in the south of the village; and (iv) Chong Po Phai (Roob pog faiv) situated in the west of the village.

The total area of the four community grazing locations is about 1,565.75 ha. However, in recent years, cows of families in Long Lan village are mainly breeding in two areas, Phou Sung and Ca Xia. Each area is used for breeding for about 3 years, then they turn to the second area. These areas were selected based on criteria drawn from experiences of elderly and good cow raising families as well as those who understand the ecological and landscape features of Phou Sung Mountain. The criteria were:

First, it must be an uninhabited are, far away from the residential zone to avoid environmental sanitation problems affecting the health of human, as well as convenient for

the control of disease. At the same time, this community grazing area should not belong to the locations designated as farming areas.

Second, there must be a variety of different types of grass to feed the cattle. In addition, there should be a variety of plants, especially bananas, to be used to supplement water in the dry season, when the water in the ponds is exhausted.

Thirdly, materials such as bamboo, rattan and wood should be available to make the fences surrounding the grazing area. These areas should also be convenient and easy to track and protect in order to prevent cows from eating and destroying crops in the upland fields.

Fourth, it should be in terrain that is not too complicated and sloping to avoid the risks of endangering the cattle as well as people during the time of taking care of their cattle. At the same time, it should not need much effort to make protective fences if the grazing areas are in favorable terrain conditions.

Fifth, there should be water available for cows to drink, especially in the dry season. If the area does not have ponds or water reservoirs, especially in the dry season, then there should be forest trees, such as bananas, which contain water, available for cows to eat.

Sixth, it should be an area where cattle have never been infected before. According to the experience of villagers, if the areas were selected in which a disease had occurred before, the germ could be very easy spread to their current herds.

Seventh, they should be places where the previous cattle had grown fast. Especially, where mother cows had given birth to many healthy calves.

4.3. Community regulations for the common cattle grazing areas

Regulations on types of cows in each area

After determining the grazing areas, Long Lan has set up rules to regulate the types of cows released in each location. This regulation is based on the sex of the animal and the amount of grass consumed by each breed of cattle. Accordingly, the areas of Zo Tia Qenh (Tshav Zo Tiaj Nqeeb) and Tshav Roob Pog Phaiv are set aside for mother cows with calves; Zo Chia (Tshav Zo Tshiab) is the location for raising bulls. This is because if mother cows and bulls were raised together in the same area it would affect the growth of the calves because the grass that is actually for calves would be eaten by the bulls. While the bulls would become thin due to frequent mating with cows. Moreover, it enables control of the reproductive cycle of mother cows. If they are kept together in the same area, it not only affects the health of mother cows that are pregnant, but also the calves in the womb, and the newborn calves.

Regulations on marking cow ears

In the process of managing and caring for cows, controlling cattle diseases, and limiting the impact of cattle on crops, disputes among families who have cows in the community grazing areas sometimes occur. This is due mainly to the fact that families do not know who the owners of the calves are. Thus, elder Tua Zang and Xay Khu Zang, who had the most experience in raising cows, took an initiative that later became the common practice for the whole community, that is cow ear marking. Accordingly, during the period of one year after calves have been born, their ears must be cut with different shapes to register them with the village cow management team. The age of one year for the calf's ear to be marked is appropriate because at this age the cow's coat color is unchanged. As a rule, the cows of each family will have their own ear marking shape. When cutting the calf's ear, a representative of the household, the village cow management team, and some other cows' owners are required to be present. A cow's earmarks are then drawn in a special record book managed by the village cow management team. Cow hair is also described in the book to distinguish the calf from the cows of other families.

Under this rule, if any family does not comply, it means that the family's cows will not be monitored by the village cow management team. If there is any problem with these cows, the cows' owners have to bear all responsibilities.

Regulations defining the families' responsibilities in raising cattle

In addition to the community regulations on grazing areas, types of cattle in each area, and marking of cattle ears, households inside and outside the village are charged with different duties. Firstly, households that sell their cattle must pay 2,000 kip per cow to the village development fund. If any family sells its cows in the village or its cows are slaughtered for religious procedures and festivals such as funerals, weddings, 'Thu Ti', 'Tong Xenh' rituals, etc., this family does not have to pay. Secondly, families with cows in the community grazing areas are responsible for contributing labor to make the surrounding fences, and periodically, with the village cows' management team, monitoring the cows. According to the regulations, for one day, two people from these families together with representatives of the village cows' management team, go to monitor the cows in the common grazing areas. This assignment is rotated among families who have cows in the community grazing areas. Thirdly, households with cattle must contribute their labor to periodically repair or renew grazing area fences, as well as take care of and protect the cows. Fourthly, when moving cows in and out the community grazing areas, the cows' owners must inform the village cow management team. If this duty is not followed and the infected cattle caused any problem for the cattle of other families, then the cows' owners have to compensate them. Fifthly, families must be responsible for declaring and registering a cow's earmarks when a cow is one-year-old. If this duty is not followed, and disputes arise, then the village

cow management team will not be responsible. Sixthly, any household that has planted before, without planning the farm, other families with the cows in the community grazing areas are responsible to help such family make a fence. Once the farm was planned, such family is self-responsible for crops' protection.

Regulations for rotating community grazing areas



Figure 25: Phou Sung cattle grazing area of Long Lan village (Photo by CHESH Lao / SPERI, 2017)

According to the community land use plan, Long Lan has four common grazing areas. However, in reality, there are only two main areas often used for cattle raising. They are Phou Sung and Ca Xia.

At present, Long Lan village has regulations that cows should not be in any community grazing area for more than 3 years. After that, all cows must be moved to other grazing areas. This is to ensure that the vegetation, especially grasses and plants for cows' feed, properly regenerate in each livestock area. Continuous livestock production in one area would result in a scarcity of feed for cow and that would affect the growth and development of the herd. In addition, having livestock continuously in one area would compact the soil in the area. Therefore, organisms such as worms would not have a suitable environment

for development, and forest seeds would not have favorable conditions for regeneration. Hence, the regeneration of forest vegetation, including grasses, would be slowed, or prevented altogether.

As analyzed in the ecological vegetable cultivation section, the zoning of production areas is closely linked to the forest and livestock areas. These cropping areas are always selected and planned in valleys surrounded by natural forests and community grazing forests. Every year, 455 cows and horses of 55 families release about 982,800 kg of manure into the natural ecosystems (including forest and farms). This source of organic nutrients is very important for meeting the nutritional needs of plants, especially in areas of continuous vegetable cultivation (not fallow).

In addition to these above two factors, the rotation of cattle around different livestock areas helps to reduce the risks of disease infection, as continuous grazing of livestock in one area provides a suitable environment for the germination of diseases.

4.4. Economic value of cows in Long Lan

In addition to their cultural and religious values, the herd of cows is contributing significantly to the income of 55/74 households in Long Lan village. On average, the economic value of the herds of the 13/15 interviewed households amounted to 13.58% of their total income (see table 8). In particular, in 2016, the household with the lowest income from selling cattle, at 1,563,000 kip, was Nhia Chia Ly, and the highest income, at 11,124,000 kip, belonged to Lenh Chi Ly. According to the proportion of income from different sources, the average income from raising cows contributed from 5.17% (Va Khach family) to 28.32% (Tho family).

Table 8: Proportion of income from raising cows from the interviewed families in Long Lan in 2016

<i>Stt</i>	<i>Households</i>	<i>Vegetables cultivation (1,000 kip)</i>	<i>Upland farming (1,000 kip)</i>	<i>Raising pigs and poultry (1,000 kip)</i>	<i>Raising cows (1,000 kip)</i>	<i>Total (1.000 kip)</i>	<i>%</i>
1	Nhia Chia Ly	1,300	5,062.5	1,142	1,563	9,067.500	17.24
2	Tua Ly	9,200	5,775	753	1,969	17,697	11.13
3	Cu Tho	8,725	-	500		9,225	-
4	Chu Cong Ly	8,800	8,182	1,165	2,878	21,025	13.69
5	Va Senh	38,400	10,268	615	2,685	51,968	5.17
6	Giang Chong Tho	21,900	7,200	2,500	2,971	34,571	8.59

<i>Stt</i>	<i>Households</i>	<i>Vegetables cultivation (1,000 kip)</i>	<i>Upland farming (1,000 kip)</i>	<i>Raising pigs and poultry (1,000 kip)</i>	<i>Raising cows (1,000 kip)</i>	<i>Total (1.000 kip)</i>	<i>%</i>
7	Ka Lau		11,797.5	3,170	3,184	18,152,4	17.55
8	Giong Senh Ho	10,080	-	-	4.364	14,444	30.21
9	Lenh Chi Ly	39,440	11,100	6,510	11.124	68,174	16.32
10	Senh Ly	30,366	12,072	420		42,858	-
11	Gia Sua Ly	4,500	8,775	1,990	2,345.600	17,610	13.32
12	Lenh ho	6,480	9,600	1,420	6,592	24,092	27.36
13	Cong Chu Ly	3,000	8.605	3.660		15.265	-
14	Che Giang	21,150	300	930	6.694	29.074	23.02
15	Bay Tha	8,285	9.250	3.473	8.300	29.308	28.32
	Total	211,626	107,987	28,248	54,670.5	402,531.500	
	Average	14,108.4	7,199.133	1,883.2	4,205.423	26,835.433	13.58

(Source: Result of the interview with 15 families in Long Lan, July 2017)

By comparison, if vegetable production provides a stable source of income, and distributes income evenly between the months in the year, cattle raising provides a "cumulative" source of assets / capital for the households in Long Lan. If there is no need for the greater expenditure, such as for buying land, a car, or building new houses, then families will not have to sell cattle. Therefore, the asset (cattle) in that year will continue to accumulate for the next year. On the other hand, when any household has a big event, such as a funeral or ritual ceremony, the family has its cows ready, so it is not necessary for them to buy a cow. Recognizing this, currently many households in Long Lan village, besides other types of farming, tend to focus on livestock in order to accumulate capital for expanding their production.

V. CONCLUSION

Throughout the history of moving to, settling and living in the watershed area of Phou Sung, the Hmong people of Long Lan have preserved many traditional cultural values and customary laws related to their behavior toward nature, as well as local indigenous experiences in production and husbandry in harmony with the specific ecological, landscape, soil and climatic conditions.

It can be said that community regulations based on the customary law of the Hmong people, in combination with the law of Laos, are promoting the strengths of each system to regulate and adjust relationships that relate to natural resources and productive farming, both within and outside the community. In this system, the village elders, heads of families, prestigious villagers and key farmers are playing a decisive role in maintaining the traditional values, structures and regulations. They are at the center in regulating relations amongst families and clans, contributing to the stabilization of life and the sustainable management of natural resources in the watershed area of Phou Sung.

The transition of traditional farming practices from shifting cultivation and rotational cultivation to small-scale ecological commodity production has been gradual, selective and adaptive under suitable conditions of climate, ecology, soil, native species and traditional techniques, as well as the traditional cultural practices of Hmong people. This has enabled villagers in Long Lan to establish a position of self-reliance and self-determination, instead of passive dependence on the outside. This has allowed them to create many initiatives to contribute to gradually stabilize and improve their livelihoods, and ensure the long-term sustainability of natural resources.

Agricultural production of Long Lan is supporting three core factors that ensure sustainable livelihoods of families. The first of these is that households are still maintaining their basic rotational farming system. This is helping families to be self-sufficient in terms of food, income and the accumulation of long-term assets. The second factor is that Long Lan's agricultural activity has shown strong indicators of effectiveness and sustainability relating to livelihoods, environment and social ecology. In spite of its small size, about 1% of the villages' total natural area, in addition to providing adequate nutrition, cultivation of ecological vegetables is the main source of income for the majority of households. At the same time, this type of production is creating significant employment opportunities for villagers, especially women, young people and the elderly. The third factor is that in addition to the cultivation of ecological vegetables and upland fields, community grazing in Long Lan village is of significant importance. Besides its cultural value, the activity of raising cattle in Long Lan is considered a significant source of capital and asset accumulation for the majority of households.

The people in Long Lan village have accumulated a lot of experience related to techniques and solutions in agricultural production in general, and local eco-vegetable cultivation and cattle grazing in particular. These experiences involve the appropriate and harmonious combination of local ethnic knowledge in upland cultivation and newly adapted techniques to ensure the sustainability of a production system that does not harm the natural forest ecosystem, landscape characteristics and other natural conditions.

The case of Long Lan is a practical demonstration of how traditional species, local knowledge and specific landscapes are the three most crucial factors in determining the sustainability of a naturally occurring agricultural production system. It is the traditional farming - rotational swidden - that has been handed down for generations. In many other places, local varieties have been replaced by exotic species, and local knowledge and solutions are being overridden by modern technologies. This has led to imbalances in productive systems and destroyed landscapes. The consequence is that these agricultural farming systems become dependent on external influencing conditions, rather than capable of sustaining themselves by their own internal energy flows. By contrast, Long Lan has been effective in promoting the application, testing and adaptation of the three crucial factors of traditional species, local knowledge, and landscape characteristics to changes in the overall ecosystem, including the agro-ecosystem.

REFERENCES

1. CHESH Lao (2000-2002, 2003-2005, 2006-2009). CHESH Lao proposals through different phases.
2. CHESH Lao (2005). Holistic planning of Long Lan in terms of socio-economic, culture
3. CHESH Lao (2005). Summary of the community based forest and land allocation in Long Lan village, Luang Prabang district, Luang Prabang province, Laos.
4. CHESH Lao (2009). Economic and welfare indicators Long Lan village, Luang Prabang district, Luang Prabang province, Laos.
5. CHESH Lao (2014). Types of the traditional vegetables of Long Lan village
6. CHESH Lao (2014). Seasonal calendar of Long Lan village
7. CHESH Lao (2017). Local knowledge in grazing cows of the Hmong in Long Lan village, Luang Prabang province, Laos.
8. Directive No. 09 of the Lao People's Revolutionary Party issued in 2004.
9. Keith Barber (2012). Cultural Identity, Network Action, and Customary Law _
<http://speri.org/eng/detail/Cultural-Identity-Network-Action-and-Customary-Law-164.html>
10. Laos Law on Forest issued in 1999 and 2007
11. Laos Law on Land issued in 1997 and 2005
12. SPERI (2009). Report on socio-economic indicators of Long Lan village, Luang Prabang district, Luang Prabang province, Laos.
13. SPERI (2013): Ethnobotany Book: An Approach to Biological Human Ecology Theory _
<http://speri.org/eng/detail/Ethnobotany-Book:-An-Approach-to-Biological-Human-Ecology-Theory-186.html>
14. CHESH Lao (December 2002). Yearly report of the CHESH Lao during the period 2000-2002.
15. CHESH Lao (November 2005). Customary law of the Hmong in Long Lan in natural resources management and usage.
16. CHESH Lao (December 2005). Yearly report of the CHESH Lao during the period 2003-2005.
17. CHESH Lao (12/2005). Methodology of the CHESH Lao in community based forest land allocation in Long Lan village, Luang Prabang district, Luang Prabang province, Laos.
18. CHESH Lao (March 2006). Evaluation report of the CHESH Lao during the period 2003-2005.
19. CHESH Lao (December 2006). Yearly report of the CHESH Lao during the period 2006-2007.

20. CHESH Lao (12/2008). Yearly report of the CHESH Lao during the period 2007-2008.
21. CHESH Lao (March 2009). Lessons learned in community development based on cultural identities of the Hmong, Kho Mu and Lao Loum ethnics in Luang Prabang province, Laos.
22. CHESH Lao (8 July 2010). Model on customary law based community governance of the Hmong in Long Lan village, Luang Prabang district, Luang Prabang province, Laos.
23. SPERI (23/3/2017). Certified appreciation of the rainforestation farming to the native eco-products of Long Lan. <http://speri.org/info/373/Vinh-danh-cong-nhan-nguon-goc-rung-mua-nhiet-doi-doi-voi-cac-san-pham-sinh-thai-ban-dia-cua-Long-Lan-1072.html>
24. CHESH Lao (June 008). The cultural identity and forest land resources of the Hmong in Long Lan village, Luang Prabang district, Luang Prabang province, Laos.