

Transition from traditional rotational shifting cultivation to growing ecological vegetables in Long Lan village, Luang Prabang province, Laos

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Introduction

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

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.

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.

"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.

The case study found out that 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.

Given the support of SPERI/CHESH Lao since 1999, to date, the transition from traditional farming practice to native ecological vegetables is the main source of income for 74 households in Long Lan. Agroecology practices in Long Lan have 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 agroforestry products have now officially been recognized as safe forest-based products by both the Lao Ministry of Agriculture and Forestry and NatureLife-International.

Principles of the agroecology practice in Long Lan

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.

This is the result of seven principles developed by Long Lan in accordance with their belief in nurturing nature, their traditional customary law, 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.

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

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

Fourth principle: Integrating farming and livestock.

Fifth principle: No using of chemicals in cultivation.

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

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

Given the above seven principles in agroecology, Long Lan families have in so far initiated different types of growing native ecological vegetables. Growing chayote in valleys IS one amongst these methods. Chayote, *Chi Thai* in Hmong language, is a temperate fruit species, climbing by tendrils, its stalk is divided into 3 to 5 branches. 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.

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 undergrown 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 some families in the village. 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.

Values of growing ecological vegetables in Long Lan

The survey in Long Lan showed that the time spent on growing vegetables accounted for 40-50% of total working days. At the same time, the cultivation of vegetables can take place continuously for about 9-10 months / 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 in supporting their parents to grow and harvest vegetables.

Villagers in Long Lan are self-sufficient in diverse vegetables, roots and fruits for their daily meals. On average, with two meals (breakfast and dinner), and each meal 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 whole village would have to spend about 213,120,000 Kip on vegetables.

Eco-vegetables are playing a major role in the income components of households in Long Lan. The figure below shows the important role of vegetables in household livelihoods in Long Lan. Accordingly, the proportion from ecological vegetable cultivation accounts for about 52.57% of total household income.

Totally, Long Lan can produce about 450 tons of various eco-vegetables per year. If the average price of 1 kg vegetables is 4,000 Kip, the entire village can earn approximately 1.8 billion kip per year. Therefore, the average income per household is over 24 million kip annually.

Conclusion

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. Therefore, the experience of Long Lan needs to be shared and replicated to other locations with similar characteristics in terms of livelihoods and natural conditions. At the same time, this best practice should be further researched to incorporate sustainable agricultural development strategies at all levels as well as integrate them into the training and education institutions regarding agro-forestry.