Sustainable Land Management Demonstration Sites

Established under the IFAD Grant 'Scaling up Sustainable Land Management practices by smallholder farmers: working with agricultural extension services to identify, assess and disseminate SLM practices'.

November 2020

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Sustainable Land Management Demonstration site 1: Utilization of Water from a Fishpond to Irrigated Paddy Rice

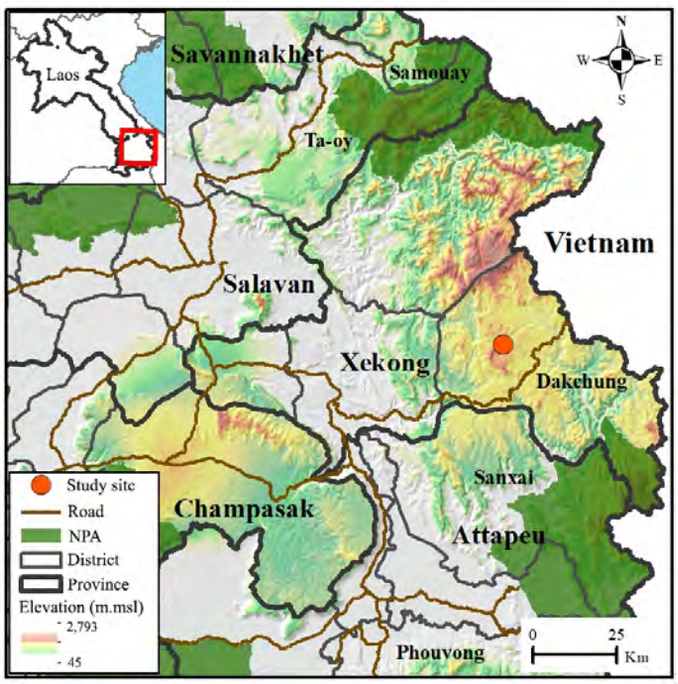
Name and contact details of farmer: Mr. Sonesing Sayyamuth, Darklern village in Darkchung district of Xekong province

Name and contact details of extension worker: Mr. Nouannavong, Darkchung District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Mr. Phonesiri Phanvongsa, kangphanvongsa@gmail.com

The land users established a demonstration of the "utilization of water from a fishpond to irrigated paddy rice". This demonstration began with the establishment of a fishpond and the release of approximately 3,000 fish fingerlings including tilapia, Pa Pak (Barbonymus gonionotus) and Pa Nai (Cyprinus carpio). The farmer was satisfied with the outcome of the demonstration as he observed that he increased through the expansion of the existing rice paddy. Previously, they could produce the equivalent of five sacks of rice and recently they have been able to harvest seven sacks of rice (50kg/sack). Additionally, the pilot household also engaged in aquaculture activities for household consumption including the rearing of tilapia, Pa Nai, and Pa Pak, each weighing between 300-400 grams on average (with 5-10 fish/harvest). After the fish had been released into the pond they could be harvested for home consumption after about a period of four months. The pilot household only had a few active labours (the main labour force consisting of two individuals) who maintained the water system by diverting

Demonstration map



water from a natural upstream water channel into the newly constructed fishpond. Sometimes, the diversion pipe was leaking or clogged up which resulted in an insufficient supply of water in the pond. This PVC diversion pipe can range between 5 – 10 cm in diameter but the smaller the pipe size, the lower will be the flow rate into the fishpond (it should be noted that the distance from the stream to the fishpond is approximately 200 metres). The lack of labour to conduct weeding and the collection of natural fish foods such as

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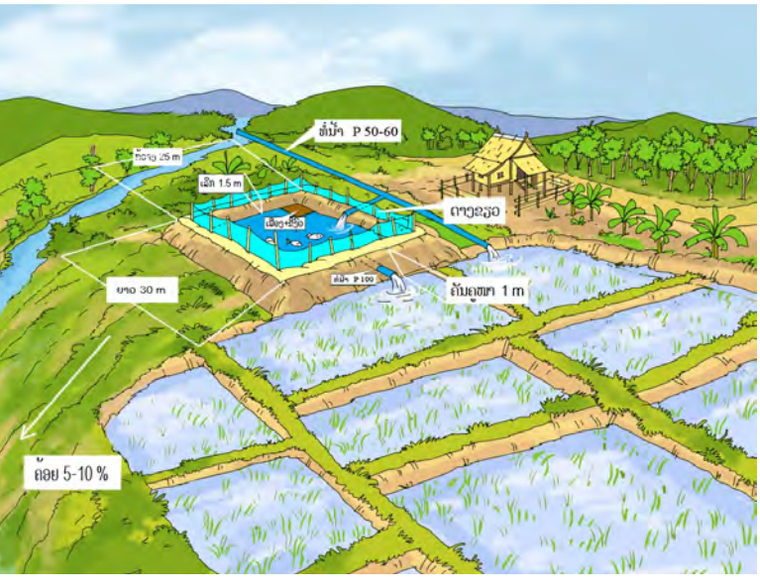


termites, insects and natural grasses was a challenge faced by the pilot household.

Based on the advice given by the project the land users gained various insights, including the utilization of vegetable scraps, and natural organic vegetation to feed the fish. Furthermore, the use of rice straws after the harvest which can be mixed with animal dung and afterwards placed in the fishpond to produce phytoplankton, which provides a good source of food for small fish fingerlings. Water from the fishpond also acts as a fertilizer for the soil because of the compost (cow dung and fish feces) as well as the decaying rice straws and other organic matters deposited at the bottom of the pond, as these provide the necessary nutrients for the rice to grow. Moreover, the movement of fish stimulates the changing of the water's colour cause by fish movement. It also possible to improve the water quality by mixing in some of the animal dung, before the water is allowed to drain into the rice paddies. The water supply is retained in the fishpond by firstly sourcing the water from the upstream location with the use of PVC pipes, and this avoids a direct flow into rice paddies. The farmers maintain the water at the required level and then allow a free discharge of overflow into the rice paddies. If one compares the old practice of transferring water directly from the stream into rice paddies, the water flowed slowly and it took a longer time to reach the sufficient water level in the rice paddies. After the establishment of the fishpond, the water was temporarily stored in the pond prior to release into the rice paddies, which could be done at the desired flow for planting and the maintenance of water levels. Moreover, the land users set up a duck house in the fishpond and placed green plastic nets as fencing around the embankment of the pond to prevent the entry of fish predators. The farmers also integrated the cultivation of vegetables along the fishpond's embankment for household consumption, and the use of vegetable scraps to feed the fish. A further benefit is that these vegetable plots also prevent embankment erosion.

The demonstration plot is located approximately 12 Km from the district capital of Dakcheung district of Sekong Province. The current access road is paved with laterite and has a gradient of around 10%. The fishpond is a distance of 30 meters away from the main road. It can be accessed by car but a 4WD is required during the wet season as the road becomes slippery. The climate is mild with an average temperature of 20° and an average annual rainfall of 3,200 mm.

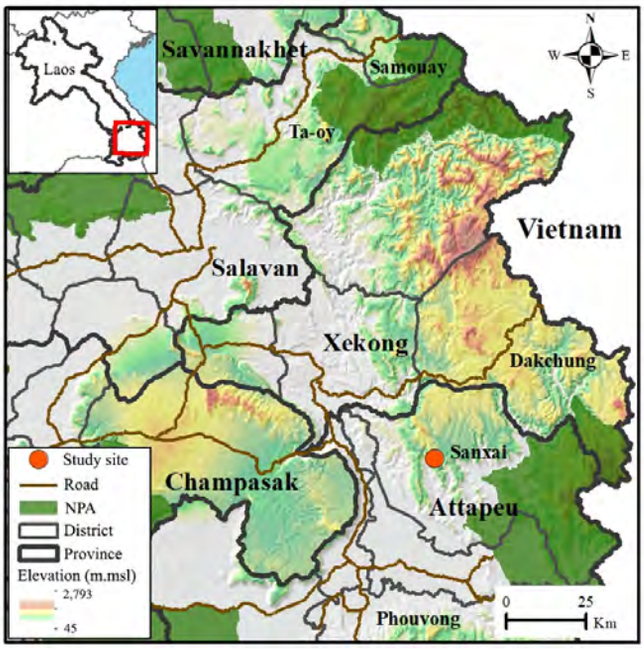
Sustainable Land Management Demonstration site 2: Coffee Cultivation Under the Cover of Big Trees

Name and contact details of farmer: Mr. Khamkong, Darksuem village in Xanxay district of Attapue province

Name and contact details of extension worker: Mr. Keovixay Phimmasone, Xanxay District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Syliphone Thongpasong, noytps85@gmail.com

Demonstration map



After the establishment of a coffee plantation under the cover of big trees, Mr. Khamkong is presently knowledgeable of the land preparation process prior to planting. This technique only requires the clearance of bushes and smaller trees with the remaining large trees left standing to provide shade for the planting of the new coffee. Land preparation does not require burning, as was the old practice, whereby farmers cleared all of the vegetation and burned it off before planting the coffee. The old practice explosed the young coffee plants to direct sunlight which affected their health and survival rates. The farmer also learned how to develop suitable planting rows and to lay out their directions with the use of plastic ropes and by marking planting holes with sticks. He also learned the technique of depositing organic matter into the planting holes before the actual planting of saplings so that it provides suplementary nutrients to the soil. Another technique includes the planting of saplings in a tilted position so that it stimulates the growth of new buds on the twigs. Once planting has been completed, there are further maintenance requirements such as

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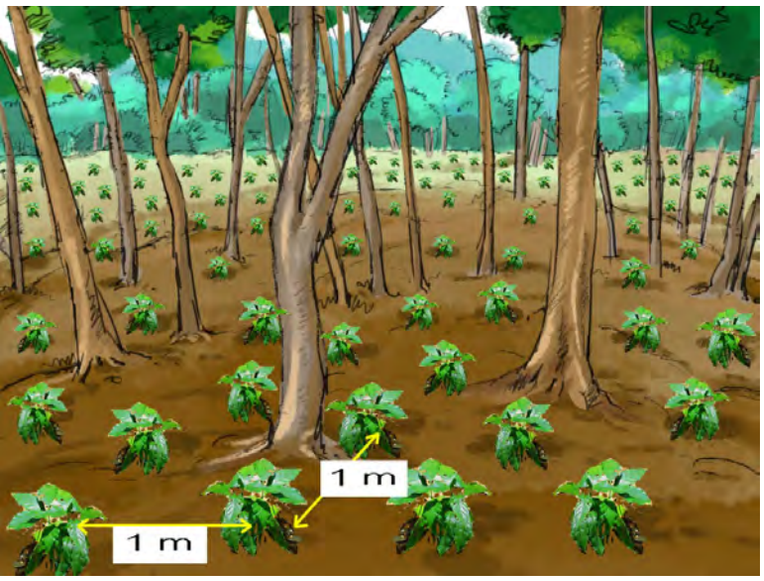


weeding and fencing so as to prevent animals from entering the area and destroying the crop. However, the erection of fencing is still a burden for farmers due to the costs involved in the acquisition of steel wire and nails. Previously, animals destroyed an average of 10% of the plantation's 3,4000 coffee plants. Additionally, there were diseases which affected a further 10% of coffee plants. Some of the local farmers who believe in traditional practices said that this may be the result of starting cultivation on an inappropriate date as well as time. They presume it to be true that if one plants on bad day and at the wrong time, that this will not produce a rich yield due to a lack of rain.

After the crop had been planted, it became noticeable that some of the coffee plants were quite healthy. It was also observed that the coffee twigs under others grew more buds and therefore the farmer decided to trim the old branches leaving no more than three branches to grow. Some of the coffee plants had animal compost (dung collected from grazing buffalos) added to the surrounding soil and these tended to develop very well. Therefore, he started to collect animal waste to use as fertilizer for the coffee plants. He also observed that many of the coffee seedlings which had been planted without the protective shade were not growing so well and that some even died, in comparison to those that had been planted in the shade, as these remained healthy. This lesson learned was therefore shared with neighboring farmers which generated further interest and led to the application of this technique by another five households.

The demonstration plot is accessible on approximately 55 km of laterite road from Sanxay capital distrit. The plot is also situated in a relatively upland landscape with an average slope gradient between 12-14%. Furthermore, there is a small stream which intersects the southern end of the area under cultivation. The local climate can be described as tropical monsoon, with average temperatures ranging between 28-30°C. Access to the plantation site is possible either by 4WD or by motorbike. This journey is more comfortable during the dry season as the road is more difficult to negotiate during the wet season due to the erosion of the road's surface.

Sustainable Land Management Demonstration site 3: An Integrated Rice-Fish System

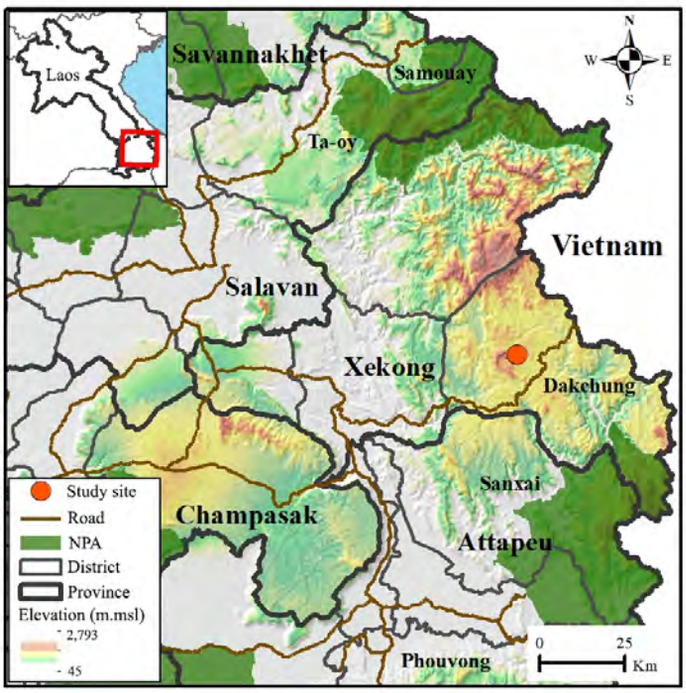
Name and contact details of farmer: Mrs. Monedavan Sayyamang, Darklern village in Darkchung district of Xekong province

Name and contact details of extension worker: Mr. Lerd, Darkchung District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Mr. Phonesiri Phanvongsa, kangphanvongsa@gmail.com

At the beginning of the pilot scheme to implement an "integrated rice-fish system", the participating household had the challenge of improving the conditions of their rice paddy which are located adjacent to a mountain with a running stream, and so often they became flooded. This site had suitable conditions for the building of ponds to store water which was diverted from the stream and other natural water channels before being discharged into the downstream rice paddies. It also involved the construction of nursery ponds to allow the fish fingerlings to adjust to the local environment before releasing them into the rice paddies. This aquaculture technique increased the fish survival rate when the fingerlings were transferred from their original home to the demonstration site. One and a half months after the seedling transplantation had been completed the juvenile fish could be released into rice fields. The nursery pond's dimension are 5 x 10 meters (with a depth of 50cm), and the berms have been built to a height of 1.2 meters to retain an adequate water level for the fingerling nursery.

Demonstration map



The total area utilized for rice-fish aquaculture is 10 x 30 meters, and it is situated in a valley which has slopes with gradients between 3-5% in the vicinity of the pond. The rice-fish aquaculture stock took approximately three months to mature and then each fish weighted around 300 grammes. During August and September, there were tropical monsoon rains that led to the flooding of the rice bench terraces as well as significant sediment loading of the water channels which provided fish habitats around the rice paddies. The rice was

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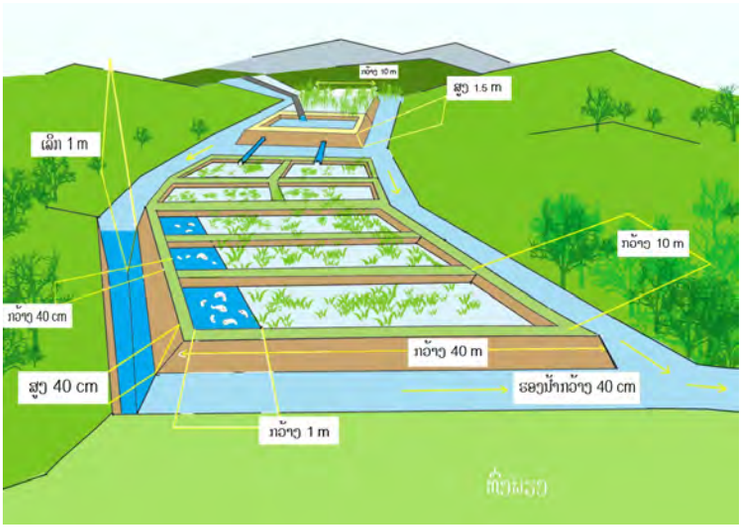


not impacted during this period but many fish were lost due to the floods. Some of the fish remained in the rice fields of neighbouring farmers. When these farmers observed that it is beneficial, they became interested in applying this technique, just like the farmer who had participated in the trial scheme. The participating farmer had only managed to once collect fish for home consumption before the floods, but his rice production was relatively more successful as the rice harvest increased from seven to ten bags (50kg/bag). The rice field was fenced off with nets to prevent predators, particularly otters from entering. The berms had been raised to approximately 40cm and the bench terraces were put up at a height of around 20cm. Round logs with a diameter between 5 -10 cm and a length between 50-60 cm were used to construct a fence on the bench terraces so as to prevent erosion. It was notable that the rice paddies were not inundated with weeds with the application of this technique because the fish had contributed by removing both aquatic vegetation and pests (such as grasshoppers).

In the past, the land users utilized PVC pipes to divert water from the nearby stream through the fishponds to the rice paddies, but the flow was slow and there was an inadequate amount for it to overflow. Hence, the project provided two additional 100 mm pipes so as to transfer water directly from the fishpond to the rice paddies so that there now is sufficient water. The construction of fishponds among the rice paddy also helps to reduce a potential overflow from the stream's discharge onto the rice fields which would then wash away soil nutrients and fertilizers from the rice paddy. In addition, the fishpond serves as sediment retaining basin through which the discharge from upstream channels can be controlled to downstream rice paddies . Furthermore, this reduced a leachate water discharge to the rice paddy as this solution has caused low pH levels of both the soil and water and resulted in soil degradation as well as affected fish production . The initiative was implemented by a farming household who had excavated a ditch that was suitable as a fish habitat. The ditch was constructed parallel to the bench terrace (running the length of one side of the rice paddy measuring 10 meters, with both a width and a depth of 50 cm). The farmer had some knowledge of the collection of natural fish food including organic wastes, grass and termites to reduce expenditure on manufactured fish feed.

The location of the pilot scheme is 12 km from the district town of Darkchung, which can be reached by following a paved road most of the way, with the last kilometer completed after turning down a lane. It is accessible by car but a 4WD vehicle as it slippery road conditions in the rainy season. There is a transecting walkway which runs for 200m before one gets to the fishpond. The local climate is fairly comfortable with an average temperature of 20°C. The rainy season lasts from March to November with an average rainfall of 3,200mm/annum.

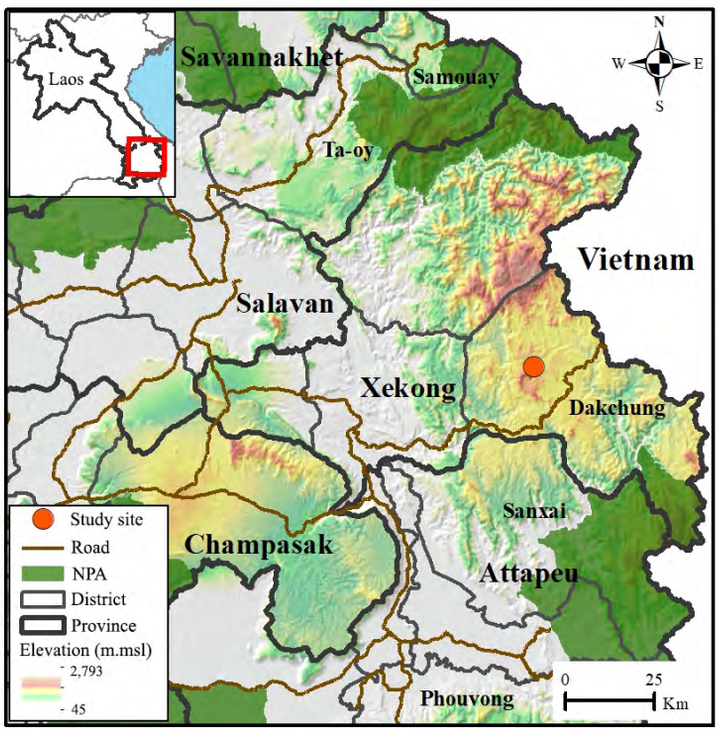
Sustainable Land Management Demonstration site 4: Soil Improvement Through Effective Micro-Organism (EM) and Compost Production

Name and contact details of farmer: Mrs. Keomala, Darklern village, Darkchung district of Xekong province

Name and contact details of extension worker: Mr. Souliyakone Anon, Darkchung District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Fardavan Souliya, fsouliya@yahoo.com

Demonstration map



The households involved in the pilot activity focusing on "effective microorganism (EM) and compost production" learned how to improve the fertility of the soil and to realize pest management through the following two methods: (i) The first technique, involved gathering and stockpiling organic matter which was not decomposed such as coffee leaves, dried grass, rice hulls and then approximately 70% of this amount is burned. Afterwards the ashes and the remaining materials can be directly applied onto the soil. (ii) The second technique, utilizes organic matter that is decomposed. The goat, cow and buffalo manure should be burned together with dried mulch and leaves. This substance should burn 70% to make the compost so as to avoid the direct application of animal manure on vegetables. This is because animal

Technical drawing

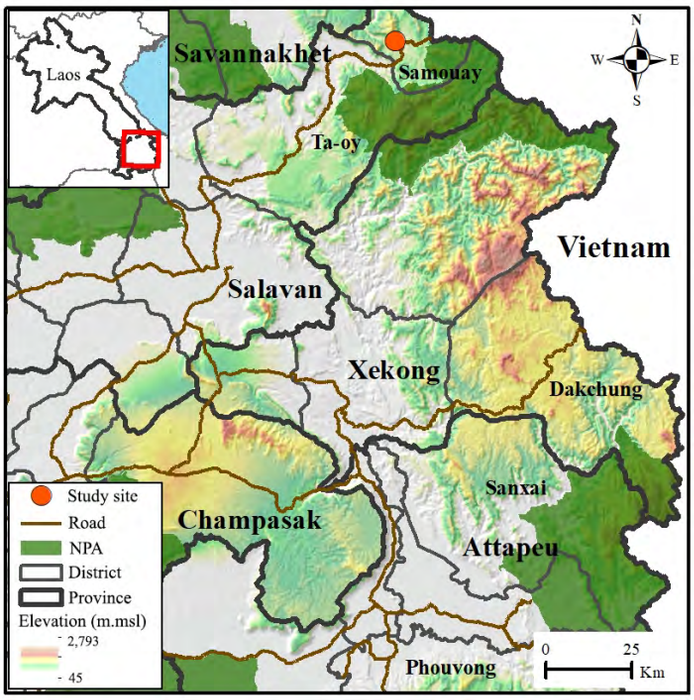
dung contains diseases, insects and pests which may affect the crops. The application of different compost whilst cultivating crops had successful results as there were fewer weeds such as grass, and it was also safer to maintain the crops. Furthermore, the participating farmer also produced EM to apply as organic compost (similar to the first and second approach). Later these burned materials were mixed with EM. Then this compost mixture could be applied on the pre-prepared vegetable plots. The farmers commented that they had previously used human urine on their crops as this is a traditional practice to improve soils. Once the farmers had learned how to produce EM and organic compost from Project's team, they continued with their own trial. They collected human urine in a container and added mulch Siam weeds (Chromolaena odorata) and then this mixture was left to decompose for a period of 5-7 days. Afterwards, a mixture was created with a ratio of 1.5 litres of water with 3-5 tablespoons of urinal EM which was then applied on the crops (2-3 times a week). This urinal EM can be only be utilized in the morning while pure water is used for irrigation in the afternoon. This technique enhances soil nutrients, improves the soil and boosts crop production.

The farmers who participated in the scheme could sell their produce and earned between 300,000 – 400,000 Kip in one season (~1,800,000 Kip/year). The farmers could cultivate a large variety of crops such as lettuce and scallions. However, the households involved in the pilot scheme lacked labour power as they had to concern themselves with many livelihood activities (operated coffee plantation, household gardening, and upland cultivation which is workload activity). The project's activities placed an additional strain on the labour force, particularly the time involved in the collection of animal manure as livestock are not held in pens.

The demonstration site is located in Ban Darkrean, in Darkchung district, which is approximately 12 km from the district township of Darkchung city. The village is accessible throughout the year. Once reaching the village, the demonstration plots can be found adjacent to the access road. The rain falling most of the year.

Sustainable Land Management Demonstration site 5: Production of Effective Micro-Organisms for Soil Improvement and Organic Herbal Pest Repellent

Demonstration map



Name and contact details of farmer: Mr. Kongnouan, Tapongleng village, Samouy district of Salavan province

Name and contact details of extension worker: Mrs. Douangmany Khounnabouth, Samouy District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Fardavan Souliya, fsouliya@yahoo.com

The household involved in the demonstration of "effective micro-organisms (EM) for soil improvement and organic herbal pest repellent" was initially a cooperation linked with vegetable cultivation in shaded areas through the Food Security, Nutrition and Market Linkages Project, which was financially supported by International Fund for Agriculture Development (IFAD). The IFAD Project provided the necessary materials for the construction of shaded areas while WOCAT continued to enhance the farmers' capacity on EM and pest repellent production for soil improvement and pest control. These activities applied simple techniques and the raw materials can be sourced locally. For example the production of organic herbal pest repellent involves a cost-effective mixture of lemon grass, galangal, ginger, pepper and chili. However, there were some expenses that the household incurred in order to produce herbal pest repellent such as the purchase 1kg of sugar. The farmer also had to purchase rice hulls from a local rice mill so as to produce organic compost. This was because the members of the participating household belong to the Pako ethnic minority group. Their traditional belief is that it is forbidden to take rice hulls from their own farms to their homes, but if they are sourced from a rice mill (therefore the hulls do not originate from their rice) it is possible to use them. The household also decided to use sawdust as an alternative material to rice hulls (wood wastes domestic construction). When burning the sawdust it is a similar process to burning rice hulls as the farmer firstly allows 50% of the total amount to ignite. It is then left to cool down before mixing it together with animal

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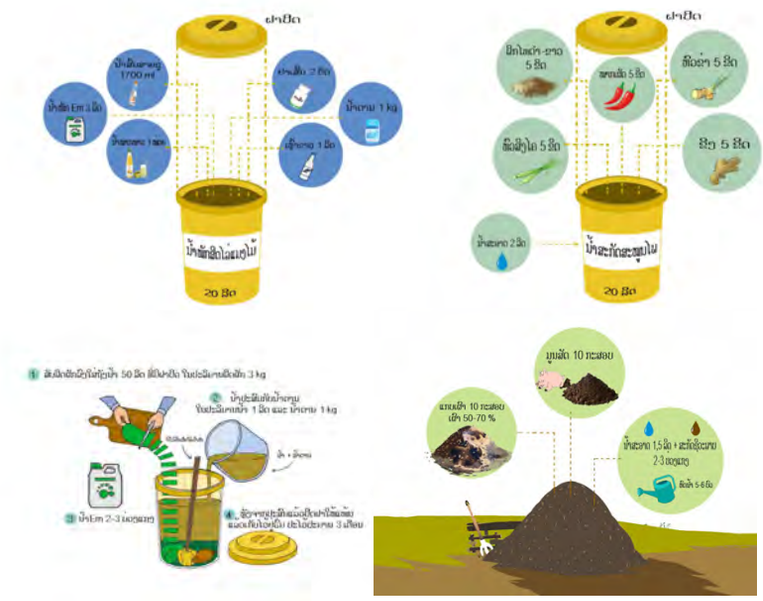


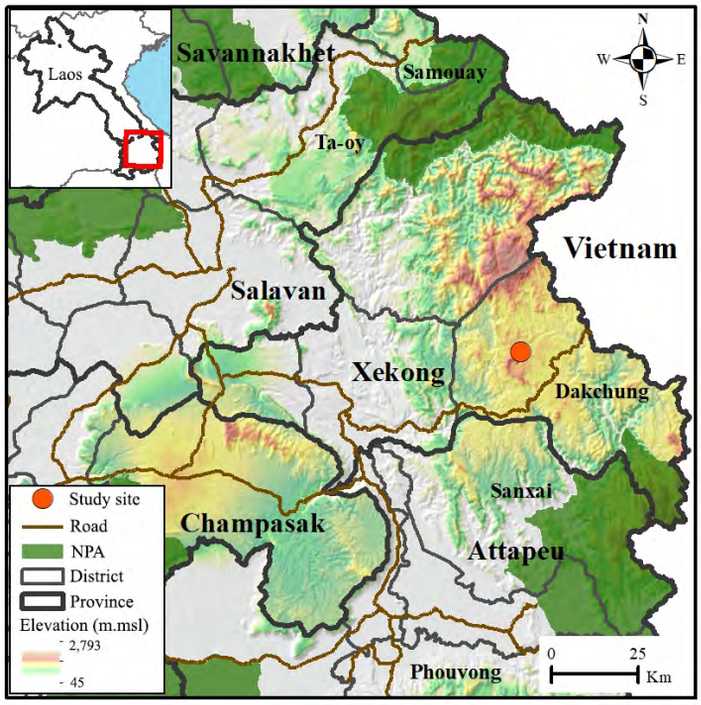
manure. This prepared compost can be applied directly onto the vegetable plots or be used substrate before planting (this can be done approximately two times per planting season). In addition to the utilization of cow and buffalo dung, the farmer also used goat, duck and chicken manure to produce compost. This was facilitated by the fact that they had built proper cages for livestock management and the collection of manure. There are two methods which can be applied in the production of biological pest repellent. The first method involves a combination of lemon grass, galangal, ginger, pepper and chili and the second recipe is a mixture of rice whisky, shredded tobacco (cultivated tobacco), sugar, EM liquids and lemon. Both of these recipes enable the effective control of pests, particularly insects (such as assassin bugs, grasshoppers, worms, ants and crickets that can all damage green vegetables). These organic repellents can be stored for a long period of time while the vegetable produce can be stored for a longer duration after it has been harvested without spoiling. It was also noted that the produce attained a good weight which enabled the sale of vegetables such as mustard greens and green onions. Unfortunately however this repellent cannot be used to control ticks and lady bugs.

The cultivation of crops in shaded areas creates an additional income for households as both the mother and the daughters can be directly involved in this activity through the sale of their produce at local markets. The average income from the sale of vegetables was 2,080,000 Kip per year compared to previous years where it stood at 1,600,000 Kip per annum. It is possible to cultivate vegetables in four cycles throughout the year. However, the household had an inadequate water supply and therefore the area under cultivation remained limited.

The location of demonstration site is in Ban Tapongleng, in Samouay district. It is easily accessible by travelling along a paved road. The village is approximately 2km from the Samouay district township, and is accessible throughout the year.

Sustainable Land Management Demonstration site 6: Planting Coffee under Big Trees

Demonstration map



Name and contact details of farmer: Mr. Khamsavong, Darklern village, Darkchung district of Xekong province

Name and contact details of extension worker: Mr. Phimmasone Thavisak, Darkchung District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Syliphone Thongpasong, noytps85@gmail.com

A family conducted a trial on their farm by planting coffee on two different plots so that they would be able to make a comparision. The first plot was chosen on the downward gradient of a mountain with an average gradient of 5%. On this plot all of the land was cleared. The second plot is located in a higher terraced area with the average slope gradient ranging between 12-15°. Here the large trees were left standing during the land clearance and preparation process. After the seedlings had been planted the farmer noticed several differences between the two plots. On the plot without the big trees, the coffee tree' leaves become yellow and some died resulting in an average survival rate of approximately 50% (out of a total of 600 seedlings). The second plot had 1,100 coffee seedlings planted on it, which mostly survived, apart from those that were damaged by livestock (this amounted to around 20% of the area under cultivation). The

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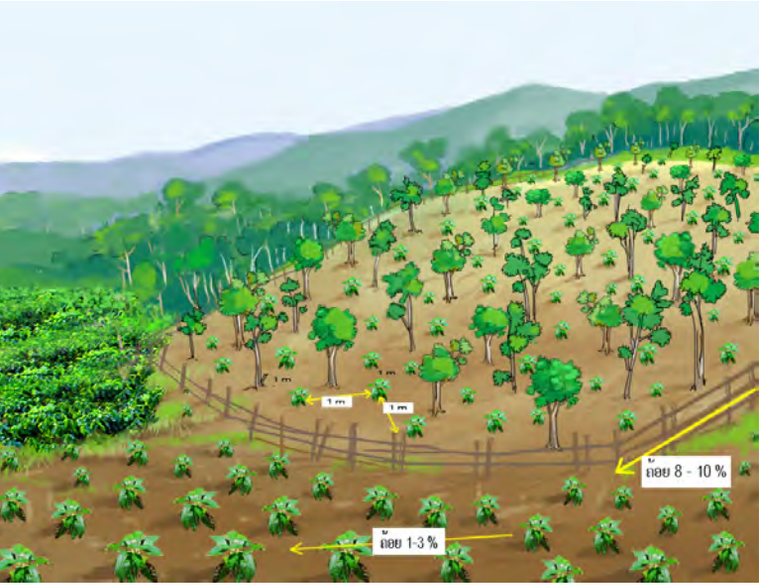


surrounding area is entirely made up of coffee plantations and livestock roam freely on these old plantations. Additionally there were heavy tropical storms during the last rainy season, which lasted from September to October. The strong winds during these storms blew over one large tree which destroyed six coffee trees in the process. It was also noted that there were outbreaks of a number of diseases which spread from the neighbouring plantations.

On the neighbouring farmers' coffee plantations where the large trees had been removed and burned before planting, it was noted that the young coffee trees had initially been growing well. However after the rainy season the soil became very dry and this resulted in the coffee trees' leaves turning yellow and then some died. In On the farmer's trial plot in comparison, the coffee plants remained green and the soil remained moist. Subsequently, the neighboring farmers became interested and visited the plantation that had successfully been cultivated under the large trees.

In terms of economic considerations, the farmer had inadequate funds to purchase fencing materials such as steel wire and nails, and also lacked the labour power to collect the wooden posts for the fencing. He was also engaged in upland rice cultivation and therefore had limited time to look after the two demonstration plots. Some of the farmers visiting the demonstration plot were interested in the new planting technique as they normally removed all of the vegetation and burned it before planting. The coffee trees of course grew well as the nutrients remained in the soil for the first year. After the demonstration, the farmers became aware of the fact that the new technique is more successful as it does not require intensive labour to clear the land and weed it. However the neighboring farmers still want to wait and see if the new technique on this plot will produce good yields. If it does prove to be successful, many of farmers will follow the pilot farmer's example.

The pilot plantation is approximately 22km from Dakcheung district which can be accessed by dirt road. There is a 200m track that one needs to walk along from the village in order to reach the plantation. The plantation area is relatively flat with the gradient of the slopes ranging between 8-10%. The local climate is humid with average temperatures ranging between 18°-30°C.

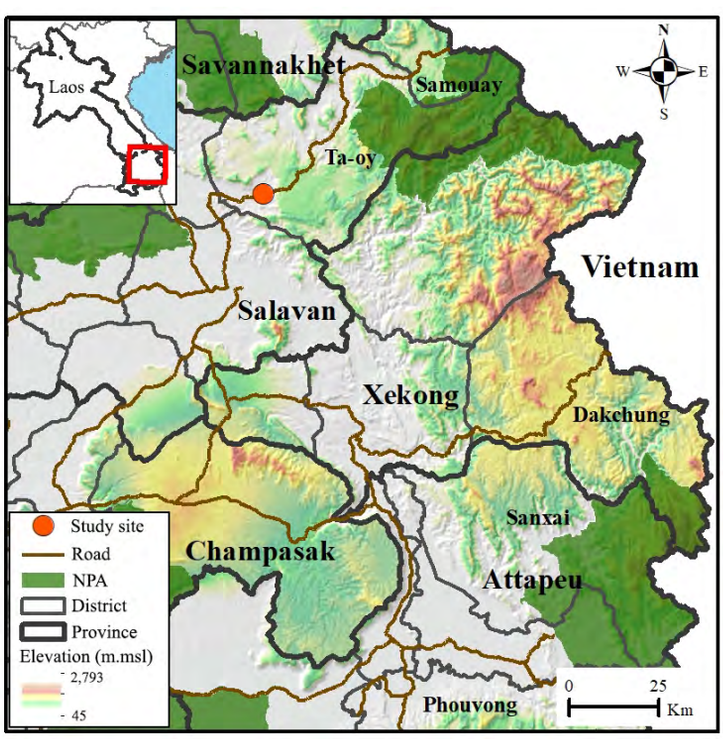
Sustainable Land Management Demonstration site 7: Intercropping Cassava and Peanuts for Soil Improvement

Name and contact details of farmer: Mr. Touy, Pachou village, Taouy district of Salavan province

Name and contact details of extension worker: Mr. Bounsom Vorlasan, Taouy District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Fardavan Souliya, fsouliya@yahoo.com

Demonstration map



After the farming household had intercropped cassava and peanuts, they became aware of many new techniques including the selection of cassava seedlings, as well as the classification of seed varieties through the visual observation of stems and leaves. Furthermore, they learned how to keep crop varieties for the next planting season. This can be accomplished through the collection of selected cassava stems which should be approximately 1.5 meters in length. These are then stacked in a vertical position in the sun so as to avoid the stems becoming rotten because this induces plant diseases. The farmers also learned how to enhance cassava root growth and make them strong. By combining shrimp paste and the energy drink M150 (a local brand) the farmers are able to produce a root enhancement liquid. The

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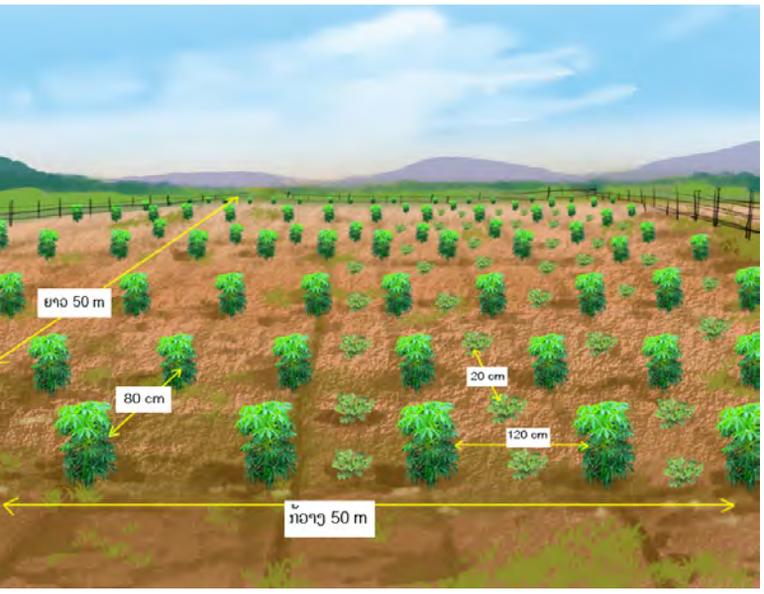


layout of the plantation can be arranged in rows with the use of plastic ropes to create lines. This technique is distinct from the common practice of not planting the crop in rows . Traditional cultivation practices tend to promote the growth of weeds which are difficult to manage, are less productive and make it harder to harvest the crop.

The pilot project's farmer cultivated two plots with cassava. The first plot was intercropped with peanuts and in the second plot he only planted cassava. Both of the plots were prepared in the same manner. After the establishment of the plantation it was observed that there was a difference in the soils of the two plots. The soil of the plot intercropped with peanuts retained its moisture and became browner than the soil of the plot without peanuts. However, their yields were relatively similar as this was still in the first year of trial in which the soils remained fertile. The farmer learned that intercropping cassava with peanuts helps to reduce soil degradation as the peanuts can improve the soil by adding nitrogen. Moreover the peanuts help to cover the land area and thereby prevent weeds without the need of applying herbicides. In addition, the peanut bushes' leaves help to retain soil moisture through the prevention of evaporation. The result of the pilot scheme indicated good yields, whereby the farmer made 7,800,000 Kip/annum (after having harvested cassava between 5-7 tons/rai). The cassava was sold as dry chips (for the value of 1300 Kip/kg) while peanut production was between 20-30 kg. However, the farmer was not able to sell this amount due to the lack of market demand and so instead it was all used for household consumption. The participating farmer wanted to expand the intercropping system to 2ha. Currently, the farmer has distributed cassava varieties to the households of four neighbouring farmers who had shown interest.

Ban Pachu, in Samouay district is located approximately 30 kilometers along the main road that leads to the district town . At this point one then has to turn into a paved alley and continue for 500 meters to reach the demonstration plot.

Sustainable Land Management Demonstration site 8: Forage Management

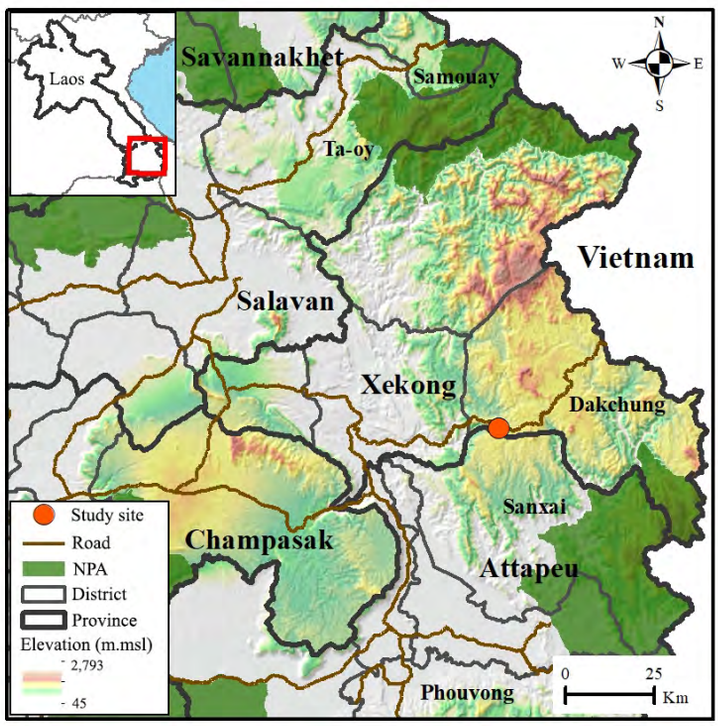
Name and contact details of farmer: Mr. Bao, Xienglouang village, Darkchung district of Xekong province

Name and contact details of extension worker: Mr. Souliyakone Anon, Darkchung District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Syliphone Thongpasong, noytps85@gmail.com and Thongsavanh Norlakham, norlakhamkhoud@yahoo.com

In the past, the livestock in this area were allowed to roam freely. This meant that each day the animals' owners had to spend more time in gathering and placing them in pens. Seasonal and natural varieties of grass are often not available all year round. After participating in the pilot project, during which the farmers were introduced to new forage species, it was noted that they had adequate fodder for their seven cows. The cows were healthy and sold at a high price. The participating household in the pilot scheme divided the available land into three plots for the different

Demonstration map



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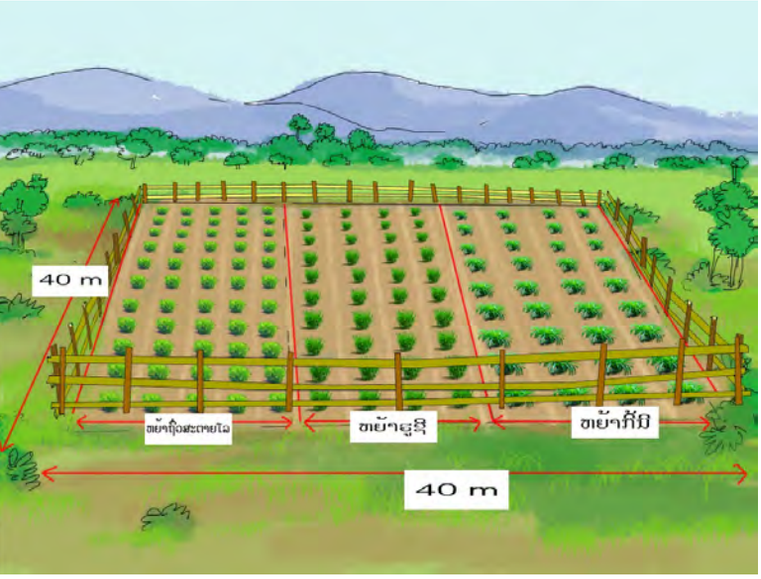


forage species. These included Ruzi (Brachiaria ruziziensis), Guinea (Megathyrsus maximus), and Stylo (Stylosanthes guianensis) as these grass varieties have a high protein content for the animals. The pilot area under cultivation measured 40 x 40 meters and fenced. The Guinea and Ruzi grass varieties are more preferable for cows as opposed to Stylo grass. However, the farmers collected Stylo grass and shredded it before mixing with rice hull power in order to feed their pigs. Although cows did not like Stylo grass, it does augment the improvement of the soil. The pilot household has become aware of the nutritional value of each forage species as the cattle like to eat different grass varieties.

When the pilot scheme had been successful, the farmer decided to expand the forage production area up to 2 ha with an emphasis on the Guinea and Ruzi varieties. This new area of land was previously a barren and vacant plot. The household collected grass seeds from the pilot area, and as the grass grew well the results were satisfactory. However, in some areas that were not fenced, the animals of neighbouring households entered some areas that were not fenced off and damaged the forage. Instead of cutting-and-carrying the forage to the cattle in their pens, the farmer decided to allow the cattle to graze freely on a rotational basis so as to reduce labour.

The demonstration site is located in Ban Xiengluang, in Dakcheung district, of Xekong province, which is approximately 38km far from the location of the Darkchung town. The site is approximately 4km from the village's settlement area which can be reached on a paved road, before turning onto a small dirt road for tractors and motorbikes that can be accessed all year round.

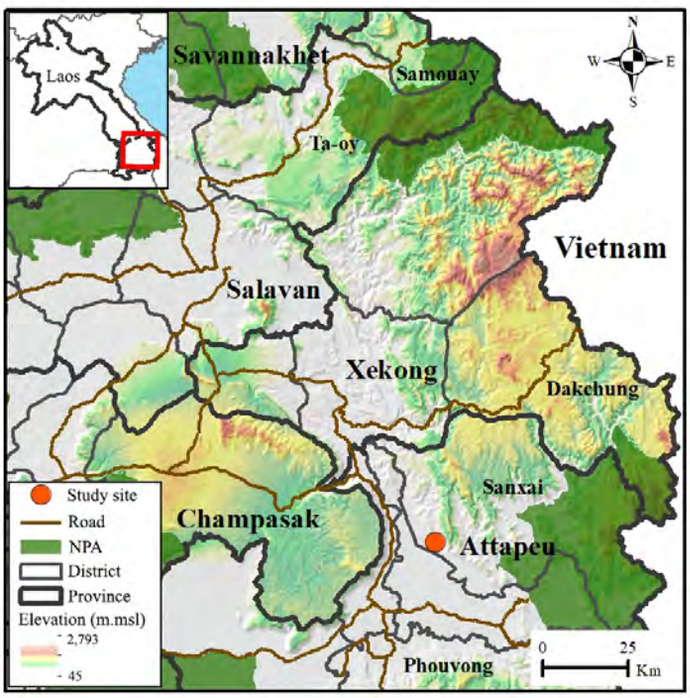
Sustainable Land Management Demonstration site 9: Forage Production for Livestock Management

Name and contact details of farmer: Mr. Thongsouy, Tadseng village, Xanxay district of Attapue province

Name and contact details of extension worker: Mr. Keovixay, Xanxay District Agriculture and Forestry Office

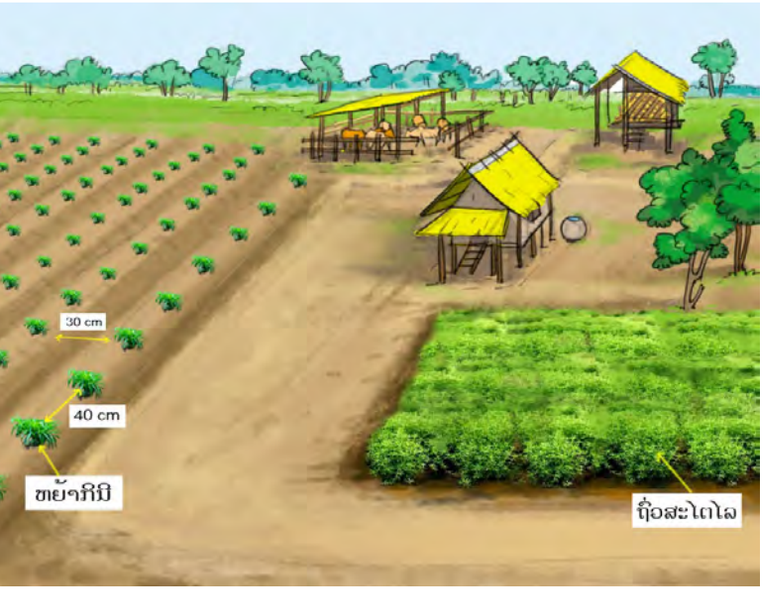
Name and contact details of NAFRI staff: Thongsavanh Norlakham, norlakhamkhoud@yahoo.com

Demonstration map



In the past, traditional livestock practices meant that people allowed their animals to roam freely. It was actually time consuming as they had to gather their cattle every day and particularly during the dry season grass was often not available. After the forage had been cultivated for feeding the cattle in their stalls, it was noted that the farmer had a sufficient amount fodder for their cows, and also they did not have to spend a lot of time on the collection of natural forage from other locations. This technique only requires labour input during the land preparation and planting stages, or sometimes the land users had to engage other people in order to help with these activities. Additionally, when maintaining the cattle in stalls the farmers can collect manure and then sell.

Technical drawing



The household learned about a new livestock raising technique through the implementation of the forage production method. This included the initial preparation of land for the different forage species such as Stylo, Napier, Guinea and Ruzi. The first technique regarding forage production is the treatment of seeds which involves placing the Ruzi and Guinea grass seeds in warm water for 5 minutes so as to stimulate germination. The seeds are then spread out to let them dry so that they do not stick to each other when they are being planted The Stylo seeds can be planted directly in the soil without requiring treatment in water. After planting the grass varieties, it was observed that the Stylo seeds grew more successfully than the other species. However the cows are not fond of it and actually prefer eating the Guinea and Ruzi grass. Nonetheless the main problem that was encountered in this pilot activity is that the Guinea grass was not so bountiful due to the poor quality of the seeds if one compares its performance to other households that planted this grass species.

Moreover, the farmer learned about the production of forage from rice straw or other grass because natural grass is often not available during the dry season. Forage can be produced by using one of the following two techniques: (i) Cattle can be fed more quickly with forage grown with the application of this method as molasses are used to enhance the decomposition process when mixing in rice straw or hay. Afterwards water and nitrogen fertilizer are added to this mix. The decomposition process with the second technique takes at least one week without the use of molasses. In this case the rice straw and mulch are mixed with the nitrogen fertilizer and water. The household engaged in the pilot activities were satisfied with the first rapid technique as with this method they do not have to wait for the decomposition process and are able to feed the animals more quickly, even though they did have to purchase some molasses.

The pilot site is located near the local community on a relatively flat surface area. However, the soil here is of a poor quality. The pilot site is approximately 12km far from the Sanxay District Agriculture and Forestry Office, and the village is approximately 1km from the site. Vehicles can access the pilot site throughout the year by using the laterite road.

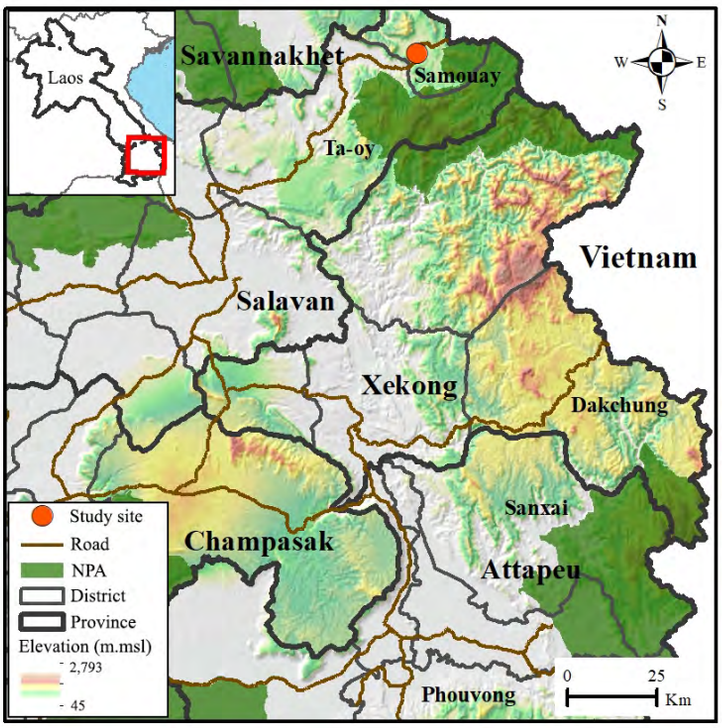
Sustainable Land Management Demonstration site 10: Broom Grass Cultivation to Prevent Soil Erosion on Sloping Areas

Name and contact details of farmer: Mr. Keo, Lavatai village, Samouy district of Salavan province

Name and contact details of extension worker: Mr. Sakmixay, Samouy District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Syliphone Thongpasong, noytps85@gmail.com

Demonstration map



The household that was engaged in the pilot activity "broom grass cultivation to prevent soil erosion on sloping areas" learned about an effective Khaem (Thysanolaema maxima) cultivation technique by planting then in rows ensuring that they are 2 x 2 meters apart. Furthermore they gained knowledge of seedlings and the estabishment of a nursery in bags. At the beginning, the Project provided 99 Khaem seedlings and also encouraged the farmers to collect natural Khaem seedlings with rhizomes (a total of 525 seedlings). After they had been planted, it was noted that the Khaem seedlings which had been obtained from the nursery had a higher survival rate as opposed to the planted rhizomes which had been collected from natural forest areas (30 seedlings died out of the seedlings while 481 of therhizomes also died). This is because the separation of rhizomes had not been performed properly. Most of the Khaem rhizomes were placed directly into the holes without having undergone any treatment in

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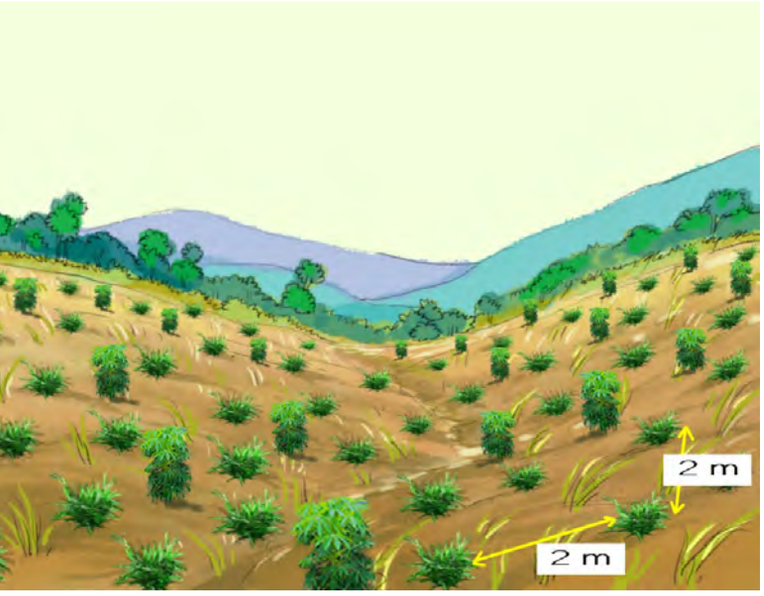


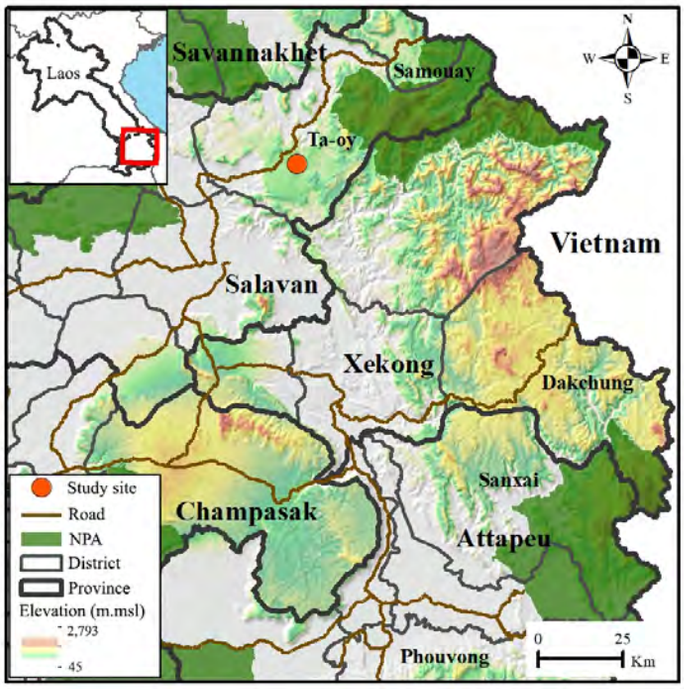
the nursery. Afterwards the household had the idea to increase the number of Khaem seedlings so as to expand the area under cultivation. This was done by applying one of the lessons learned in seedling techniques, as the seedlings had been kept in bags so that they could be planted during the next planting season, which was mostly in August (they had previously been planted in May but this was not sucessful due to the lack of rain).

The household who participated in the pilot scheme planted Khaem in riparian areas on steep terrain (the drainage channel measures approximately 1.5 meters x 3 meters and has a depth of 60 centimeters) that intersect upland rice areas. These had previously caused the damage of crops because of erosion. After the Khaem seedlings had been planted, a reduction of soil erosion in these susceptible areas was noted, which is positive development for the areas of land under cultivation. After harvesting the Khaem, the old stems and leaves can be cut and used cover the ground to boost the soil's quality and moisture content. The household participating in pilot scheme has currently collected 4 kg of Khaem to make brooms for their own household use and these have yet to be sold. In the past, people typically burned their upland rice fields after the harvest as part of the preparation for the cultivation of other crops. However, after the introduction of Khaem, the household currently does not burn the fields but have adapted to a rotational cropping system by intercropping cassava and other dry season crops with the Khaem. After planting Khaem and collecting its flowers for the production of brooms, there were five more households that became interested in learning about this technique and then afterwards planted it on their own land.

The demonstration plot is approximately 4km from the district town of Samouay. However this route is only possible during the dry season as the bridge ends up being submerged during the wet season. During this time one may cross the river by barge and then from there following a small track, the distance from the village to the site is about 1km.

Sustainable Land Management Demonstration site 11: Construction of a Dyke to Store Water for the Dry Season

Demonstration map



Name and contact details of farmer: Mr. Bounlieng and Mr. Keo, Bongnam village, Taouy district of Salavan

Name and contact details of extension worker: Mr. Khamvilay, Taouy District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Mr. Phonesiri Phanvongsa, kangphanvongsa@gmail.com

There were two households which participated in the construction of a dyke for water storage. The initial construction work required the engagement of outsourced labour, particularly for maintenance and other repair work (hard tasks, the transportation of construction materials, etc.) as the fields under cultivation are located a considerable distance away from community's residential area. Many households were not interested because they lacked confidence in the project's pilot scheme and not sure for the outcome. However, the demonstration indicated that the construction of the dyke created the feeling that it belonged to the community and that they had full ownership. More importantly, the community needs to consolidate and support each other as well as participate in the pilot scheme for it to be successful.

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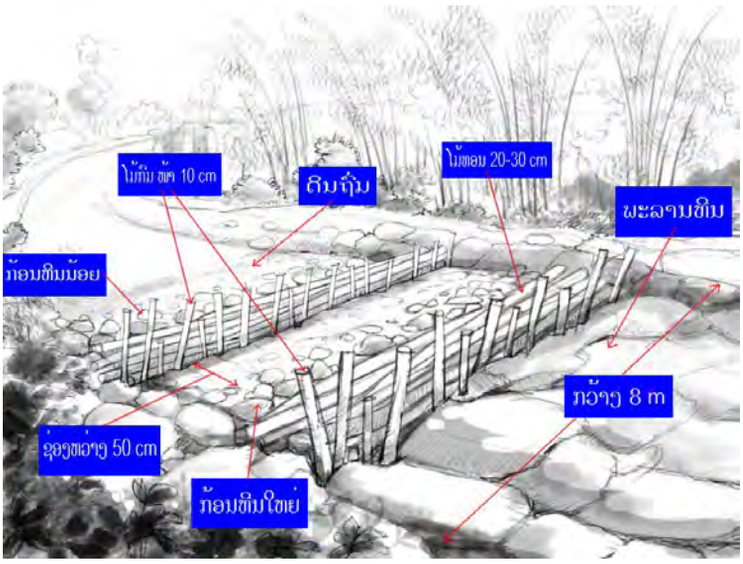


The dyke was stabilized and stood its ground at the beginning of the wet season. However, when it continued into the months of August and September there was intense rainfall and this caused severe flash floods in the region resulting in the dyke being washed away. It was a useful lesson for the households who participated in the pilot activity in collaboration with the Project. They had to address issues such as the selection of an inappropriate location as well as improvements in the dyke's design and lack of construction methods. The following year, the participating households decided to move to an upstream location where they had previously built a traditional dyke. This site was a more suitable location to build a one meter high dyke (the former dyke reached a height of 1.5 meters). This was done to reduce the costs and the necessary materials required for the construction of the dyke. The households required some PVC pipes to direct water from the dyke to the areas under cultivation. The main challenge continued to be the situation where their fields were approximately 300 meters from the dyke. The households used soil/clay which they had collected from nearby to build up the dyke's embankment thereby providing additional stabilization.

The dyke is located approximately 15km from the district township of Ta-Oy with the main access road being a paved bitumen road with an approximately 10% gradient. Then there are another 10km which need to be driven on a paved road with a relatively moderately sloping road surface in order to reach the community. The actual pilot dyke scheme was situated about 2-3km from the community's residential area and this can be accessed by taking a small track on foot or by motorbike. The dyke was constructed on a small stream (which cannot be accessed by car). The average local temperature is 24°C and most of the rain falls between July and September with an average of 2,000mm/annum.

Sustainable Land Management Demonstration site 12: Broom Grass Cultivation to Prevent Soil Erosion in Sloping and

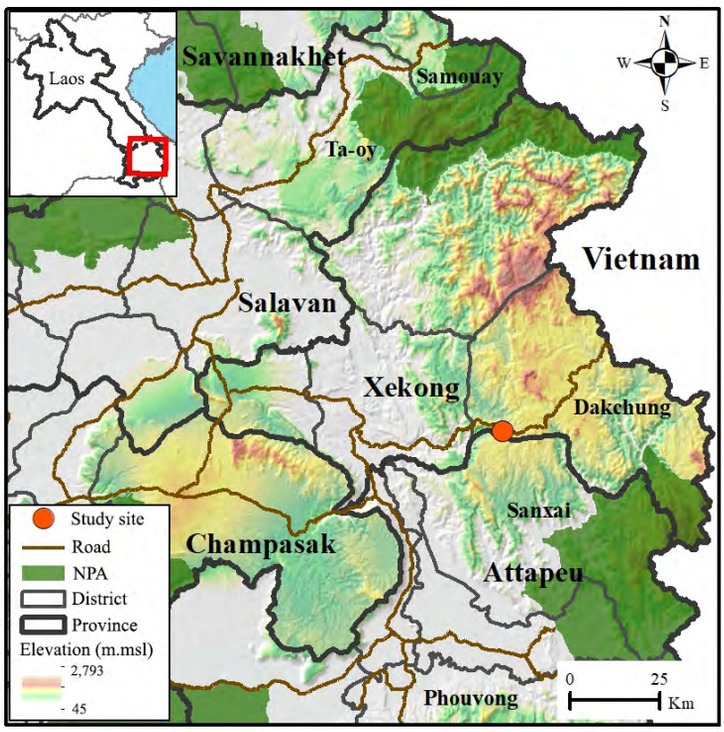
Name and contact details of farmer: Mr. Nousone, Xienglouang village, Darkchung district of Xekong province

Name and contact details of extension worker: Mr. Souliyakone Anon, Darkchung District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Syliphone Thongpasong, noytps85@gmail.com

The household involved in the pilot scheme was engaged in the activity "Khaem cultivation to prevent soil erosion on sloping areas" learned about the Khaem (Thysanolaema maxima) cultivation technique through the utilization of natural Khaem rhizomes that had been collected from nearby forests to then be planted in bags. Each one of the healthy rhizomes was planted in a bag and later after it had grown 3-4 rhizomes - these were then separated and planted in additional bags. The grow bags were filled with a mixture of burned rice husk or animal manure so as to enhance root development and to increase the survival rate of the Khaem plants. The farmers also learned about the traditional production of a rooting hormone with the use of the following materials: monosodium glutamate power (1 table spoon), shrimp paste (1 table spoon), and the local energy drink M150 (1 bottle). A mixture of these

Demonstration map



ingredients is then diluted with 5 liters of water. The Khaem rhizomes are then soaked in this solution for approximately 10-15 minutes before they are planted

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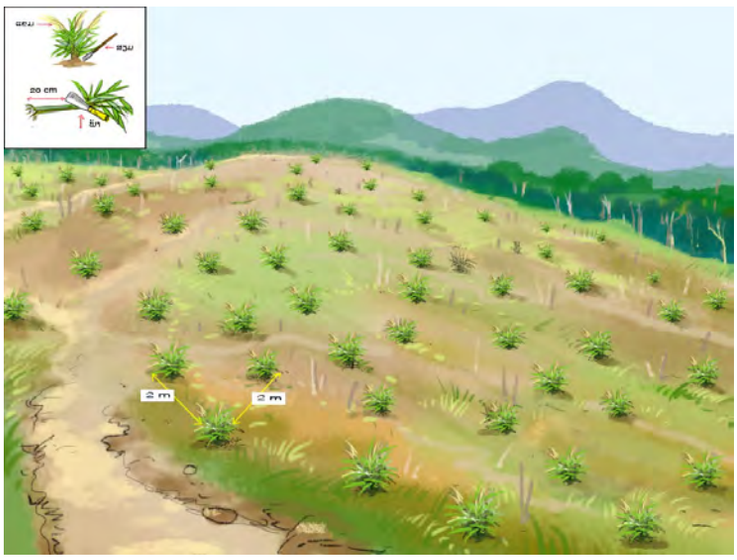


in the grow bags. The farmer also learned about soil preparation techniques particularly concerning the creation of holes and the method of planting in rows. According to the Project team's estimates it would be possible to plant 4,800 seedlings in an area measuring 0.5 ha. However, in practice the participating farmer could only collect and produce 1,500 seedlings. In the initial phase they planted all of these seedlings, with technical support being given by the the Project's team. The farmer was unable to collect more seedlings from the surrounding natural forests to plant on the remaining land as they found that livestock had fed the Khaem seedlings, with particularly the new leaves being eaten by the animals. It was later assessed that more than 1,200 Khaem seedlings had been lost (~80% of all the total seedlings planted). The trial area under cultivation was situated near the village's residential area and this is where the animals grazed freely. As the result of this situation, the farmer were not interested in continuing to plant the Khaem species as they could not build a fence all the way round their field. Additionaly, there was no rain for a long period of time after the farmer had planted the Khaem which affected the quality of the remaining Khaem seedlings. Meanwhile, the Food Nutrition Market Linkage Project (FNML) funded by IFAD had promoted the production of forage grass within the local community, and had given interested farmers the opportunity to become involved with the Project. Afterwards the farmer decided to convert the land that had been cultivated with Khaem into forage grass fields for the raising of livestock.

The location of the pilot scheme is approximately 38km far from the Darkchung District Agriculture and Forestry Office. Once one has reached the village the site can then be accessed either on foot or by motorbike approximately 1 km far. Furthermore, the site can be accessed throughout the year.

Sustainable Land Management Demonstration site 13: Broom Grass Cultivation in Land Degradation

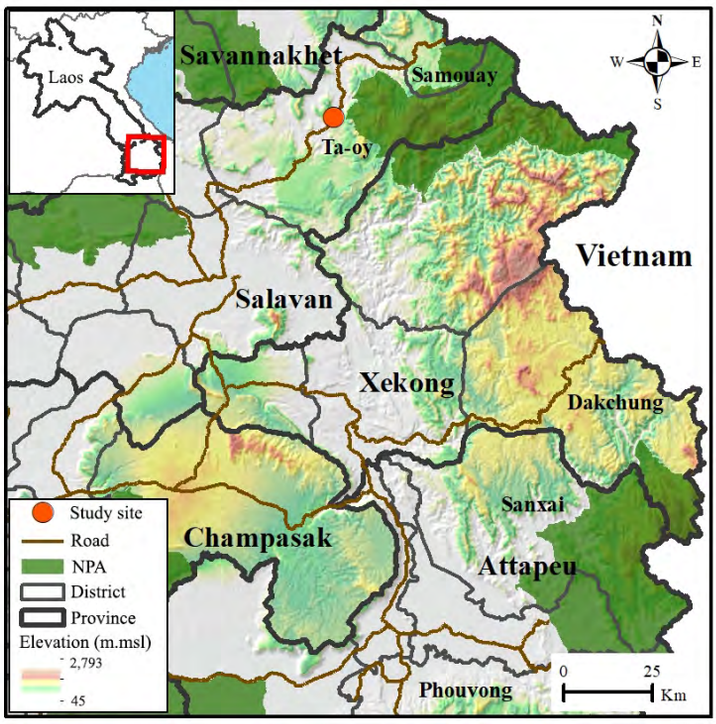
Name and contact details of farmer: Mr. Bouala, Phachouchern village, Taouy district of Salavan province

Name and contact details of extension worker: Mr. Vatthou, Taouy District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Syliphone Thongpasong, noytps85@gmail.com

The pilot household was engaged in cultivating Khaem (broom grass). This was carried out by planting Khaem between the rows of banana trees in an area measuring 50 x 50 meters. The initially the farmer received 100 Khaem seedlings from the Project's team. After they had been planted it was extrememly dry during May and this affected the Khaem plants – leading to some loses When it eventually rained, the Khaem plants produced new shoots and stems. The pilot household found that the Khaem species grows very well in the local climate and is resilient to drought. The farmer then decided to collect Khaem from natural forest areas

Demonstration map



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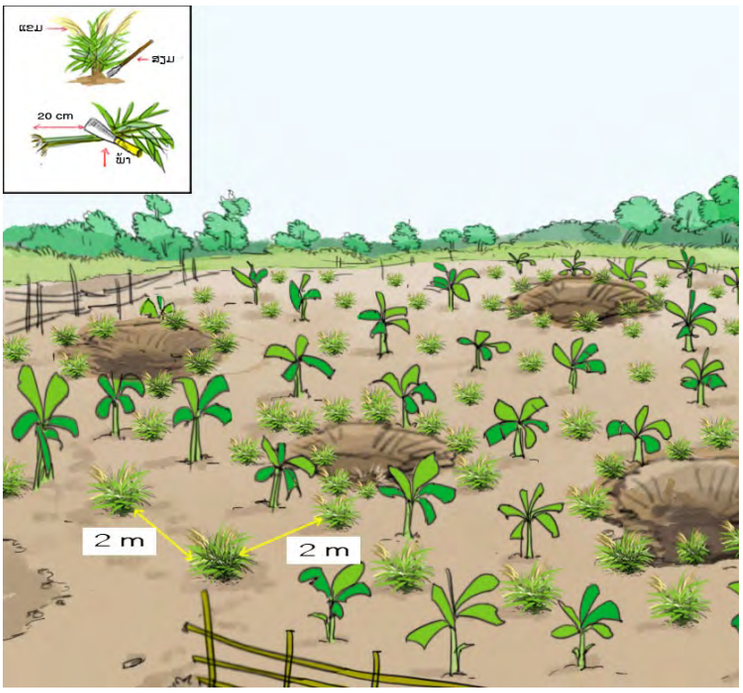


in order to expand the exisitng plantation which only had the intial stock of 100 seedlings. It was noted that the Khaem that had been planted in the nursery in plastic bag grew more effectively than those that had been planted directly.

Moreover, the pilot household also noted that in the areas surrounding the old ponds that resulted from the bombing that had occurred during the war, where it had previously not been possible to cultivate any crops and therefore they had been left vacant, it was now feasible to introduce khaem in these areas. The results were satisfactory as the Khaem species is able to flourish here. The household shared the lessons learned and its experiences with two other familites who were interested in planting Khaem by sharing their pool of labour. This provided the opportunity for the new families to learn by undertaking the actual practices of this technique.

Access to the pilot site is quite convenient with all types of vehicles throughout the year. The site located along to the main road from Taouy to Samouy district where approximately 30 km far from the Ta-Oy District town.

Sustainable Land Management Demonstration site 14: Intercropping System

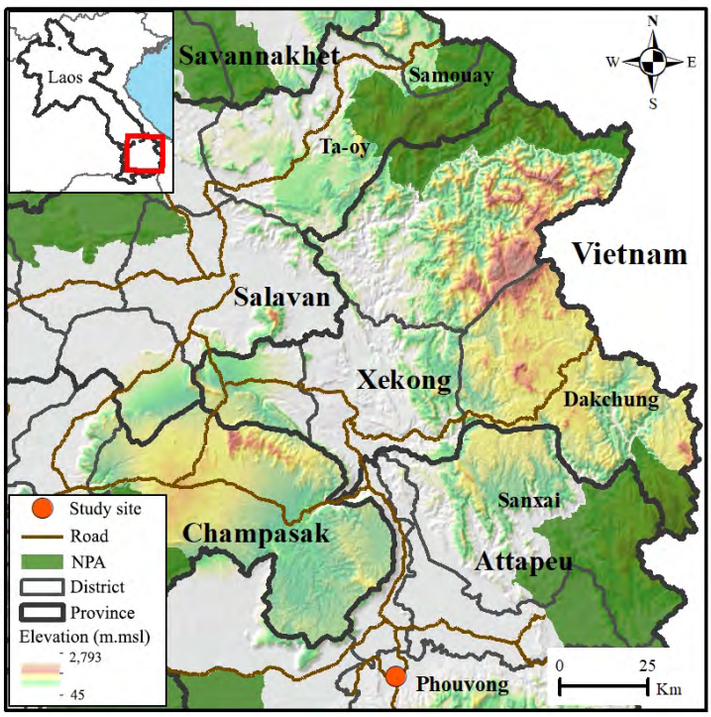
Name and contact details of farmer: Mr. Bounma and Mrs. Xomphou, Vongsomphou village, Phouvong district of Attapue province

Name and contact details of extension worker: Mr. Phonepaseuth Phetsavong, Agriculture Technical Center, Phouvong District Agriculture and Forestry Office

Name and contact details of NAFRI staff: Mr. Phonesiri Phanvongsa, kangphanvongsa@gmail.com and Fardavan Souliya, fsouliya@yahoo.com

The pilot household was engaged in an integrated agricultural technique with the cultivation of upland rice and vegetables, intercropped with fruit trees. The farmer used water that had been pumped from an open well and also produced organic compost in order to improve the soil. The household cleared a plot of vacant land measuring 40 meters X 40 meters with a gradient between 2-3 degrees for the implementation of this pilot scheme. The intercropping system commenced in May with the planting of fruit trees and rice as this is the beginning of the rainy season - and these crops rely on rainfall. After the rice was harvested from October – November, the farmer introduced watermelons and peanuts on the same plot of land so as to enhance the soil without the practice of burning. After the peanuts and watermelons had been harvested, it was once again the start of the upland rice cycle and the farmer could continue with the cultivation of upland rice in the same area. The farmer also planted bamboo around the boundary of his land to prevent animals from entering.

Demonstration map



The pilot household also learned how to manage and maintain a water pumping system to supply water to the garden and the other areas under cultivation

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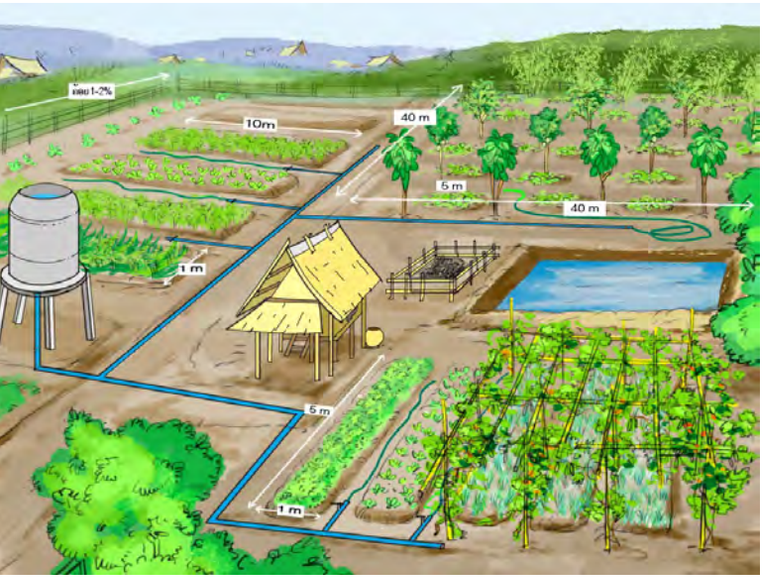

during the dry season. The water was pumped up and stored in an aluminum container with a capacity of 2,000 liters. PVC pipes with a diameter of 35mm and 20mm were installed around the farming area to effectively irrigate crops and fruit trees in both a cost-effective and timely manner. The storage of water in the aluminum container also helped to reduce the prolonged running of the water pump which could lead to damage and/or shorten its life span. However, there were electric costs involved with the use of the water pump. The household also provided water to the neighboring farmers' land when they were experiencing water shortages at the time of their farming activities.

As a result of the pilot scheme the participating household was able to expand the land under cultivation up to an area measuring about 10 meters x 20 meters. Here the farmer could grow vegetables throughout the year with the utilization of the pumping system. The household also learned how to make organic compost to improve the soil as the land in this region is composed of sandy clay which retains heat and allows the loss of moisture from the soil thereby affecting the growth of crops. The household is currently growing many crops including green onions, green leafy vegetables, morning glory, coriander, mint and gourd as there is a high market demand for these vegetables. Nowadays pilot household can sell their produce locally for around 1,200,000 – 1,400,000 Kip/year compared to the 700,000 – 900,000 Kip/year that they could make previously.

The pilot household learned how to manage livestock manure by collecting and containing it in a designated area, so as to use it for the production of compost. Mulch or dry rice straw was put on top of animal manure and then 40-50% of this was burned off. Afterwards this half burned material was used to make compost. The pilot household also learned how to effectively mix liquids containing microorganisms with water. Previously the solution was not diluted with water, but the Project team recommended to also add one liter of water with the waste vegetables, mulch and molasses, so as to enhance the decay of these materials.

The pilot site is located is in Phouvong district and it can be accessed throughout the year. The site is approximately 3-4km from Phouvong district capital and one can reach it by taking a laterite road through a relatively flat area. The pilot site is just off this main access road.