

# Developing and evaluating forage technologies with farmers in Lao PDR

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The livestock sector in Lao PDR is almost exclusively smallholder-based. The livestock practices of smallholders are very traditional, with minimal or no inputs used. Animals are generally left to graze, either on native grass that is available in forests and grassland or on crop residues in harvested fields.

Although the livestock production systems of Lao PDR are highly diverse, four broad categories exist:

## 1. Livestock in association with lowland agriculture

These systems are dominated by intensive rice cultivation and livestock play a vital role in providing draft power and manure and in stubble recycling. The opportunities for forage development in these systems are often limited by lack of land for planting forages.

## 2. Livestock associated with long-rotation shifting cultivation systems.

In these areas (predominantly in the northern part of the country), livestock producers often have very low-input systems of livestock management. Frequently, buffalo and cattle are allowed to graze in the mountains and forests year-round. They are only brought back for work or for sale. The opportunities for forage development in these systems appear limited, as farmers perceive few problems with the existing feed resource. However, in some areas, there is growing activity at the farm level and animal raisers plan to sell livestock to neighbouring countries, especially to Thailand, Vietnam, and China. Under these situations, livestock management systems are likely to change rapidly and a demand for forages may emerge.

## 3. Livestock in association with short-rotation shifting cultivation systems

In these areas (principally in the central north area such as Luang Phabang, Xieng Khouang), few forests remain. Agricultural systems are under increasing pressure from shorter fallow cycles and increasing populations. Livestock, especially in the more remote areas, is a major buffer against calamity in the household or community. Only a few other commodities exist that can be produced with little labour and resources, that can be sold at any time, and that are relatively easy to bring to market regardless of distance.

In these systems, the opportunities for forage development appear to be very high. Many farm communities are recognising both the value of livestock in maintaining their livelihoods and the need for better livestock management. Interest in managed forages is already high, with farmers in some areas already attempting to manage their feed resources by cultivating grasses.

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#### 4. Livestock in the southern sandstone regions and Pek savannas

These areas in the southern provinces have very poor soils, long dry seasons, and low population densities. The livestock management systems are based on extensive grazing. The opportunities for improvement with forages appear limited, partly because the existing feed resource (though poor) is extensive and partly because farmers are heavily occupied with trying to support their fragile agricultural livelihood. However, the government is trying to promote livestock production for smallholders in these areas.

The Forages for Smallholders Project (FSP) has been working in Lao PDR to develop forage technologies with farmers in these regions. Some common problems are experienced by farmers in raising livestock across these regions:

- Disease.
- Lack of feed throughout the dry season.
- Lack of feed at critical times during the wet season (such as planting and harvesting), when animals must be kept penned to prevent damage to crops but there is not enough labour to care for animals.
- Loss of animals (that graze in far villages) to thieves and predators.
- Damage to other farmers' fields, causing conflicts in villages.

Many of these problems can be addressed by planting forages. Therefore, the FSP began on-farm development of forage technologies in 1997. The sites initially selected were those identified by local agriculture officers or rural development workers as having potential for forage development. These are found in two provinces: Xieng Khouang and Luang Phabang. The characteristics of these two areas are listed in Table 1.

**Table 1. Physical characteristics of locations for on-farm forage evaluations.**

Site	Latitude	Altitude (m)	Annual rainfall (mm)	Wet season	No. of wet months (>50 mm)	Soil characteristics	Farming system
Xieng Khouang	18.5-20°	1100 to >2000	1300 to 1700	April to September	8	<ul style="list-style-type: none"> <li>- pH (1:5 H<sub>2</sub>O): 5.4 (4.7-7.7) upland; 4.8-5.0 on the plain.</li> <li>- Loam – clay loam (upland).</li> <li>- Alluvium (plain).</li> <li>- Moderately fertile upland.</li> <li>- Very infertile (plain).</li> <li>- Well drained.</li> <li>- P deficient to extremely deficient.</li> </ul>	<ul style="list-style-type: none"> <li>- Wetland rice in valleys and shifting cultivation on the slopes.</li> <li>- Some shifting cultivation on ploughed savanna grassland.</li> <li>- Upland crops in pine tree zone (rice, maize, and other crops) with integration of livestock production.</li> </ul>
Luang Phabang	19-21°	300 to 1900	1300 to 1700	May to October	7	<ul style="list-style-type: none"> <li>- pH (1:5 H<sub>2</sub>O): 5-7.</li> <li>- Loams, sandy loam.</li> <li>- Well drained.</li> <li>- Infertile to moderately fertile.</li> <li>- Low organic matter content and low base saturation.</li> </ul>	<ul style="list-style-type: none"> <li>- Shifting cultivation and upland cropping on slopes.</li> <li>- Rainfed rice in lowland with livestock production integrated.</li> </ul>

### Description of sites

#### Chomphet, Luang Phabang

##### *General description*

Chomphet is located opposite of Luang Phabang township on the other side of the Mekong River. About 80% of the area is mountainous or hilly. Altitude varies from 300 to 1900 m. The upland area has mostly been cleared for shifting cultivation. Rice

production is practiced in the lowlands. Annual rainfall ranges from 1100 to 1800 mm. The dry season lasts from November to March, with December to February being particularly dry (about 1-3% of total rainfall). Soil is mostly infertile and moderately acidic (pH 5-6).

#### *Description of community*

There are three main ethnic groups in Chomphet: the Lao Lum, Lao Theung and Lao Soung. The latter groups normally live in upland areas. The farming systems common in Chomphet District are subsistence cultivation of rainfed paddy and upland rice integrated with livestock raising. In upland and mountainous areas, farmers cultivate upland rice in swidden fields as the primary crop and staple food. The crops are sometimes inter-planted with additional food and cash crops such as maize, cassava, taro, eggplant, and cucumber. Rice is mostly planted in narrow valleys. Most of the fields in the district are rainfed; only a very small portion is set aside for irrigated dry season rice. In addition to rice, farmers also plant maize, soybean, garlic, spring onion, and other vegetables. The livestock raising system in Chomphet varies from village to village. In the lowland areas where rice is grown, farmers keep buffalo. In some villages, there are no cattle at all. In these areas, villagers do not like to eat cattle meat. Cattle are mostly kept in the upland areas. Animals provide food, income, savings, draft power, transport, and manure. Ruminants in the upland areas can freely graze on native grasslands and forests year-round. They are brought back to the village only when they are sick or if they will be sold. In lowland areas, livestock are released into the forest during the dry season, after which they are taken back to the village to be used for land preparation. The agricultural land for each household ranges from 0.5 to 2 ha, depending on the availability of labour in each household. Family cash income is mostly derived from the sale of animals and occasional crop surpluses (including maize, vegetables, cotton, and rice). Other off-farm activities (such as handicraft, off-farm work) can also be an important source of income for villages that are not too remote.

#### *Participatory diagnosis*

Participatory diagnosis was conducted at Ban Thapho. The problems identified by farmers (in order of priority) were

- Animal diseases, especially in pigs and poultry.
- Shortage of feed for working animals during the planting season.
- Poor-quality forage during the dry season.
- Long calving interval (24-30 months).

Farmers tried to solve these problems by

- Using vaccination (but only against haemorrhagic septicaemia in buffalo).
- Storing rice straw to feed their working animals during the planting season.

#### *On-farm activity*

1996

- Establishment of regional evaluation of forages managed by farmers.
- Organising field trips to forage evaluation nursery.
- Training of farmers on basic forage agronomy.

1997

- On-farm work started this year with individual farmers and groups of farmers in five surrounding villages. The forages selected by the farmers from the regional nursery were *B. brizantha* CIAT 6780, *B. decumbens* cv. Basilisk, *B. ruziziensis*, *Panicum maximum* TD58, *Stylosanthes guianensis* CIAT 184, and *Centrosema pubescens* cv. Cardillo.

## **Xieng Ngeun, Luang Phabang**

### *General description*

Xieng Ngeun is one of 11 districts within Luang Phabang Province. It is located about 30 km to the south of Luang Phabang City. Mountains and hills dominate the area, with elevation varying from 300 to 1900 m. The area has mostly been cleared for shifting cultivation. Annual rainfall ranges from 1100 to 1800 mm. The dry season lasts from November to March, with December to February being particularly dry (about 1-3% of total rainfall). Soil is mostly infertile and moderately acidic (with soils on the limestone bluffs being more fertile).

### *Description of community*

The farming systems in Xieng Ngeun District are based on various practices of rice production: (1) subsistence swidden farming system, (2) subsistence paddy rice, and (3) mixed swidden and paddy farming systems. Many similarities exist between the farming systems of Xieng Ngeun and Chomphet districts. In the upland and mountainous areas, farmers cultivate upland rice in swidden fields as the primary crop and staple food and often interplant with additional food and cash crops such as maize, cassava, taro, eggplant, cucumber, squash, kale, etc. Separate upland fields may be also used for maize, ginger, and soybean. Paddy rice is mostly practiced in narrow valley bottoms by the Lao Loum ethnic group. Most of the agriculture in the district is rainfed and only a small portion is reserved for irrigated dry-season paddy rice. Livestock is an integral part of all farming systems. They provide food, income, saving, draft power, means of transport, and manure. The dominant livestock are cattle, buffalo, goat, pigs, and chickens. The cattle usually graze freely on native pastures in high mountain areas or in swidden areas for the whole year and are brought back to the village only for sale. Family cash income is derived from various sources but the main source is livestock (especially cattle). Occasional crop surpluses (including maize, ginger, vegetable, cotton, rice) are sold locally. Off-farm activities include making handicrafts and providing labour (but many villages are too remote for this).

### *Participatory diagnosis*

Participatory diagnosis was conducted once in this district at Ban Kieuw Taloun Yai (a Hmong village). The problems identified by farmers, in order of priority, were:

- Livestock disease.
- Feed shortages in both dry and rainy seasons due to competition for land from cropping and shortening fallow periods.
- High mortality among young animals (falling from high mountains, starvation during dry season, cold weather).
- Animals wandering off and becoming lost or causing damage to other farmers' fields.

The interventions the farmers have been able to make to minimise these constraints include:

- Vaccination.
- Regularly visiting and caring for their animals in the grazing area.
- Growing elephant grass be used as feed in the dry season.
- Establishing village rules allocating specific areas for grazing and cropping.

### *On-farm activity*

1995

- A forage evaluation nursery (60 species) was established at Houakhoth. It was managed by provincial and district livestock officers.

1996

- Establishment of regional nurseries throughout the province; best species planted and managed by farmers.

- Farmers were brought to the forage evaluation nursery to see what forage species were available and to get feedback on which species looked promising and why.
- Farmer training on basic forage agronomy was provided.

1997

- On-farm evaluation of the best forage species started in May 1997 at six villages in the area with both individual farmers and farmer groups. The species included in the evaluation are *Brachiaria brizantha* CIAT 6780, *B. decumbens* cv. Basilisk, *B. ruziziensis*, *Panicum maximum* TD58, *Stylosanthes guianensis* CIAT 184, and *Centrosema pubescens* cv. Cardillo. Some farmers have already started to expand the area of their preferred species (*Brachiaria brizantha* CIAT 6780, *B. ruziziensis*, and *Panicum maximum* TD58). They are beginning to change their opinions on which species they like after seeing the dry season performance. There is substantial interest from other farmers to join the evaluations this year and some farmers already started to expand their areas.

### **Luang Phabang district, Luang Phabang**

#### *General description*

Luang Phabang District is located between Chomphet and Xieng Ngeun districts and has similar climate, soils, topography, and land use systems. Mountains and hills dominate the area, but not as much as in the other two districts. The sloping areas have mostly been cleared for shifting cultivation. Annual rainfall ranges from 1100 to 1800 mm. The dry season lasts from November to March, with December to February being particularly dry (about 1-3% of total rainfall). Soil is mostly infertile and moderately acidic (with soils on the limestone bluffs being more fertile).

#### *Description of community*

The farming systems in Luang Phabang are similar to those in Chomphet and Xieng Ngeun. In the upland and mountainous areas, farmers cultivate upland rice in swidden fields as the primary crop and staple food and often use additional food and cash crops such as maize, cassava, taro, eggplant, cucumber, squash, kale, etc as interplant. Separate upland fields may be also set aside for maize, ginger, and soybean cultivation. Paddy rice is grown in the valleys of the Mekong and Khan rivers. Livestock is an integral part of all farming systems, especially in the upland areas. As in the other districts, the animals provide food, income, saving, draft power, means of transport, and manure. The dominant livestock are cattle, buffalo, goat, pigs, and chickens. The cattle and buffalo usually graze freely in the cropland (dry season only) and among the swidden fields. They are generally kept closer to the villages. Family cash income is derived from various sources. Being close to Luang Phabang, markets for many products exist and livestock plays a less dominant role in augmenting family cash income.

#### *Participatory diagnosis*

- Participatory diagnosis has not yet been conducted.

#### *On-farm activity*

1995

- A forage evaluation nursery (57 species) managed by provincial and district livestock officers, was established at Houakhoth.

1996

- A regional nursery of the best species (planted and managed by farmers) was established in the district. Farmers were brought to the forage evaluation nursery to see what forage species were available and to obtain feedback on what species are promising and why.
- Farmers were given training on basic forage agronomy.

1997

- On-farm evaluation started without having conducted a PD, as the district livestock officer had already identified farmers who appeared keen on planting forages and wanted to begin immediately. Seeds of the most promising species were given to five individual farmers. The species distributed were *Brachiaria brizantha* CIAT 6780, *B. decumbens* cv. Basilisk, *B. ruziziensis*, *Panicum maximum* TD58, *Stylosanthes guianensis* CIAT 184, and *Centrosema pubescens* cv. Cardillo. All these farmers have not been successful. This maybe attributed to the lack of diagnostic work at the beginning – they were not able to identify problems and farmers who are most motivated to solve these problems.

### **Nonghet, Xieng Khouang**

#### *General description*

Nong Het is located in the western part of Xieng Khouang Province (about 150 km from the provincial capital Phonsavanh). The area is mountainous with altitudes up to 2000 m. Rainfall data are not available for this district, but it is likely to be in 1800-2000 mm range. The dry season lasts from November to March. Soils are moderately fertile and moderately acidic (soil pH varies from 5.0 to 5.5). For many years, the land has been cleared for shifting cultivation and growing upland rice and other cash crops.

#### *Description of community*

The communities in Nong Het District are dominated by the Hmong people who cultivate valley areas for wetland rice and practise shifting cultivation on slopes, growing upland rice and maize. There are also separate upland fields used for maize and soybean production. These crops are normally used to feed pigs but are also reserved for human consumption in case of rice shortages. The district is well known for its pig production. Most communities keep small to moderate-size herd of cattle and buffalo, which graze on abandoned upland rice fields, roadsides, and native pasture. The cleared areas utilised for grazing on the upper hill slopes are dominated by *Imperata cylindrica*. Livestock provide food, income, slaughter for traditional ceremony, draft power, transport, and manure. Goats, pigs, and chickens are also common. Cattle and buffalo are normally left in the forest, being brought back only when needed. The main source of family cash income is cattle and cash crops. Handicrafts and non-timber forest products are also occasional sources of farmer income.

#### *Participatory diagnosis*

- Participatory diagnosis has not yet been conducted.

#### *On-farm activity*

1997

- On-farm work commenced here without conducting a PD. The provincial livestock officers reported farmers who planted elephant grass to feed their animals at critical times of the year, but who were not satisfied with its performance. The provincial officers decided to begin work as soon as possible with the species they had seen growing in the regional nursery in Lat Sen. On-farm evaluations started with individual farmers from two villages participating. The species evaluated were: *Brachiaria brizantha* CIAT 6780, *B. decumbens* cv. Basilisk, *B. ruziziensis*, *Panicum maximum* TD58, *Stylosanthes guianensis* CIAT 184, and *Centrosema pubescens* cv. Cardillo.

### **Pek, Xieng Khouang**

#### *General description*

Pek District is near the capital of Xieng Khouang Province. The area consists of rolling hills interspersed with lowland paddies, savannah, and large areas of grassland. The upland areas are cleared for planting upland rice and other crops. The lowland areas are



used for paddy rice. Average rainfall varies from 1000 to 1500 mm. The rainy season lasts from April to October. Altitude varies from 800 to 1200 mm. Soil in the grasslands is extremely infertile and very acidic (pH 4.0-5.0) but soil in the hills can be neutral and relatively fertile (as a result of the underlying limestone).

#### *Description of community*

Members of the communities in Pek District are often of mixed ethnic origin, mostly Lao Loum and Lao Soung with some Lao Theung. Farmers in upland areas cultivate rice through shifting cultivation on slopes. Only very small areas of rice are found in narrow valleys. In addition to rice, many crops, including maize, soybean, cucumber, taro, cassava and peanut are either planted with rice or in separate fields. These crops are mostly for home consumption; occasional surpluses are sold in local markets. Most villagers keep cattle, buffalo, pigs, and chickens. The cattle and buffalo graze on vacant upland rice fields, roadsides, and in large native grassland on mountain tops. The cleared area used for grazing on the upper hill slopes are often dominated by *Imperata cylindrica*. In some places, livestock is an essential source of manure for maintaining fertility in crop fields. Livestock also provides income, and draft power and is slaughtered for traditional ceremonies. In some places, animals are left in the forest year-round and brought back to the village only when needed (for land preparation or for sale). In other villages, animals are allowed to graze in the high grasslands during the wet season but they return to the village to graze on fallow cropland in the dry season. Family cash income is derived mainly from livestock and crop surpluses (if there are any). Non-timber forest products and hunting are also occasional sources of farmer income.

#### *Participatory diagnosis*

The on-farm work in Pek District is a collaboration between the FSP, the GTZ NAWACOP project (a broad-based rural development project), and the Provincial Agriculture and Forestry Office. In 1995 and 1996, detailed PRAs were conducted by the GTZ project in eight villages. In all the villages, farmers identified livestock feeding as a major concern (after diseases), because of their dependence on livestock for livelihood security and manure. In two villages, farmers had already started to plant forages on their own initiative. The collaboration with FSP was a result of the outcome of these PRAs.

#### *On-farm activity*

1997

- On-farm evaluation of forages began this year with individual farmers in three villages ( Ban Sang, Ban Phousy, and Ban Ta). In all locations, *Brachiaria brizantha* CIAT6780, *Brachiaria decumbens* cv. Basilisk, *Panicum maximum* TD58, and *Stylosanthes guianensis* CIAT184 have performed well. These trials have generated substantial interest from other farmers (within the same villages and from surrounding villages). The number of farmers evaluating forage technologies will be greatly expanded in 1998.

## Results and lessons learned after one year of on-farm activities

The on-farm work described above involves 71 individual farmers and 7 groups of farmers in 23 villages. In some locations (especially Xieng Ngeun and Pek districts), there is significant and spontaneous demand from farmers for expansion of the evaluations in 1998. In most of the on-farm evaluations, *Brachiaria brizantha* CIAT6780, *B. decumbens* cv. Basilisk, *Panicum maximum* TD58, and *Stylosanthes guianensis* have performed very well and have been selected as promising by farmers. Before the end of the first wet season five farmers and three farmers groups had already expanded the forage area.

We have learned some useful lessons from the first year that should help us make plans for expansion of activities in 1998.

### **1. Careful selection of sites and farmer participants is essential**

We learned that choosing locations and farmer participants very carefully is critical to the success of the program. The FSP is working with district development workers, most of whom have not had any experience with participatory methods. Often, their role is to promote livestock raising rather than try to solve existing problems. For this reason, we find that they are sometimes too keen to nominate some farmers who do not even own livestock yet but who are just trying to get credit to start a livestock business. These are not the farmers who will innovate and expand forage technologies to solve the widespread local problems. More participatory diagnosis activities will help us understand farmers' needs and enable us to select innovative farmers for on-farm evaluation.

### **2. Working with informal farmer groups was not very successful**

In some cases, farmers were keen on planting forages in a single village plot controlled by an informal group of farmers. This has not worked well as enthusiasm for maintaining and evaluating the forages disappears when farmers have no feeling of 'ownership'.

### **3. Evaluations must be done over several seasons**

It is critical that we continue evaluating forages with farmers over several seasons rather than for one season. Their preferences will change as they see how species perform over seasons. For example, in some of our sites, farmers liked the performance of *Brachiaria ruziziensis* and expanded it to other areas. However, in the current dry season it has not performed well. Most farmers now prefer *Brachiaria brizantha* CIAT6780 because of its better dry season growth.

### **4. More training and planning activities for farmers are needed**

We have not provided farmers with enough basic information about forages from the beginning of the evaluations. For example, sowing rates have frequently been too high. We need to put more efforts into familiarising farmers with the basic features of forages and answering any of their questions before planning what evaluations they would like to do.

### **5. Opportunities exist for bargaining with farmers**

A possible trap with the participatory approach is that, early in the process, farmers may reject technologies with broader, long-term benefits. In these cases, we could bargain with farmers to try some technologies that they may not prefer initially but which we think have long-term promise. For example, at initial stages, farmers almost always select species for intensively managed plots. However, we may also see opportunities for forages for gully stabilisation. We should provide the species that the farmers want for cut feed, but we should also encourage them to establish an area for planting forages to be used for gully stabilisation.

### **6. Seed must be made available early**

Last year, at some sites, farmers obtained seed rather late. The start of the wet season varies, depending on the area. Farmers use local indicators to decide when to plant. We need to supply them with seed early enough so they can decide to plant whenever they see fit.



### 7. On-going, informal training is needed

Under the project, we have so far focused on formal training (FPR and forage agronomy). However, district officers must be provided informal training opportunities. Participatory evaluation, for example, is an activity that needs to be learned, practiced, and refined. Bringing groups of district officers together to practice and revise these skills on-site is both helpful for the evaluations and also for building their enthusiasm. These are the people who hold the key to the successful development of forage technologies in villages.

### 8. The evaluation methodology may have to be improved

Simply ranking the species does not tell us how much farmers like one species over the other. We are trying a modified preference-ranking methodology to include 'rating' of species. The change involves asking farmers to rate how much they like each species on a scale of 0-10 (where 0=extremely poor species and 10=excellent species). A rating evaluation might look like the example in Table 2.

**Table 2. Example of preference rating.**

Species	Farmers			Average Rating	Rank	Number of farmers
	A	B	C			
P	8	9	6	7.6	1	3
Q	7	9	7	7.6	1	3
R	4	4	4	4.0	3	3
S	0	-	3	1.5	5	2
T	-	-	3	3	4	1

This will give an indication of the relative performance of the species. It also allows for evaluation of different numbers of species by farmers (which is going to be common at our sites).

### Future activities

The farmer participatory research approach requires a substantial commitment of time from researchers and development workers. In Lao PDR, the major activities are being planned for the next year:

- Conduct at least one training course on 'Developing forage technologies with farmers' to increase the skills of district officers.
- Conduct regular on-site farmer training in forage management .
- Continue to work with farmers who are currently testing and developing forage technologies.
- Expand the on-farm evaluations in Luang Phabang and Xieng Khouang and begin work in Oudomxay, Luang Namtha and Savannaket provinces.

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