Livestock Development by the Shifting Cultivation
Research Project in Luang Prabang Province, Lao P.D.R.¹

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Abstract
The Shifting Cultivation Research Sub-programme has, among other activities, carried out livestock related development and research work since 1991. This includes revolving fund credit schemes, vaccination, veterinary service, pig cross breeding, extension of improved management methods, trials on fodder production systems and research on farmers’ livestock technology. Good results were obtained in introducing vaccination of large ruminants, expansion of stocks, adoption of fish ponds, and familiarising farmers with more intensive management systems. Because farmers have different resources and interests, most activities were only relevant to a minority of households. Extension of new management practices should therefore offer several options for farmers to choose from. A common constraint on technology adoption was the extra labour requirements, which few farmers were prepared to apply. Another problem was the limited staff capability in extension and community development.

Introduction
Animal husbandry is economically important to shifting cultivators in Laos. As an economic venture, livestock production benefits from relatively stable prices, from independence of infrastructure, and from being a productive means of saving. Surplus capital is therefore very often invested in farm animals, and farmers generally see increased livestock production as a plausible way of improving their livelihood. Furthermore, animal husbandry can make use of natural pastures, open forest, household waste products and crop residues that are of little other use. Support to the livestock sector was therefore prioritised by the Shifting Cultivation Research Sub-programme, as described in this paper. Project activities included credit schemes, vaccination, veterinary service, pig cross breeding, extension, trials on fodder production and improved fallows, and research on farmers’ livestock technology.
The Shifting Cultivation Research Sub-Programme

The Shifting Cultivation Stabilisation Sub-programme in Luang Prabang Province was established in 1991. Up to 1995, the main objective was to test technologies and extension methods that may improve the land-use in shifting cultivation areas of Laos. This was attempted through a combination of research, training and practical development activities in forestry, crop production, horticulture and animal husbandry.

Method development was the main scope of the project, but practical development work was initially carried out in fourteen villages, and in 1992 expanded to an additional twenty villages. The Sub-programme also assisted other target areas of the Lao Swedish Forestry Programme, both in the North and the South of Laos.

During 1996-2000, the Sub-programme will concentrate on applied research, so a new name was accordingly adopted: the Shifting Cultivation Research Sub-programme (SCRS). The purpose is to create an adaptive research system that will produce results for improving the land-use in shifting cultivation areas of Laos. Research includes both experimental field trials and descriptive research.

The Sub-programme is part of the Lao Swedish Forestry Programme (LSFP), which is carried out by the Department of Forestry, with support from the Swedish International Development Cooperation Agency (Sida). The SCRS works closely with the five other sub-programmes of the LSFP, namely: Institutional Strengthening, Extension, Land-use Planning, Forest Management, and Conservation.

The Target Area

The original target areas of the SCRS consisted of Thong Khang Sub-district of Luang Prabang Province. The area covers 16,000 ha and fourteen villages located in Nane District, 38 km south-south-west of Luang Prabang City (66 km by road). As conditions in the target area are fairly typical for Luang Prabang Province and for much of Northern Laos, some general aspects are described below (based on Hansen and Sodarak 1996).

The land is mountainous, consisting mostly of steep and very steep slopes. Flat and gently sloping land represents less than 15 percent of the area and occurs at foot hills, at the bottom of river valleys and on limestone plateaux. Elevations vary from 480 to 1380 meters above sea level, but areas higher than 1000 meters account for only about 12 percent of the total area. The altitude range induces different climatic conditions, which in turn cause variations in soil properties, vegetation, crop suitability, etc. The average rainfall is about 1600 mm per year, which is relatively low for mountainous areas in Laos.

The most common rock types are siltstone, sandstone, limestone, schist and phyllite with quartz inclusions occurring sporadically. Alluvial deposits cover less than 1 percent of the area. Soil properties vary greatly, particularly in response to varying slope conditions and soil parent material. The most widespread soil groups are Haplic Alisols, and Dystric and Farallic Cambisols. Such soils are mainly found on the hill slopes, which make up most of the area. The upland soils are moderately fertile, usually having medium levels of exchange capacity and nutrient availability. The main soil fertility constraints are probably phosphorous deficiency and low pH.

The climax vegetation is deciduous and evergreen forest, but shifting cultivation and, to a lesser extent, logging have all but eradicated the mature forest. Today, older forest stands account for only about 10 percent of the total area, and are almost exclusively found on the steepest and most inaccessible hill sides, especially limestone escarpments. Most of the vegetation is in some stage of secondary regeneration. Younger stages are often dominated by *Eupatorium odoratum* (syn. *Cromolaena odorata*), other herbs and bushes; although grasslands of *Imperata cylindrica* are formed where longer or repeated cultivation periods are practised. Bamboo thickets are common, particularly where the land has been under repeated and short-term cultivation. Regeneration of forest is usually good, and dense, low tree stands may establish in 6-10 years. However, the succession is often interrupted by cultivation as only short fallow periods are used nowadays.

Ban Thong Khang Sub-district contains fourteen villages, ranging in size from 30 to 127 households, but with an average of 49 households per village. The population consists of about 4000 people in 690 families; of which 42 percent are Lao, 41 percent Khamu, 12 percent Hmong, and 5 percent Yao Mien. Of the fourteen villages, four are at the Luang Prabang-Sayaburi road, while three other villages are situated on all-weather secondary roads. The other seven villages are located 30 minutes to 3 hours walk from a road.

Agriculture in Thong Khang Sub-district is mainly aimed at subsistence production, but commercial production
is gradually increasing. Shifting cultivation is the predominant occupation, with 82 percent of the households engaged mainly in shifting cultivation and an additional 12 percent combining shifting cultivation with other activities, such as paddy farming. Because of land scarcity and government regulations the fallow periods are now only 3-6 years, alternating with cultivation periods of one or two years.

Upland rice is planted on at least 70 percent of the cultivated area; the remaining production being paddy rice, 13 percent; maize, 8 percent; and other crops, 9 percent. The group of other crops include sesame, Job's tear, cowpea, peanut, mungbean, soybean, castor, cotton, tobacco, vegetables, etc. Upland rice yields are on average around 1300 kg/ha, paddy rice 2200 kg/ha, maize about 1800 kg/ha and most pulses around 600 kg/ha.

Domestic animals include chickens, turkeys, ducks, pigs, buffalo, cattle, horses, goats, dogs and cats. Sale of animals and animal products provides about 50 percent of the average farm's cash or barter income (not including subsistence crop production). The average farm income from livestock production is about US$ 80, compared to a mean household income of US$ 450-500.

Only about 5 percent of the area are under cultivation in any one year, but at least half the area is part of the shifting cultivation cycle, or has been cultivated within the last 20-30 years. The uncultivated land, including the remaining forest, is used for a variety of purposes: grazing, hunting, and as sources of building materials, food, fodder and sales products. Fishing in streams and rice fields probably gives an important supplement to the diet. Commercial logging took place until 1986, but commercially accessible timber is no longer available.

Land-use has changed in recent years, partly because of project initiatives and the general economic liberalisation. Thus, crop production has become more diversified, more land has been put under paddy cultivation, fruit tree areas have increased, tree plantations have expanded, and animal husbandry has improved.

Major development problems in the Ban Thong Khang area include:

- Decreasing sustainability and productivity of agriculture and forestry.
- A rapidly increasing population.
- Poor human health and nutrition.
- Poor education opportunities.
- Few job opportunities outside agriculture

The Sub-programme has carried out various activities related to livestock production, including:

- Revolving fund credit schemes.
- Vaccination and veterinary service.
- Pig cross breeding programme.
- Extension of improved management methods.
- Expand the livestock production.
- Trials on fodder production and improved fallows.
- Research on farmers' livestock technology.

Some results and experiences are summarised below.

**Revolving fund credit schemes**
Limited and costly access to credit is believed to be a major constraint on farmers’ adoption of land-use alternatives to shifting cultivation. In 1991, the Shifting Cultivation Stabilisation Sub-program therefore started trials on revolving funds in three villages and later expanded to 29 other villages.

The credit was distributed to and administrated by the Village Development Committee, who obtained technical and administrative advice from the project. To rationalise the dispersal of funds and to have farmers support each other, loans were usually released to groups of at least five households. However, members of loan groups did not share liability for the loans.

Villagers were free to suggest activities for funding, although the contracts would often stipulate that farmers should follow certain practices recommended by the project, e.g., vaccinating animals and ensuring that enough fodder is produced. Twenty-five percent of the budget were allocated as support to women’s groups, as an attempt to benefit women.

**POTENTIALS AND BENEFITS**

- Credit schemes were much appreciated by villagers and could have a major development impact.
- Revolving funds helped introduce new technology and management systems to farmers.
- Farmers perceived animal husbandry as the main possibility of agricultural development. Thus, credit for livestock raising constituted 80 percent of the released funds.

**CONSTRAINTS**

- The repayment rate was too low to justify the revolving fund scheme.
- Households depending solely on shifting cultivation were mostly unable to repay the loans.
- The mortality rates of pigs and chicken were very high. However, the reported mortality rates were inflated because the project had promised to replace dead animals if farmers followed the management recommendations.
- The credit enabled some families to become involved in pig production although they did not have the necessary experience, management skills and feed resources.
- Administrative support and monitoring proved extremely time consuming to the project, partly because of inappropriate routines.
- The commitment to repay loans vanished as a growing number of farmers were unable to pay.
- The project probably pushed too hard for farmers to borrow money, which lead some families with inadequate capability into debt.

**RECOMMENDATIONS**

- The use of revolving funds should be accompanied by technical support to farmers.
- Specialist credit organisations, for instance the Agricultural Promotion Bank, are probably better than development projects in administrating revolving funds and other credit schemes. However, implementation by projects may be suitable when working with shifting cultivators in remote areas, who would have difficulties in obtaining credit through commercial channels.
- Proven administrative and monitoring routines are essential. Gradual implementation may therefore be best to test the applied methods.
- Activities promoted through revolving funds must be economically viable and profitable, not experimental or merely aiming at improved sustainability. Careful monitoring and evaluation of pilot activities should be carried out before large scale promotion.
- In retrospect, many farmers suggested that larger sums of money should be allocated to a few
households rather than small sums to most households. Thus, small sums would not enable farmers to change their production system sufficiently.

Livestock vaccination

Vaccination was made available in all villages since 1992. Vaccination was given against hog cholera (pigs), haemorrhagic septicemia (buffalo and cattle) and Newcastle disease (chicken). A village livestock volunteer was elected in all villages, and received training from the project. The livestock volunteer was responsible for co-ordinating the livestock activities, for vaccination, for training of farmers and for communication with the project.

POTENTIALS AND BENEFITS

- Vaccination is an efficient and cheap way of helping farmers.
- Vaccination can be self-financing.
- Most cattle and buffalo were vaccinated, and farmers have accepted vaccination as a regular management practice.

CONSTRAINTS

- Farmers requested vaccination after animals have become ill or epidemics have started.
- Farmers' interest in pig and poultry vaccination remained low (around 20 percent of households).
- Animals died of other causes which diminishes the credibility of vaccination to farmers.
- Village livestock volunteers were not sufficiently motivated and trained.
- Difficulties in maintaining the cold chain because of inadequate cooling facilities, long transportation time to remote villages and inadequate co-ordination in the villages.
- Communication problems with farmers, e.g., in collecting all animals in time for vaccination, or under-reporting of the number of vaccination doses needed.
- Erratic supply of vaccine from the Department of Livestock and Fisheries

RECOMMENDATIONS

- The delivery service must be improved, through better information and communication with farmers, timely delivery of vaccine, and through monitoring and analysis of the work.
- Community rules and regulations should be promoted to ensure a sufficiently high vaccination coverage.
- The low interest in poultry and pig vaccination may be related partly these animals being the responsibility of mainly women, whom the project was less efficient in addressing. Thus, more efforts must be put into establishing effective working relationships with women.
- The Village Veterinary Workers should be better motivated, for instance through more training and better remuneration.

Pig cross breeding programme

In 1992, ten pigs of the exotic breeds Duroc, Yorkshire and Landrace were obtained from the Nong Taeng Pig Station in Vientiane for cross breeding with local pigs. The breeding was mainly done at the project's demonstration and training ground, but some farmers obtained pure-bred animals for further cross breeding in the villages. Farmers obtained pure or crossbred pigs for either fattening or further breeding. Many pigs were distributed to farmers through the revolving fund scheme.

POTENTIALS AND BENEFITS

- Cross bred pigs were generally superior to local pigs in litter size, weight gain and carcass quality.
- Farmers with sufficient pig feed and management skills benefitted economically from raising cross-bred pigs.
CONSTRAINTS

- For most farmers cross bred pigs probably have few advantages as their pig production is constrained by high morbidity and mortality rates, by lack of feed and by low management skills.

- The evaluation criteria and breeding principles were not sufficiently substantiated from the start.

- It was difficult to obtain new supplies in Laos of superior pure bred animals to renew the breeding stock.

- Testing, selecting and maintaining a large number of breeding animals is very expensive unless the offspring can be sold at a premium rate.

RECOMMENDATIONS

- A pig cross breeding programme is mainly suitable to farmers with good management skills and feed resources.

- Private companies may be more suited to serve the relatively few farmers who may benefit from cross breeding.

- Improvement of local pigs through simple selection seems plausible and more realistic than a cross breeding programme. Such selection may also be a necessary first step to gain full advantage of cross breeding programmes.

Extension of improved management methods

The project sought to improve farmers’ management practices through technical advice and by providing them with access to vaccine, medicine, fingerlings, etc. A general management recommendation for all types of animals was the improvement of feed quality and quantity. This included promotion of higher yielding maize varieties, leaf fodder from fast growing tree legumes, cut and carry feeding from improved pastures, and dry season cover cropping. Another recommendation was balancing the number of animals with the availability of feed, since most farmers raise more animals than their feed resources can sustain. Furthermore, the project promoted better criteria for selection of breeding animals, and in particular dissuading farmers from selling their best animals. Lastly, penning of pigs and poultry was promoted as a mean of diminishing disease and parasite transmission.

POTENTIALS AND BENEFITS

- About 30 percent of the households improved or expanded their livestock production significantly.

- Farmers became familiar with new technologies, and may increase the adoption as further land-use intensification becomes necessary.

- Vaccination, medicine, fingerlings, barbed wire and other production inputs were well received, even though farmers had to pay for them.

- Staff capability improved considerably. This included a more realistic picture of suitable and unsuitable technologies for the given production conditions.

CONSTRAINTS

- Lack of a formal extension system that can provide farmers with comprehensive access to information, production means and other services.

- The project was uncritical in accepting farmers’ expressed wishes, but did not assess farmers’ capability and production objectives.

- Lack of economic analyses of livestock production, including the profitability of fodder production systems.
Implementation was biased towards men, the richer farmers, and the more capable farmers.

Many technologies, e.g., improved pastures and the penning of pigs, were inappropriate to the current farming systems and production goals employed in the area.

The conditions and production problems were not sufficiently analysed when project activities started. Also, experience gained from extension was not sufficiently employed to change the extension recommendations.

RECOMMENDATIONS

- Careful evaluation of technologies and extension methods before large scale implementation starts. This would involve close co-operation with farmers in all stages of the work.
- Demonstration activities can be improved by providing more data and practical recommendations. Also, different systems should be demonstrated, not just a single recommended technology.

Expand the livestock production

Many activities mentioned above aimed at expanding farmers' livestock production and lower their dependency on shifting cultivation. Livestock promotion was also inspired by the government's recommendation to establish model farmers who have abandoned shifting cultivation and adopted so-called permanent occupation.

POTENTIALS AND BENEFITS

- Many farmers consider increased livestock production the most realistic way of increasing the income.
- About 30 percent of households expanded their animal production considerably.
- A few farmers specialised in livestock production and virtually stopped upland rice production.

CONSTRAINTS

- Only richer households can specialise in livestock production because of the investments, longer return periods, and risks involved
- Livestock production requires more land than plant production to generate an equivalent income
- Some farmers increased their herd sizes without increasing their management inputs.
- Many farmers already have more animals than they can raise in a rational and productive manner.

RECOMMENDATIONS

- Most farmers should continue integrated livestock and crop production.
- The number of animals should be balanced with the amount of feed available.

Trials on fodder production and improved fallows

Trials were carried out to screen exotic pasture legumes and grasses, to investigate the possibilities of improving the natural fallow vegetation, and to improve the pasture production systems.

POTENTIALS AND BENEFITS

- Out of 20 pasture legumes 11 species performed well under the local conditions: Crotolaria juncea (sun
hemp), *Cajan s caj an* (pigeon pea), *Vigna unguiculata* (Cowpea), *Delichos lablab* (Lablab). *Desmodium intortum* (Greenleaf desmodium), *Arachis pintoi* (Perennial peanut), *Stylosanthes hamata* (Verano stylo), *S. guianensis* (Cook stylo), *Pueraria phaseoloides* (Kudzu) and *Centroscema pubescense* (Centro).

- *Crotolaria juncea* (sun hemp), *Arachis pintoi* (Perennial peanut), *Stylosanthes hamata* (Verano stylo), *S. guianensis* (Cook stylo), *Pueraria phaseoloides* (Kudzu) and *Centroscema pubescense* (Centro) were able to persist for four years in a profuse natural fallow, indicating that they may have a role in improved fallow systems.

- Pasture lugeumes that did not perform well include: *Neonotonia wightii* (Cooper glycine), *Calopogonium mucunoides* (Calopo), *Macrotyloma axillaris* (Archer), *Macroptilium atropurpureum* (Siratro), *D. uncinatum* (Silverleaf desmodium), and *Medicago sativa* (Hunter River lucerne). Low soil pH is presumed to be a main constraint on many of these species.

- Low soil pH may also explain the low performance of potential leaf fodder trees, particularly Leucaena leucocephela.

- Rice yields were significantly higher after three years of legume fallows than after three years of natural fallow.

- Introduced maize varieties gave much higher yields than local varieties, and were readily adopted by farmers as a cash crop.

- Biologically improved fallows were of less interest to farmers than economically enriched fallows, such as fallows of paper mulberry (*Broussonetia papyfera*) and *Styrax tonkinensis*

**CONSTRAINTS**

- Many on-station trials were bio-physically very interesting, but impractical to adopt on a whole farm scale because of the extra labour requirements for weedin g and establishment.

- Farmers showed little interest in participating in on-farm trials on pasture species, as they saw little benefit from intensified production systems

- On-station trials were over-prioritised, which meant that critical issues to farmers, their experience, and their opinions on new technologies were disregarded.

**RECOMMENDATIONS**

- Screening of exotic species and varieties is recommendable when introduced in a new area.

- Dry season feed production should be a major objective of pasture trials.

- Experimental cropping systems should be tried in farmers' fields early in the testing programme.

- Farmers should participate in all stages of the research.

Research on farmers' technologies and production

Accompanying the livestock extension and vaccination work, various surveys were conducted to analyse the situation and monitor the project achievements. Latterly, more analytical research was conducted to assess the constraints and potentials of livestock production.

**POTENTIALS AND BENEFITS**

- Research results were used in both extension and strategy recommendations.

- Surveys of the livestock numbers, ownership and economic indicators gave a better grasp of the importance of the livestock sector to different groups of farmers.
• The combination of research and extension improved the quality and relevance of both.

CONSTRAINTS

• Too little attention was given to assessing farmers' livestock production. For instance, we do not know enough about the causes of the high mortality rates and the relationship between disease, feeding and other management.

• Much of the collected information was not used sufficiently or was generated after development activities had already started.

• The staff capability and training were insufficient to take full advantage of the work.

• More knowledge could be generated from comparative studies in areas representing different environmental conditions and production strategies.

• Surveys were too large and too concerned with quantitative information.

RECOMMENDATIONS

• Early efforts should be put into additional participatory diagnostic research carried out as co-operation between farmers, extension workers, veterinarians and researchers.

• Small, but repeated surveys of key indicators should be preferred to large surveys that are difficult to repeat and analyse.

• Further attempts should be made to describe and analyse farmers' technologies and the development potentials and constraints in different areas.

Conclusion

The conditions for animal husbandry varied greatly between villages and between individual households. Each of the different livestock development activities promoted by the project was only suitable, or of interest, to a minority of farmers. However, by offering farmers a choice of several activities, many farmers were able to benefit. Projects will normally not be able to consider the great variety in individual households’ resources and inclinations. It is therefore important to enable farmers to take advantage of project support through their own initiatives. Regrettably, the potentials and constraints of many project activities were not sufficiently analysed from the start. Farmers’ reluctance to adopt certain activities was therefore unjustly considered a sign of ignorance, rather than sound scepticism.

The most relevant technical options for livestock extension and development in areas similar to our project’s core area seems to be:

• Vaccination programmes, including vaccine supplies, training and community awareness.

• Improved pig feeding systems.

• Better selection of local breeding animals through, culling, castration and improved selection criteria.

• Credit for buying cattle, if suitable grazing areas are available.

• Fish raising, if suitable areas for ponds, as well as fingerlings are available.

• Assist communities in developing regulations and co-operation in the livestock sector.

Community regulations may include agreements on, for instance, the organisation and coverage of vaccination, penning or other confinements, management of communal grazing areas, control of crop damage by animals, and the role of and incentives for village volunteers.
From carrying out the various livestock development activities, we find a particular need for further research into:

- Pasture and pig feed production systems suitable for shifting cultivators in the uplands, especially in regards to higher protein supply and year-round feed availability.
- Studies of farmers’ production technologies under different conditions.
- The direct and associated causes of the high mortality and morbidity rates in livestock.

It should be noted that much of such research has recently started in Laos, including research projects presented in this volume.

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