

# Forest extraction or cultivation?

## Local solutions from Lao PDR

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Abstract: Lao PDR is a unique country in the Southeast Asia region, with a high dependency on forest products, due to its low population density combined with a high rate of forest cover. Non-Timber Forest Products (NTFPs) provide 50% of cash income of rural villages, where 80% of the Lao population lives. Local subsistence use of NTFPs may account for 20-30% of the Gross National Product. While free extraction remains the main mode of forest use, local communities have developed some interesting “intermediate” forest management systems.

We can discern a breakdown of typical traditional intermediate forest management systems, e.g. shifting cultivation, privately owned trees in common forest e.g. yang oil trees (*Dipterocarpus alatus*), holy forests and hunting taboos. The key factors causing the decline of these systems are the rapid population growth and massive population movements during and after the war of 1964-1975, disruption of traditional social structures, rapid conversion of forest to agricultural land, increased timber production, low prices for both timber and non-timber forest products (NTFPs), and a growing insecurity on land tenure and access rights.

On the positive side, a number of new systems are also evolving, e.g. agro-forests based on domestication of NTFPs, community based aquatic resource management, (single-) community based NTFP harvesting rules and multi-village NTFP conservation rules. Examples are given of domestication of cardamom (*Amomum villosum*), ‘si siet’ bark (*Pentace burmanica*) and broom grass (*Thysanolaema maxima*), harvesting rules for rattans (*Calamus* sp.), wildlife and fish, marketing of edible ‘bitter’ bamboo-shoots (*Indosasa sinica*). The key factors that drive this process of local intermediate forest development are the importance of NTFPs in the rural economy, the wealth of ‘indigenous technical knowledge’ on NTFPs and forests, increasing market penetration, innovative and enterprising attitude of local forest users and the support of facilitating projects/programs.

These systems could be a very good basis for sustainable, community based forest management. They provide local adaptability, a good risk aversion strategy, nutritional diversity, a safety net function in times of emergency and a stimulus to social cohesion. They also provide a basis for food security and poverty alleviation, they give strong incentives for biodiversity conservation and they contain potentials for the development of a strong and sustainable forest-based industrial and trade sector.

Local people can develop solutions, but often they can only do so if they are assisted by strong technical and market information exchange networks. Typical examples of elements of such networks for information exchange are the use of participatory techniques (RRA/PRA), on-farm and in-forest research trials, working closely with existing social/administrative structures, planned regular evaluation/feedback events, sharing lessons learned through workshops, technical papers and reports, village-to-village study tours, participatory decision making processes and group building approaches at village and multi-village level, etc. A case is made for local experimentation and local knowledge as the key factors to create sustainable forest use systems. Researchers should tailor their programs to the needs of local forest users.

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## **1. Introduction**

Local people are very creative and innovative in developing locally adapted strategies of extraction and cultivation of tropical forests. More and more evidence of this creativeness is being presented in papers from all over Southeast Asia (Fischer 1995, Michon 1994, Poffenberger 1990). This capacity to innovate, based on an intimate knowledge of the local environment, could provide an excellent basis for the development of sustainable forest management systems.

With relative high forest cover and low population density, compared to neighboring countries, Lao PDR is a unique country in the Southeast Asian region. The dependency of the population and the national economy on forest products is very high.

To what extent has this unique situation resulted in modified forest use systems, be it managed extraction or forest cultivation systems? What are the trends and driving forces in forest use? Could locally developed forest management systems be applied throughout the country to increase rural productivity and manage forest resources in a sustainable way for the long term?

This paper tries to address these questions, based on the experience of the IUCN-NTFP Project in Lao PDR. The project aims to support local communities to develop sustainable use systems of Non-Timber Forest Products for improved wellbeing and bio-diversity conservation. The project is funded by the Royal Netherlands Government and executed by IUCN and the Forest Research Center of the Lao Ministry of Agriculture and Forestry, since the end of 1995 (Foppes & Ketphanh, 1997).

## **2. Intermediate forest use systems in Lao PDR**

Until quite recently, Laos was mainly covered in forests and very thinly populated. Local people have responded to this situation of relative abundance of forests in several ways. In the hills, where it is difficult to make permanent paddy fields, swidden cultivation became the dominant way of life. This system can be regarded as an intermediate forest management system.

In the valleys, forests were seen as plentiful and never ending, and forest access was seen as free for all. This notion still prevails among many Lao people, even though the situation has changed. Over the last fifty years, forests have rapidly declined due to growing population and logging pressures. Forest cover reduced from 70% of the total land area in the 1940s to 41% in 1999 (Southavilay and Castren 1999). Only a few cases of intermediate forest management systems existed, e.g. private tree ownership, holy forests and hunting taboos.

Conflicts between village communities start to appear as more people compete for less forest space. As a result, local people start to develop new systems of managed NTFP extraction or 'forest cultivation' systems (see table 1). These systems are still quite rare and should be seen as 'under construction', against a background of predominantly 'free access' forest extraction. This paper is aimed at examining the future potential of such intermediate systems.

**Table 1: Intermediate forest use systems in Lao PDR**

NO	INTER-MEDIATE SYSTEMS	TYPICAL PRODUCTS	ACTORS	TRENDS	SUSTAINABILITY	DRIVING FORCES
1	Shifting cultivation	-upland rice -NTFPs, firewood and wildlife from fallow	Local communities	Shortening fallows Lower rice yields Less NTFPs from fallows General poverty for hill dwellers, Migration to cities	Low: system converts to grasslands, permanent agriculture, protected forests	-Population growth -Government policies on land allocation and moving villages -Opium is still very important
2	Privately owned trees	Yang oil	Individual families	-Old system very sustainable -Now, most trees are cut for timber	Old system very sustainable. System now disappearing fast	-Low price for yang oil -Strong demand for timber -Unclear policies
3	Holy forests	Funeral forests, Spirit forests	Local communities	Very small areas, often disappearing	Low: small sizes, little impact on conservation	-Pressure for agriculture land is too high
4	Hunting taboos	Soft shelled turtles Elephants	Local communities	-Very few cases -Rapidly disappearing	Low: Spirit is willing but the flesh...	-High demand for wildlife -Many war guns left
5	Agro-forests based on domestication of NTFPs	Cardamom Paper tree Bamboo Sisiet bark Rattan Broom grass	Local individual innovators	-More and more initiatives occur -Some systems expand rapidly -Competition from crops like coffee	High: Markets for NTFPs pull strongly, less wild harvest	-Market forces are strong but volatile -People need cash to buy rice -Local knowledge on NTFPs
6	Community aquatic resource management	Fish Frogs	Communities Projects, Local authorities	-High local interest and local initiatives -Outside facilitators often assist in initial awareness raising	High: Great interest from local people (but only for fish/frogs)	-Importance of wildlife in local diet and income -High local knowledge on wildlife
7	Community NTFP harvesting rules	Bitter bamboo Rattan	Communities Projects, Local authorities	-Recent initiative started with outside project assistance -Methods for monitoring need to be worked out	Medium: -No previous examples exist in Laos -Poverty can force people to opt out	-Awareness on rapid depletion -Subsistence needs of growing population -Empowerment/ leadership building
8	Multi-village NTFP conservation rules	Wildlife Livestock grazing Fire control NTFPs	Communities Projects, Local authorities	-Recent initiative -Depends on outsiders to facilitate initial meetings	Medium: No previous mechanisms for multi-village cooperation	-Government needs to involve communities in management of Protected Areas

### 3. Examples of intermediate forest use systems in Lao PDR

#### 3.1 *Shifting cultivation*

Shifting cultivation is the dominant mode of agriculture in the hills and mountains of Lao PDR, which cover 70% of the land area. With long fallow cycles, this rotational system provides stable upland rice yields and a plethora of wildlife and NTFPs, which thrive in the regenerating forest fallow. Because this system has been practiced for thousands of years in the hills of Lao PDR, almost all forests there have been slashed and burned regularly over the centuries. They can be regarded as 'modified' by human activity.

The main trend is a rapid decline in fallow periods, due to increased demands for land and resources as a result of population growth. This leads to an abundance of weeds, poorer soils,

lower rice yields, increased erosion and a decline in NTFPs obtained from the forest fallow (Roder et. al. 1993, Foppes et. al. 1993). As a result people tend to live in increasing poverty and migrate to become laborers in cities. Opium production and addiction remains a key problem (Epprecht, 1998). The Government tries to end shifting cultivation by resettling villages in valleys, introducing land allocation programs and promoting permanent agriculture, so far with mixed results.

This is a case of people changing the forest, but the forest may have changed the people too. In surveys of the NTFP Project, local people regard edible bamboo shoots consistently as the most important forest product. To what extent is this preference for bamboo shoots an adaptation to the abundance of bamboo forests, resulting from shifting cultivation?

### **3.2 Traditional ownership rights for specific types of trees**

Whereas most of the forests were traditionally considered as 'free access' zones, certain trees are traditionally regarded as privately owned. A good example is the traditional individual ownership of yang oil producing trees (see text box 1). Due to rapid changing markets, these traditional ownership systems are rapidly disappearing. This is a severe loss for the landscape and for the local people, who lose their cash income.

#### **Box 1: Private ownership of yang oil trees**

The large trees of *Dipterocarpus alatus* usually grow around streams in the lowland forests of central and southern Laos. The trees are tapped for their liquid oleo-resin, locally known as 'yang oil'. This oil is traditionally used to caulk boats and to produce torches, the main source of lighting in rural areas. These trees are always owned and harvested by individual families.

The production system is very sustainable: trees can be tapped from the age of 50-100 years. The annual oil yield of a tree is 20-30 liters. After 100 years, an average tree can still produce 10-20 m<sup>3</sup> of valuable timber, with an export value of US\$ 150-200 per m<sup>3</sup> at present. Yang oil trees grow slow but are regenerate easy. Plantations of yang oil trees can be found in villages in South Laos.

Over the last decade, Lao PDR experienced an unprecedented growth in the exports of 'yang oil' (similar to 'gurjan' and 'keruing' oil). The oil is exported to Thailand from where it is re-exported to other destinations, e.g. India. Exports from Laos to Thailand rose from 200 tons in 1995 to 1,000 tons in 1997, followed by a drop to 134 tons in 1998. The local price went down in dollar terms from US\$0.86 /liter in 1995 to US\$0.75 in 1997 to US\$0.35/liter in 1998. According to the Lao Government, all exports of 'yang oil' after 1996 were re-exports from Cambodia. Although some tapping could still be observed in Lao villages after 1997, local trade diminished quickly.

At the same time, logging of yang oil trees rapidly went up. In 1997, more than 60% of all timber exported (total 10,493 m<sup>3</sup>) from Savannaket Province was derived from yang oil trees. It seems reasonable to assume that this surge in cutting yang oil trees was somehow related to the disappearance of demand for yang oil. This development is a loss for local people. Their previous income was \$17-26 per tree per year, or \$860-1,300 over a tapping period of 50 years. They only get \$50-100 for the timber of a 100 years old yang oil tree. The real story behind the increase of yang oil exports from Cambodia and the decrease from yang oil from Lao PDR remains another interesting topic of research.

### **3.3 Spirit forests and hunting taboos**

Almost every Lao village has a holy forest or spirit forest. These spaces are traditionally honored as burial grounds or a refuge for spirits. Large holy forests are becoming very rare, most holy forests are 1-2 ha in size. These forests are made smaller as people need more land. In spite of an interesting variety of rules applied to these forests, it would seem that these forests hold little prospects for future biodiversity conservation.

A lot of the destruction of holy forests is blamed on outsiders moving into the village. This phenomena is widespread in Lao PDR, where two thirds of the population was displaced in one way or the other towards the end of the war in 1975. A study on migration in two provinces of Southern Laos found three quarters of all villages there had been moved over the last thirty years (Goudinot, Lucas & Lucas, 1996).

Individual village communities may have taboos on hunting and eating certain types of animals. A village in Savannaket is well known for its pond, teeming with soft shelled turtles. Everywhere else in Laos, soft-shelled turtles are considered a delicacy, but the people of this village are convinced they will die if they eat one. Members of the Katang ethnic group, living around the Xe Bang Nouan Protected Area in Salavan, never kill gaur, a wild cattle species. Interesting as these taboos are, most villages stopped adhering to them, or got new neighbors who don't adhere to them, especially during the times of war and upheaval in the sixties and seventies of the twentieth century. The prospects for conservation seem limited.

### **3.4 Community aquatic resource management**

Fish conservation zones have emerged as a very popular concept over the last seven years (see text box 2). Fish are considered by most rural Lao people as a forest product. Indeed much fish is caught in forest streams and wetlands close to forest. Because fish is such a vital food resource for Lao people, interest in sustainable fish management is very high. Results are quickly visible and easy to monitor. Fish conservation provides an excellent entry point for integrated development and conservation programs.

#### **Box 2: The successful adoption of fish protection zones in the Siphandone area**

In the South of Laos, where the Mekong diverges into thousands of islands before flowing into Cambodia, the waters are extremely rich in fish. Local people traditionally relied heavily on fish for their food. Over the last twenty years, improved road and boat connections to urban centers stimulated a surge in commercial fishing, introducing new fishing methods e.g. gill-nets. As a result, cash income of villagers from fishing became very important, but catches of fish declined rapidly.

The Lao Community Fisheries and Dolphin Protection Project developed a program of village level meetings, which enable communities to become aware of these problems and to make decisions on management regulations (Baird, 1999). The meetings are held in harmony with local customs. Meetings involve all existing local organizations and decisions are documented and validated by local authorities. As a result, over 60 village communities in one district in Southern Laos have set up successful co-management systems for fish and frog conservation since 1993.

The management systems take into account the complex system of seasonal water flows and fish migration patterns. Fish migrate from main streams to spawn in wetlands and paddy fields as water levels increase during the rainy season. During the dry season, water and fish recede back to the main streams. There are all sorts of exceptions to this general pattern, but the whole system leaves local fishermen with dozens of opportunities to catch fish travelling in one direction or another at any time of the year. Typical management options chosen by local communities are:

- No-fishing zones in well-defined strips of the mainstream Mekong river. These deep-water areas act as a refuge for fish during the period of peak fishing pressure in the dry season.
- Bans on stream blocking. This measure allows fish to move into spawning areas such as wetlands and paddy fields at the beginning of the wet season.
- Bans on various methods that are seen as unfair ( e.g. water banging, fishing with spears lights, use of explosives, chemicals and electricity)
- Juvenile fish conservation (ban on scoop-netting of juvenile snakehead fish, *Channa striata*)
- Regulations for fishing in paddy fields and communal ponds (revive community traditions)
- Frog conservation schemes (limited hunting during spawning season, no catching of tadpoles)

### 3.5 Village agreements on forest use rules

Village communities are starting to make agreements on forest use rules (see text box 3).

#### **Box 3: Example of community NTFP harvesting rules in Southern Laos**

Forest dwelling communities can make a good estimate of declines in off-takes of NTFPs (see table 2). Exposure to examples of management practices from other areas in Lao PDR or from other countries assisted the community in developing its own set of use rules. The village of Ban Nong Hin, Champasak, developed management systems that vary from rotational harvesting rattans to prohibited fishing seasons or total hunting bans for certain species of wildlife (Kritchaoen, forthcoming).

**Table 2: Changes in off-takes per effort units for 3 key NTFP's over the last 10 years (1989-1999), assessed by villagers of Ban Nong Hin, Champasak, 17/2/99.**

NTFP	10 years ago	Today
<b>Wildlife</b>	Plenty of wildlife: turtles, monitor lizards, deer, snakes, jungle fowl, other birds. You could easily hunt them in your backyard. There was no outside market, no selling. Only our village hunted (9 families only).	Many species disappeared: turtle, deer, jungle fowl, birds. You can walk for 48 hours and still not get anything. Market demand is big, prices are getting higher (1 mouse-deer costs 12,000 kip). Many outsiders come to hunt in our forest. Village has 57 families now.
<b>Fish</b>	You could catch 4-5 kg within 1 hour. There were only 9 families. No selling, no destructive methods used, only traps and nets.	You can not even get 0.5 kg in 1 hour. There is not enough to feed all our 57 families. Strong outside market (2,500 kip/kg). Destructive methods used by outsiders: explosives, guns, poison. Decline: 90%
<b>Rattan</b>	In 1 day, you could get 300 stems, or as many as a man can carry. We used to also have big diameter rattan, now only small diameter species.	You can only get 20-30 stems in a day. Harvesting has intensified over the last 2 years. 1 stem sells for 200kip. We know there is no quota but we need to sell anyhow. Decline: 90%.

The reality of multiple user groups competing for the use of the same forest remains a challenge. Villagers of Ban Nong Hin could easily enumerate seven other user groups involved in (illegal) hunting and fishing in their forest blocks: (1) high ranking Government officials from the Provincial capital, (2) District officers, (3) soldiers of the District army camp, (4) soldiers of the army camp in the next village, (4), (5), (6) and (7) the four surrounding villages.

The NTFP Project then organized a meeting with all these stakeholders. Participants discussed the declines in forest products, reasons for destructive harvesting, alternative sustainable management systems, new rules and sanctions, the roles of all forest users, etc. At the end of the workshop, all participants agreed to adopt the proposed rules, giving village committees the right to use agreed sanctions against trespassers. This model is now replicated in the surrounding villages.

In some cases, a community first develops rules on selling NTFPs, before addressing the issues of sustainable management (see text box 4). There may be a lesson here how to sequence activities in group-development. It may be better to start with an income raising activity (e.g. an NTFP selling group) or a wellbeing improvement activity (e.g. rice banks), before venturing into forest management or sustainable harvesting agreements.

#### **Box 4: selling bamboo shoots in Oudomxay: a successful case of participatory group building**

In the village of Nam Pheng, Oudomxay, villagers used to be very poor, and could not produce enough rice to feed the community all year round. In the dry season they collected off-season bamboo shoots for sale, but the income was never enough. The IUCN/NTFP project assisted them to analyze their problems (Soydara, 1999).

In a series of meetings, the community gradually realized that they could improve their sales if they would all team up and sell for a fixed price, in a fixed place, not measured per bundle but measured per kilo. The community continued to discuss this idea until every family agreed to join the village selling group. The results were above all expectations. In five months, the village sold more 47 tons of shoots and earned 50 million kip or US\$6,670 (on average 1 million or US\$130 per family), at least four times more than the year before. The community also gained 5 million kip in a village development fund, setting aside 100 kip for every kilo sold. In the year 2000, the marketing group sold 44 tons, resulting in the equivalent of US\$7,000 (1 US\$ is about 7,500 kip).

As a result, the community started to be very interested in monitoring and managing its bamboo forests. Together with district forestry officers, they are now making inventories of their bamboo forests and are testing various cutting regimes to determine optimal harvesting regimes.

### 3.6 Multi-village arrangements on forest use rules

Villages around the Xe Bang Nouan Protected Area in Salavan, Southern Laos, have a history of poverty, permanent rice shortages and debts. Over the last sixty years, various governments forced these communities out of the forested protected area on to the very fragile exhausted sandy soils around the Protected Area. People still use the forests inside the protected area intensively for fishing, collection of NTFPs, grazing of livestock, collection of firewood and illegal hunting of wildlife and logging. Inevitably, this intensive competition for limited forest resources resulted in conflicts of interest between villages.

As the village community is the traditional unit of organization in Laos, there are few structures for inter-village conflict resolution. Using workshops to create common understanding on the need for conservation and sustainable forest use, the NTFP project brought representatives of up to twenty neighboring villages together. These workshops lead to basic agreements on forest use rules that will be worked out in more detail in follow-up workshops. All participants, including district Government representatives are excited and eager to continue the process (Dechaineux, forthcoming).

### 3.7 Domestication of NTFPs

Another way of organizing the production of NTFPs is domestication in individual forest gardens. Typical cases of 'forest cultivation' or 'agroforests', forested landscapes influenced by forest users, can be found in Bachiang district, Champasak Province, in the South of Lao PDR. Here, many villages have specialized in the domestication of various NTFPs. We present five cases: cardamom, 'si siet' bark, broom grass, bamboo and edible rattan tips.

#### 3.7.1 Domestication of cardamom in Southern Lao PDR

In the South of Lao PDR, shade-loving cardamom (*Amomum villosum*) is grown in gardens that can be more than 60 years old under high secondary forest. This is a locally developed agro-forestry system, combining forest conservation with cash crop production (see text box 5). The main reason for growing cardamom is to provide cash income to buy rice, as the hilly landscape is not suitable for making paddy fields. Recently, planting coffee is becoming more popular than cardamom. Cardamom still has the benefit a stable niche market in China, whereas the low-grade Robusta coffee from Laos is subject to a very volatile world market.

#### **Box 5: Cardamom gardens in Southern Lao PDR**

Cardamom (*Amomum villosum*) is the second biggest agricultural export from Lao PDR. Every year 400-500 tons of dried seeds are exported to China, where it is used as an ingredient in Chinese medicine, known as "sha ren". Roughly 70% of cardamom produced in Lao PDR comes from the wild, 30% from cultivated gardens. Export price has been stable around US\$ 7 per kg dry seed over 5 years (Saint-Pierre, 1998).

Cardamom cultivation is wide spread in the districts of Bachiang, Pak Xong and Laongam in Southern Laos. These gardens are not real plantations in the strict sense but clearings in the forest where wild forest cardamom is allowed to regenerate after a year of growing upland rice. By weeding and other cultivation measures such as pruning bigger trees, clearing climbers etc, farmers achieve an almost pure stand of cardamom. Cardamom remains the dominant ground cover, for a period of 20-40 years while the secondary forest grows back over it.

In the village of Ban Kouangsi, 200 families have cardamom gardens. Due to the hilly terrain, it is difficult to grow paddy rice. Two thirds of these families cannot produce sufficient in rice and have to buy rice to feed the family all year round. Cardamom sales make up 35 % of gross crop income per family and 87% of the cash requirement to buy rice. Other major cash income sources were groundnuts and livestock sales (Foppes, et. al. 1996a)

All cardamom gardens are owned by somebody, there is no "open access". The best cardamom is said to be from 3-4 year old fields, but most fields are 20-30 years old, the oldest field was 60 years old. These gardens continue to produce over an indefinite period of time, as long as the gardens are maintained properly. Maintenance is done once per year, at the same time as the harvesting. Cardamom needs some shade. Harvesting of cardamom usually takes place in October. The average yield is 120 kg/ha dry seed. An average family of 5-6 persons has 1-2 ha of cardamom gardens.

### 3.7.2 'Si siet' tannine tree gardens

A small cluster of villages around Pialat, Champasak, is specializing in producing tannin rich bark locally known as 'si siet', which is popular for chewing with betel nuts (see text box 6). This is good example of a local 'niche market'. The trees of *Pentace burmanica* producing this bark take 15-20 years to grow. The trees are planted and maintained in gardens around the house and produce a stable source of cash income for the owners.

#### Box 6: The case of growing 'si siet' tannine bark trees in Pialat, Southern Lao PDR

A small cluster of villages around Pialat, Bachiang, are specializing in the production of 'si siet', *Pentace burmanica*. The 'si siet' growers are specializing on a niche market. The tannin rich bark of this tree is an ingredient in chewing betel (nuts of *Areca catechu*), a traditional stimulant used by millions of older persons all over Laos and Northeast Thailand. Bark of si siet can be sold all year round, but most buyers come in the dry season. The bark is also exported to Thailand.

All 40 families of Piali at grow these trees in gardens around their houses, for the last 30 years or so. Most trees are planted near the house, where the soil is fertile and they can be easily protected. The average planting distance is 4 x 4 m. Propagation is done by seedlings. The trees start to flower after 15-20 years. Flowering takes place in December, seed can be collected in April. One cup of seed, is enough to produce about 100 trees. Planting of trees is done in the rainy season, June-July.

The bark can be collected from trees that are 10 years or older. If the soil is very good a tree might be harvested from 5-6 years onwards. Harvesting consists of cutting the tree and removing the bark. A tree with a diameter of 7-8 cm. sold for 5,000 kip or US\$5.4 in 1996, which was equivalent to about one fifth of average annual family income in the district then. Some people do not cut the tree, but remove the bark from one side of the stem only, expecting the bark to recover, thus allowing two or three harvests from the same tree.

### 3.7.3 Bamboo gardens in Ban Lak25

The village at km 25 from Pakse, called Ban Lak 25, specializes in the production of bamboo products. Villagers display a wealth of local knowledge on bamboo (see box 7). There is a

#### Box 7: Bamboo cultivation and use in Ban Lak 25, Bachiang, Champasak

Villagers of Ban Lak 25 use seven species of bamboo. In a group discussion, villagers identified six criteria to rank these species (see table 3).

Table 3: Villager Ranking of Bamboo Species by Species and Use, Ban Lak 25, March 1996.

Species	Abundance	Selling/ Income	Making Walls	Handicrafts	Poles	Edible (Taste)	Shoots
mai sod	ooooo* 30%	ooooo 25%	X	X		ooo	20%
mai hia	ooooo 25%	oooo 20%	X	X		none	
mai sang pai	ooo 15%	oooo 20%				oooooo	30%
mai phungwan	o 5%	ooo 15%			X	ooo	15%
mai lai	oo 10%	oo 10%		X		oooo	25%
mai phai ban	o 5%	o 5%		X	X	o	5%
mai ko	oo 10%	o 5%		X	X	o	5%

\* oooo represent numbers of pebbles allotted to each species by villagers, by way of ranking.

Three species are most abundant: 'mai sod' (*Oxytenanthera parvifolia*), 'mai hia', (*Cephalostachyum virgatum*) and 'mai sang pai' (*Bambusa nana*). These are also the species that are sold most. The wild species 'mai sod' and 'mai hia' are slender bamboos, mainly used for making walls and floor mats of bamboo houses, as well as for handicrafts such as basketry, fish traps food containers etc. 'Mai hia' has very thin walls, mai sod has thicker walls. 'Mai lai' (*Oxytenanthera albociliata*) looks very similar to 'mai sod', it is mainly used for basketry. 'Mai ko' (*Dendrocalamus sp.*) is a wild thick walled species used for construction.

Three species are planted. 'Mai sang pai' (*Bambusa nana*) is planted by villagers in large numbers. It is mainly cultivated for the production of edible bamboo shoots, which can be sold. 'Mai phung wan' (*Dendrocalamus sp.*), the biggest bamboo, is also planted and used for construction. This species has thick walled stems with a wide diameter. 'Mai phai ban' (*Bambusa blumeana*) is also thick walled, used for construction and handicrafts.

gradual transition from wild bamboo stands to privately owned bamboo gardens. There is also a growing trend to cultivate bamboo. Cultivation of bamboo is mainly done to produce edible bamboo shoots that can be sold, instead of bamboo poles.

#### 3.7.4 Gardens of 'khem' grass to make brooms

The grass of *Thysanolaema maxima*, locally known as "khem", is used to make brooms. Lao PDR exports 200 tons of broom grass per year to Thailand. "Khem" grows abundantly in the fallow fields of northern Lao PDR, which is the main production area. In southern Lao PDR this grass is less abundant. One family near Pakse has recently started to grow this grass as a commercial crop (see text box 8).

##### **Box 8: Domestication of broom grass in Bachiang**

In the village of Ban Tiang Xai, Bachiang district, Mr. Kamphien started growing "khem" grass since 1996, after trying many other crops. "Khem" can be planted from root cuttings spaced in holes of 40 cm deep, 1-2 m. apart. One should plant when it rains, only then it will establish well. The main issue is to keep buffaloes, cows and other grazing animals out, as they love eating "khem" grass. A strong fence is absolutely needed. It takes 3-4 years for the plants to establish. In the first years, one annual weeding and cleaning are enough. After three years, flowers can be annually from January to March. Mr. Kamphien only sells finished brooms, not the raw material. He has established 2 ha of "khem" grass, which provide him with an annual income of 9 million kip (US\$1,200) in 1999. Ten other families have now started growing "khem" too.

#### 3.7.5 Planting rattan to produce edible tips

Edible shoots of rattans are considered a delicacy in Laos. They fetch a good price (US\$0.20-0.30 /kg) at local urban markets. As forests disappear, it becomes more difficult to find rattan shoots. Local innovators saw the potential for cultivating rattans to produce edible shoots and started planting in 1994. They learned nursery methods from examples in nearby Northeast Thailand, where rattan cultivation was started earlier. The cultivated species (*Calamus sp. aff. C. tenuis*, locally know as 'vai nyeh') grows well on fertile deep soils near rivers and it does not need shade. It takes about two years before shoots can be harvested, after that they can be harvested every year. At least three families are making a good income from selling rattan seedlings at least 20 families are selling rattan shoots from their rattan gardens. Yields vary between 1,000-2,000 kg/ha (Sengdala and Evans, 1998).

## **4. Trends and key driving forces in forest extraction and forest cultivation**

### **4.1 General trends**

We can discern several downward trends in intermediate systems, including:

- a breakdown of the shifting cultivation/fallow forest systems,
- increased social marginalization and poverty of forest dwellers,
- disappearance of traditional ownership systems of trees, holy forests and hunting taboos.

On the positive side we also have noticed an increased interest and activity of local people in:

- domesticating NTFPs in agro-forest gardens,
- setting up community based fish conservation zones and other NTFP use rules,
- making multi-village arrangements to conserve larger blocks of forest.

What are the driving forces behind these trends? An overview of key economic/demographic, technical/ecological, political and social-cultural factors driving forces is given in table 4.

**Table 4: Driving forces behind intermediate forest management systems in Lao PDR**

NO	SYSTEMS	ECONOMIC DEMOGRAPHIC	TECHNICAL ECOLOGICAL	POLITICAL	SOCIAL CULTURAL
1	Shifting cultivation	Rapid population growth makes system untenable. Mainly for subsistence. Young people disappear to Thai labor market.	NTFP-rich secondary forests, now disappearing. Alternative sloping land techniques not easy to find, given present labor availability.	Government drives people out of the hills to settle in valleys. Tenure rights and tax duties still unclear, in spite of land allocation program.	Isolation and lack of education make it difficult for hill dwellers to compete in marketing systems. Poverty, drugs, labor migration.
2	Privately owned trees	Market of yang oil has disappeared, forcing people to cut trees for timber.	Original tapping methods quite sustainable. Planting easy.	Unclear role of Government in yang oil trade development.	Tappers have lost a good income source, who has gained?
3	Holy forests	The war caused large movements of people. Newcomers often blamed for cutting holy forests.	Holy forests used to have considerable wildlife and plant biodiversity values. Now much less.	No direct political effect. War migrations broke down traditional taboo systems.	Spirit forests are a mind construct, they need not be very big.
4	Hunting taboos	Displacements and hunger during the war increased hunting pressures.	Large amounts of war guns are still available.	See above.	Taboos were always rare, Lao people like to eat meat.
5	Agro-forests based on domestication of NTFPs	Improved roads led to more market exposure. Population grows.	Local knowledge on phenology/ ecology is used to domesticate NTFPs	Land tenure rights can be secured by making gardens.	Habit of planting trees always existed, e.g. home gardens.
6	Community aquatic resource management	Fish are a key cash income source for many rural villages.	Catches of fish provide a fast if not always precise monitoring device.	Communities can easily apply social control to impose group rules	Fish are the most important source of animal protein in Lao PDR.
7	Community NTFP harvesting rules	NTFPs touch every aspect of rural livelihood for 80% of Lao people	Rapid depletion of some NTFPs alerts users, they want to find solutions	NTFP management fits Government policies on land allocation etc.	NTFPs are the main source of subsistence for Lao people: safety net.
8	Multi-village NTFP conservation rules	Competition in forests becomes a new problem that touches economy.	new mechanisms must be created, active support networks	Government officers and military are also NTFP collectors.	Some groups are less skilled to defend their rights, might loose out.

Five key forces seem to drive these trends

- Rapid population growth and massive population movements during and after the war of 1964-1975, leading to the disruption of traditional social structures
- Increased market for forest products as a result of changing Government policies on economics and trade and improved transportation systems
- Growing insecurity on land tenure and access rights, despite Government policies to regulate these matters
- A very active and enterprising attitude of local innovators who continue to invent and test new intermediate forest use systems
- A growing network of support organizations/projects who assist local innovators to learn from each other and to continue testing new intermediate forest use systems.

Each of these driving forces contains favorable and unfavorable effects on intermediate forest use systems, as summarized in table 5.

**Table 5: Key driving forces with favorable/unfavorable effects on intermediate systems**

Key driving force	Favorable	Unfavorable
Population growth	Shift to more labor intensive rural production systems	Forest could become depleted soon Forest are converted to agriculture land
Markets	More demand for forest products stimulates domestication	Domination by foreign buyers, ignorance of local people on market structure
Land tenure changes	People are motivated to establish ownership by making gardens or forest co-management agreements	Unclear practices of Government do not encourage people to take ownership
Local knowledge	Local people are capable of inventing/adapting new forest use systems	Local knowledge not documented, can easily be lost, often overlooked by 'official' researchers
Support networks	Trained facilitators are necessary to catalyze and empower local forest user groups	Lao PDR has not yet a capacity to provide this support to user groups, dependence on outside support

## 5. Role of NTFP extraction and forest cultivation systems

### 5.1 Key roles of NTFP extraction and forest cultivation systems

So far we have pointed at the main trends in intermediate forest use systems and the driving forces behind these trends. But what is the actual impact of these systems? In this section we will examine the role of these systems for the household economy and in local social strategies. We will also their effect on landscapes and biodiversity. We will attempt to assess what the comparative advantages of intermediate systems are, compared to free access extraction. An overview of the key roles of intermediate systems is given in table 6. We will describe these roles in more detail in the following paragraphs.

**Table 6: Key aspects of intermediate forest management systems in Lao PDR**

NO	SYSTEMS	Household economy	Local social strategies	Landscape level effects	Biodiversity Conservation	Comparative advantage
1	Shifting cultivation	Only possible way to produce rice, buffering, rich supply of NTFPs	Survival strategy in hilly areas, less competition on land than in valleys.	All forests in hilly areas of Laos have been formed by this system.	Wildlife habitat was improved by creating a mosaic of forest types.	Natural buffer, economic use of scarce labor, locally adapted
2	Privately owned trees	Important cash income to owners of trees	Social control in one village easy to impose	Large trees create gallery forests along streams	Gallery forests good habitat for many animals	No need for plantations, adequate rules
3	Holy forests	Peace of mind	Part of local cosmic value system	A bit of shady forest near every village	Good habitat for animals, who were left alone	Social cohesion
4	Hunting taboos	Concern for good health	Part of local value system	Not visible	Non-hunted species survived	Easier than patrol forests
5	Agro-forests based on domestication of NTFPs	Steady source of cash income, reduce walking time	Gardens establish right to own land	Locally, agro-forests make the landscape more green	Good habitat for large trees and many animals	Adapted to local ecology, based on local knowledge
6	Community aquatic resource management	Vital source of cash income and food (protein)	Agreements fit to local social structures	Good income from fish keeps people out of the forest	Direct benefit to the rich fish fauna in the Mekong waters	Easy to agree, direct cash benefits, easy to monitor
7	Community NTFP harvesting rules	Securing cash and subsistence production systems	Protecting access rights to forests for the local community	Keep forests from being replaced by agriculture	Forests survive as managed units, good regeneration	Easier than domestication for some products
8	Multi-village NTFP conservation rules	Solves problem of 'tragedy of the commons'	Provides a new management structure	Protected areas can be maintained by local people	Rare species survive in protected areas	No other way to keep people out of forest

## 5.2 household economy

Eighty percent of the Lao population or 4 million people live in the countryside, half of them below the poverty line. Their main benefit from forests lies in NTFPs, both for subsistence use as for selling. The most important use of NTFPs is for subsistence. The majority of the Lao population lives in rural areas and relies heavily on forest products for food and shelter. Local people consider edible bamboo shoots, fish, vegetables, and wildlife as the most important products from the forest (see table 7). In a special study in Salavan province, the IUCN-NTFP project found that virtually all other foods except rice were collected from the forest (Clendon, 1999). Not surprisingly, the most popular and successful village conservation activities in Lao PDR are those that are related to food, e.g. fish protection zones.

**Table 7: Top ten NTFP's for subsistence use in Lao PDR, ranked by villagers during RRA surveys in 28 villages in 1996, throughout Lao PDR (Foppes & Ketphanh, 1997).**

1 edible bamboo shoots (food)	6 frogs (food)
2 fish (food)	7 mushrooms (food)
3 vegetables (food/ medicines)	8 edible rattan shoots (food)
4 wildlife (food)	9 bamboo canes (construction, basketry)
5 rattan canes (tools, construction)	10 pandan mats (weaving)

Subsistence use of NTFPs is very poorly documented and it is difficult to put a number on its value. A rough estimate would be US\$280 per rural family of five persons, equivalent to 40 % of family income, cash and non-cash (see table 8).

**Table 8: Simplified model of the economy of an average Lao rural household of five persons (estimates based on various sources)**

Income category	US\$	%	Remarks	Source of data/estimate
Forest foods	\$200	28%	Bamboo-shoots/fish/greens etc.	K. Clendon, IUCN-NTFP, 1999
Firewood	\$40	6%	Firewood & local use wood	Southavilai T. & T. Castren, 1999
Other NTFPs	\$40	6%	Medicines/rattan/bamboo etc.	Sounthone Ketphanh, p.c.
<i>Total NTFPs</i>	\$280	40%	Almost equal to rice!	
Rice	\$350	50%	350 kg paddy/person/year	Various IUCN-NTFP field reports
<i>Total non-cash</i>	\$630	90%	Almost no cash income	
Cash income	\$70	10%	NTFPs 55%, livestock 30%	Various IUCN-NTFP field reports
<i>Total income</i>	\$700	100%	NTFPs provide 44% of non-cash and 55% of cash income...!	

Apart from pure subsistence, NTFPs were found to provide also on average 55% of family cash income of villages near forests (Foppes & Ketphanh, 1997). Sales of livestock are the only other main source of cash income. In times of rice shortage, about one half of all rural families get in debt to borrow rice. Such debts often force people to harvest and sell forest products (timber, wildlife and NTFPs) in a destructive manner. Rice banks can reduce pressure on forest resources by reducing chronic debt relations.

NTFPs provide a low-cost survival system securing food, housing and medicinal needs which can not be overstated. They also provide a security system in times of food shortage or other emergencies. Every program directed at rural development and biodiversity conservation in Lao PDR should have an NTFP strategy, similar to the way each project should have a gender/equity strategy.

Apart from shifting cultivation, the role of intermediate systems of forest cultivation is still limited. Rural communities have already started to develop strategies for controlled extraction, e.g. fish and hunting regulations, as well as domestication of NTFPs. There seems to be a good case for pursuing these strategies to support the household economy sustainably.

### **5.3 local social strategies**

Intermediate systems play a crucial role in providing a biologically diverse range of food to the majority of rural people in Lao PDR. They also procure for almost all other subsistence needs. Because of their inherent biological diversity, they provide an excellent risk insurance system against slack periods or times of crisis. Some traditional social structures, e.g. hunting taboos, seem to be crumbling as the pressure on land increases. Fish conservation and NTFP domestication seem to fit very well as local social and survival strategies and may provide a solid basis for rural lifestyles in the new century.

### **5.4 landscape level effects**

Shifting cultivation dominates the landscape in the vast hilly areas of Laos. The other intermediate systems have minor effects on the landscape, compared to logging, shifting cultivation and conversion to agricultural land. Forest cultivation e.g. agro-forests could provide forested landscapes over large parts of what are now agriculture or fallow lands. The economic occupation of cultivating NTFPs or sustainable management of aquatic resources may reduce pressure on remaining forest resources, leaving more forests intact.

### **5.5 biodiversity conservation**

There are two ways in which harvesting of NTFPs (including wildlife) can affect biodiversity:

- the harvested species itself can be affected by harvesting or planting
- other species can be affected as a result of the harvesting or planting

The depletive effect of extraction of NTFPs on their own survival depends on largely on which part of the organism is harvested when in the life cycle of the plant. Harvesting of fruits hardly affects the regeneration of the mother plant. A good example is cardamom: the fruits are harvested whereas the plant multiplies mainly through rootstocks. On the other scale of the spectrum, plants harvested for their stems or as a whole can quickly become critically depleted, if mother plants are not maintained or some part is not left to regenerate. Wild orchids, popular in Germany, Holland and the US (Foppes et al. 1996b), some rattans, popular in Vietnam and the costly scented wood of 'ketsana' (*Aquilaria sp.*), popular in the Middle East and Japan, are sad examples of the effect of overzealous extraction.

The domestication of NTFPs can have negative effects on the availability of other species. Forest gardens of cardamom are lower in biodiversity than wild forests, as cardamom replaces a number of under-story species (Wang et al. 1997). This can affect not only the availability of other plant species but also of animal species feeding on such plants. However if we compare the cardamom agro-forests to their agricultural alternatives, e.g. annual mono-cropping with groundnuts or perennial cropping of coffee, the biologically more complex agro-forests are a far better environmental alternative. Agro-forests have hundreds of tree species, hovering up to 30-40 m., which give shelter to unknown quantities of animal life, large and small. Another research project is waiting to be done here.

Finally, domestication of NTFPs and promotion aquatic resources management could have the effect of occupying people outside of forests, reducing their time spent hunting or harvesting other NTFPs. Little evidence exists of this effect so far. The NTFP Project did observe a similar effect from its rice banks.

Initially, rice banks were started in Salavan to solve an acute problem of rice shortage due to drought in 1997. Soon after, village observers noted a drastic reduction of illegal hunting and illegal logging. It turned out that poor villages would normally borrow rice from neighboring villages and pay back their debts in kind with wildlife and timber, obtained illegally from the nearby Xe Bang Nouan protected area. Because of the rice bank, this time they did not have any debts with other villages and started paying more attention to agriculture than to hunting (Dechaineux, 1998). This example shows that substitution of extraction of forest products by creating alternative sources of income is very feasible.

## 5.6 Comparative advantage of forest cultivation vs. extraction

Intermediate forest management systems seem to have a number of strong advantages, compared to pure extractivism, plantation forestry and agriculture. The *biological diversity* (the large variety of trees/plants/animals) in these systems is perhaps the biggest advantage. It not only promotes environmental health but also provides local people with:

- a great *local adaptability* to diverse ecological conditions;
- a good *risk aversion* strategy: if one plant/crop did not do well, another will survive;
- *nutritional diversity*: people eat a well balanced diet, consisting of hundreds of different plant and animal species;
- a *safety net*: forest products provide emergency food, shelter and income in times of emergency;
- *social cohesion*: intermediate systems require constant collaboration inside the community and provide a solid basis for a socially rich rural livelihood, reducing the need to migrate.

## 6. Potential for future management of forests in Lao PDR

Intermediate systems, especially NTFP based systems, are a very promising solution to the problems of replacing shifting cultivation and other cases of forest co-management in Lao PDR. Local people can develop such locally adapted solutions, but they cannot do it without support from outside facilitators. A network of services needs to be available to provide information exchange, technical support, social services, credit assistance and other services. The IUCN-NTFP Project developed and tested a number of models for delivering such support services. Examples that worked well are summarized in text box 9.

### Box 9: Models of networking support to NTFP user group, from the IUCN-NTFP Project

- Work closely with selected appropriate local institutions at all levels.
- Organize and train province/district level field teams, who facilitate participatory processes at village community level.
- Use RRA techniques to record local knowledge, stimulate problem analysis and raise conservation awareness (ranking lists, forest walks, calendars, sketch maps, etc).
- Use participatory techniques (PRA) to facilitate user groups and identify options for action.
- Identify and support 'entry point' starter activities, e.g. rice banks, planting trials, marketing groups, land allocation processes.
- Apply participatory monitoring methods.
- Share results through workshops at village, district, province, national and regional levels.
- Improve local networking through stake-holder workshops focussing on specific topics.
- Villager- to-villager exchange visits and study tours for effective exchange of local information.
- Provide examples from other countries to local user groups through international networks (e.g. IUCN) by workshops, study tours, e-mail exchange, literature and magazines.
- Use examples of successful villages for study tours by outsiders from other villages, provinces, and other countries.

Government and aid organizations will have to make choices as to how they will support the development of intermediate NTFP production systems. Some options are:

- Add an NTFP strategy to all rural development and biodiversity conservation projects/programs in the country.
- Set up NTFP development support units at Province and District level.
- Specify NTFP programs for forest dwelling ethnic minorities to emancipate themselves socially, reduce poverty, preserve their cultural heritage and protect their environment.
- Support national research and training programs to backstop locally adapted NTFP programs.
- Establish national program for forest products marketing/trade support.
- Set-up permanent institution for ethno-botanic data collection and storage.
- Create a regulatory framework to strengthen community rights and stimulate fair trade.
- Support the establishment of international linkages to encourage the regional exchange of technical information on NTFPs

## 7. Conclusions

We examined eight types of intermediate forest management systems in Lao PDR. Most of the traditional systems seem to be transitional, with a trend to be replaced by other land use systems. Some newer systems are very promising for future forest management in Lao PDR:

- domestication of NTFPs
- community aquatic resource management
- community NTFP use rules
- multi-village forest co-management arrangements.

These activities have a good chance of becoming widely adopted because they fit into the local social strategies and they have a direct positive impact on the household economy, landscape and biodiversity conservation. These systems also have strong comparative advantages over extractivism, plantation forestry and agriculture: they provide social cohesion, they provide a safety net in times of crisis and a good risk aversion strategy, they provide biological and nutritional diversity and a great local adaptability.

Some key constraints remain to be overcome, especially the rapid population growth, the lack of local capacity to deal with the complex marketing systems, the lack of security on land tenure and forest access rights, the lack of systematic support for local innovators and for community forest user groups.

Local people can only overcome these constraints if they are provided with a strong network of support and exchange services. Outside support will be essential for the initial period of building up such a network.

Lao PDR has a remarkable opportunity to build a strong NTFP sub-sector as a basis for sustainable economic development in the Southeast Asia region. It also has the best chances to preserve its rich biodiversity and cultural heritage by strengthening its rural communities. Intermediate forest systems are likely to turn out to be the only realistic alternative, given the unique combination of relatively low population densities and large areas of forest in Lao PDR. It is not too late, if we all make a concerted effort!



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