Chapter 14

# Paper Mulberry (*Broussonetia papyrifera*) in Lao PDR: a successful example of forest product domestication

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| Common names | Part of the resource used | Management | Degree of transformation | Scale of trade | Geographic range |
|---|---|---|---|---|---|
| Paper mulberry, Posa | Bark | Wild/ Cultivated | Medium | International | Large |

## OVERVIEW

Paper mulberry, *Broussonetia papyrifera*, is a pioneer species, commonly found in fallow after slash-and-burn cultivation. In Lao People's Democratic Republic (Lao PDR), paper mulberry is cultivated in Sayaboury province as a cash crop, while in Luang Prabang province naturally occurring paper mulberry is harvested from fallow lands. Paper mulberry bark is usually integrated in a trade system of several cash crops, dominated by Thai buyers. It is processed into paper in Thailand and then exported to Japan and Korea. In Luang Prabang, the government's attempt to stop shifting cultivation by allocating only three plots of land for cultivation to farmers has encouraged farmers to intensify exploitation of wild mulberry for extra cash income. This government policy has also stimulated the cultivation of paper mulberry in monocultures, at a cost to the existing agroforestry systems. Paper mulberry production could be improved, for example, by improving grading activities. However, the production in Lao PDR will remain vulnerable to fluctuations as it is controlled by Thai demand. The study of the paper mulberry network, like that of many other forest products, has enabled this research to touch on agricultural and environmental policies and the restrictions on land these policies have introduced for other activities, characterised as traditional. It has also enabled the following of regional and international marketing networks in the country. Paper mulberry provides a good example of successful domestication of a forest product.

## INTRODUCTION

Paper mulberry, *Broussonetia papyrifera*, belonging to the *Moraceae* family, is widespread in Lao People's Democratic Republic (Lao PDR). Paper mulberry is a shrubby tree that sprouts spontaneously in swidden fields, after the harvesting of *ray*[2] rice. Paper mulberry is also common in degraded forests and is used more and more often as a plantation tree in forests and fields. Its branches supply the bark that is used in paper production.

Paper mulberry bark has long been used. The French explorer Auguste Pavie related that in 1887 he had attended a parade, in Luang Prabang, organised under a triumphal arch covered with 'cardboard made from mulberry pulp, from a pattern sent specially from Bangkok' (Pavie 1995: 37). Before the introduction of imported sisal and nylon ropes, farmers used to make string and rope from mulberry fibres. Paper production, however, is still limited in Lao PDR. It is the work of a small number of Yao people who draw Chinese characters, constituting the written form of their language, on mulberry paper, for use in religious rituals. Nowadays, paper production is promoted within the context of small development projects, intended to raise the standard of living of mountain people, and on the initiative of handicraft shops for tourists.

Large-scale export started only recently, after the economic opening of the country since 1989, when the communist government began to promote a market economy, and because of a growing demand from Thailand, where the bark is processed into paper pulp for further export to Japan and South Korea. In the latter countries, it is used to process special papers for banknotes, liturgical objects, lanterns, luxury stationery, etc.

### The research area

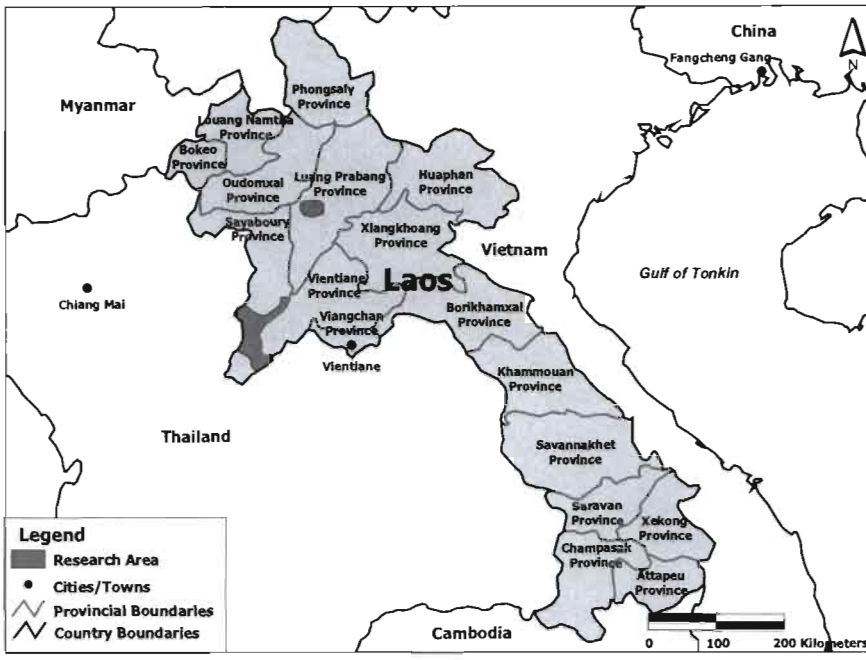
This monograph is based on field studies carried out during the 'forest areas management' research project led by the Institute for Research and Development (IRD) and the Nabong Faculty of Agriculture of the National University of Lao PDR in Sayaboury and Luang Prabang provinces (Figure 1). Sayaboury is a dynamic area because of its commercial relationship with neighbouring Thailand. In Sayaboury province, data were collected in Kenthao and Paklay districts, where paper mulberry is grown as a cash crop. In Luang Prabang, which is a more traditional mountain area of northern Lao PDR, paper mulberry comes mainly from fallow land. The population densities in the two provinces are similar, at around 20 people/km$^2$.

## THE PRODUCTION-TO-CONSUMPTION SYSTEM

### Description

Paper mulberry, called *Posa* in Lao and *Salae* in Khamu (the second largest ethnic group in the Lao PDR), grows rapidly and reaches its full mature height at between six months and one year. The ordinary stature of the species is about 3 m and the stem diameter is about 5 cm. At first, the stems are

**Figure 1.** Map of the study area




Source: ESRI Data and Maps 2002.

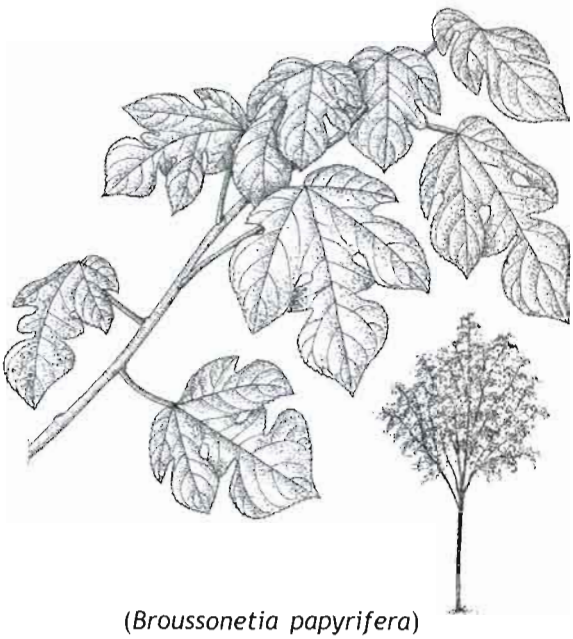
covered with down and then the bark turns smooth and grey. Its leaves are large, with several lobes, and measure more than 20 cm. The red fruits are small (3 cm in diameter) and though reportedly edible not much sought after.

Paper mulberry grows as a pioneer species all over the country. It grows at moderate elevations (500-800 m) in secondary forest and early fallow regrowth following slash-and-burn cultivation. It is traditionally a regeneration species under *ray* requiring a moist forest environment on flat or sloping land (Fahrney *et al.* 1997). Paper mulberry is especially common in northern Lao PDR, particularly in Luang Prabang, and also in the south-eastern province of Sayaboury, where it is now cultivated on a large scale. When domesticated, paper mulberry is grown in managed agro-ecosystems. In Sayaboury, it is cultivated with success as a flood crop along the Mekong riverbanks. Though it is adapted to all kinds of soil, paper mulberry grows particularly rapidly on moist alluvial soils.

The species sprouts spontaneously after burning and has long been considered a weed by foreign agricultural experts. However, paper mulberry trees are much appreciated by farmers because they accelerate the regeneration of soil fertility (thanks to their extensive carbon-fixing root system and their large leaves), along with their rapid growth, resulting in rapid canopy closure, which in turn reduces weeds.

It can be assumed that this is the same variety that grows all over Lao PDR. Male and female flower types occur on separate trees, which are

harvested in the same way. The species propagates through spontaneous germination and sprouts from the base when properly harvested. No serious diseases that affect the tree have been reported.



(*Broussonetia papyrifera*)

## Harvesting

The more important part of the production is harvested in March and April, before the wet season. The quality in these months is higher with little moisture (less than 35%), which is reflected in the prices paid for the bark. The second and lesser part of the production (25%) is harvested between October and December, at the end of the wet season. This period is reported to be suitable because the inner bark is easy to strip, easily dried and therefore free of fungal problems when stored.

Paper mulberry can be harvested when the tree is just one year old and then every six to eight months thereafter. The theoretical yield increases until the sixth year and then begins to decrease. If the tree is harvested for commercial purposes, the harvest cycle will be short (six months). If the objective is to occupy an area for reasons of land speculation, the cycle can be very long, more than four years and even then the trees may not be harvested.

Quality paper mulberry must be young, from six months to one year. However, three to four year old paper mulberry bark can be sold at a price that may be 30% to 50% lower. The optimal stem diameter seems to be between 2 cm and 4 cm. Three to five branches are harvested on each tree.

## Harvest from fallow lands

In active swidden *ray* fields, studied in Luang Prabang, the stocking density amounts to 300 plants/ha. Farmers do not let paper mulberry grow too long in fallow fields to prevent competition with other plants. It is generally harvested and removed from two to three year fallows after having fulfilled its function as a weed control. Harvesting in swidden *ray* fields is usually carried out in conjunction with other hunting or gathering activities. Farmers harvest from fallow fields belonging to their household or to other villagers. Traditionally, in Luang Prabang province, the harvest of paper mulberry from fields where rice had just been harvested was free for all the villagers. The freedom to harvest paper mulberry from old *ray* has tended to disappear with the reduction of forest areas and the increase in individually owned plots

If properly harvested without damaging the tree (it is not necessary to cut the tree down completely), new shoots will sprout. Harvesting paper mulberry is not detrimental to plant or environment. Paper mulberry is one forest product for which there is no threat of extinction through overexploitation.

## Cultivation of paper mulberry

Cultivation has developed following demand. It was implemented by the farmers themselves. They practise selective weeding in order to protect paper mulberry shoots. Then they plant root cuttings for propagation in their *ray*. Today, in Sayaboury province, paper mulberry is mostly planted in fields with significantly higher yields than those recorded in *ray*.

Paper mulberry is still a secondary crop for farmers, and is extensively produced by those who have enough land. It is generally intercropped with fruit trees and trees grown for their shade, like the kapok tree in Sayaboury and teak in Luang Prabang.

Farmers plant root cuttings, which they obtain either directly or through a tree nursery, in June, during the wet season. It is possible to plant seeds but the results are judged less reliable. The proper spacing to obtain longer fibrous fibre is reported to be about 1.5 m x 1.5 m, which represents a planting density of about 5,000 plants/ha. But the planting density depends on the objective of the farmer: weed control, limited competition with rice (3 m x 3 m) or with other trees (4 m x 4 m) or to show and mark ownership of a field (very wide spacing is then possible).

Paper mulberry cultivation requires several kinds of activities: fencing, first-year weeding and stripping. Then, the upkeep consists of weeding two or three times each year and cutting off any excess shoots, leaving only four to five on each tree. Weeding is the most restricting activity because it is labour intensive. In Sayaboury, the fields are weeded in January, May-June and September. A worker can cut and strip between 7 kg and 8 kg of dried bark per day. For one hectare yielding one ton of bark, the theoretical labour requirement amounts to 120 days. In Sayaboury province, each family harvests on average 100 kg of bark per year. Few families own large areas, most have less than 0.5 ha (Pelliard 2000).

**Photo 1.** Two year old paper mulberry tree in a mulberry paper plantation, Huaphan Province, Viengthong district (Photo by C. Aubertin)

As a rule, the areas under cultivation vary greatly according to market prospects. Farmers can easily change paper mulberry for another crop, and let it grow again spontaneously to harvest it the following year. They can also choose not to harvest if the price is too low. They either keep a standing stock of paper mulberry or give up the activity. The labour force is limited to family members. Both men and women plant, harvest and strip the outer bark from the mulberry trees. There are no particular rituals.

## Production in Kenthao and Paklay districts, Sayaboury province

It is estimated that about one third of families in the southern districts of Sayaboury (7,000 families out of 20,500) harvest paper mulberry. The agricultural departments in Kenthao and Paklay districts in Sayaboury province, where we carried out a survey, only register the areas of paper mulberry that are either planted or looked after. It is therefore difficult to gain an understanding of the importance of 'wild' paper mulberry, forming scattered and temporary islands that are not registered. Yet this paper mulberry is also harvested and sold, and represents the main part of the production in other provinces.

In Kenthao district, the increase in cultivation of paper mulberry has followed the general agricultural growth in the area after the economic

opening up of Lao PDR. In 1997, there were 9,099 ha of cultivated lands in Kenthao district. Paper mulberry represented 4.7% of this area and 9% of the 4,718 hectares devoted to cash crops. Up until 1997 the land planted with paper mulberry in Kenthao district had been slowly increasing, but the area has since decreased again by 50% to 203 ha. This might be seen as a consequence of the economic crisis in Thailand in 1998-99, though it did not have any obvious effect in Paklay district, where the areas planted with paper mulberry have increased steadily since 1990. In 1999, the area planted with paper mulberry was twice as large in Paklay as in Kenthao (RDPL 1999).

The quantities reported by the trade department fit neither the areas reported to have been planted nor the yield assessed at the district level nor the statements of the actors who have undergone a downturn in their activities during the 1998 crisis. In Paklay there are huge gaps. In 1999, the quantity officially produced was 585 tons whereas exporters reported to have exported 500 tons and the trade department registered only 219 tons (Table 1).

## Postharvest treatment and trade of paper mulberry

After cutting the branches, inner and outer barks are stripped from the woody stems. The inner bark is then separated from the outer bark, which is discarded. This is generally done in the field. The inner bark is hung out in the village to dry in the sun for a day. This step is important to limit mould. In Sayaboury (as in Luang Prabang), mulberry bark is sold in 1 kg bundles with most transactions being recorded in April.

The village first order traders are based in the villages and collect all kinds of products, according to the season. There is generally only one collector in a village, situated by the main road or riverside. These collectors store the paper mulberry in their homes on boards and protected by canvas covers. Once they have collected a given amount, generally more than 1 ton, they inform the exporter who comes to collect it. The farmers, who come from the most isolated villages, must deliver their harvest on foot, in carts or in cultivators. Each collector works principally for one specific merchant. The number of village collectors in Paklay and Kenthao districts is estimated at about 100.

There are no exclusive relations between collectors and traders, so the bark can be sold to the first trader who passes through the field or the village. Thirty percent of the production is directly collected at the central collection centre and 70% is collected in the villages. Farmers from villages close to the border sometimes transport and sell their products in Thailand, without going through a middleman.

Information on prices is circulated one to two weeks before the harvest. Kenthao authorities assert that prices are discussed between Lao traders and the trade department, after which the village leaders are officially notified. This was not the case in Paklay. A farmer sells about 100 kg per year. A trader may buy up to 20 tons and exporters from 10 tons to 1,000 tons. There is at present a concentration trend in the network that benefits the biggest traders, who sell directly to the Thai processors.

**Table 1.** Paper mulberry production in Kenthao and Paklay districts (Sayaboury province)

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kenthao District** | | | | | | | | | | | |
| Area (ha) | | | | 118 | 118 | 128 | 384 | 427 | | 203 | 300 |
| Production (t) | | | | 117 | 117 | 128 | 460 | 513 | | 243 | 360 |
| Yield (t/ha) | | | | 1 | 1 | 1 | 1.2 | 1.2 | | 1.2 | 1.2 |
| **Paklay District** | | | | | | | | | | | |
| Area (ha) | 10.35 | 40 | 124 | 244 | 357 | 360 | 240 | 300 | 450 | 450 | 600 |
| Production (t) | 7.24 | 31.5 | 85 | 95 | 324 | 324 | 312 | 390 | 585 | 585 | 780 |
| Yield (t/ha) | 0.7 | 0.82 | 0.68 | 0.66 | 0.9 | 0.9 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 |

Source: Statistics of the agricultural departments of Kenthao and Paklay Districts.

Paper mulberry is sent mostly to factories in Sukkothai (1,500 tons of bark was processed in 1997), Uttaradit and Konkhaen (Phoenix factory). Private wholesalers and purchasing companies share the Thai market among themselves according to defined geographic areas. The eastern area comprises Loei and Konkhaen, and the central area Bangkok and Sukkothai. They buy directly from big Lao exporters or from four to five Thai middlemen who control the products crossing the border in Kenthao (Pelliard 2000).

**Photo 2.** Bark stripping, Huaphan Province, Viengthong district (Photo by C. Aubertin)

## Quality of the bark

The product collected in Lao PDR is of medium quality, and competition between first order traders leads to the purchase of bark that is not properly dried. The first trader who arrives in a village rushes to buy the bark. Bark grading requires much attention and is often done too fast by buyers. Thus quality is not properly accounted for in the price.

There are different grading categories. Top quality bark must be as white as possible and without knots or discoloration from fungi. Bark quality depends

mostly on the plantation age and is better when harvested from the secondary stems of young plants, less than three years old, with a diameter of 2 cm to 4 cm. It is essential to store bark in a dry place because mould appears quite rapidly in a moist environment. After one month in storage, about 20% of the bark quality may be lost.

In Thai processing factories, which buy the raw material, mulberry fibres are valued for their length and suppleness and resistance to tearing and creasing. The factories then grade the bark into four categories. 'Super A' grade is exported to Japan, and processed there. Grades 'A' and 'B' are processed either into paper or loose fibres that are compressed for further export to South Korea. Grade 'C' is sold to small Thai handicraft companies, where it is processed by hand.

**Box 1.** Export routes

There are two main export routes. Mulberry fibres may be sent from Luang Prabang by boat up the Mekong River to Bokeo province, reaching Houayxay and then on to Thailand. Or they may be sent down river to Sayaboury province in the south, down to Paklay harbour and then transferred by truck to the border town of Kenthao. The latter route is used for paper mulberry fibres produced in Kenthao and Paklay districts.

## Processing paper mulberry

All Lao paper mulberry production is exported as raw material (in bundles) or as paper pulp. There is no paper processing in Sayaboury and only one paper mulberry processing factory in Luang Prabang, the Pethlama factory. This factory has been in operation since 1988. It buys paper mulberry bark locally and also from the northern provinces of Huaphan, Phongsly and Oudomxay. They semiprocess the bark using two grinders and then export the paper pulp to Thailand.

The most delicate stage is the final grading of the bark. After grading, the bark is cleaned and dried in the factory for the first time. The fibres are then soaked for one night, after which caustic soda or ashes are added and the mixture is stirred and boiled for 6 to 8 hours to bleach and thicken it. Between 50 g and 100 g of caustic soda are needed for each kilogram of paper mulberry bark. The resulting fibre slurry is cooled in cold water for a day. The lumps are then cut and ground. The pulp that is obtained is then dried in the Luang Prabang factory and exported to Thai factories where paper is produced. The Pethlama Company employs 80 workers. Fifty are employed to collect and buy the bark, while the others wash and defibre the pulp.

We did not observe paper processing in Thai factories, but at the head office of the Japanese FORCAP project, south of Luang Prabang on the road to Vangviene. To carry on with paper production, the damp pulp is poured into a fine sieve, often made of wire mesh in a simple frame the size of the sheet

that will be obtained. The standard size seems to be 60 cm x 80 cm. The thickness of the sheet depends on the sieving know-how. The more often the pulp is sifted, the better the quality. The frames are set in the sun to dry for a few hours, then the sheets are separated from the wire mesh and pressed. One kilogram of wet paper mulberry fibres yields 400 g of dried fibres. One kilogram of dried fibres yields 400 g of paper. At the FORCAP project headquarters, seven people can produce about 100 sheets of paper per day.

## Prices and incomes

The economic profitability of the product can be assessed at US$1.7per working day per person with a price of US$0.25 per kilogram in 1998 (Phongsavath 1998). Paper mulberry has a higher yield per hectare than rice but a lower yield than maize or kidney beans.

In July 2000, the average family income for two workers in the studied area in Sayaboury province amounted to US$800[3]. More than 70% of the family income is monetary, which is exceptional in Lao PDR and is a result of closeness to the Thai market, which sustains the development of cash crops. With an average harvest of 100 kg of bark, sold at US$0.35 per kilogram, paper mulberry can provide a family with an income of US$35 per year, i.e., about 4.5% of total family income and 6% of their monetary income. The harvest of paper mulberry bark is a supplementary farm activity. Decision-making regarding this activity depends on the need for rice and the market evolution of a set of cash crops.

Mulberry bark processors insist on paper quality. For example, the Luang Prabang factory has instituted three markedly different prices according to raw material quality (US$0.2, US$0.4 and US$0.5 per kilogram). A comparable price difference can be observed in Sayaboury. However, first order traders seem unconcerned about passing on this price difference to the households harvesting mulberry bark. Either they want to increase their margin or they refuse to take on additional selection and grading work. Farmers do not seem to be well informed of these various prices. According to official data, which do not account properly for inflation and exchange rates among the three currencies used (USD, Lao kip, Thai baht), during the years 1997, 1998 and 1999 the price paid to paper mulberry producers varied between US$0.25 and US$0.6 per kilogram. In kips, the price has increased evenly from 500 kips/kg up to 3000 kips/kg. (Pelliard 2000). It is therefore difficult to gain a clear understanding about the evolution of the product price.

In Sayaboury province, in Kenthao and Paklay districts, there is not a big difference between the price paid to the producer (US$0.37) and the free on board (FOB) price at the frontier (US$0.5) per kilogram. The collectors manage to retain a margin of US$0.04 per kilogram of bark, whatever the export price. The adjustment cannot be such that the price paid to the producers is too low, or they are likely to give up harvesting. The adjustment is often to the detriment of the exporters' margins (Table 2).

**Table 2.** Breakdown of FOB prices in US$ in different districts

| Price per 100 kg of dried bark | Kenthao US$ | Paklay US$ |
|---|---|---|
| *Price paid to producers in the field* | 37.50 | 34.50 |
| Labour force: weighing, loading, grading (paid by exporter) | 0.40 | 0.40 |
| Transport to collection centre (district) (paid by exporter) | 0.13 | 0.13 |
| *Price paid to collectors (district)* | 41.50 | 38.50 |
| Collector's net profit | 4.00 | 4.00 |
| Transport to border | 0.53 | 2.40 |
| Tax on forest products (3% of price paid to producers in the field) | 1.12 | 1.04 |
| Customs dues (3% of price paid to producers in the field) | 1.12 | 1.04 |
| *FOB price* | 47.00 | 47.00 |
| Exporter's gross profit | 2.20 | 3.49 |
| Part levied by state company (30%) | 0.66 | 1.05 |
| Exporter's net profit | 1.54 | 2.44 |

Exchange rate in July 2000: US$1 = 7500 kips
Source: Pelliard 2000.

## An export-oriented market

Since 1989, with the economic opening of the country and the promotion of a market economy, the demand has turned a product with local home use into a much sought-after export product. While the development of tourism in Luang Prabang supports the renewal of local consumption of handicraft objects (decorated papers and souvenirs), the traditional use of paper mulberry, the making of fetters for animals, has almost disappeared.

While local agricultural departments are interested in the development of paper mulberry, it is not really a matter of concern for the national agricultural department, perhaps because of the status of paper mulberry. As a forest plant it is close to being regarded as a weed. In Vientiane, paper mulberry has such a poor image that it did not even appear in the last agricultural census (1998/1999) questionnaire and is not included in the list of plants for which the Ministry of Agriculture has issued production forecasts for the 1999/2000 harvest. Only the forestry departments have data on this product. The figures they have are the result of an attempt to centralise the data of all the provinces. They are not made public so that we had to conduct a survey within the departments. The results are unconvincing. They indicate a national total quota of 1,740 tons (collection authorisations given to merchants) for an actual production of 735 tons at the end of 1999. The main producing provinces are those of Sayaboury (quota of 1,500 tons and 60 tons

of production registered) and Luang Prabang (quota of 100 tons and 591 tons of production registered) while, according to our estimates, the production would amount to 1,000 tons in Luang Prabang and 800 tons in Sayaboury.

Paper mulberry appears in the customs' export statistics, but only 508 tons were reported as exported to Thailand in 1998, representing a value of US$150,000. The export price would then be US$0.3/kg, without distinction between paper pulp and the various qualities of dried fibres of lesser value. The export data are therefore more likely to be an underestimate.

Thailand is the main buyer, Japan and Korea then buying high-quality paper from the former. Paper mulberry is no longer cultivated in Thailand, which is more developed than Lao PDR and offers better opportunities to increase the profitability of land and labour. Lao PDR appears as a buffer zone for Thailand and the Lao production is used as a marginal supply, enabling the adjustment of the Thai market to meet international demand.

## TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

### Demand for a panel of products

A product destined for export cannot be studied in isolation. Paper mulberry, being exported to Thailand, has always played a supporting role in exchanges and networks that were dominated by cotton some years ago and are now dominated by maize. However, its relative importance has tended to increase against that of other products, following demand.

All the merchants endeavour to meet the Thai demand for products from cotton, maize and peanuts to kidney beans, sesame seeds and Job's tears, among others. Consequently there is no merchant specialising in paper mulberry. As paper mulberry is an export product, it does not concern small retailers who intervene only at a local level.

The local production of paper mulberry in some other areas of Lao PDR is often insufficient or does not fit the demand from Thailand. Lao traders sometimes have to get supplies from the Luang Prabang area to honour their orders. However, paper mulberry depends on trade channels that also concern several other products. Thai traders who deliver products to Luang Prabang may take back a cargo of paper mulberry from Luang Prabang to cover transport costs. For example, a big merchant who supplies Thai products in Luang Prabang (e.g., cement) makes the return journey pay by taking back agricultural products. Likewise, the merchants of the Kenthao area who supply Luang Prabang processing factories with agricultural products look for freight for the return journey.

The demand for a group of products is determined by the Thai local market and above all by the international market, through the processing factories in Thailand. Peanuts and maize are processed for the Thai and international markets, beans are exported to Japan, and paper mulberry is exported to Japan and Korea. The demand is passed on to Thai wholesalers, to Thai retail dealers, and eventually to Lao exporters.

Because of its monopoly Thailand can control the trade in Lao agricultural and forest products, which includes prices and quantities. When prices drop on the Thai market, Lao producers and merchants have some difficulty selling their produce. In 2000, only half of the cotton production was sold in Thailand and the rest had to be stored or an outlet in Luang Prabang found.

## A credit-sustained monopoly

Thai domination is all the more important as it controls demand but also supplies credit for all farming activities. The collection of products is often prepaid. This campaign credit is integrated into the production network of cash crops in Kenthao. These funds are used not only to prepare the soil or to buy seed but also for the purchase of building materials or rice for the poorest people. The interest rate, outwardly nonexistent, can then reach 10% per month.

Except two big, independent merchants who have their own capital, Lao exporters obtain credit for the campaign from Thai intermediary buyers. This credit can then be shared among village collectors and farmers. Each actor, from Thai merchant down to local farmer is therefore assured that he or she will be able to carry out commercial transactions (sale or purchase), which is a decisive asset given market instability, inflation and the fluctuations in exchange rates. These campaign credits account for one third to one half of merchants' working capital, the rest being made up from their own capital. It is an important asset for merchants to have this credit granted in Thai bahts, the currency commonly used.

The situation is noticeably different in Paklay, where commercial exchange between traders and collectors is based on trust. The merchants, who have less capital of their own and receive fewer credit facilities from Thai buyers, would rather borrow from the bank to finance the campaign. These merchants prefer to use the Lao kip as currency.

## The Lao import-export company

The Thai economic crisis in 1998 unfortunately coincided with the attempt of the government of Lao PDR to win back economic control over profitable businesses. This policy was given up in 1983 when the Lao government stopped the co-operative system and set up a new market mechanism, a kind of transition from socialism to a market economy. But recently a state-controlled import-export society granting a monopoly on the trade of products was set up to master the market and to avoid the fraudulent export of agricultural and forest products. It must be mentioned that, unlike agricultural products, forest products are considered state property. A special tax is levied on their export, theoretically to compensate for the damage done to the national forests and heritage. This 3% tax is also levied on paper mulberry, even if it is produced in plantations and not harvested from the forest.

The State Company, present in Kenthao and Paklay districts, has signed contracts with private exporters for several reasons:

- To control exports: it grants exporters export licenses and buying quotas.
- To collect taxes: 3% of customs dues measured on the price paid to the exporter and 3% taxes on forest products.
- To be able to levy a considerable part of the profits of the traders (30%).

Merchants think of the company as a 'tiger that eats and sleeps'. Indeed it does not: a) grant support or credit, b) intervene in agricultural product networks, c) assist in the search for new markets, or d) help to establish contractual relations with the Thai market. Official agreements on the quantities and prices are, however, claimed for.

The two biggest merchants in Kenthao have not been obliged to sign contracts with the State Company. They are organised in family groups of three to four people who pool their capital and share the profits. However, they must show their accounts and theoretically they pay the same taxes as the other traders but directly to the Trade and Customs Department. Nine merchants in Kenthao and 11 in Paklay have signed agreements.

## How to develop the product?

It appears that the paper mulberry network is such that it is near impossible to create a large income before the final processing stage. The margins are limited and marketing is above all favoured by the fact that paper mulberry is integrated into a panel of products that makes the trade structure possible. However, the State Company has found enough interest in the sector to levy taxes on its activities. It is also difficult to interpret the decrease in the number of exporters. Is the sector so profitable that it fosters competition, or, on the contrary, is it possible for only the biggest traders to bear the hazards of the activity, including taxes and the instability of demand? Despite the development of areas devoted to paper mulberry, cultivation and production could stop if Thai demand did not guarantee a minimal price. It is therefore necessary to take into account local dynamics when aiming to support or develop this product. There is a market for paper mulberry: it requires neither specific inputs nor technology and presents good adaptive, ecological qualities in monoculture as well as in silviculture.

The first step forward would be to improve the quality of production. It is possible to improve the sorting of the bark by quality grading through information and an incentive price system. It is essential that the drying process and storage facilities be improved so as to improve both quality and prices.

Another possibility would be to look for new markets. The development of a processing industry would require much investment and training for the workers while the market is questionable. Would it be feasible to bypass high-demand markets such as Japan, controlled for so long by Thailand, with the support of the authorities or of family networks in Lao PDR? How can new trade networks be created? The comparative advantage of Lao PDR, in terms of rural image and ecological production, could possibly open up the development of networks in fair trade and eco-products.

Finally, institutional reform is urgently needed. The State Company should supply actual services as a counterpart of taking in taxes. It could play the part of a professional organisation that would negotiate contracts with potential buyers to stabilise prices and quantities.

## Spontaneous domestication

Although paper mulberry does not fit the traditional description of a non-timber forest product (for it is a wood product), it offers a good example of the domestication of a forest plant. This domestication has taken place in Sayaboury province under the influence of strong Thai market demand and as a result of the instability of the prices of the main products, e.g., cotton, which made it necessary to diversify production. Farmers have begun to cultivate paper mulberry in their fields and to encourage its growth in fallows. They have successfully used the banks of the Mekong River and they have turned this forest plant into a riverbank flood crop. The domestication has been carried out rapidly, without the intervention of the agricultural department.

## Response to land restrictions

Agricultural and land policies have also exerted some influence on the change process. There is no longer any forest in the district of Sayaboury, and most farmers have turned to a farming system in which cash crops—among them paper mulberry—prevail. In Sayaboury paper mulberry is no longer a *ray* plant linked to shifting cultivation of rice.

The situation is different in the northern provinces of Lao PDR, e.g., Luang Prabang, where mulberry forms part of shifting cultivation systems and where presently land reforms related to shifting cultivation are implemented. The new land allocation regulation aims at abolishing slash-and-burn and at developing the private ownership of land, allocating three plots of land to farmer households (MAF 1999). This raises questions related to mulberry production: Should paper mulberry be planted only in the fields or in the so-called 'production forests'? Can it be exploited as well within agroforestry systems as in 'protected forests'? This is a highly debated issue because it refers to the impossibility imposed on mountain people to preserve their lifestyles (Aubertin 2001) and to the disappearance of paper mulberry as a 'wild' *ray* plant and even as a domesticated plant present in the forest.

Development and domestication of paper mulberry in forest areas, where the market is not widespread, show some similarities with cardamom production in Lao PDR[4]. The redistribution of three plots of land to each household for rice production (existing gardens and rice fields are not included in the lands subject to redistribution) implies a reduction in the land area devoted to rice and a reduction of fertility (due to a short fallow period), resulting in lower rice yields. As a result, harvesting of wild paper mulberry from natural forest has increased in order to obtain cash income to buy rice. Related to the farmers' increased need for cash, we observed in Luang Prabang

that the production of Job's tear, encouraged by the government, did not find a buyer. As a result, farmers have intensified their exploitation of forest products in reserved areas.

Since the harvest of mulberry paper is theoretically forbidden in protected areas, its plantation in the allocated land plots is presented as a means to bring additional income to farmers and to reduce the area under slash-and-burn used for subsistence production of rice. This is the viewpoint of the FORCAP project. The domestication of products comes within the context of the search for perennial species likely to replace rice. Since paper mulberry favours weed control and can be harvested after a few months, several projects suggest that it be planted in two-year fallow rotations, the only ones that are possible with the allocation of three plots to each household. However, intercropping paper mulberry with rice is probably not a real solution to ensure adequate soil fertility for rice each year.

As we have seen, the optimal age for harvesting depends on the objective sought: weed control, rice yield, quality fibre for paper production, or a strategy to obtain land ownership of squatter lands (declared as gardens to evade redistribution of the three plots). Reaching the latter aim implies playing with words. Gardens (*swan)* and rice fields (*na*), when recognised as such, remain the property of the user. If producers manage to convince the institution in charge of land allocation at the district level to recognise that the paper mulberry they grow in fallows or in forests is cultivated in a garden, they evade the condemnation incurred for *ray* and cultivation in protected forests. If the manoeuvre is carried off successfully, these gardens are actually privatised and are not included in the lands to be redistributed. They are added to the family's three plots of land.

## Biodiversity and the market

There has been a boom in paper mulberry production in Lao PDR, but it could still disappear at any time. The harvest of wild paper mulberry from fallows is doomed in the very short term because of land policies. The low price, which can be partially explained by the fact that it does not depend on the quality of the product, is no incentive to continue growing paper mulberry or to upgrade its quality, especially since the farmer can very easily give up harvesting it by weeding it out and replacing it with another crop, or it can simply be kept standing. Paper mulberry is only one part of the household income in a very diversified farming economy.

Questions might arise as to the future of such a product, which is dependent on Thai demand and credit, while the government mostly endeavours to hinder the sector rather than to support it by imposing contractual agreements with Thailand.

It may well be delusive to look at paper mulberry from the viewpoint of biodiversity. The trend is towards planting in monoculture outside forests, and no longer associated with the practice of *ray,* paper mulberry does not have the ability to protect forests. By aiming to eliminate shifting cultivation, the government compromises farmers' agroforestry practices and is

encouraging monocultures of mulberry. Paper mulberry plantations do not require chemical inputs for the moment but the intensification process will probably continue.

It is difficult to assess the comparative advantages and specificities of paper mulberry in Lao PDR to explain its development. If there is a comparative advantage of mulberry production in Lao PDR, it is linked to the opportunity costs of land and labour in comparison with Thailand where paper mulberry production is no longer profitable. In Lao PDR, paper mulberry production is not supported by a market that acknowledges its ecological or genetic characteristics. It is supported because Lao PDR acts as a market regulator for Thailand, providing raw materials for use in Thai processing industries. Paper mulberry has become a cash crop like any other and is bearing less and less resemblance to a NTFP.

This case stresses that the development of paper mulberry production, probably like most NTFPs, implies the integration of a whole ecological and socio-economic system into a market economy. Consequently, the actors' interplay, the production conditions and even the botanical variety are no longer the same.

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## ENDNOTES

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2. *Ray* is an area where the forest has been cut and burnt for temporary cultivation of rice and other crops. It is the cornerstone of shifting cultivation, a form of agriculture in which soil fertility is maintained by rotating fields rather than crops. New plots are usually cleared by slash-and-burn and cropped until soil exhaustion. The land is then left to regenerate naturally while cultivation is conducted elsewhere.
3. Exchange rate July 2000: US$1 = 7500 kips.
4. See chapter 3 in this volume.

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