

Chapter 6

The production of oak mushrooms (*Lentinula edodes*) as a source of farmers' income in the Republic of Korea: the case of Cheongyang-Gun

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Common names	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Shitake, Oak mushroom, Pyo-go	Mushroom	Cultivated	Low	International	Large

OVERVIEW

This chapter describes the current situation and trend of oak mushroom [*Lentinula edodes* (Berk.) Pegler] consumption and cultivation with special reference to the case of Cheongyang-Gun in the Republic of Korea. Oak mushroom cultivation has a history of more than 400 years in Korea. The consumption of oak mushrooms is increasing because it is considered to be a natural food, free of toxic chemicals. The government has been promoting the cultivation of oak mushrooms because they are an important source of income for rural communities. The production of oak mushrooms in Korea has tripled during the last 10 years. The import of oak mushrooms is also steadily increasing because domestic demand is outstripping domestic production. Oak mushroom cultivation has provided the basis of oak stand improvement, which is more ecologically sound than establishing softwood plantations for fibre production. Mushroom cultivators in Korea face an uncertain future because of an ageing labour force in rural communities and increasing competition from overseas producers.

INTRODUCTION

As South Korea becomes industrialised and urbanised, the people have become more concerned about their health and food safety. Mushrooms are considered a natural product free of chemicals. Over the last two decades the demand for

oak mushrooms [black forest mushroom, *Lentinula edodes* (Berk.) Pegler] has been increasing steadily (Youn 2000). Even though the production of oak mushrooms has been increasing the growth has been slower than the increase in demand. Mushrooms imported from China therefore have to meet much of the domestic consumption. In 2000 there were 6,888 oak mushroom producers in South Korea who produced 17,531 tonnes of fresh mushrooms (Korea Forest Service 2000). The locally produced oak mushrooms compete well with imported products and have contributed to the increase in the farmers' income.

The importance of non-timber forest products (NTFPs) is demonstrated in the statistics of forestry production in the Republic of Korea. According to statistics, the value of NTFPs produced in 1999 was US\$10.5 billion accounting for 92% of all forestry outputs. The value of oak mushrooms accounted for 11% of the NTFP production, a share that is increasing.

The consumption of oak mushroom has long been restricted to East Asia, but people in other regions of the world are now starting to eat them too. The world-wide production reached 1.57 million tonnes in 1997, which was 7.8 times that of 1983. Most of the growth occurred in China, which is the most important oak mushroom producer in the world, while Japan is the leader in oak mushroom cultivation technology (Chang undated).

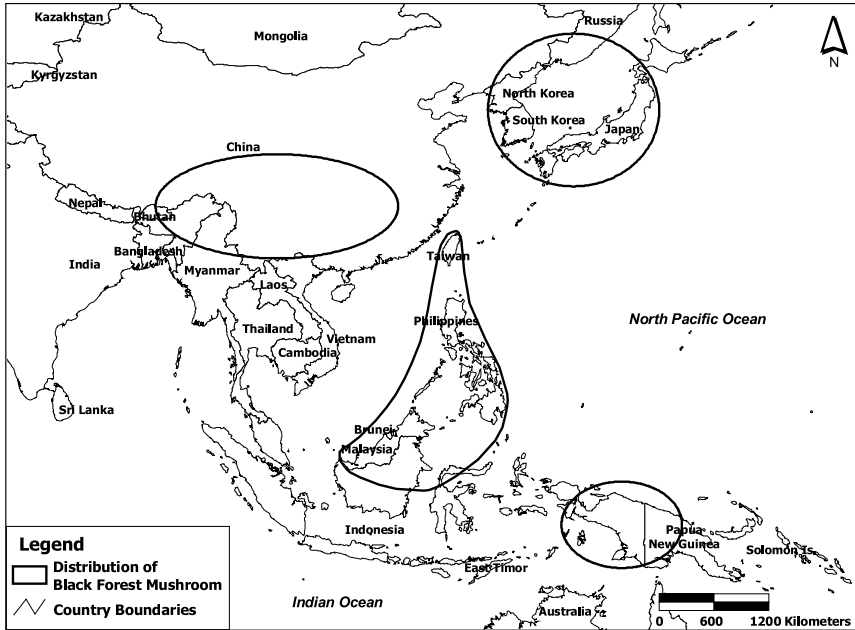
The study area: Cheongyang-Gun

This case study is set in South Korea (Republic of Korea, ROK), a country that has experienced dramatic changes both economical and ecological since the late 1960s. Korea is a peninsula of mountains and forests where about 70 million people reside. The Demilitarised Zone between North and South Korea divides the peninsula into two. Forests cover two thirds of the country's land area. The main type of forest is mixed stands of natural species, with exotic conifers such as pitch pine and Japanese larch. The hardwood forests cover more than a half of the Korean forest lands. The main native forest species are the Japanese red pine (*Pinus densiflora*) and oak species. The oak forests provide a good soil for mushroom production.

As country people live in close contact with nature, their diet tends to develop in close relation to nature. Forest mushrooms have been collected as a food for a very long time. Oak mushrooms and pine mushrooms (song rong, *Tricholoma matsutake*) are most preferred among forest mushrooms. Oak mushrooms have been cultivated in China, Korea and Japan for the last 1,000 years. The biological distribution is much wider than the cultivation area, as shown in Figure 1.

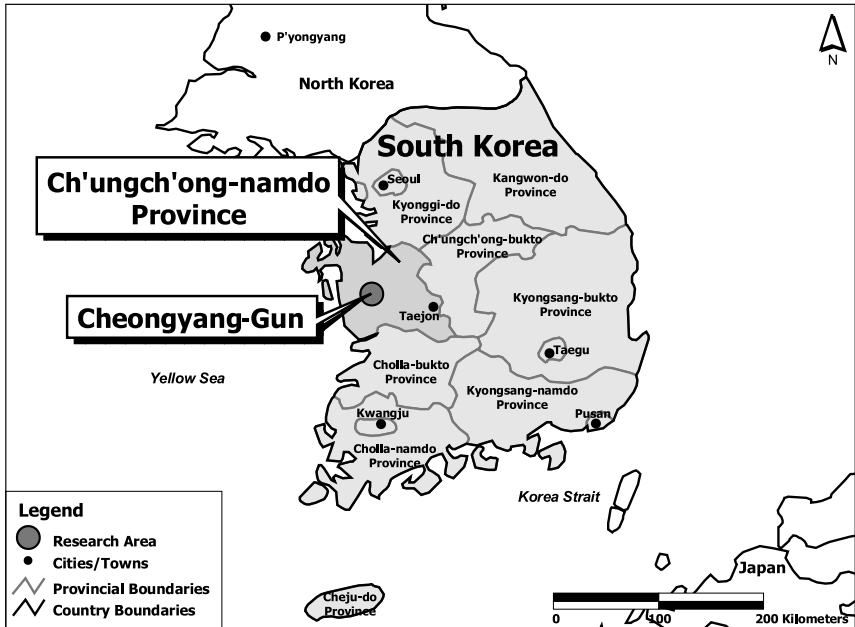
The study area, Cheongyang-Gun² is located 150 km south of Seoul, the capital of ROK (see Figure 2). It is a mountainous region and forests cover 67 percent of the land while another 23 percent is agricultural lands. Agriculture and forestry are the major sources of income, and more than half of the households are farmers. The population density is 88 inhabitants per square kilometer, one fifth of the national average. The population distribution resembles a hanging bridge since the most productive body of the population (those 25 to 54 years of age) has left the countryside to find work in urban areas.

Figure 1. Distribution of oak mushrooms

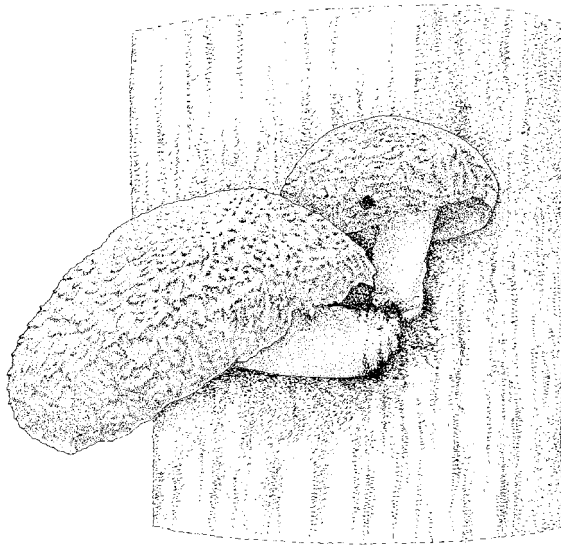


Source: ESRI Data and Maps 2002.

Figure 2. Location of the study area



Source: ESRI Data and Maps 2002.



(*Lentinula edodes*)

THE PRODUCTION-TO-CONSUMPTION SYSTEM

Mushroom production

Oak mushrooms grow naturally in southern parts of the Korean peninsula, while most mushrooms destined for the market are grown by farmers with modern production technology. The traditional oak mushroom production technology was first developed in China and introduced to Korea and Japan, where newer technologies have been developed. There are basically two types of oak mushroom production technology in widespread use in Korea. In one system the mushrooms are cultivated on oak log beds, while the other uses sawdust bags on which to cultivate the mushrooms. In Cheongyang-Gun the latter is still in the early stages of adoption. Mushrooms raised on log beds are grown either outdoors or in greenhouses like the sawdust production system. In general larger producers build greenhouses while smaller ones still cultivate mushrooms outdoors. Other species that can be used for mushroom cultivation are *Carpinus laxiflora*, *Castanea crenata*, *Ficus crenata*, *Castanopsis cuspidate* and *Acer* spp., these species can be found in Korean forests in abundance. However, farmers use almost exclusively the oak tree. In 2000 about 200,000 m³ of oak logs were used for mushroom production.

The producers of oak mushrooms are farmers living in rural areas where oak logs can be secured. There were 6,888 households cultivating oak mushroom in South Korea in 2000. The 60% majority of these growers do not own forests and normally grow their mushroom crops in agricultural fields, with purchased logs, under artificial shade. Most of these growers purchase bed logs from loggers or timber traders, but some use sawdust imported from China. The other 40% of oak mushroom production households have

Photo 1. Freshly cut oak logs for mushroom cultivation (Photo by Yeo-Chang Youn)



Photo 2. Oak logs inoculated two years earlier are ready to produce mushrooms (Photo by Yeo-Chang Youn)



some forestlands from which they obtain their logs for mushroom cultivation. In 2000, the average production was 686 kg per mushroom grower, with an average volume of 11.5 m³ of oak logs inoculated per mushroom grower.

There are 398 mushroom growing households in Cheongyang-Gun. Most of them have their own forests of 1 ha to 3 ha nearby, but most mushroom growing businesses here are small compared to producers in other parts of the country. Seventy-eight percent of mushrooms are produced in greenhouses while 21% are grown under natural shade outdoors. Mushroom growers are usually entrepreneurs, unlike farmers who grow rice and other traditional crops. The average income per mushroom growing household is about 20% higher than the average farmer's in the study area.

Mushroom growing relies on the labour force within the family, in which female members play an important role. The women participate in activities such as inoculation, picking mushrooms and drying.

Processing Industry

Oak mushrooms are best cooked when fresh, but since they are a product that perishes easily half of the oak mushrooms produced in Korea are dried prior to being sold. Oak mushroom farmers usually have their own dryers, which use petroleum as the source of energy. There are a few factories that process oak mushrooms into drinks and snacks and others that use oak mushrooms as an ingredient in Korean soybean and red pepper preserves. Only a small percentage of the oak mushrooms are thus processed; the majority are consumed unprocessed either fresh or dry.

Trade and Marketing

The import of oak mushrooms to Korea has increased rapidly over the last decade as the country has liberalised the agricultural commodity markets for most commodities (rice is one of the few exceptions) in compliance with a World Trade Organization (WTO) agreement. The import of oak mushrooms increased from 329 tonnes in 1990 to 1,139 tonnes in 2000 (see Table 1). Almost all of the imported mushrooms come from China. Meanwhile some Korean oak mushrooms are exported to overseas markets including Japan, Hong Kong, USA and Singapore. The quality of exported oak mushrooms is higher than that of imported ones.

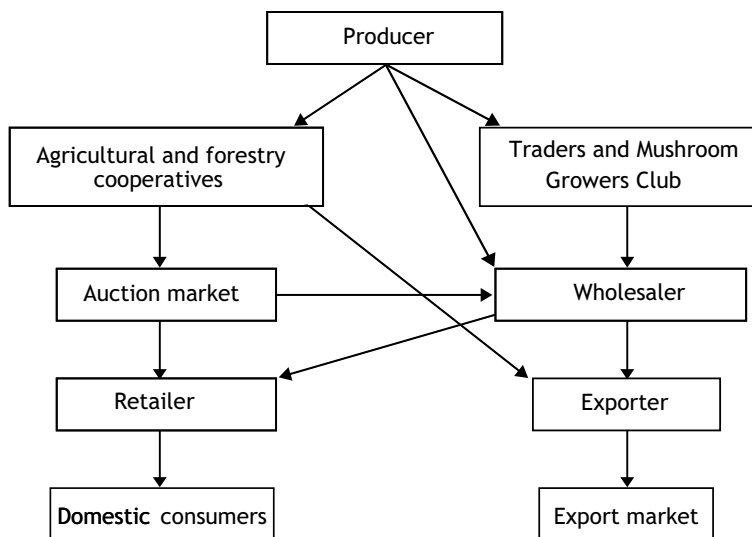
Most of the mushroom cultivators are members of a co-operative or of the so called Mushroom Growers Club. These organisations facilitate the sale of mushrooms and provide cultivators with marketing and loan services, while the government provides technical support. The marketing channels are different depending on whether products are dried or fresh (see Figure 3 for the trade diagram of fresh mushrooms).

Mushrooms for fresh consumption are usually cultivated near the urban consumers, while farmers located farther from consumers market their product after drying. The marketing costs for fresh mushrooms, including transportation and storage, are higher than those of dried ones.

Table 1. Import trends

Year	Total		Dried		Fresh		Manufactured	
	Quantity (tonnes)	Value (US\$1,000)	Quantity (tonnes)	Value (US\$1,000)	Quantity (tonnes)	Value (US\$1,000)	Quantity (tonnes)	Value (US\$1,000)
1990	329	477	-	-	-	-	-	-
1991	652	1,403	-	-	-	-	-	-
1992	1,240	3,826	1,205	3,751	35	75	-	-
1993	514	832	514	777	6	55	-	-
1994	922	1,635	866	1,538	56	97	-	-
1995	495	867	495	867	-	-	-	-
1996	840	2,462	837	2,135	3	147	-	-
1997	1,318	3,260	1,298	3,201	20	59	-	-
1998	1,143	2,054	1,136	2,024	3	7	4	23
1999	1,103	2,543	1,041	2,422	57	100	5	21
2000	1,139	2,738	1,079	2,639	59	95	1	4

Source: Korea Forest Service 2001.

Figure 3. Trade diagram for fresh oak mushrooms

Policy Environment

There are several laws supporting mushroom farmers and rural development in the Republic of Korea. Foremost among them are the Forest Law of 1961 and the Forest Co-operative Act of 1980, both of which support the production of NTFPs such as mushrooms. Based on these laws, the government provides mushroom growing farmers with technical and financial support. Farmers can get loans for the purchase of bed logs and greenhouse construction at favourable rates. Forest co-operatives as well as agricultural co-operatives provide mushroom growers with marketing support for example in the form of collective shipment. The government also supports mushroom growers by developing new technologies through research and development, and information dissemination through the Internet. The Korean government has also tried to manipulate the tariff rate levied on imported mushrooms in order to protect domestic producers.

The Korean government forest policy has been biased toward timber production for the last three decades. This has led to a lack of appreciation of the native species such as oak. Oak seedlings were treated as weeds while conifers were given priority in planting and tree improvement. Increasing demand for oak logs for mushroom cultivation has created an incentive for the growing of native hardwood species in South Korea.

Recently the government started to promote the production and consumption of organic farming products in order to provide incentives for environmentally friendly agriculture. Oak mushrooms were included in the categories of products supported by this policy, and there are some oak mushroom producers who are certified producers of environmentally friendly products.

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

Trends

The increase in production of oak mushrooms in Korea stems in part from the country's consumers' increasing interest in food safety. The rising production and decreasing export figures presented in Table 2 show how dramatically domestic consumption has risen since the early 1990s. The demand for oak mushrooms is expected to increase further in Korea as well as other countries, including Western countries. Although production of oak mushrooms has increased to meet the growing demand, an increasing share of the demand in Korea is met with imports from China. Due to the rapid expansion of supply from both domestic and overseas producers, the price of oak mushrooms has decreased over the last 10 years. As consumers prefer fresh local mushrooms to dried imported ones, the price of fresh mushrooms is higher than that of dried ones, which has led domestic mushroom growers to shift from marketing dried mushrooms to fresh ones in recent years. Therefore, producers located near the final consumers enjoy a more favourable marketing position than those in remote areas.

Table 2. Production and export of oak mushrooms

Year	Production (tonnes)	Exports	
		Total (tonnes)	Value (US\$1,000)
1990	1,648	1,056	23,258
1991	1,761	864	25,178
1992	2,254	710	18,386
1993	2,580	615	13,481
1994	2,694	467	11,612
1995	2,824	727	14,658
1996	3,403	356	9,415
1997	3,800	329	8,292
1998	4,049	376	8,703
1999	4,591	417	7,711
2000	4,722	228	5,012

Source: Korea Forest Service 2001.

Ecological implications of oak mushroom production

The increasing production of oak mushrooms has led to an increase in oak logs consumed. The logs, for mushroom bedding timbers, are extracted mostly from publicly owned natural forests where the demand for other public functions of forests is high as well. There have been a number of complaints from environmental conservationists about logging in natural forests, which diminishes both the ecological and landscape values.

There are not enough oak stands near major mushroom cultivation regions like Cheongyang-Gun, because forest policies have favoured coniferous species over hardwoods. Therefore, most oak logs are produced in other regions nearby. Recently forest owners as well as national and local governments

have come to understand the importance of oaks and that growing them is more profitable than growing conifers. This new thinking is resulting in an increase in hardwoods and a decline in conifers.

Competition with imported oak mushrooms

Mushrooms are tradable goods, which can be moved in a fresh or dried state. Imports from China dominate the Korean dried oak mushroom market, while the fresh mushroom market is highly competitive. There is presently a 20% tariff rate against imported mushrooms, which is expected to decline. The traditional export markets, such as Japan, have been eroded mostly because Chinese producers export mushrooms at a lower price. It remains to be seen whether the mushrooms imported into Korea will erode the domestic mushroom market in the future.

Ageing labour and technical innovations

Most oak mushroom producers are quite old and there are only a few younger farmers. The aged farmers will soon retire from mushroom cultivation because the traditional cultivation methods using timber beds requires physical strength. Therefore, oak mushroom cultivation will need to be more mechanised to reduce the need for labour. However, the uncertainty of the profitability of oak mushroom cultivation makes capital investment unlikely.

There are a number of forestry extension staff in Korean Forest Cooperatives, supported by the national government, but few of them are competent in the technology of mushroom cultivation. Mushroom crops sometimes fail for lack of sound mushroom cultivation techniques and because of the poor quality of purchased spores.

Lessons of this case

The growth of oak mushroom cultivation has succeeded in providing farmers and forest owners in rural areas with an important source of income. In the last two decades the number of farmers has increased, as has the output from oak mushroom cultivation. Since the implementation of the aforementioned WTO agreement, few Korean agricultural commodities remained competitive with overseas suppliers. The competitiveness of oak mushrooms stems from the strong demand from both domestic and international markets for natural food, which is influenced by growing environmental awareness and concern. This case presents a good example of a NTFP that can be marketed as a green commodity to affluent urban consumers.

The price of oak timber is more than twice that of softwood produced in Korea. This has made forest policy makers change their perception on native species, which have never before been thought of as candidates for timber production in Korea. In recent years the government started to advance stand improvement in natural forests. This effort promotes conservation of native species and natural forests, which can support the production of NTFP.

If mushroom cultivators and farmers were not in the habit of using oak logs, oak trees and oak-bearing native forests would not be valued by forest owners. Therefore, the mushroom cultivation boom has had a positive influence on the conservation of forest ecosystems in Korea.

ENDNOTES

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2. 'Gun' denotes an administrative unit akin to a county.

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Chapter 7

Extraction and trade of Cardamom (*Amomum villosum*) from Ba Be National Park, Vietnam

*Dinh Van Tu*¹

Common names	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Cardamom, Sa nhan	Fruit	Wild	Medium	International	Large

OVERVIEW

Medicinal cardamom (*Amomum villosum* Lour) occurs naturally in the strictly protected area of Ba Be National Park, Vietnam. Women from neighbouring villages enter the park to collect cardamom illegally. The picking and drying of cardamom does not require any investment, so it is accessible to everyone. Because of competition among gatherers for the same plants, collectors are tempted to pick young fruits, even though these are much less valuable than the ripe fruits. Cardamom extraction in the district has very little impact on the ecosystem and is a source of additional income for many households, but park management and local government largely overlook cardamom production. Trade in cardamom is dominated by women, who buy dried cardamom from harvesters and take it, in small quantities, to the district capital. The cardamom is bought by a few big buyers, who smuggle the product into China, where it is used to produce traditional medicines. The prohibition of non-timber forest product extraction from the park keeps the cardamom trade outside the legal system and thus maintains the state's inability to capture any benefits from the cardamom trade.

INTRODUCTION

The cardamom species *Amomum villosum* Lour is used in traditional medicines for curing digestive diseases, rheumatism, malaria and toothache, among other maladies, and as an ingredient in the production of soap and shampoo.

In Vietnam the plant has a wide distribution, mainly in secondary forests. This study focuses on Ba Be district, where cardamom² is collected from natural forests. The trading and marketing of cardamom has existed for decades in Ba Be, largely as a result of the location, which is relatively near the main market, China.

Ba Be district and Ba Be National Park

Ba Be is a mountainous district located in Bac Kan province, near the Chinese border (see Figure 1). The district covers 115,173 ha, comprising 24 communes. There are 70,620 people living in Ba Be, about half of whom belong to the Tay ethnic group, a third to the Dao ethnic group and the remainder to minority groups living scattered in the foothills and high mountains (Ba Be District Department of Statistics 2000). Most households in the district are predominantly subsistence oriented. It is estimated that cash income constitutes less than half the total income of most people. Cash income is earned from a number of sources such as the sale of fish, livestock (e.g., chickens, ducks and pigs), agricultural surplus and various non-timber forest products (NTFPs) such as cardamom, mushrooms, rattan, bamboo, medicinal plants, fuel wood and fruits. Farmers most often have a small paddy field and a garden with vegetables and fruit trees. Some farmers practice shifting cultivation with crops such as maize, green beans, soybean, indigo and cotton. Households in Ba Be, especially those of ethnic minorities living in and near forested areas, are heavily dependent on forest products. Income from the sale of forest products makes up more than one quarter of the cash income of households living in and near forested areas.

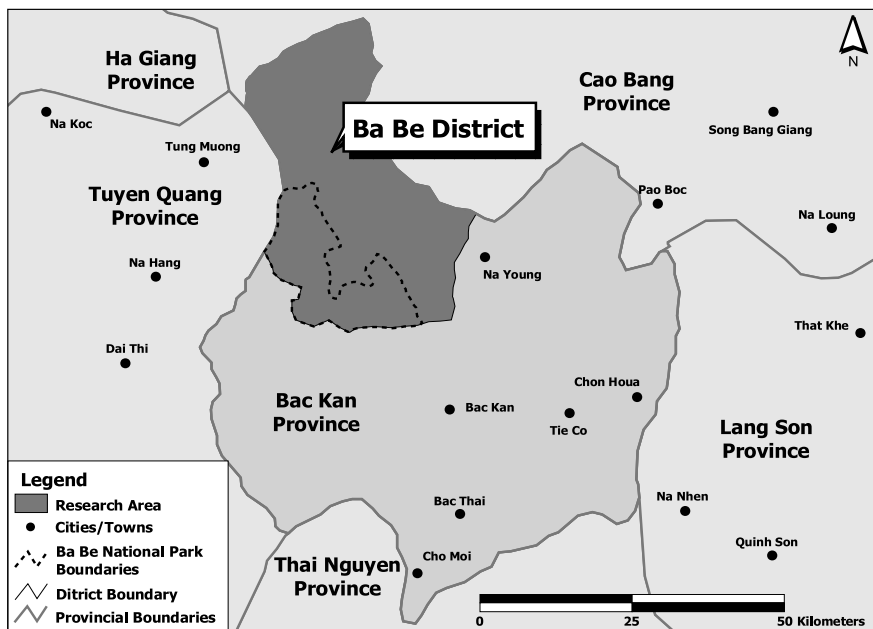
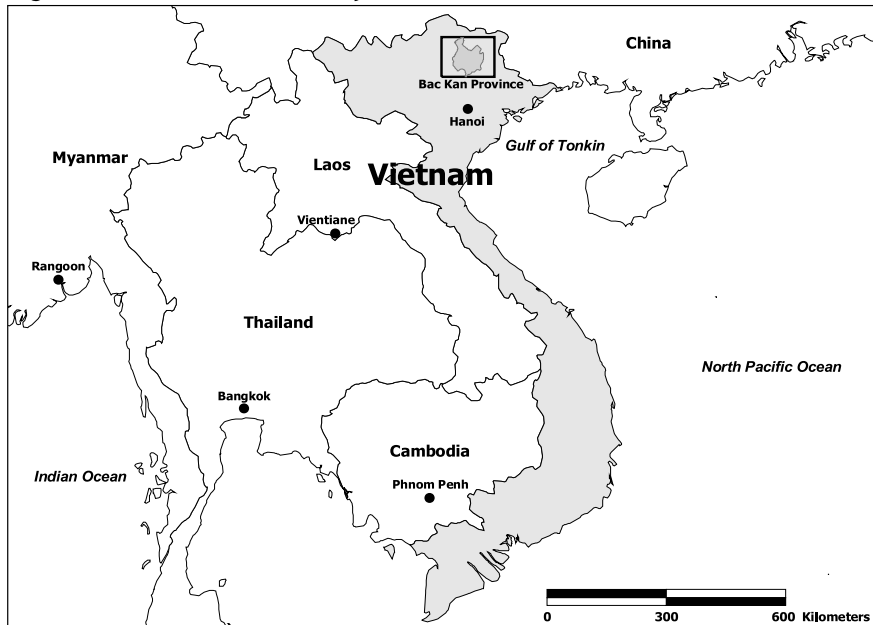
The most important source of forest products in Ba Be district is the forest of Ba Be National Park. The park covers an area of 7,610 ha, of which 614 ha is primary forest. One village of 520 households is located within the park (Nong The Dien personal communication). Collection of forest products from the park is prohibited, but people from both within the park and the surrounding villages do harvest illegally. Park management has made an effort to stop hunting through a 'food for guns' programme, exchanging rice for firearms. Efforts have also been made to promote agroforestry in the most degraded parts of the park.

THE PRODUCTION-TO-CONSUMPTION SYSTEM

Wild cardamom

In Vietnam, there are 14 different cardamom species, only three of which provide fruits of high quality and are commercially used: *Amomum villosum* Lour, *Amomum xanthioides* Wall, and *Amomum longiligulare* T.L.Wu. This study focuses on *A. villosum*, which is widely distributed in Bac Kan Province and occurs in the secondary forests of Ba Be. Commercially *A. villosum* is referred to as 'wild cardamom' and the local name is *sa nhan*. It is an herbaceous perennial plant, which grows to a height of approximately 1 m

Figure 1. Location of the study area



Source: ESRI Data and Maps 2002.

to 2 m and requires shady, humid conditions. The availability of harvestable cardamom fruits from the wild depends on the status of the forest; cardamom grows well in forests with 50% to 70% shade and along streams and rivers with good shade (Dinh Van Tu 1990, 1997).



(*Amomum villosum*)

Cardamom extraction

Fewer than 10% of the households in the district are involved in cardamom extraction, but in the villages near forested areas the share is estimated to be more than 50%. Most of the cardamom extraction occurs in Ba Be National Park. A small percentage of the district's cardamom comes from forested areas located outside of the park; lands managed by Ba Be State Forest Enterprise, communal forests and forestlands for which households have user right certificates. In some other areas of Vietnam people have started growing *A. villosum* in the shade of plantation forests, but in Ba Be it is not planted (Dinh Van Tu 1990).

Harvesting takes place in the rainy season, from May to July. The fruits ripen in sequence and ideally only ripe fruits are picked, leaving the younger ones for the next picking. However, because of competition between gatherers for the same plants, there is the temptation to collect younger fruits as well, even though they fetch a much lower price or are even rejected by the buyer. The harvesting does not have a negative impact on the growth of the cardamom plant, nor does it result in significant disturbance of the ecosystem.

According to the collectors, cardamom fruiting peaks every two years, implying that producers' income also fluctuates.

The harvest of cardamom is done by women, sometimes assisted by children. It is a sideline activity conducted when the labour demand is relatively low. The collecting is done individually and the decision to harvest depends, to a large part, on the availability of the collector's time. It is estimated that about 5% of the cash income of the average cardamom-extracting household comes from cardamom. Only very small amounts of extracted cardamom are kept for subsistence use; the cardamom is boiled and mixed with some other ingredients and used as traditional medicine by pregnant women and to cure stomach aches.

Processing and trading of cardamom from the park

After harvesting, the fruits are taken to the collector's home, where they are dried in the sun or over a wood fire. Sun drying is preferred, and only for large amounts or in the case of bad weather is a wood fire used. Drying of the fruits is a profitable activity, which can increase the value by as much as 100%.³ Traders collect the cardamom at the harvesters' houses or buy it in a nearby local market. Virtually all first order traders are women and they are often involved in the trade of other forest products as well. The trader sorts the cardamom and pays lower prices for low quality fruits, i.e., mainly those that have been picked too young. When fresh fruits are bought, the trader takes care to dry them before selling them on. First order traders, who buy cardamom in small quantities from collectors in the villages near the forested areas of the district, take the cardamom to bigger traders in the district capital. Quantities of cardamom sold are usually not more than 5 kg at a time. There are many small traders that operate between the producers in the villages and the bigger traders in the capital.

The main market for cardamom from Ba Be is China, where the dried seeds are used to produce traditional medicines. The distance from Ba Be district to the Chinese border is about 150 km on good roads. In Cao Bong, a province located on the border, there are ethnic links with the neighbouring people of China, which plays an important role in trade relations. Often a Chinese buyer will contact a Vietnamese trader in Cao Bong. The trader from Cao Bong then contacts traders in Ba Be district to place an order and comes to Ba Be to collect the cardamom by truck. The cardamom is transported to the Chinese border, where it is transferred onto the Chinese buyer's truck. All this is done illegally. Second and third order cardamom traders may also be involved in the illegal trade of other forest products like snakes, turtles, bamboo shoots and mushrooms.

Local processing usually involves mainly drying. A minor portion (<1%) of the cardamom is further processed locally, using simple methods to produce medicines for the local market. Most of the cardamom, however, is processed into medicines outside the country. Producers in Ba Be have generally little knowledge of where and how the cardamom is further traded, how the cardamom is further processed, and the prices that are paid along the trade

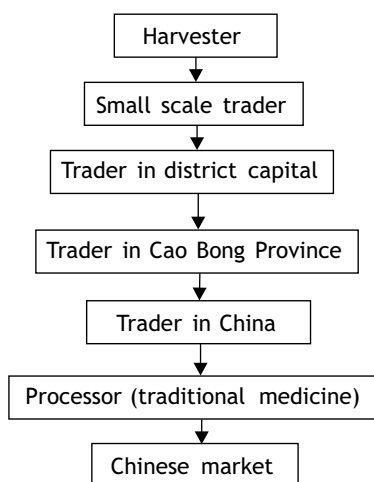
Photo 1. Cardamom harvester selling a basket of cardamom to a trader (Photo by K. Kusters)



chain (NTFP-RC 1999) (Figure 2). Prices of cardamom are determined by the market in China and tend to fluctuate. Both second and first order traders may therefore decide to store the cardamom and wait for a better price. Storing facilities are usually not good, however, which means greater risk of being attacked by fungi. The product can lose as much as 50% of its value in three to five months of storage.

Park regulations

Ba Be National Park employs several protection units to prevent illegal cultivation and harvesting of forest products. If the guards patrolling the park and its boundary catch a harvester, they confiscate her tools and the illegal products and sometimes assess a fine. The effectiveness of the forest patrols is rather limited, however, and in practice they do not scare or prevent harvesters from going into the park to collect cardamom and other products. In addition to the patrols in the forest, local markets are being inspected for the sale of illegal products, and this practice has reportedly caused ‘considerable problems’ for people selling cardamom in larger quantities.⁴ Thus, though the control of illegal harvesting is mostly ineffective (with only a few harvesters per year being caught), the trade of large quantities of illegally harvested cardamom near the park is risky and there is a high chance that it will be confiscated.

Figure 2. Trade diagram

Land use certificates

In 1998, the government started allocating land use certificates for forestland to households. The main objectives of the allocation programme are to stimulate rehabilitation, reforestation and agroforestry activities (MARD 1996). The Ba Be district government has had difficulties implementing the programme and therefore land allocation is proceeding slowly. So far only a small portion of the district's forestlands have been allocated to households.

Further forestland allocation could theoretically mean an incentive for sustainable harvesting of cardamom by reducing the competition amongst harvesters for the same resources. However, outside Ba Be National Park, most lands classified as forestlands are barren or scrub⁵, which implies that the lands that are (potentially) to be allocated have no cardamom⁶. Furthermore, the lack of forest cover makes these lands unsuitable for cardamom cultivation in the short term. The land allocation process will thus have little direct impact on cardamom production in the research area.

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

Availability of cardamom

It can be argued that some of the logging activities in the past have resulted in a slightly higher density of wild cardamom in the remaining forests of Ba Be, since the plant prefers an open canopy. Nevertheless, over the last 20 years the availability of cardamom in Ba Be district has been decreased dramatically as a result of absolute deforestation. Presently, the annual trade is around 10 tonnes, while annual trade in the 1970s was said to have been

much higher⁷. Since the early 1990s, thanks to a series of new policies and interest from the government (e.g., land allocation and reforestation programmes), the overall trend has been towards forest regeneration and this development may positively influence the future production of cardamom in the study area.

Changing trade in response to the establishment of the park

With the establishment of Ba Be National Park in 1992, control of the harvest and trade of forest products became tighter. In practice access to the resource did not change much; cardamom has been 'free for all' both before and after the establishment of the park. The trade system, however, does seem to have changed significantly. Previously, traders came to the village to collect large quantities of cardamom by truck. Now, harvesters sell their cardamom to traders who transport the product in small quantities to the district capital, where it is bought by bigger traders and then smuggled to China in large quantities. The most important reason for the trade flow change would appear to be the fact that transporting large quantities in the vicinity of the park has become a risky business since forest guards have the task of checking all trade in forest products. Thus, the transaction of large quantities has spatially shifted away from the villages near the park towards the district capital in order to reduce the risk of fines and confiscation by park staff.

Women and cardamom

One of the striking features of this cardamom case is the dominance of women in both production and trade. The collection of forest products like cardamom, mushrooms, and medicinal plants is women's business, while rattan and bamboo are the responsibility of men. The involvement in production and first order trading of cardamom gives women control over part of the household money, providing them with decision making power over household expenditures. One collector explained the female dominance in the cardamom trade by saying that men were uninterested in first order trading because it involved going from household to household to buy small quantities of cardamom and take it to local markets. Of the three biggest traders in Ba Be district, however, only one is female.

The need for recognition

The well-established illegal trade network attracts illegally harvested cardamom from the park as well as legally harvested cardamom from elsewhere in the district. Although the explicit prohibition of cardamom collection from the park may not have given rise to the illegal trade network (cardamom was being smuggled into China long before the park came into existence), it has not helped the recognition and formalisation of cardamom production and trade either. As a result, the government is unable to obtain any benefits from the cardamom trade; nor can it regulate harvesting and

trade activities. Since the harvesting of cardamom has an insignificant impact on the plant and its surroundings, it can be reconciled with the conservation objectives of the park. Recognition by park management and government would, for example, open possibilities for the regulation of harvesting activities and designation of cardamom extraction areas, which could result in more appropriate harvesting activities and higher profits. Presently, *de facto* open access to the remaining resources and the lack of regulations induce people to collect immature fruits in order to be ahead of the competition.

ENDNOTES

1. Non-Timber Forest Products Research Centre. 8 Chuong Duong Do, Hoan Kiem, Hanoi, Vietnam. E-mail: ntfp.project@hn.vnn.vn
2. In this chapter the term cardamom refers to the species *Amomum villosum*.
3. In 2003 it was reported that collectors sold fresh fruits for US\$0.2 per kilogram, while dry fruits were sold for US\$2 per kilogram. Since 5 kg of fresh fruits equals 1 kg of dry fruits, drying increases the value of the fruits by 100%. Exchange rate in 2003: US\$1 = VND15,000.
4. It is unclear how cardamom can be recognised as coming from within the park.
5. In the Vietnamese land qualification system the term forestlands is used not only for lands that are covered with natural or plantation forests, but also for lands that are barren with the intention of having them reforested.
6. This is in contrast to the Vietnamese bamboo case presented elsewhere in this volume (Chapter 21), where most of the allocated forestlands do contain bamboo.
7. Estimates of the amount of trade in 'wild cardamom' in the 1970s are hard to make because district statistics did not differentiate among cardamom species.

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Chapter 8

Lapsi (Choerospondias axillaris) emerging as a commercial non-timber forest product in the hills of Nepal

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Common name	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Lapsi	Fruit	Managed/ Cultivated	Medium	National	Medium

OVERVIEW

The *lapsi* tree [*Choerospondias axillaris* (Roxb.) B.L. Burt & A.W. Hill], a native species to the Himalayan range, is traditionally grown by Nepali hill farmers on slopes between terraces mixed with other fruit and fodder trees, and recently on terraces too. The tree used to be grown mainly for its timber, but over time the marketing of its fruits has become much more important. The commercialisation of the *lapsi* fruit has encouraged people to plant the tree. On the basis of a study in Sindhupalchok and Kavrepalanchok districts, it is concluded that farmers have not been able to reap the full benefits of *lapsi* due to several constraints. *Lapsi* growing demands a long-term perspective, as investments do not pay off immediately. Investment security can be improved when the techniques to distinguish fruiting female trees from male trees are improved. Markets for *lapsi* fruits in the region are expanding, but, because of a lack of information and credit possibilities, small landholders and the landless are still deprived of such emerging opportunities. The absence of a growers' institution limits growers' bargaining capacity, and traders are getting the larger share of the benefits. Incorporating *lapsi* in community and leasehold forestry may create an appropriate avenue for benefiting poor farmers.

INTRODUCTION

The fruits of the *lapsi* tree [*Choerospondias axillaris* (Roxb.) B.L. Burt & A.W. Hill] are widely used in central Nepal. Having long been pickled and used for subsistence consumption, in the last four decades the fruits have also become important commercially. The fruit is used in several products: (i) *manda*, a dried mixture of *lapsi* pulp and salt used as a snack and to make pickles;

(ii) candy, made of *lapsi* pulp and sugar; and (iii) 'ground-skin', a powder made by grinding the fruit's skin, which is widely used as sour topping in restaurants and hotels in Kathmandu. In addition to these uses of pulp and skin, the seed is used as fuel, especially in brick kilns. *Manda* and candy are the most important commercial *lapsi* products, and are traded in domestic markets. Most of the sweet shops, grocers and supermarkets in Kathmandu sell both. Diplomats, expatriates, tourists and trekkers favour the candy, indicating prospects for an export market (Gautam 1997). Traditional use of *lapsi* for pickles is still popular in both rural and urban areas of Nepal.

Study area: Sindhupalchok and Kavrepalanchok districts

Nepal is broadly divided into three physiological regions—mountains, hills and Tarai, the plains of southern Nepal. Of Nepal's population, approximately 45% live in the Tarai region, another 45% in the hill regions, and about 10% in the mountains (CBS 1998). Administratively, the country is divided into five developmental regions and 75 districts. The Central Development Region is the most accessible and developed of the five. It extends across the country from north to south, covering high mountains, mid-hills, Siwalik (low hills) and Tarai. About 33% of the total population resides in the Central Development Region, which covers 19 districts. The Kathmandu valley, consisting of Bhaktapur, Kathmandu and Lalitpur districts, and the surrounding districts of Dhading, Nuwakot, Sindhupalchok and Kavrepalanchok are located in the central mid-hills of the Central Development Region, though some surrounding districts extend into the higher mountains (Figure 1).

The study area covers Sindhupalchok and Kavrepalanchok districts, which are the main districts for commercial *lapsi* production. Although the study area is close to the Kathmandu valley, the literacy of the population six years and older is only 45% (60% among males and 31% among females). There are few towns, and only about 5% of the population is urban. Brahman, Kshetry, Tamang and Newar are major ethnic groups in the area; several other ethnic groups such as Sherpa, Gurung, Damai, Kami are scattered all over the area. Hinduism and Buddhism are the most important religions. The construction of the Arniko highway from Kathmandu to the Tibet border has 'opened up' the area and some farmers are now engaged in trade by importing goods from China and selling them locally or in Kathmandu. The Helambu valley in the northern part of Sindhupalchok and the Sunkosi river, which flows through the research area, are top tourism spots which attract many people for trekking and water rafting, generating employment opportunities for local farmers, for example, as guides. Nevertheless most farmers in the area are still subsistence oriented.

Most of the resources of the districts surrounding the Kathmandu valley were used in the infrastructure development of the valley. Forests in these districts were severely affected by the expanding population in the valley and their needs, after the nation's capital was moved from Gorkha to Kathmandu ca 200 years ago (Gautam 1991). At the same time, the urbanisation of Kathmandu valley created opportunities for the development of adjoining districts. The increasing demand for agricultural and forestry products from Kathmandu

Figure 1. Map of study area



Source: ESRI Data and Maps 2002.

stimulated the increase in production and intensive harvesting of such products in the adjoining districts. Amongst others, medicinal and aromatic plants and *lapsi* have been harvested from the forests to feed the markets in Kathmandu. Through the trade in these products contacts were established between traders in adjoining districts and traders/exporters in Kathmandu valley. Although *lapsi* is grown all over the mid-hills of Nepal, it is mostly in the districts surrounding the Kathmandu valley that it has become a commercial product. Increased demand for *lapsi* fruits in Kathmandu led forestry programs to initiate its production. Accordingly, the cultivation of *lapsi* trees has increased as part of forestry activities since the early 1970s, and processing industries have been developing in and around the Kathmandu valley in response. At present the *lapsi* tree is widely used for private planting in the hills, as part of the community forestry programme². It is a highly preferred species for agroforestry in the study area because of the high demand for the fruits in Kathmandu valley.

THE PRODUCTION- TO-CONSUMPTION SYSTEM

Lapsi fruit

Lapsi, a medium to large deciduous and dioecious tree, grows between 900 m and 2,000 m a.s.l. in the Himalayan range (Jackson 1994). Its distribution is not restricted to the Himalayas, however, and the tree is also found in Thailand

(Jackson 1994), Vietnam (Nguyen *et al.* 1996) and China (Hau *et al.* 1997; Zhou *et al.* 1997; Feng *et al.* 1999; Zhou *et al.* 1999; Lin *et al.* 2000). In the hills of the study area, *lapsi* trees stand in small patches in the natural forest or scattered in the farmlands and at religious sites (see Box 1). The tree does not occur in the lower-lying parts of the study area, since they are unsuitable for *lapsi*. In forests, associated species are, amongst others, *dhalne* (*Castanopsis indica*), *kafal* (*Myrica esculenta*), *chilaune* (*Schima wallichii*), *chutro* (*Berberis asiatica*), *mahuwa* (*Engelhardtia spicata*), *phalame* (*Homalium nepaulense*), *lankuri* (*Fraxinus floribunda*), *jamun* (*Syzygium jambos*) and *jhingan* (*Eurya acuminata*). The *lapsi* tree has a low tolerance of shade and frost and is moderately tolerant of low fertility and drought (Tyystjarvi 1981).



(*Choerospondias axillaris*)

Box 1. The use of *lapsi* trees at religious sites

Lapsi is mentioned in various religious documents of Hinduism. The fruits are used in Hindu rituals, for example, as an offering to the gods. *Lapsi* trees are maintained at most of the religious sites in Kathmandu valley, and the fruits are crucial to the survival of monkeys and birds in many temples in the capital.

Because of the superstition that the presence of *lapsi* tree makes a site prone to lightning strikes during thunderstorms, people have tended not to plant the tree around their homesteads. However, *lapsi* trees have been protected, as fruit trees, for a long time and stray old trees—the oldest ones over 100 years old—stand on farms, in forests, or religious places. The planted trees found all over the study area are usually less than 30 years old, indicating that people started growing *lapsi* trees in the last few decades. In the natural forest *lapsi* trees are sparsely distributed.

Growing *lapsi*

Lapsi is one of the major tree species used in community forest nurseries established in the early 1980s as part of the government's community forestry programmes, the district forest office and community managed nurseries. There are over 100 village nurseries in the study area and the bulk of seedlings for growing *lapsi* come from these nurseries. Nurseries supply seedling for planting both on private lands as well as in community forests. Most of the seedlings go to private lands, and consequently the bulk (about 90%) of fruits collected in the study area are from private lands. The rest is gathered from *lapsi* trees in public (community or government) forests. Survival of planted seedlings has been recorded as 67%, which shows it is a species relatively suitable for cultivation (Campbell and Bhattarai 1983; Hannah 1984; Nielsen 1985). The practice followed in forest nurseries in the district is described in Box 2.

Box 2. Nursery technique for the propagation of *lapsi*

Ripe fruits are picked from November to January and put on a polythene sheet in the bottom of a pit 1 m² to 3 m² in size and 1 m deep. The fruits are covered with soil and left for two to four weeks. The fruits are then dug up, mixed with sand and rubbed until the seed-stones are separated from the flesh and skin. The seed-stones are washed in water and dried for five to seven days. The seeds are then stored in jute or polythene bags. They need to be dried in the sun once a month to prevent fungus. The seeds stay viable for nine months. Seedbeds have 5 cm of gravel on the bottom, covered with 2.5 cm of local soil and on top of that 7.5 cm sieved, fertile-soil. The seeds are sown 3 cm to 5 cm apart and covered with sieved sand. The seedbeds are watered twice a day. Germination starts after two weeks and is complete in six. Two to three weeks after germination, the seedlings are transplanted into polythene bags 7.5 cm by 18 cm. The seedlings are ready for transfer to the plantation in five to eight months. The number of plants per seed-stone varies with its size: on average 1 kg of seed-stones produces 600 seedlings, but large seed-stones can sometimes produce up to 1,500 seedlings.

The average number of established trees of any species on farmland is 33 per household, out of which 14 (42%) are maintained mainly for fruit. *Lapsi* trees constituted 36 percent of total trees and 86 percent of fruit trees. *Lapsi* trees used to be grown on slopes between terraces, mixed with other fruit trees and fodder trees. Today, medium to large landholders have started growing trees in upland terraces as a long-term investment. Even city dwellers from Kathmandu and other towns in the district are buying land in rural areas to start *lapsi* orchards. Small landholders cannot afford to convert all of their terrace lands into *lapsi* plantations, because these lands are largely used for subsistence.

Farmers who want to plant *lapsi* obtain seedlings from a nearby nursery or collect wild seedlings. As described, *Lapsi* propagation in nurseries is mainly from seeds. Although Napier and Robbins (1991) indicated that vegetative propagation is easily possible, no such instance has been recorded in the nurseries in the study area, and attempts at tissue-culture propagation have been unsuccessful (H.K. Saiju, personal communication). Farmers have domesticated the tree by selecting seedlings from good trees: seeds not dispersed by wildlife and ruminant cattle (the main dispersal agents) germinate under fruit-bearing trees. Farmers assume that the quality of the seedling depends on the quality of the mother tree and intend to domesticate the better product through adoption of seedlings regenerated under the best-recognised trees. Local people consider factors like size of fruit and seed, taste of fruit, thickness of skin, age of first fruiting and probability of fruit-bearing (female) tree for the selection of the best trees. These factors are very much valid. Selection of female plants is a vital part of domestication, and farmers have developed their own techniques for identifying male and female trees. Their assumptions in this regard are: (i) female plants sprout earlier than male plants under the same conditions at the beginning of the growing season; (ii) only female plants release milky latex when leaves are pricked; (iii) wood from female plants does not blast while burning whereas that from males does so loudly; and (iv) wood from male trees splits easily. Though these assumptions were found to be valid, they are yet to be studied further.

***Lapsi* collectors and their socio-economic context**

Most people in the two districts live in hilly areas and there are relatively few settlements in the valleys. People are mainly subsistence-oriented farmers growing maize, mustard, millet, wheat and dry rice. The average size of the landholdings in Sindhupalchok and Kavrepalanchok are 0.62 ha and 0.81 ha, respectively. Cash flow is very scarce and collection and selling of *lapsi* is an important source of cash. Other non-timber forest products (NTFPs) collected include medicinal and aromatic plants from the forest at high altitudes, which are sold to traders. Some farmers collect bark from *Daphne* species, which is sold to local small-scale paper factories. In addition to collection of NTFPs, cash income is earned by selling surplus agricultural produce, from tourism and through wage labour.

It is estimated that between 10% and 30% of people living in the study area use *lapsi* for commercial purposes. *Lapsi* fruits are a reliable product for barter or cash income, as confirmed by comments from various *lapsi* growers (Box 3). *Lapsi* is grown on private lands by both poor and richer farmers, and usually both men and women are involved in the picking of fruits. Some of the poorest farmers, however, prefer to use all their land for subsistence crops instead of making the long-term investment of planting *lapsi*, which demands protection of seedlings from grazing cattle and thus extra work for the farmer. Farmers who do not own *lapsi* trees may be involved in *lapsi* picking from (community) forests and are sometimes hired for picking from private lands and processing work.

Box 3. What *lapsi* growers say about the impact of *lapsi* on their daily lives

- “Two of my neighbours were visiting Chautara, the district headquarters of Sindhupalchok district, for some other business. They asked me for *lapsi* fruits. I advised them to pick the fruit themselves from the tree and bring me two *pathis* (9 litres) of salt when they returned. They collected the fruits in one hour and the quantity of fruits came to about 16 *pathi* (72 litres). In the evening they returned with the said quantity of salt. Thus I bartered *lapsi* fruits of one tree for 9 litres of salt.”
- “My daughter took about a *dhwang* (18 litres) of *lapsi* fruits to the market and bought six notebooks for her studies.”
- “During the last *dasain* (the biggest Hindu festival) I had the goat I needed at home for meat but had no money to buy spices. A local shop-owner supplied me with the spices I needed in exchange for fruits from one *lapsi* tree.”
- “Whenever I have to buy smokes or sugar I take *lapsi* fruit to the local shops and exchange it.”
- “As I had no money to pay the school fees for two of my children, I asked them to collect *lapsi* fruits on Saturday and take them to market on their way to school. They each took a small bag of the fruits and sold them so that they could pay their school fees.”

Processing

The two main *lapsi* processing industries in the study area are the processing of *lapsi* to *manda* and candy (Photo 1). These are cottage industries, operating at the household level. There are less than 100 processing households in the research area. Most of these households are also engaged in other activities and are involved in processing only part time. Some producer household also process their own fruits.

Photo 1. *Manda* and candy made from *lapsi* fruit (Photo by K. Kusters)



Two qualities of *manda* are available, one handmade where only the flesh of the fruit is used and another machine made where flesh and skin is mixed. For most of the processors of handmade *manda* it is a part time activity in addition to farming (even in urban areas most people farm), while processors owning a machine (for separating the flesh and the skin from the seed) are often engaged in processing full time. The technology of making *manda* is simple, and *manda* processors are located in various parts of the area, though most of the factories operate in Sanga, a town in Kavrepalanchok on the highway going to Kathmandu valley. Processing of *manda* started in Sanga, where the processing techniques were developed. Only recently some households started processing *manda* in other villages.

Lapsi fruits for making *manda* are procured from September to January, sometimes till February; even unripe fruits are procured. The fruits are boiled in water for two hours in a drum, and salt is added up to 30% of the volume of fruits. Seeds are separated from the boiled fruits manually or by use of a power splitter. The pulp is placed on a polythene sheet and laid in a pit in the ground, where it can be stored for a longer time. Whenever it is convenient, the pulp is taken out, spread on wooden planks and dried in the sun for two days, after which the *manda* is ready.

There are only about five candy processors, and all of them are located in Sanga. These are household level enterprises as well, but some of them employ a few labourers. All the candy processors are involved full time. Candy producers separate flesh, skin and seed-stone manually. Only the flesh is used to produce candy, the ground-skin is sold separately.

The fruit for making candy is collected at the same time as that for *manda*, but only fully ripened (not dried, rotten or exposed) fruits are selected. They are washed thoroughly three times. Eighteen litres of *lapsi* fruits are boiled in

2 litres of water for 20 minutes. The boiled fruits are then emptied into a bamboo basket for filtration. The fruits are peeled and the seeds separated. A quantity of sugar equal to the quantity of pulp is mixed in, and the mixture is stored in a polythene container. A veneer 30 cm x 45 cm is framed with a 4 mm thick lining on all sides (like a tray), and the upper surface is greased with cooking oil. Two kilograms of stored mixture is then spread over the greased surface of the veneer and solar dried for 4 to 19 days depending upon the intensity of sunlight. The degree of dryness can be checked by testing the stickiness of the surface. Once dry, the mixture is diced and packaged.

Leftovers from *manda* and candy processing are usually sold to brick and tile kilns, which use the seeds as fuel. The processing industry in the research area is growing with the increasing production of *lapsi*. No organisation among processors was reported, although some processors expressed a need for some form of organisation. *Lapsi* processors have not encountered any policy hurdle to processing and selling their products.

Trade

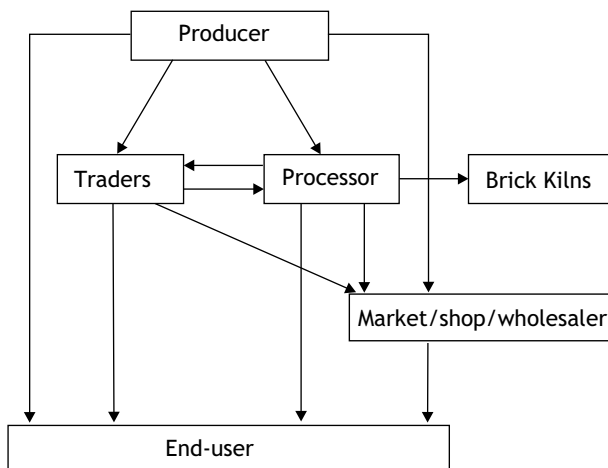
Lapsi fruits entered the market in the mid 1960s and trade increased rapidly buoyed by brisk demand in Kathmandu for unprocessed fruits as well as candy, *manda*, seeds and ground-skin. Figure 2 is a generic diagram of the trade in *lapsi* fruit and its processed products. Sometimes producer households may also take care of the processing; these producer/processor households are not represented in the diagram. Sometimes several traders are involved, for example, first order traders provide the *lapsi* in large quantities to second order traders, who then sell it to candy factories. The markets (including fresh-fruit markets, wholesalers and retail shops) are located both in the study area and in Kathmandu. End users who buy the fruit in the unprocessed form do not necessarily consume the fruit in its raw form but will often process it themselves to pickles or *manda*.

The average annual income from the sale of *lapsi* fruit is US\$14.30³ per tree, and ranges from US\$1.60 to US\$32.10 (1996). Raw material producers sell fruits per *dhwang* (18 litre containers that hold about 12 kg of fresh fruit). The highest price so far paid is US\$0.80 per *dhwang*, but the average comes to about US\$0.70 per *dhwang*.

Traders may reserve trees by paying the owner of the tree a certain amount as an advance payment for the fruits of that harvesting season. When farmers are paid in advance they often end up accepting lower rates for the fruits, but it is an attractive option when the owner of the tree is in need of money, for example during the crop planting season or festivals.

Manda is sold mainly in local markets in packages of 25 g for US\$0.10 each, which is equivalent to US\$4.00/kg, while candy is sold mainly in supermarkets and department stores in Kathmandu in packets of 200 g for US\$1.00 each. Foreigners from diplomats and expatriates to tourists and trekkers are the main consumers of the candy. The most important outlets are the Kathmandu hotels and trekking agencies.

Figure 2. Trade diagram



In Tables 1, 2 and 3, examples are given of profits and costs that have been recorded in the study area. The table figures represent only monetary inputs, not the value of labour, and show that processing and trade in processed products are the most lucrative activities.

Table 1. Costs and profits for 1 *dhwang* (12 kg) of *lapsi* fruit in the study area

Actor	Monetary costs (US\$)	Selling price (US\$)	Margin (US\$)
Producer	0.00*	0.70	0.70
Trader	Purchase <i>lapsi</i> fruit: 0.70 Jute bag for packing: 0.05 Transport, load, unload: 0.25 Tax: 0.05 Total: 1.05	1.80 at Kathmandu market	0.75

* Tree growing cost is not included.

Table 2. Costs and profits for *manda* made out of 1 *dhwang* (12 kg) of fruit in the study area

Actor	Monetary costs (US\$)	Selling price (US\$)	Margin (US\$)
Producer	Jute bag for packing: 0.05	0.75	0.70
Local <i>manda</i> processor	<i>Lapsi</i> fruit in bag: 0.75 Salt (1.8 kg): 0.35 Total: 1.10	<i>Manda</i> (7.8 kg): 7.70 Seeds: 0.20 Total: 7.90	6.80
Trader selling in Kathmandu market	<i>Manda</i> : 7.70 Transport and packing: 1.80 Total: 9.50	7.8 kg <i>manda</i> in packets of 25 g: 31.20 Total: 31.20	21.70

Table 3. Costs and profits of Candy made out of 1 *dhwang* (12 kg) of fruit in the study area

Actor	Monetary costs (US\$)	Selling prices (US\$)	Margin (US\$)
Producer	Jute bag for packing: 0.05	0.75	0.70
Local candy processor	Lapsi fruit in bag: 0.75 Sugar (5 kg): 2.00 Total: 2.75	Candy (10 kg): 14.30 Seed: 0.20 Skin-ground: 1.90 Total: 16.40	13.65
Trader selling in Kathmandu market	Candy: 14.30 Transport, packing: 2.70 Total: 17.00	10 kg candy in packets of 200 g: 50.00 Total: 50.00	33.00

Government policies

The Nepalese government has been supporting the growing of trees on communal and private lands for a long time. In 1957, His Majesty's Government enacted the Private Forest Nationalisation Act, intending to nationalise large blocks of forests owned by former feudal rulers (HMG 1957). However, it was not communicated to the people which areas would fall under the act. As such, the act unintentionally damaged scattered small blocks of private and communal forests because their owners converted these lands so they would not fall under the act. The community forestry legislation (HMG 1977, 1989) put emphasis on the development of private forest resources by planting trees on private lands. In the late 1970s the forestry authorities started programmes and projects in the district to stimulate the planting of trees, including *lapsi* trees because *lapsi* was seen as a promising product for sustainable forestry. These programmes and projects were funded partly by the government and partly by donors, and focussed on the establishment of nurseries for the propagation and free distribution of seedlings for private planting, mainly in hill districts. In 1994 a charge was introduced for seedlings in Sindhupalchok district, aiming to achieve self-sustainable seedling production. Other projects have provided training and extensions. Most of the forestry projects are still active in the research area, managed by either the district authority, local communities or 'user groups'. Local users maintain the User Group Nurseries but nursery materials are supplied by forestry offices under the Department of Forestry. For other nurseries all costs (including labour) are paid for from project funds through the forestry office.

Forestry legislation in Nepal was designed to increase the tree cover on private lands along with the development of forest resources on communal lands. Forest legislation (HMG 1993, 1995) categorised timber and other forest products, and fixed the levy for collection and export of these products. *Lapsi* fruit has not been listed by forest legislation as a forest product, since most of the fruiting *lapsi* trees are not in forests and picking of fruits does not involve felling trees. As a result a levy is not charged on collection and sale of *lapsi* fruits. Sometimes such levies are fixed by local user groups for products collected from community forests they manage, but these levies are modest

and have so far not resulted in substantially higher prices than *lapsi* from private lands.

The increase of planted *lapsi* trees in the last 20 years can largely be attributed to government initiatives encouraging tree planting on private lands. The community forestry programmes have been equally successful in converting degraded lands into forests and their subsequent management. Efforts to stimulate sustainable forestry have been most successful in the hills of Nepal, whereas the forests in the southern plains of Nepal are threatened by illicit felling and encroachment. Government efforts to stop further deterioration of those forests have had little effect.

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

Intensification of *lapsi* fruit production

Over a century ago, farmers in the study area started protecting *lapsi* trees on their farmlands mostly to make use of their timber. These days the trees are used mainly for their fruit; they are only occasionally cut for timber and never the fruiting trees. As such the use of *lapsi* trees in agroforestry systems has made a gradual shift from agrosilviculture to agrohorticulture.

The commercialisation of *lapsi* fruit since the 1960s, driven by the development of the Kathmandu valley, has caused considerable changes in land use in the study area. Since farmers started to grow *lapsi*, they have gradually intensified production on private, communal and leasehold lands. More and more farmers have been introduced the *lapsi* tree into their agroforestry systems and the trend towards intensification is continuing. Although the system of free distribution of seedlings from forest nurseries was terminated in Sindhupalchok in 1994, the demand for *lapsi* seedlings in the district is still increasing. Farmers are now planting *lapsi* trees on terrace boundaries, slopes, marginal lands, thatch-lands and terraces. Absentee landholders are also investing in the development of *lapsi* orchards in the study area, planting thousands of seedlings. Such changes indicate that people realise the potential of *lapsi*. In addition to the rising number of growers, numbers of processors and traders are also increasing in the research area, which is reflected by the increasing availability of *manda* and candy in the markets of Kathmandu.

Importance of *lapsi* production in the study area

For most raw material producers the growing of *lapsi* is a sideline activity and a source of income to cover incidental expenses. Beyond the direct economical benefits people derive from the fruit, the commercialisation of *lapsi* has also created opportunities for rural people to begin some sort of business, and it can be argued that it has provided some entrepreneurship to local people. In Box 4 it can be seen that the development of a processing industry can have important socio-economic impacts in certain areas as well.

Box 4. The importance of the *manda* industry in Sanga

Sanga, a small town located in one of the four passes into Kathmandu valley, has become renowned for its *manda* industry. A resident of Sanga stated: “There were many people here without work. Houses were in poor condition. The *manda* industry has changed the face of this area. Thirty years ago one person started this work, now there are more than 80 households involved in it. All the reinforced cement concrete buildings have been put up with the income from the *manda* industry and most of the industrialists send their children to boarding school. *Lapsi* fruits raised the standard of living of this locality. However, the hygiene standards for processing *manda* have yet to be improved. The authorities need to be aware of hygiene standards and the industrialists need to be concerned for public health for the long-term.”

Development and conservation lessons of the case study

Lapsi has a high potential for further domestication and commercialisation in agroforestry systems in the hills of Nepal. The fruit has already been adopted in the agroforestry systems of many farmers, a market within the country has been established and further market opportunities—including export markets—are promising.

Lapsi growing demands a long-term perspective, since investments do not pay off immediately. Investment security can be improved when selection of the fruiting female trees is improved. Farmers would be ready to invest more in planting if they were more certain that the trees will fruit. At present there is a wait of several years to find out whether a tree that has been planted is male or female. Local people are now approaching forest offices looking for research results that would help them to identify female trees and to select the best seedlings, but the forest offices have limited experience with domestication techniques. Therefore there is a need for research regarding identification of the fruiting tree and its management. Efforts should also be made to ensure that more benefits go to the growers, as the benefits so far have gone more to those beyond the tree growing farmers (see for example Tables 2 and 3). An important issue in this regard is the lack of marketing information for *lapsi* growing farmers, since farmers with market information may fetch a higher price for their fruits. Ensuring that benefits go to the farmers may include providing market information and making credit available. Groups managing community and leasehold forests may play an important role in the further domestication and commercialisation of *lapsi*. These groups, supported by the forestry authorities, could organise *lapsi* producers into co-operatives or associations and so strengthen their position. Furthermore, since the planting of *lapsi* on private lands is not very attractive to the poorest farmers because it is a long-term investment, the growing of *lapsi* in community and leasehold forests may be of particular importance to them.

The number of producer households involved in processing is increasing. Processing activities are very simple, have high returns and do not demand big investments. However, becoming engaged in processing is attractive only for farmers owning many *lapsi* trees or those with enough cash to buy *lapsi* fruits from other farmers. Some of the farmers have shown interest in forming a co-operative to run *manda* enterprises, which could work out to be very beneficial for the growers, since processing is a profitable business (see Tables 2 and 3). The organisation in a co-operative would make processing activities accessible and feasible for individual growers without the necessity to have a large number of *lapsi* trees.

The technology for processing *lapsi* fruits could be effective and easily adopted elsewhere. The extension of these simple technologies to other areas is preferable to looking for highly sophisticated technologies. Further research should aim to increase efficiency of processing techniques based on local knowledge and skills.

Regarding the ecological effects of commercialisation of the *lapsi* fruit, it can be argued that the harvesting of *lapsi* has some averse effects, since there is less fruit available for animals to feed on. Harvesting of fruits may also affect natural regeneration, which in turn affects traditional ways of domesticating *lapsi* from well-known trees because it reduces the number of seedlings under the best trees. However, with regard to the role of *lapsi* commercialisation in conservation of forest resources in the study area, it is clear that commercialisation of *lapsi* fruit has helped to motivate local people to plant trees. The trend towards the planting of more *lapsi* for fruit production has increased the tree cover on private lands, contributing to soil and water conservation in the hills, and branches of planted *lapsi* trees are used for firewood, which reduces use of wood from natural forests. Though the planting of *lapsi* has been more prevalent on private lands than in community forests, the introduction of *lapsi* trees in community forestry projects has helped to encourage community participation in these forestry activities. Based on recent promising results it is expected that the role of these community forestry activities in the conservation and development of forest resources and the improvement of local livelihoods will further increase and that *lapsi* can play an important role in this development.

ENDNOTES

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2. Community forestry programmes were implemented in most of the hill districts of Nepal in the early 1980s with support from bilateral and multilateral donors. Programmes included establishing and operating nurseries in villages in order to produce seedlings of preferred species for planting in community and private forests. Australian Aid played a significant role in developing community forestry in Sindhupalchok and Kavrepalanchok since the early 1980s.

3. Exchange rate (1996/1997): US\$1 = NR56.

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Chapter 9

Cardamom (*Elettaria cardamomum*) in Kerala, India

*T.K. Raghavan Nair*¹ and *M. Govindan Kutty*²

Common names	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Cardamom, Elam	Fruit	Cultivated	Low	International	Small

OVERVIEW

In this case study we look at the production and processing of cardamom (*Elettaria cardamomum* Maton) in the High Ranges and Nelliampathy hills in the state of Kerala, India. At present virtually all produced cardamom is grown in managed forest plantations. Some 90% of the households in the study area are involved in production or processing of cardamom in some way or other, deriving most of their cash income from cardamom. Of the cardamom produced, most is sold dry as a food additive while a small percentage, mostly of poor quality, is processed further into oil, oleoresin, medicinal preparations and ground cardamom (powder). The growing of cardamom involves the use of chemicals, disturbance of undergrowth and shade regulation. Still, the cardamom agroforests are considered less detrimental to the local ecology than most alternative agricultural land uses. Further expansion of the growing area in the natural forest is prohibited by strict and enforced regulations.

INTRODUCTION

Cardamom through the ages

Since time immemorial India has been known as the land of spices, and cardamom is the most important spice the country produces and trades. Its known history dates back to first millennium B.C., when the ancient Assyrians, Egyptians, Arabians, Mesopotamians and Chinese established a wide network of trade arrangements for cardamom and other spices with India (Mitra 1987).

It was the Indian spices, particularly cardamom and pepper, that attracted Europeans to this part of the Asian continent. This subsequently led to the opening of a sea route from Europe to the East around the Cape of Good Hope, which was first used by Vasco de Gama in 1498, the first European to arrive in India by this route. Traders from the ancient Indian ports of Alleppey, Cranganore and Calicut were already shipping cardamom to Arabia and Europe. Competition among European forces to acquire supremacy over the spice trade with India resulted in many a battle leading to the rise and fall of empires. Cardamom has been, over the centuries, a witness to vigorous political activities staged among Western forces and between them and the East.

Today the most common use of cardamom is as a food additive, and it is also widely used in Indian medicine. Essential oil and oleoresins extracted from cardamom are used as food additives and in medicines and cosmetics.

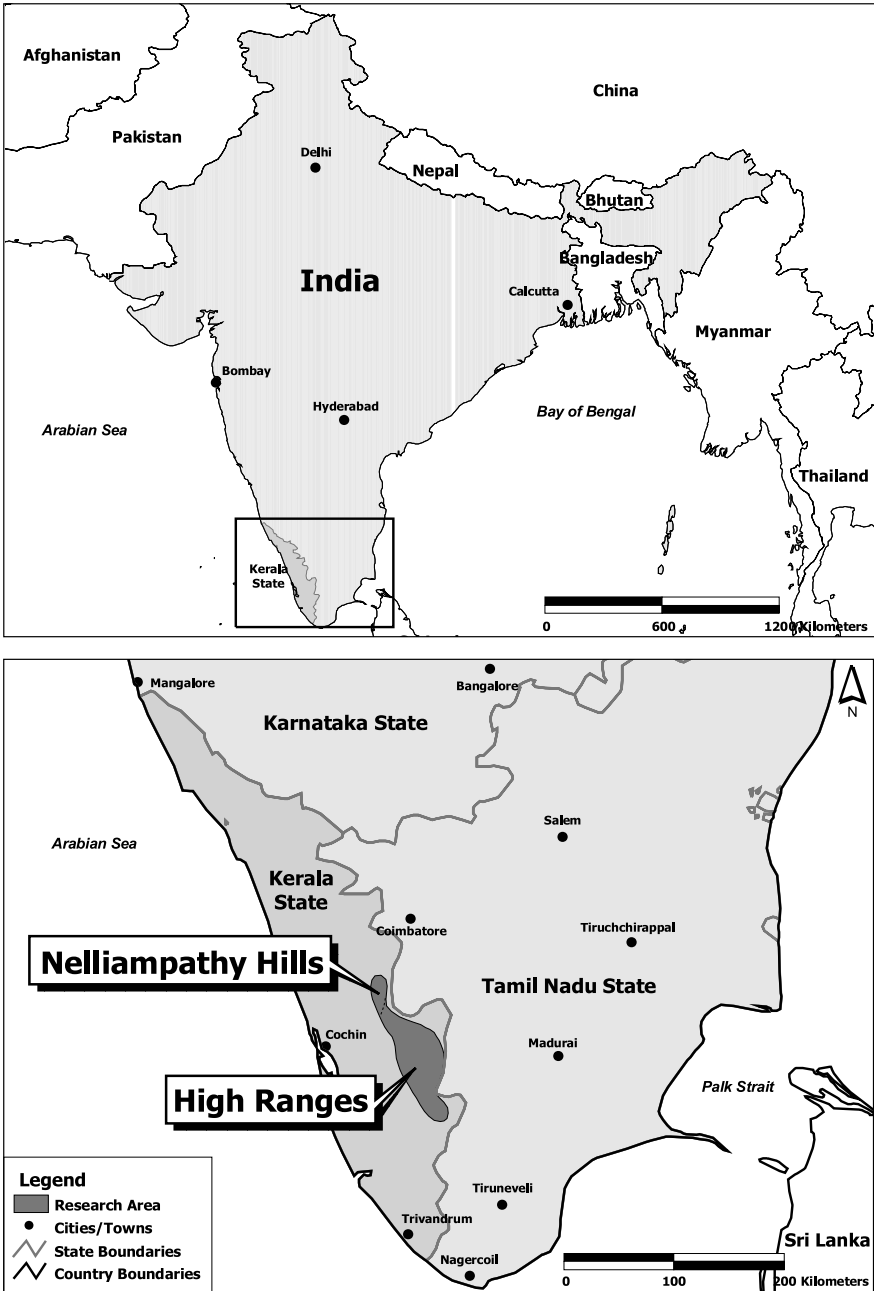
The study area

The cardamom zone, the area in India where cardamom naturally grows and is commercially cultivated, is located in the forest belt of the Western Ghats mountain range. Of the cardamom zone, 60% lies in Kerala, 30% in Karnataka and 10% in Tamil Nadu (APK 1999). The study area (Figure 1) is located in the state of Kerala, in south-west India. In Kerala, cardamom is cultivated mainly in the High Ranges of Idukki district, in the Nelliampathy hills of Palakkad district, on the Wynad Plateau in north Kerala and in Kochu Pamba in Pathanamthitta district. The High Ranges and the Nelliampathy hills, constituting 85% of the cultivated area of Kerala, are taken as the study area (GOK 2000).

The forest in this area can be classified as primary tropical rainforest, disturbed to a certain degree because of shade control, tillage, soil improvement activities and removal of rank weed growth. The soils are deep, well drained and rich in humus, and belong to the group of Ultisols. The climate is warm and humid with a mean annual temperature of between 10°C and 30°C and a mean annual rainfall varying from 2,500 mm to 3,850 mm, which falls mostly from the end of April through December. The study area terrain is highly undulating with good drainage and an elevation ranging from 600 m to 1,500 m a.s.l. Thinly populated, the study area has a total population of 78,061 in an area of 350 km² (GOK 1996, 1998; GOI 2001). The cardamom zone, in particular the study area, is fairly well served by a network of roads; the average distance to a trafficable ('vehicle worthy') public road from any raw material production holding is estimated at only 2 km.

Human settlements in the cardamom zone could be called cardamom villages. About 90% of the households of the study area are in one way or another connected to the production, processing and/or trade of cardamom. Of the total number of households in the study area, 50% can be classified as cardamom labour households, while 40% are producers and/or involved in the cardamom trade.

Figure 1. Map of the study site



Source: ESRI Data and Maps 2002.



(*Elettaria cardamomum*)

THE PRODUCTION-TO-CONSUMPTION SYSTEM

Cardamom: a description

Small cardamom, scientifically known as *Elettaria cardamomum* Maton, takes its name from the word *elattari*, which means ‘seeds of cardamom’ in Malayalam, the language of Kerala. The plant is indigenous to the tropical rainforests of the Western Ghats of India and Sri Lanka. It is also cultivated in Guatemala, Tanzania, El Salvador, Vietnam, Laos, Cambodia and Papua-New Guinea. The product is known by different names in different parts of the world. In Italian, Spanish and Portuguese it is known as *cardamomo*. The Arabs call it *hal*, while the Chinese call it *pai-tou-k’ou*. In trade, it is generally known as ‘cardamom (small)’. A sister species, *Amomum subulatum* Roxb., known as ‘large cardamom’, is grown in the Darjeeling district of West Bengal in India, Nepal, and Bhutan. Large cardamom is a cheap substitute for small cardamom. Here small cardamom shall be simply referred to as cardamom.

Cardamom grows in clumps, 3 m to 5 m tall with long, narrow leaves (Photo 1). The normal commercial life of a clump is 10 to 12 years, though the rhizome is almost perennial. Tillers that produce fruits die out within two years of producing new rhizomes and aerial shoots, and so growth is perpetuated (Joseph and George 1998). Cardamom grows best in tropical wet/moist rainforests, deep, fertile soils and around 50% filtered overhead shade. These are the typical local (microclimatic) conditions for optimum growth of the plant, so much so, that it grows well in disturbed primary forests.

Photo 1. Cardamom plant (Photo by K. Kusters)



Flowering normally starts in March to April. The white, violet striped flowers, locally known as *saram*, are hermaphrodite, appear on a long flexible stalk arising from the base of the plant and are pollinated by the honeybee. This characteristic of the species encourages cultivators to practice bee-keeping to increase production. The lowermost flowers open first and develop into fruits. It then takes 75 to 80 days for flower buds to form fruits ready for harvest. Fruits are small and ovoid in shape, with a green leathery husk. Each fruit has many small, round, dark seeds inside, covered by a thin layer of pulp. Propagation is mostly through tillers with rhizomes. In its natural state, in the undisturbed primary forests, the population density of cardamom is low, ranging from 250 to 300 clumps per hectare. As a result, productivity from undisturbed primary forest is low.

Management practices

In the study area, 99% of the cardamom produced comes from managed cardamom lands on which cardamom plants are planted. Management systems range from small forest gardens with a few plants to large intensively managed plantations. Plant density on holdings varies from 1,200 to 3,000 per hectare, 1,600 on average. Around 40% to 45% of the cardamom holdings are under intensive management in its strict sense, which means fertilisers and pesticides are used on a regular basis and irrigation is applied. Other growers apply chemicals irregularly and irrigation is partial or nil. In intensively worked

areas productivity has been increased up to 1,000 kg/ha/yr. However, the average yield in such areas can safely be taken as 400 kg/ha/yr, whereas the yield from ordinary cardamom lands is approximately 125 kg/ha/yr. A relatively small portion (less than 20%) of the growers can be classified as marginal cardamom farmers, which means they have a financial resource crunch that restricts them from intensive cultivation. Smallholders usually keep 10% to 30% of their land for cultivation of other agricultural crops (intercropped with cardamom in agroforestry gardens), as an additional safeguard to spread their risks in case cardamom prices drop.

Till the 1960s, cardamom was propagated mainly from seed, but now only tillers are planted. The Indian Cardamom Research Institute, Myladumpara, and the Indian Institute of Spices Research, Calicut, have done elaborate work on the improvement of planting material and have developed a number of varieties that are high yielding and reasonably disease resistant (Spices Board 1999). The latest scheme is to propagate using tillers (rhizomes with aerial shoots) selected from superior individuals with proven qualities. This has the advantage that the planting stock already has a mature root system enabling early and easy establishment. Offsets are cheaper than seedlings or plantlets. New plants will have all the characteristics of the mother plant and will bear fruits earlier than those originating from seedlings or plantlets. The latest tiller cultivars in the field are reasonably disease resistant, high yielding and early bearers, but demand higher inputs. They readily respond to fertiliser application and irrigation. Higher expenditure on inputs is then adequately compensated by higher production (KCPMC 2001). Tillers are collected at the beginning of the rainy season from 'superior' type plants in the same or different plantations and are planted in pits immediately after collection. Management further requires periodic shade control to the desired level by lopping branches of trees and the replacement of dead, low productive and diseased plants with new ones. Applying manure, weeding, forking³, trashing⁴ and the application of fungicides and pesticides to all plants are conducted periodically (Spices Board 1997). The cardamom plant is susceptible to fungal and insect attacks, the worst problem being a fungal disease called *katte*. Fungicides and pesticides are applied whenever deemed necessary. Irrigation is beneficial during hot months and in low rainfall areas and may increase productivity by 50%, but only the intensively managed plantations have irrigation facilities, to varying degrees.

Mature cardamom plants flower and fruit every year and the harvesting (picking) season extends from May-June to November-December depending on local conditions, especially the availability of water. In irrigated areas the harvesting season is likely to be extended to 8 to 10 months. Fruits are collected just before they are fully ripe, because fully ripe fruits may split and lose the much-desired green colour on drying. Only mature fruits are picked, which are at the bottom end of the panicle (fruit stalk). In normal plantations the harvest is spread out over a number of pickings at intervals of 14 to 21 days. There are about seven to eight pickings per year. With intensive cultivation using high yielding varieties, manure application, irrigation and plant protection, the number of pickings will increase.

Cardamom is cultivated on private lands or in areas that are leased out by the government for cardamom production. Local tribal communities harvest wild cardamom in areas that are not specifically designated for cardamom production, but this activity constitutes less than 1% of total production of cardamom in the study area (FWLD, GOK 1999). The state government has given tribal communities permission to collect wild cardamom on certain conditions, from time to time. As this cardamom, from undisturbed forests is not contaminated by chemicals (fertilisers, pesticides and fungicides), it is valued more highly for some medicinal preparations.

Cardamom producers

Cardamom producers—the holding-owners with a lease or ownership title to their land—are a diverse group in terms of the size of the holdings (Table 1). The producers are the ones making financial and technical investments in their cardamom lands. Cardamom cultivation is highly labour intensive, the average annual requirement of labour per hectare being 444 workdays. Most producers hire labourers to assist them, but small owners do a considerable amount of the work by themselves.

Table 1. Pattern of cardamom holdings in study area

	Holdings							
	<2 ha		2-20 ha		>20 ha		Total	
	No.	Area	No.	Area	No.	Area	No.	Area
Nelliampathy	28	29	47	398	27	2,522	102	2,949
Idukki	15,383	12,561	3,661	13,920	77	5,526	19,121	32,007
Total	15,411	12,590	3,708	14,318	104	8,048	19,223	34,956

Source: APK 2001.

In 1998, the average annual income for a plantation owner household was US\$3,408.⁵ The average value of the annual production from intensively managed plantations was US\$4,912 per hectare, total expenses amounting to about US\$2,717 per hectare per year. Under less intensive management systems, the value of the average annual production of 1 ha was US\$1,535, with total expenses of US\$1,087.

To increase their inputs growers can avail themselves of financial assistance from various public and private financial institutions. All producers who have legal rights over their holdings can get financial assistance subject to the usual restrictions put forth by the financial institutions. However, not all farmers go in for finance for various reasons. Some of the chief factors determining whether a farmer will go in for high investment through interest bearing loans are the geographical location of the plantation (e.g.,

the location's potential for responding to treatment), the readiness of the grower to take risks related to financial credit (mental preparedness of the farmer to take out a loan) and the grower's socio-economic situation.

Cardamom producers occupy the upper strata of local society financially, socially and politically. Most are reasonably well educated: 83% of the owners of more than 20 ha and 73% of the owners of less than 2 ha have at least passed middle school (Joseph and George 1998). On a national scale producers enjoy an upper middle level status. Some owners and workers have become people's representatives in the *Panchayat* (a local self-government administrative unit comprising a group of villages) and state legislature. There are a number of technocrats and bureaucrats among them. A few large owners are non-resident producers and have other agri-horticultural businesses or other occupations elsewhere.

Box 1. Financial assistance

The Spices Board, a government institution, has come up with several promotional measures to help those in the field. Financial institutions like the National Bank for Agricultural and Rural Development, Village Co-operative Banks, Industrial Development Bank of India, Industrial Finance Corporation of India and local private financing agencies are also in the field of helping producers, processors and traders. There are several schemes for aiding replanting, irrigation, plant protection works, fertiliser application and the building of infrastructure for processing and trade.

Cardamom workers

Workers on cardamom holdings are generally better off than their fellow workers in other agricultural fields. The harvest season itself extends to more than 210 days and hence a worker is assured of employment almost throughout the year, while in other agricultural sectors the average number of workdays per year may be only around 90 to 130. This keeps cardamom workers at an advantageous position much above their fellow workers. The annual income of a cardamom worker also is higher than that of other agricultural workers. A cardamom worker's annual household (consisting of two workers) income is approximately US\$904 (89% of which is derived from cardamom related activities alone), while that of the general household (consisting of two workers) in the study districts is only US\$729. Approximately 75% of cardamom workers are women. Planting, harvesting and cleaning are dominated by female labour, while men dominate in shade control, pitting, soil conservation works, drying and rub cleaning.

Because the study area is thinly populated, holders rely partially on imported labour from neighbouring areas (seasonal labour in-migration), especially in the peak season (roughly from July to October). Also, temporary

labour is imported from adjacent areas for highly skilled work such as shade control, which needs to be carried out every few years. Approximately 43% of the total workforce in the study area is seasonal.

Primary processing

Harvested fruits are sent for primary processing (curing/drying) immediately after harvesting. Primary processing is an integral part of the production process as fruits in the raw form will start to decay within two days. Of the producers 85% have their own facilities for curing, the remaining 15% use another producer's facilities, on a payment basis. The primary processing consists of five stages: preliminary cleaning, drying, rub cleaning, final cleaning and grading, and packing. Harvested fruits are first cleaned removing parts of inflorescence and then taken to the drying unit, which mostly uses firewood to produce hot air. Dried fruits are brought out while they are still hot and the fruits are rubbed till the chaff is separated from the fruits (Photo 2). Winnowing to remove any further waste material is the final cleaning process for cardamom. Because of a shortage of firewood and out of environmental considerations⁶, some producers have begun using other fuels (e.g., oil, LPG, and electricity) for primary processing. The process of improving dryers and rub-cleaning machines is ongoing through trial and error. Some of the newly developed drying units are superior to firewood units in terms of ease of use, speed of drying and quality of end product.

Photo 2. Manual rub cleaning (Photo by T.K.R. Nair)



Final-cleaned fruits are graded using sieves and also by separation by hand of substandard ones in terms of colour, size and shape. Graded cardamom is packed in double gunny bags with a coloured polythene bag in

between. These are then sent to auction centres and entrusted to auctioneers approved by the Spices Board. Some owners send their produce to auction centres without final cleaning and grading. In such cases the auctioneers will arrange cleaning and grading at the owner's expense.

Of the total cardamom production, 95% is sold after primary processing (in the cured fruit form) as a food additive. The remaining 5%, particularly lower quality cardamom, is used for secondary processing.

Secondary processing

In the secondary processing sector essential oil and oleoresins are extracted and the dried cardamom is ground into a powder. All three products are used in the preparation of medicines. Until recently the extraction of the essential oil and oleoresins was done by distillation. Now, 'supercritical fluid extraction technology' is being used in most of the processing units, using carbon dioxide as the solvent for extraction. The processing industries involved in the extraction of the essential oil and oleoresins from cardamom usually process several raw materials, cardamom being only one of them. These industries are medium-scale, technologically intensive and require high investments. At present there are 23 such units in India, 18 of which are located in Kerala.

There are also smaller industries, where dry cardamom is husked and ground into powder, sieved and packed for the market. In addition to medium and large units with mechanical production systems, there are a large number of small home-level producers of medicine throughout the country using cardamom⁷. Kerala alone has 888 such medicine-producing units (Thomas 2000).

Box 2. Extraction of oil

The oil content of cardamom is around 7% of dry weigh. The oil content of the seeds does not depend on the grade of the fruits, which is based mainly on shape, size and colour. Fourteen kilogram of dry fruit will give 1 kg of oil. Cardamom oil is valued at US\$118 per kilogram. The average price of low quality fruit is only US\$6.54 per kg. The percentage of oleoresins and other derivatives distilled from cardamom oil does, however, vary.

Trade and marketing of cardamom

Most holding-owners sell their cardamom at public auction through auction houses registered with the Spices Board, which arrange the auctions at specified times and days. There are 296 registered (first order) traders in India, 118 of whom are in Kerala. About 30 to 50 registered traders take part in each auction. The producers can sell their product to any trader. The sale

value is paid to the producer within 21 days after the auction. If any delay occurs, the producer is entitled to interest as well. The producer has to pay 1% of the sale value to the auctioneer as a service charge and US\$0.02 per kg to the Welfare Fund. If by chance a producer's product is not sold at auction, the material is returned within three days and the producer is at liberty to offer it again for sale. A prospective seller may withdraw his produce from sale at any time before the conclusion of the sale.

Only about 5% of the cardamom produced in India is exported (Table 2), most of it going to the United Arab Emirates, Saudi Arabia and Japan, while the domestic market consumes the rest. A simplified trade diagram, representing the most important trade channels, is given in Figure 2. The bold arrows represent the bulk of the traded cardamom. There are more than 500 retailers in the study area and the number of retailers in India is well above 50,000. Producers also sell their produce directly to traders at negotiated rates. These traders may or may not be registered with the Spices Board. The system is locally known as *kaivella vyaparam*, meaning 'hand-to-hand trade'. This type of marketing takes place only rarely as the price obtained is less than that at auction and payment is not guaranteed. These are arrangements made between two individuals without adequate legal cover, based on mutual trust. Hence payment in time or quantum has no guarantee. But when immediate cash is required, this system may be helpful. These traders sometimes extend financial help to the producers for cultivation and processing and usually sell the material to second order traders or retailers. Less than one percent of the product is marketed in this way.

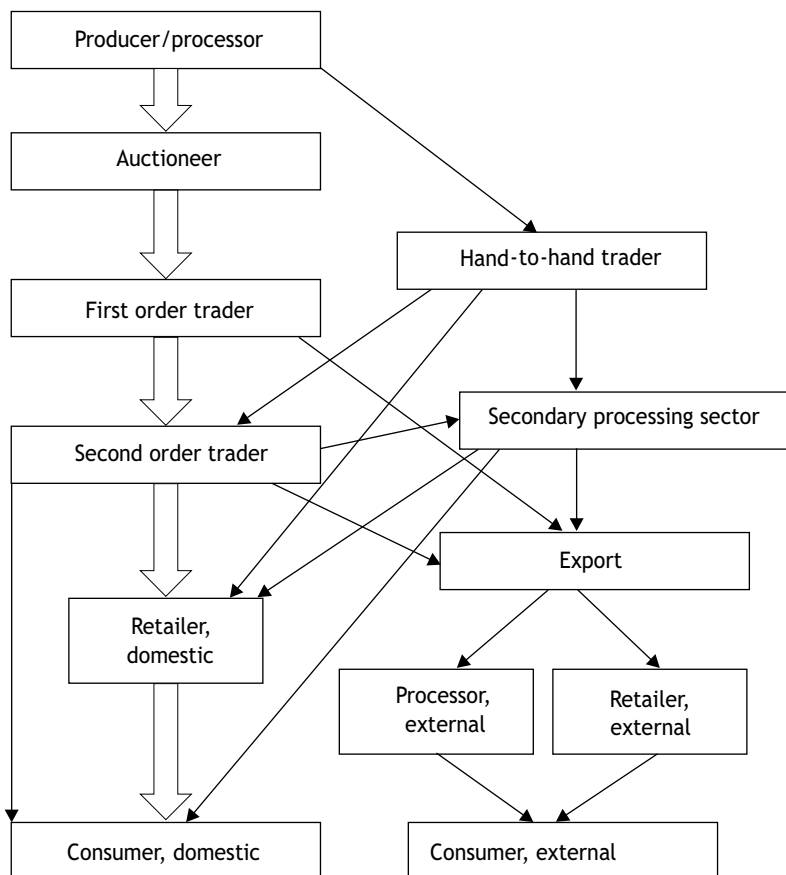
Table 2. Production, export and value of cardamom (small) in India

Year	Production (tonnes)	Export (tonnes)	Export value (US\$million)
1988-89	4,250	785	2.55
1989-90	3,100	175	0.68
1990-91	4,750	400	2.36
1991-92	5,000	540	3.39
1992-93	4,250	190	1.63
1993-94	6,600	385	3.16
1994-95	7,000	255	1.66
1995-96	7,900	527	2.82
1996-97	6,625	226	1.89
1997-98	7,900	370	2.75
1998-99	7,170	476	5.49

Sources: Ministry of Commerce, Government of India/Centre for Development Studies, Trivandrum, India Association of Planters of Kerala, <http://indianspices.com/html>

Policy regulations

The entire forestland cultivated with cardamom in the study area had been under government ownership until demand for land for cardamom cultivation increased in the latter half of the nineteenth century. The government started to assign or lease out a major portion of its forestland suitable for

Figure 2. Trade diagram

the cultivation of cardamom since it wanted to encourage cardamom cultivation in a systematic manner. Some areas were given on permanent assignment while others were on lease for different periods. Today, 69% of the area cultivated with cardamom in the study area is under private ownership, assigned by the government, and 31% is state owned, but on lease. Both assignments and leases are governed by a number of regulatory conditions. Cultivators are not authorised to cut or remove the tree growth or switch to another crop without prior permission from the government. These restrictions are to protect the tree growth and to eliminate the chances of the area being cleared⁸. Before 1980 people were allowed to extend cardamom production in forest areas if approved by the state government. Since cardamom is by and large a rather remunerative crop, there was a tendency to open up more and more fresh areas for its cultivation. The government of India did not want to sacrifice any more forest areas and therefore introduced the Forest (Conservation) Act in 1980, banning the use of fresh forest areas for non-forestry purposes including cardamom cultivation.

Box 3. Organisation of producers, workers and traders

Cardamom producers are well organised and have formed various organisations, of which the most important ones are the Cardamom Planters Association (over 60 years old), the Kerala Cardamom Growers Union (since 1974) and the Cardamom Growers Association (since 1992). Of the producers 98% are members of one or another formal organisation, registered with the government. All workers are members of a labour organisation backed by a political party—so much so, they enjoy a lot of political support and possess considerable bargaining power. First order traders have also formed various organisations. Active ones are the Small Cardamom Traders Association (64 members), the Cardamom Merchants Chamber (32 members) and the Thevaram Cardamom Chamber (200 members). Second order traders and retailers are members of local and state merchants associations.

The state government has also taken several measures to protect the interests of cardamom growers. In May 1971 the government of Kerala took over all forests possessed by individuals and companies without paying any compensation and free of all liabilities. These forests thus got the status of government forests. Forest areas principally cultivated with cardamom were exempt from such vesting. Thus, the owners could retain the land because of the presence of cardamom on it. Another concession was granted under the Kerala Land Reforms Act (introducing restrictions to the maximum size of certain agricultural holdings per household to 6 ha) in order to exempt cardamom growers from the land ceiling. The government makes loans and extends subsidies to the cultivators for planting, infrastructure development, water harvesting and the purchase of fertilisers, manure, and plant protection chemicals. Besides this, the government provides technical support through its R&D network.

With the expansion of the market within and outside the country it became necessary to insist on quality control for the product. In order to maintain the traditional quality of the Indian cardamom, and in keeping with modern developments in the standardisation of agricultural products, the Government of India introduced Cardamom Grading and Marketing Rules (Agmark, a symbol of assured quality) in 1962. There are 30 grades for cardamom fruits, 3 for seeds, and 1 for powder (ground cardamom) (Spices Board 1996). The grading of cardamom ensures the quality of the produce, resulting in higher returns for producers. It also encourages producers not to harvest immature fruits.

Box 4. Cardamom exploitation versus selective logging

Logging of timber in natural forests has been prohibited in Kerala since 1987. Only trees that are dead, fallen or standing but dangerous to human life and property may be felled. Nevertheless, it may be interesting to (hypothetically) compare profits from selective logging with those from cardamom cultivation. As per silvicultural principles applicable for selective felling in rain forests, which is usually advised in such forests, following a 30-year felling cycle with an upper ceiling limit of 25 m³/ha, the annual working area is limited to one-thirtieth of the total extent. The maximum volume of timber that could be harvested from 1 ha of forest would be 25 m³. Considering an average price of US\$270 per cubic meter of timber (mainly low priced semi-hardwoods) and taking a forested area of 30,000 ha, the value of total annual removal would be US\$6.75 million. Compare this to the gross annual income from cardamom if the tract is left for production of cardamom alone, which would amount to US\$46.05 million.

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS**Dynamic changes**

Till the end of the nineteenth century cardamom was not cultivated. It was then purely a forest product of natural origin, and tribal communities residing in the forest used to collect, dry and sell or barter wild cardamom thus collected. Local rulers and chieftains developed the earliest regulations, according to which the produce could only be sold to particular agents. These agents, with prior permission from the local ruler, traded with retailers or foreign buyers on behalf of the local ruler. Since the late nineteenth century the demand for cardamom, and its value, has increased considerably, which led to its 'scientific' cultivation, initially by the British, who were the first to start cultivating cardamom in an organised and systematic manner. At present cardamom can better be designated as an agricultural product since the bulk of it comes from cultivated lands and not from forests as a wild product.

Increase in production and trade of cardamom had a positive impact on the lives of the people associated with it. Major auction centres have been developed during the last 20 to 30 years and presently the economy of the study area depends largely on cardamom. Over the last three decades there has been an appreciable increase in the use of cardamom, in both domestic and international markets, and this trend is continuing.

Conversion of cardamom lands by smallholders

As per Kerala Land Utilisation Order, the conversion of a cardamom crop into other crops without prior permission from the government has been deemed illegal. However, because of the fluctuations in market prices and

the occurrence of diseases, some of the small farmers (especially those with privately owned land) have shown a tendency to switch clandestinely to other crops such as coffee, rubber or pepper. Many of these farmers have experienced that the fate of the alternative crops is not much different and that cardamom does not return easily after lands have been cleared. Farmers have also attempted mixing cardamom with other crops like coffee and pepper, but these attempts have not been very successful because cardamom is highly sensitive to its environment and treatments: it requires 'near natural forest' conditions in and around the growing area and small changes in the microclimatic conditions can destroy a cardamom crop. Excessive removal of shade and clearance of surrounding forests also have an immediate negative effect on the cardamom plant.

The switching of smallholders to other crops has resulted in a reduction of the area under cardamom. At present few cardamom farmers switch to other crops because prices are reasonably steady, varieties that are better resistant to pests and diseases are available, and farmers have access to plant protection techniques. If the price decreases, however, illegal conversion can be expected to increase again.

Possibilities for further development of the cardamom sector

Even though demand is still rising, no further forest area in India can be converted into cardamom plantations because of the restrictions introduced through the Forest (Conservation) Act of 1980. This makes an increase in production possible only through enhancing the productivity of existing cardamom plantations. Attempts to increase production have been successful, as total production has risen while the area under cardamom has decreased. Still, there are several ways in which production, processing and marketing can be further improved.

Conservation of microclimatic conditions, timely application of appropriate fertilisers, plant protection chemicals and sufficient water are essential for optimum production of cardamom. Though organic manures and pesticides are more eco-friendly, experience shows that by themselves these are inadequate to keep up or increase production levels. Judicious combinations of organic and chemical manures and fertilisers have to be further developed if the progeny is to be continued. Improvement in primary processing techniques is necessary, since the curing of cardamom requires huge quantities of firewood, which is becoming scarcer by the day. As per studies conducted by the Regional Engineering College, Calicut, 1 kg of firewood is required for drying 1 kg of green cardamom. Substitutes like oil, electricity or solar power are needed and in a few cases producers have already turned to the use of diesel and electricity. As cardamom areas are bestowed with bright sunshine it should be possible to make use of solar energy for curing work. Also, improvements are possible regarding the storage of cardamom. As production and price are subject to large-scale annual fluctuations, it would be helpful for producers and traders if it could be held in stock for a longer duration, waiting for better days. Cardamom can retain its qualities (e.g., its green colour, which is very important in the market) for more than a year if stored properly. Finally, there should be

a vigorous search for new uses and markets for the product. In this regard it may be of interest that Japanese consumers prefer lower quality (less colour, shrivelled and less than 400 g to a litre) cardamom called the 'sick variety'.

Socio-economic importance

In the study area, vigorous agricommercial activities associated with cardamom production, processing and trade have caused fast development of the tract in all aspects. Locations that even in the recent past were mere forest camps for transit storage of wild gatherings have grown into townships with all modern amenities including technical higher education and health care facilities and a good network of roads, which is reflected in the lifestyle of the people as well. These developments can be attributed mainly to the commercialisation of cardamom. Had the product not been so valuable, perhaps the present 'cardamom villages' would have remained remote forest camps without modern facilities and high standards of living. In the present situation, cardamom production—being economically more feasible than production of other agricultural crops or logging—provides the livelihoods of the majority of the population in the research area. The collapse of this sector would render thousands of people jobless and result in a social and economic crash of the study area.

Environmental considerations

The intensive management of cardamom causes disturbance to the ecosystem by way of clearance of under-storey and middle-storey vegetation, shade control through the cutting of branches, removal of trees and climbers undesirable to cardamom cultivation, and widespread application of chemical fertilisers and pesticides. Heavy demand for firewood for drying cardamom has also had its impact on the environment. However, as cardamom does not tolerate exposure beyond a certain limit—it needs specific microclimatic conditions and its favoured habitat is primary forest with 50% filtered high shade—lopping of trees has a built-in limitation. Furthermore, it is only the fruit that is harvested, which causes no harm to the individual plant or to the environment and there are no organisms that depend solely on cardamom. The fauna is less plentiful in cardamom forests than in undisturbed forest areas because of constant disturbance and application of chemicals such as fertilisers and pesticides. But cardamom does not exclude wildlife altogether and several species seem to enjoy the additional water and forage facilities available in cardamom plantations. The sambar deer, several monkey species, the great Malabar squirrel and a large variety of birds have been spotted in cardamom estates in Nelliampathy and the High Ranges.

Natural cardamom occurs in the undisturbed rainforest and moist forests of the Western Ghats, one of the well-known ecological hot spots of the world. If original natural vegetation is considered the benchmark of environment, managed cardamom plantations definitely have a negative effect on the ecosystem and regional landscape. However, managed

plantations came into existence more than 150 years ago and disturbance to the primary ecosystem can therefore be taken only as a *fait accompli*. If this argument is accepted, the eco-friendliness of cardamom has to be viewed from a different angle. Had there been no cardamom, the present cardamom lands would have been utilised for alternate purposes, namely, cultivation of mono-crops like rubber, coffee and tea or even for human settlements, resulting in greater environmental deterioration. Considering this scenario, managed cardamom plantations have a positive effect on the ecosystem, insofar as their presence helps to ensure that the current condition of disturbed primary forests is maintained and the environment is protected from further degradation. Further, there are strict regulations against the extension of cardamom plantations into fresh forest areas and cardamom plantations that border natural forests function as a buffer helping to prevent illegal activities such as logging and encroachment. Growers are legally bound to inform the forest department about illegal activities and have an interest in protecting neighbouring natural forests, because degradation of these forests would disrupt the microclimate necessary for cardamom production.

ENDNOTES

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3. 'Forking', the raking of soil to a depth of 9 cm to 12 cm to a distance of 90 cm around each plant, promotes root proliferation and better growth of the plant.
4. 'Trashing', the removal of old tillers, dry leaves and leaf sheaths, improves the hygiene of the plantation.
5. Exchange rate 1998: US\$1 = Rs46.
6. Cardamom is highly sensitive to the environment and its impacts. If the local environment is damaged, it will affect the performance and very existence of the cardamom crop itself. Therefore the producer who is keen to get maximum net returns from cardamom will be interested in maintaining the tree cover.
7. Cardamom is an ingredient in many Indian medicines, ranging from medicated oils to concoctions and powders.
8. As a result, fuel wood has become a rare commodity, which in turn has stimulated the use of alternative fuels for cardamom processing.

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Chapter 10

Benzoin, a resin produced by *Styrax* trees in North Sumatra Province, Indonesia

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Common names	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Kemenyan, Benzoin, Haminjon toba	Resin	Cultivated	High	International	Medium

OVERVIEW

Sumatran *benzoin* is a resin produced by *Styrax* trees, managed in forest gardens in the highlands of north Sumatra. The resin is used in incense, perfume and pharmaceutical preparations and as a flavouring agent. Trade with foreign countries has existed for over a millennium, first with China and later with Arab countries and Europe. The economic and cultural roles of *benzoin* have undergone major changes in the last few decades. Previously *benzoin* gardening was considered a high status activity which generated high income and made farmers proud. Nowadays some villages have abandoned the practice as other more profitable cash crops have displaced *benzoin* as an income source. The younger generations perceive *benzoin* cultivation as a backward activity, preferring to work in their annual crop gardens or for wages. Nevertheless some farmers remain attached to *benzoin* as they recognise it as the product that gave life to their settlement and provided the means to educate generations of relatives. From a conservation point of view, *benzoin* management represents low-intensity disturbance of the ecosystem and allows the effective accumulation of a forest species while maintaining the forest environment.

INTRODUCTION

Benzoin, a resin produced by several species of *Styrax* trees, is used as a component in incenses, perfumes and medicines. In South East Asia two types

of this resin are produced: Siam *benzoin*, extracted from *Styrax tonkinensis* in Laos, Vietnam and southern China, and Sumatran *benzoin*, extracted from *Styrax paralleloneurum* and *Styrax benzoin* in Sumatra, Indonesia. In the ninth century both types of resin were already being traded in China and used as components of traditional medicine (Sumatran *benzoin*) and perfumes (Siam *benzoin*) (Hirth and Rockhill 1911). Arabs introduced the resin to Europe around the fifteenth century and were instrumental in the expansion of its trade as it was fast becoming one of the most expensive trade products from the East (Burkill 1935). This study focuses on Sumatran *benzoin*, which has the bigger market share of around 4,000 tonnes per year compared to 70 tonnes for Siam *benzoin* (Katz *et al.* 2002), though Sumatran *benzoin* is less valued on the international market.

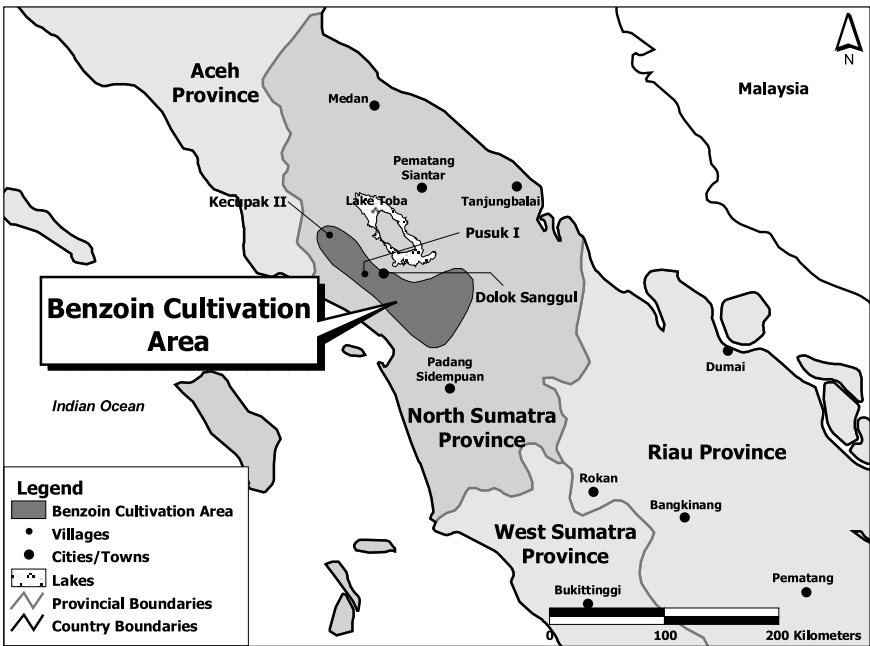
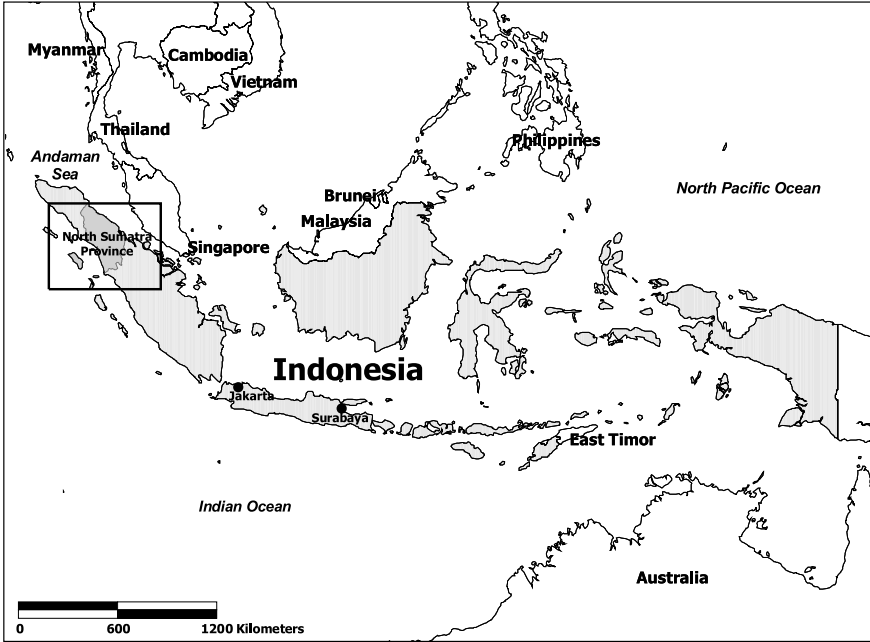
The resin has been extracted for centuries from wild trees that occur naturally on Sumatra Island, and as the market expanded local people started to plant *benzoin* trees in their gardens. It is not clear when cultivation began but it has existed for at least 200 years (Marsden 1986). The management system was already described in Dutch reports in the late nineteenth century, and today's practice does not differ much from the one reported then. These accounts mention *Styrax benzoin* Dryand as the main cultivated species, as its resin was considered to be of better quality and more fragrant. The area then under cultivation reached into the Sumatran lowlands, but nowadays *benzoin* is cultivated only in the highlands (700 m a.s.l.) of North Sumatra province (Figure 1) inhabited by the Batak ethnic group. The dominant species is *Styrax pararelloneurum* Perk, a forest species.

In the Indonesian language *benzoin* areas are called *kebun kemenyan*, which means 'benzoin garden', but the plantation structure is closer to secondary forest, where *benzoin* tapped boles are easily recognisable. The cultivation area covers around 20,000 ha between 700 m and 1,400 m above sea level, 87% of which is in the district of North Tapanuli (Perkebunan 1996). The road network in the region has grown considerably in the last few decades, and most *benzoin* resin is transported south on the Trans-Sumatran highway for over 2,000 km from the town of Dolok Sanggul to Java (Muhtaman *et al.* 1998). Some *benzoin* is transported to the North Sumatra provincial capital of Medan, wherefrom it is shipped to Singapore or Java.

The original submontane and montane broadleaf and *Pinus merkusii* forests have a long history of conversion to agricultural uses and cattle grasslands (Boomgaard 1994). *Benzoïn* gardens not only play an important role as forest remnants in an area where major land use changes are taking place, but also represent an important source of income for around 18,000 households in over 100 villages in the region.

Incense, which is the main use for the resin both in Indonesia and internationally, is used in traditional ceremonies and rituals as a link to the spiritual world, especially so in Java and Sumatra. Buddhists, Christians, Hindus and Muslims in religious ceremonies burn incense with *benzoin* resin among its components. Even so, few consumers would recognise the original product extracted from the trees. *Benzoïn* incense is rarely pure as factories mix it with *damar* resin (from *Shorea spp.*) and other ingredients to make incense blocks, which burn more slowly and reduce the final price (Katz *et al.* 2002).

Figure 1. Location of the study area



Source: ESRI Data and Maps 2002.

In Central Java there are a few local industries that still produce a traditional cigarette called *Klembak menyan*, smoked mainly by older men (Goloubinoff 1998), the main components of which are tobacco enriched with *benzoin* resin, *klembak* (*Rheum officinale*) and cloves (*Syzygium aromaticum*). *Benzoin* resin is also used as a flavouring agent in the clove cigarettes industry, which represents an important national market. In 1993, 140 billion cigarettes were produced in Indonesia (Tarmidi 1996). It is also used in pharmaceutical preparations as an expectorant tincture for bronchitis and laryngitis, and as an antiseptic to prevent infections (Burkill 1935). The resin is also an important component of traditional Chinese medicine (Coppen 1995). In the area where it is cultivated people use it for stomach ache and skin diseases, and local shamans burn it during curing ceremonies (Katz *et al.* 2002). Nevertheless, the number of applications of *benzoin* as a component of Western medicines has decreased as synthetic products are replacing many natural substances. The same situation is also true for the perfume industry.

The research reported here started in 1996 and was completed in 2000. The teams involved in the study covered different areas of expertise in order to get a global view of the current situation of the *benzoin* system. Two villages were selected as subjects of in-depth studies, Kecupak II in Dairi district and Pusuk I in Tapanuli Utara district, both in the province of North Sumatra (Figure 1). These villages were chosen to represent a cross-section of *benzoin* cultivating communities. In Pusuk income from *benzoin* still plays an important role in the village economy, while in Kecupak *benzoin* is a marginal activity as other cash opportunities are available (Table 1).

Table 1. Characteristics of study area village (Extracted from Lutnæs and Løken 1999)

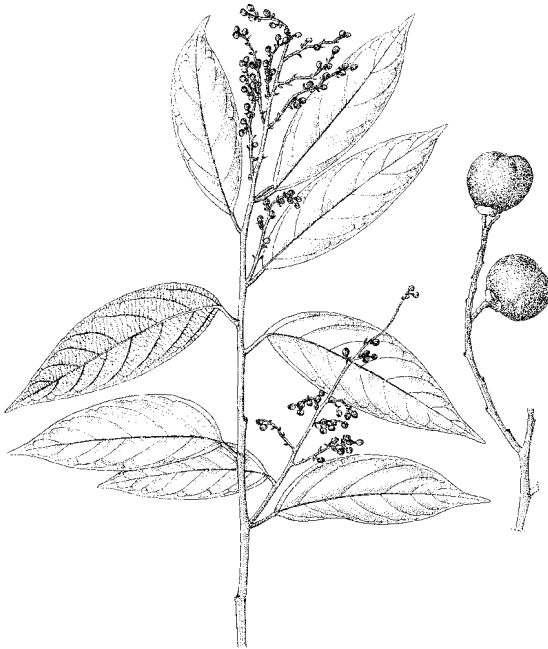
	Pusuk I	Kecupak II
Number of households	330	170
Village extension (ha)	3600	1100
Altitude (m)	1100	950
Sawah (wet ricefield) extension (ha)	300	55
Ladang (fallow land) extension (ha)	250	110
Benzoin gardens extension (ha)	700	108
Active benzoin households 1988 (%)	82	48
Active benzoin households 1998 (%)	76	17

THE PRODUCTION-TO-CONSUMPTION SYSTEM

Species ecology

Styrax is a genus with 120 species distributed over Asia, Europe and America. They are evergreen trees of medium size, up to 35 m tall and 100 cm in diameter. Leaves are simple and alternate, with bisexual flowers disposed in terminal to auxiliary inflorescences, and globular fruits, rarely dispersed by

animals, usually with only one seed (Hoesen 2000). Sumatran *benzoin* resin is extracted from *Styrax paralleloneurum* and to a lesser extent *Styrax benzoin* trees. According to farmers *S. paralleloneurum* needs shade during the first stages of growth and is therefore planted under forest cover. The tree grows well in irregular terrain. *S. benzoin* on the other hand is planted in dry rice swidden in flatter areas with good drainage.



(*Styrax paralleloneurum*)

S. paralleloneurum (the species on which this report focuses) flowers from May to August. Flowers are bisexual, small and disposed in racemes or panicles. Farmers use flowering together with leaf colour as indicators to determine whether trees are ready to be tapped. Fruiting lasts from July to December, mature fruits are globular or oblong berries, 2 cm to 3 cm in diameter. *S. benzoin* flowering and fruiting are not periodic, and thus flowers and fruits are found all year round.

Benzoin resin is an exudate produced when the cambium is wounded, most probably from newly formed cells at the end of rays in the xylem (Hoesen 2000). The resin is soft and sticky when collected from the trees, melts easily when heated and has a pleasant smell with a touch of vanilla. *Benzoin* trees can be used only for temporary construction, as the wood is rather soft and non-durable. It has a coarse grain and a density of 470 kg/m³ to 710 kg/m³ at 15% moisture content (Hoesen 2000). Rather than cutting trees that have become unproductive with age, most farmers prefer to abandon the area as *benzoin* is of cultural importance and the trees are believed to be inhabited by spirits.

Garden management

S. pararelloneurum Perk (*haminjon toba* in Batak Toba language) propagules are planted under forest cover. Farmers select a plot ranging from 1 ha to 3 ha in primary or old secondary forest and clear away small and medium shrubs and trees by slashing with a machete. According to the farmers, the gardens are established during the rainy season, preferably from seedlings. Planting material is collected from other gardens, from the best parental trees. Seedlings have to have at least two leaves, be below 50 cm in height and be young enough to avoid root damage and to facilitate transport to the new location. Seeds are also used for propagation as they can be easily stored for a longer period. Farmers collect seeds from old gardens and submerge them in water, discharging those that float. However, few farmers choose the option of using seeds for planting.


The garden is weeded every two to three years until tapping commences, when weeding becomes an annual activity. Tapping starts when the trees are 7 to 10 years old, coinciding with the first flowering, and can continue for 60 years if the trees are kept in good condition. Farmers frequently plant other species besides *benzoin* as part of a *benzoin* garden to provide additional food for the household. Some of the species planted besides *benzoin* are *petai* (*Parkia speciosa* Hassk.), *jenkol* (*Pithecellobium jiringa* [Jack] Prain) and some fruit trees like mango (*Mangifera indica* [Dalz.] Airy Shaw) and *rambutan* (*Nephelium lappaceum* L.). During the tapping and harvesting seasons a farmer usually stays for several days in a hut near the *benzoin* garden (away from the family home). Bananas, chilli plants and other food plants are usually grown close to the huts. At lower altitudes farmers also grow some other species like coffee (*Coffea* spp.), cinnamon (*Cinnamomum porrectum* Kosterm.) and rubber (*Hevea brasiliensis* [Willd. ex A. Juss.] M.A.). Although these species also have a commercial value, *benzoin* remains the main cash crop in the garden. Farmers favour the growth of wild species with subsistence value, for example, species that can be used for their fibres or medicinal properties.

Plantation density varies widely ranging from plantations like G1, with an average density of 500 *benzoin* trees per hectare to forestlike gardens (G3) with around 250 *benzoin* trees per hectare on average (Table 2). Along this exploitation gradient the decrease of *benzoin* density implies the gain in density of other tree species and therefore in species richness.

The tapping and harvesting of *benzoin* trees

Benzoïn trees are tapped once a year and up to three flows can be collected, the first of which provides the highest quality resin. Not all the trees in a garden are tapped depending on the farmer's cash needs and the trees' physiological condition. For example, trees that, for whatever reason, have not changed their foliage throughout the year and trees that have just recently changed foliage are not tapped. Farmers generally will not attempt to tap a tree that is not yet ready, according to their criteria, as doing so may result in the death of the tree, but some overexploit *benzoin* trees by increasing the number of wounds per tree. This results in a weakening of the tree, which then becomes more susceptible to disease.

Table 2. Average values for some variables in the different structural groups of gardens along a gradient of exploitation (G1 to G3)

			
	G1: Plantationlike gardens	G2: Gardens with intermediate characteristics	G3: Forestlike gardens
<i>Benzoin</i> dbh ^a ≥10 cm (trees/ha)	477	357	270
Other trees dbh ≥10 cm (trees/ha)	113	263	318
Tree species richness ^b (1,000 m ²)	26	41	44
Labour input (hour/ha*year)	447	245	166

^a Diameter at breast height.

^b Considering all diameter classes (dbh ≥ 2 cm).

Once a *benzoin* tree is selected farmers clear away small to medium size trees and shrubs within a 1 m radius of the tree to facilitate access, reduce competition for nutrients, increase light etc. The tree's bole is then cleaned of mosses and lichens and dead bark removed from the wounds of the previous year, collecting the last flow of resin. An adult tree receives between 20 and 30 wounds, in two to four rows. Ropes of sugar palm fibre are used to climb to a height of 5 m to 6 m (Katz *et al.* 2002). Additional care includes cutting dead branches and the removal of parasitic plants from the branches as they damage the *benzoin* bark, resulting in a decrease in production (Jayusman *et al.* 1998).

Benzoin resin is harvested manually using simple tools but the activity requires skills to climb the trees (Rohadi 1999). The first flow is collected three months after tapping. Farmers know that a tree produces around 200 g of high quality resin for the first flow, while second and third flows produce a little less. For a good producer the figure can go up to 500 g, depending largely on the farmer's management practices. The production per hectare per year ranges from 40 kg to 120 kg for *takasan*, the first flow. On average a farmer can collect between 2 kg and 3 kg of resin per day, a full rattan basket, or *bakul*. Jayusman (1997) gives higher values of 300 kg of total resin per hectare and 6.45 kg to 7.5 kg of resin collected per person per day. Production can be increased by changing the commonly practised tapping technique from vertical incisions, which on average yield 11.9 g per incision per year, to horizontal ones yielding 15.6 g on average (Sasmuko 1999).

The *benzoin* management system implies a transformation of the natural forest in its structure and floristic composition. Three main groups of gardens can be discerned, with density, diameter and height of *benzoin* trees progressively declining from G1 to G3 (Table 2), marking a clearly defined structural gradient along the three groups. At the same time, the higher

Photo 1. Farmer climbing a *benzoin* tree to collect resin (Photo by E. Katz)



the density of *benzoin* trees the lower the density of other trees with a diameter at breast height of 10 cm or more in the garden. These differences in structure are strongly correlated with management activities. Management practices also determine diversity levels in gardens, with species richness increasing as intensity of management (defined as density of trees plus man-days of management per year) decreases (Table 2). The *Benzoin* management model implies frequent (annual) but low intensity disturbance, especially in gardens in G3. The removal of competitor species around selected *benzoin* stands by machete allows species with vegetative growth a means by which to persist in the garden. This will influence not only the garden diversity but also the diversity value of the resultant secondary forest, once management stops, with diversity values similar to those of primary forest (García-Fernández *et al.* in press). No studies have been conducted on the impact of *benzoin* gardens on animal populations, though it is most probably negative as farmers are in the habit of putting traps close to their gardens to capture birds and monkeys, among others, to sell in city markets.

Box 1. Wild benzoin

Wild *benzoin* trees are locally exploited in some areas of Sumatra. The first farmer to tap a wild tree gains the property right to it. Production, as described by farmers, is significantly higher for wild trees approximately 20 years old. With the first tapping it is possible to collect up to 5 kg of resin compared to 0.5 kg from a top producing cultivated tree. The explanation given by farmers is that wild trees are more vigorous because, unlike cultivated trees, they have not been tapped annually since they were 7 to 10 years old. Nevertheless the amount of resin collected from wild *benzoin* trees is negligible and impossible to track down in the production system.

Socio-economic context of raw material producers

The economic role of *benzoin* in the study area has declined over the last few decades and it is currently facing some challenges that may have an important impact on the future of the system. Up to the early 1970s *benzoin* production was considered an activity with a good profile, providing high income and well perceived socially. Cultivation of more profitable annual cash crops and the loss of market value have slowly undermined *benzoin*'s position. While in the early 1970s 1 kg of high quality resin was exchanged for 32 kg of rice, by the late 1990s one needed 2 kg of resin to buy the same amount of rice. Moreover, the younger generation perceives forest activities, including *benzoin* gardens, as backwards and of low status. Few new gardens are opened nowadays and the existing gardens are getting too old to be exploited. To date farmers have opted to rejuvenate gardens by introducing *benzoin* seedlings to replace old trees, with a decrease in total production.

The contribution of *benzoin* to household income can amount to as much as 70% of total income (Rohadi 1998). This value represents one extreme and the average is around 30% to 45% of total income, still a significant share. The middle-income group² has an average annual household income of US\$482³ and *benzoin*'s contribution ranges from US\$144 to US\$216. Money from *benzoin* is traditionally used to pay school fees. In the past when prices were higher it served to put several generations of Bataks through university.

Benzoin exploitation is a male dominated activity. In the case of death of the household head, the wife may get involved in *benzoin* exploitation directly, but as a rule she would rent out the garden. Though women are not directly involved in the exploitation of the resin, they have a very active role in managing the money provided by its trade and in some cases they get involved in trading the product.

Labour inputs vary widely from 15 man-days/year/ha to 120 man-days/year/ha reflecting two opposite ends of the *benzoin* system in relation to its relevance as a source of income. Farmers with a more diversified production system and other cash options are situated at the bottom level of this range. The same is true for low-income households where labour is a limiting factor

and most efforts are directed towards ensuring a good rice harvest. On average, farmers spend 60 days/year/ha on benzoin related work, divided between slashing and clearing away undergrowth and other vegetation, preparation, tapping and resin collection. In a day's work a farmer can tap five to eight trees or harvest 10 to 15 trees since less time is required for harvesting than for tapping.

Trade and Marketing

Benzoin has been traded for centuries. The trade system has developed over this long period of time and remains quite traditional and secretive for some of the processing steps. It relies on trading networks and relationships established over several generations as well as on specific technical knowledge. In Indonesia, several groups are involved in the market chain: village collectors, regional traders, retailers, inter-island traders and exporters (Katz *et al.* 2002). Along this chain *benzoin* resin is sorted and transformed, and the further up *benzoin* moves in the chain the more complicated classification becomes (Goloubinoff 1999). Most farmers do not sort out the resin so lumps of resin of different sizes and flows are mixed. The first flow of resin is collected from inside and outside the wounds and the second and third flows are usually sold together. At the traders' level and without considering the volume of *benzoin* traded, *benzoin* processing may involve sorting or further transformation. In the sorting process resin lumps, once they are cleaned and dried, are separated and classified according to size, quality (according to the harvesting period) and colour. Besides sorting the *benzoin*, some traders, especially the big ones, carry out further processing by shaping the resin into blocks. To this end the *benzoin* resin is mixed with a certain amount of *damar* resin, the mixture rinsed with hot water until it melts, poured into a box and then pressed until it solidifies (Muhtaman *et al.* 1998). Quantity and quality of *benzoin* resin, and the amount and nature of other substances used, will determine the final quality of the block. Most of the industries where natural *benzoin* resin is transformed into blocks are located in Central Java, others are in Singapore and North Sumatra.

Around 120 villages still have productive *benzoin* gardens. The villages have 5 to 10 middlemen, some of whom are also *benzoin* farmers. The total number of village first order traders is approximately 840 and the volume of resin traded is around 300 kg/month/trader.

Village middlemen sell their *benzoin* to district traders or dealers. District traders collect 500 kg to 2,000 kg per month. Their main providers are village middlemen and, to a lesser extent, farmers. Dealers have large scale businesses with 8 tonnes to 18 tonnes per month, which they buy from village middlemen and district traders. At the exporters level, normally several individuals are associated in a joint venture to run the business as large amounts of capital are involved. Most of the resin exported is shipped to Singapore where it is processed before being exported to a third country. A study by the Indonesian non-governmental environmental organisation Lembaga Alam Tropika Indonesia on the *benzoin* market estimated that there are 10 to 15 district traders and dealers, and fewer than five export firms. Farmers are more numerous than traders and have low bargaining power.

Photo 2. The *benzoin* market in Dolok Sanggul (Photo by G. Michon 1997 © IRD)



To estimate the forest product's value in the finished product is difficult in the case of *benzoin* resin. In *Klembak menyan* cigarettes the proportion of the value of the raw material in the final product is around 27% (Alwy and Djatmiko 1999). For incense this calculation becomes harder as the industry is more secretive and the end product is more heterogeneous, involving different amounts and qualities of *benzoin* resin. For the lower qualities of incense, the value of *benzoin* in the end product ranges from 20% to 40%. For special ceremonies incense with a higher content of *benzoin* resin may be burned, in which case the *benzoin* proportion may range from 50% to 100% of the final value, though a realistic average can be established around 60%. Perfumes and pharmaceutical preparations use small quantities of *benzoin* and no estimations for the proportion of raw material value in the finished product were found.

Drying, cleaning and resorting along the trade chain all add value to the product (Goloubinoff 1999). Marketing profits increase as we move up the trade chain and so do the risks. Traders require good technical knowledge of the product, particularly when transacting with sellers, since they have to determine the composition of the *benzoin* mixture they are buying. The ability to estimate quality and quantity of different grades of *benzoin* in a mixture largely determines the buyer's profit (Muhtaman *et al.* 1998). At the farmers' level there are four established qualities based on resin flows and the amount of impurities, whereas at the traders' level one may find up to 16 qualities as more complex criteria are involved in the classification (Muhtaman *et al.* 1998).

The difficulty in entering the trade chain increases as we move up, as larger volumes of resin and capital are involved. Family ties play an important role in *benzoin* transactions as through clan relationships a trader can establish a strong

network of suppliers (Muhtaman *et al.* 1998). Nevertheless the lack of family ties is not a barrier to entry into the business.

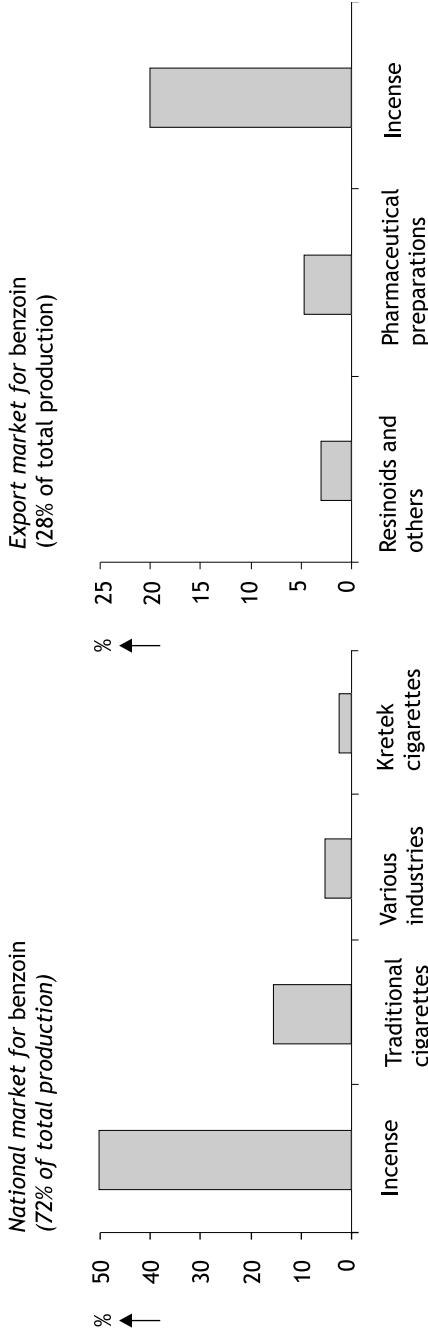
Official data show that 4,970 tonnes of *benzoin* resin from North Sumatra was traded in 1993, of which 4,700 tonnes were produced in Tapanuli Utara district, with a value of around US\$6 million (BAPPEDA 1995). In 1996 Tapanuli Utara produced 4,200 tonnes of *benzoin* resin (Perkebunan 1996). Production in this district dropped further to 4,000 tonnes in 1998, at a value of US\$4,8 million (assuming a price of Rp10,000/kg and an exchange rate of Rp8,300 to the U.S. dollar). The *benzoin* trade volume is decreasing as a result of replacement of *benzoin* with other substances and the erosion of ritual ceremonies diminishing demand for incense, combined with farmers shifting towards other, more profitable activities. Most *benzoin* is used in the production of incense for both the national and international markets (see Figure 2).

Policy Environment

Over the centuries communities have developed various types of communal land management systems, which were regulated by customary laws or rights. These traditional tenurial systems were first overridden by the Dutch colonial government taking control of forestlands in areas that were not under permanent cultivation. After Indonesia's independence a land reform took place, and the new Basic Forestry provisions (Act No. 5/1967) stated that 'all the forests within the territory of The Republic of Indonesia, including the natural resources they contain, are controlled by the state'. The law failed to include customary rights of communities living in forest areas. Local government, however, recognises these customary (*adat*) tenurial systems where the planting of trees indicates tenurial rights and unused land reverts to the state⁴ (McCarthy 2000). Thus *benzoin* trees confer property rights to land where the garden is established. *Benzoin* garden rights include the right to use, sell or rent out the land (in whole or part). Farmers were allowed to use and manage these forests according to their traditional laws even before the forestry reform but ownership of the forests remained with the government. For the time being state and traditional laws coexist without conflict. *Adat* (customary regulations) does not work as a co-operative unit dealing with the *benzoin* market or the establishment of resin quality standards, but as a regulator in conflict resolution and land adjudication. Farmers are well aware of their customary laws, but in some communities these are becoming less respected as the *adat* system is beginning to break down (Michon and Saragih 1999).

There are no formal barriers to impede access to *benzoin* production other than traditional regulations to control access to land. Farmers do not require a large amount of capital to start a *benzoin* garden as simple tools are used and no external inputs are needed. Labour and land availability are the main constraints. The permit to open a *benzoin* garden is in theory granted by the *adat* representative accountable for the forest area where the plot is located. Originally the different clans living in a village owned separate forest areas inside the communal or *adat* forest, but nowadays these forest areas are more heterogeneous and it is possible to find *benzoin* farmers of different clans who have accessed areas by marriage or by purchase of the land.

Figure 2. National and export markets for benzoin (percent of total production)



Source: extracted from Katz *et al.* 2002.

There are few government regulations concerning *benzoin*. The Ministry of Forestry Decree No. 20/1997 established a tax of 6% of the average price at the local level to be levied on forest products including *benzoin* resin. However, this regulation has never been implemented. Farmers have refused to accept it as they consider *benzoin* trees to be within their communal lands, not within public lands, thus *benzoin*, for them, does not belong to the category of other forest products (rattan, bamboo etc.) extracted from public areas (Rohadi 1999). Moreover, regulations at the local level identify *benzoin* as a garden product, and therefore regulated by the Ministry of Agriculture, not by the Ministry of Forestry.

The law allows communities to utilise customary forest management systems as long as they do not conflict with forest sustainability (McCarthy 2000). According to a recent ministerial decree on 'community forestry' (*kepmen* 677/1998), communities could gain rights to manage areas of forest based on community practices and *adat* law. The new legislation has put in place the procedures for gaining community forestry concession rights and co-management strategies, advocated by non-governmental organisations, but they are onerous and therefore unlikely to be extended on a wide scale (McCarthy 2000).

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

Efforts to promote *benzoin* production

Interest in *benzoin* resin conservation and development potential has increased over the last few decades (Simanjuntak 1996; Parsell 2000). Attempts were made to find new end products and to establish processing factories in the raw material area (Edison *et al.* 1983; Sagala *et al.* 1989), but so far results have not materialised. In 1992, a joint venture was initiated to help *benzoin* traders to export the resin to Japan, the Netherlands and France (Muhtaman *et al.* 1998). The program called 'Development of Small Ventures' was still ongoing in 1997 with 3 tonnes exported that year.

Government investments to support *benzoin* production are limited and in most cases have failed because of mismanagement. In 1974 a program to replace old *benzoin* trees was started, and the government provided funds to village co-operative units to support *benzoin* marketing but it failed to follow up (Muhtaman *et al.* 1998). The local government issued soft loans to stabilise the *benzoin* market through the Indonesia National Bank in 1980 and through the Bank of Central Asia in 1986. These efforts met with poor results as the lack of a standardised system for grading resin, resulting in erroneous estimations, and the mismanagement of funds were considered to be the main causes of failure (Muhtaman *et al.* 1998; Rohadi 1999).

Official data indicates a reduction in the number of hectares under *benzoin* cultivation in the study area, as many of the gardens are getting old and unproductive and consequently become abandoned. Few new gardens are being established as *benzoin* prices are not as good as before and farmers opt to plant other more profitable crops introduced to the area in the late 1960s and early

1970s. A few official research institutes and extension offices are trying to promote *benzoin* gardens by introducing programs in which *benzoin* is cultivated with more profitable crops like *gambir* (*Uncaria gambir* Roxb). The Forestry Research Institute in Pematang Siantar has devoted funds to the study of *benzoin* cultivation, exploitation and marketing techniques over the last few years. The research results dealing with planting materials and tapping techniques are to be published in a manual about *benzoin* cultivation (Rohadi 1999).

The future of *benzoin*

The market in *benzoin* for the production of perfumes and medicines is to some extent hindered by synthetic substitutes. It is a relatively small market, however, as most resin is used in the incense and traditional cigarette industries. Both of these uses are also facing challenges. With the modernisation of Indonesian society some of the rituals and ceremonies in which *benzoin* was burned are now considered old fashioned by the younger generation. Because most smokers of *Klembak menyanyan* cigarettes are old people and the younger generation prefers Western style cigarettes, this industry has suffered a major decrease from 70 cigarette factories in the 1950s and 1960s to just 14 at present. The future of *benzoin* depends on the maintenance of traditional ceremonies, where most of the resin is consumed, and on the modernisation of some end uses to enter niche markets for sustainable and organically produced commodities.

Conservation and development lessons

Benzoin gardens are established by local farmers who manage a diverse mosaic of forested and agricultural areas along a gradient of increasing human input. As *Benzoin* gardens are established under forest cover by eliminating competing species and favouring *benzoin* stands, the forest cover is progressively modified. Once management is abandoned, the resultant secondary forest reaches diversity levels close to primary forest. However, species typologies indicate a certain degree of degradation when compared to primary forests. Garden management does reduce biodiversity by decreasing species richness and/or by degrading species composition. But strict conservation that sacrifices basic human needs of the present for those of the future is essentially unfair (Gomez-Pompa and Kaus 1999). Fencing the forest to protect it is a short-sighted strategy to achieve biodiversity conservation in the long run.

The *benzoin* system could act as a complement, rather than an alternative, to protection areas, where local communities are counterparts of the environmental conservation process. This management system could maintain high diversity without compromising ecosystem resilience in the long run. Though farmers' prime objective is to maximise cash income, their management does not have a negative impact from the conservation point of view. In fact, within this regional context, gardens are a good conservation strategy to maintain forest cover, among other things.

At the landscape level, *benzoin* gardens cannot be considered a homogeneous land use, but rather as a range of small units defined by their intensity of use and integrated into a tessellated landscape, which includes primary and secondary forests and non-forested areas. It is within this context that intermediate management systems⁵ are particularly relevant as a conservation strategy to preserve biodiversity in the region, as happens with other systems elsewhere in the tropics (Padoch and Peters 1993; Lawrence and Mogeia 1996; Lawton *et al.* 1998).

The government has paid little attention to this management system, as non-timber forest products are normally given low priority on its agenda. This lack of strategy has neglected a product that offers a sustainable forest management system while providing communities with a source of income. There is scope for a *benzoin* system to be promoted. Recognising the importance of this product over the centuries and its present potential, interest from the research community has risen in the last decade. However, it is difficult to predict the result of interventions if they are not combined with stabilisation of *benzoin* prices, secure land rights and the improvement of the 'image' of forest related activities, which are nowadays perceived as backwards in the study area.

ENDNOTES

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2. Based on Lutnæs and Løken (1999) economic survey households were divided in three categories (low, middle and high) according to their income level, to explore the link between income and dependence on forest products and revenues from *benzoin* trade.

3. Calculated exchange rate (time of the fieldwork 1998-2000): US\$1 = Rp8,300.

4. Local governments do 'recognise' these traditional systems only informally as state law declares that forest areas belong to the state. The local government normally respects these traditional systems but in case of conflicting interests the state always wins.

5. 'Intermediate' refers to forest production systems between 'natural' forest management (basic resource collection in natural ecosystems) and 'plantation forestry' of specialised, intensively managed stands of trees.

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Chapter 11

The marketing of *tout tiang*, a climber belonging to the Urticaceae family, in Lao PDR

*Joost Foppes*¹, *Vannalak Sengsavanh*², *Michael Victor*³,
*Viloune Soydara*⁴ and *Sounthone Ketphanh*⁵

Common names	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Shui-mao-pi, Tout tiang	Bark	Wild	Medium	International	Medium

OVERVIEW

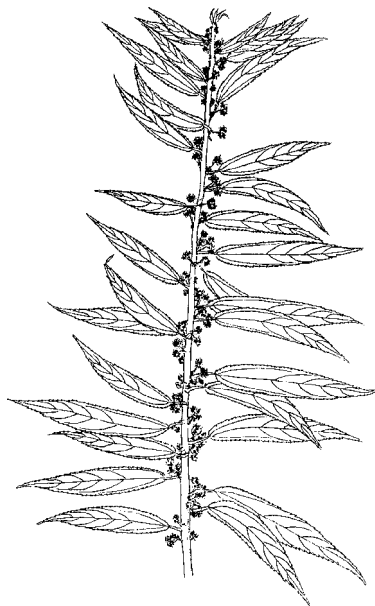
The people from Tat Mouan village in northern Lao People's Democratic Republic (Lao PDR) collect the bark of the climbing shrub locally known as *tout tiang* (a member of the Urticaceae family) from the wild. Marketing started only 10 years ago. Locally established rules and regulations, which state that only the people from Tat Mouan may harvest from its surrounding forest, have not prevented the rapid depletion of *tout tiang* resources as a result of commercial demand. Harvest is driven by the demand from foreign companies that export the *tout tiang* bark to China, where it is used to make glue for incense sticks. Quantities harvested depend on the capacity of the export company rather than resource availability and regeneration capacity. As a response to the depletion of the resource, the farmers of Tat Mouan, in collaboration with a donor sponsored non-timber forest product project, started experimenting with domestication of the product. In this report the production, marketing and surrounding policy systems are described. The main finding is that these systems have failed to provide much incentive for sustainable production so far. The report concludes with several recommendations for sustainable use of *tout tiang* to improve the livelihoods of people in northern Lao PDR.

INTRODUCTION

Tout tiang is the local name for a previously little known climber found in northern Lao People's Democratic Republic (Lao PDR). The species remains to be determined by international botanists. As a member of the Urticaceae

family, it is most likely *Boehmeria malabarica* Wedd, but it could also be *Debregeesia longifolia* Wedd. Since the 1980s the bark of this climber has been exported to China, where it is known as *shui-mao-pi*, a traditional favourite for incense making. The Lao name *tout tiang* is derived from the Khamu language, a large ethnic group in northern Lao PDR. Other Lao names for the product are *nang tiang*, *peuak meua* and *sa phan*.

Non-timber forest products (NTFPs) are an important part of people's livelihood systems in Lao PDR. By documenting the case of *tout tiang*, the authors hope to contribute to the development of sustainable NTFP use systems. Finding an alternative source of income from forest resources, other than timber production, is essential for forest management in Lao PDR for the long term (Foppes and Ketphanh 2000).



(*Debregeesia longifolia*)

Box 1. Trade of NTFPs between Lao PDR and countries in the region

Since the opening of trade with its neighbors, Lao PDR has exported several NTFPs to China, Vietnam and Thailand. Exported products include Chinese cardamom (*Amomum villosum*) and *she hu* (orchid stems) (*Dendrobium* sp.), both used to produce medicines; edible *nor khom* (bitter bamboo shoots) (*Indosasa sinica*); and handicraft products made from khem (broom grass) (*Thysanolaema maxima*) and rattans (*Calamus* spp.), among others.

IUCN-NTFP Project

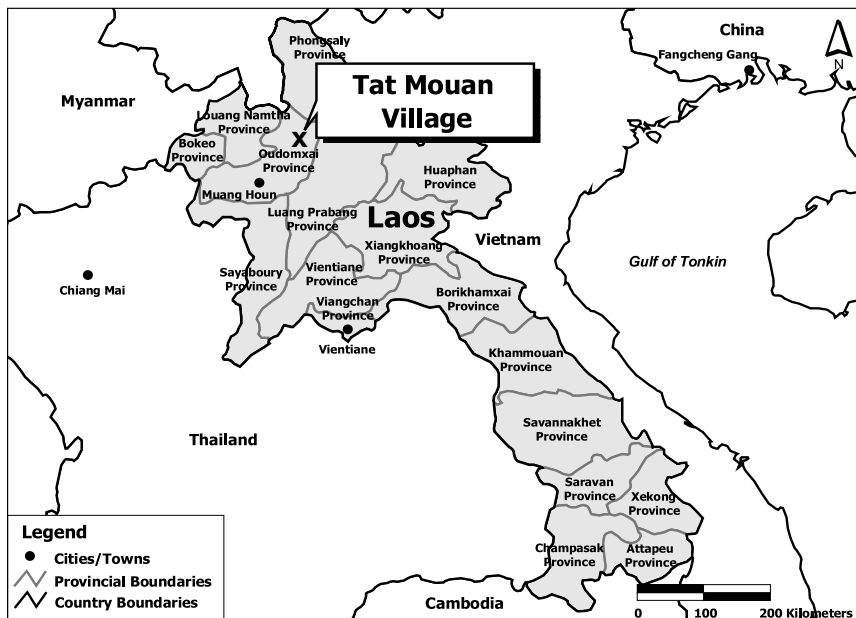
Information presented in this paper is the result of collaborative work between the International Union for Conservation of Nature and Natural Resources (IUCN) and the government of Lao PDR in supporting village communities in Oudomxai Province to improve their *tout tiang* production. The Department of Forestry implemented the NTFP project from 1995 to 2001, with technical assistance from IUCN and financial support from the Royal Netherlands Government (IUCN 2001). The IUCN-NTFP Project generated a number of valuable 'lessons learned' (Nurse and Soydara 2001) from its collaborative work with villagers and government organisations on methods of, and models for, the management of community forests, focusing on sustainable harvesting, domestication, marketing and processing of NTFP. The project operated through three field teams in the provinces of Oudomxai, Salavan and Champasak. These field teams are continuing to operate as permanent NTFP research and extension units of the Provincial Agriculture and Forestry Offices, with research support from the National Forest Research Centre.

Tat Mouan village and surrounding area

Northern Lao PDR is characterised by steep, mountainous terrain. Only 5% of the area has a slope of less than 20%, while 46% has a slope of more than 30%. Its remoteness sustains a diverse range of ethnic groups, biodiversity and ecosystems. With low population densities, the predominant traditional swidden upland agriculture has resulted in an ecologically diverse mosaic of forests and fallow lands. Over thousands of years, a cultural preference for glutinous rice as the staple food has made this area a unique genetic pool of global significance for glutinous, upland rice varieties (IRRI 1998). The main economic crop in northern Lao PDR is opium, cultivated at altitudes above 1000 m. The area bordering on Yunnan province of China, Myanmar and Vietnam shares a diverse fauna and flora, which remains remarkably little studied (Rundell 1999; IUCN 1999).

Tout tiang is thought to have originally occurred in all northern provinces of Lao PDR, but agricultural practices have caused a reduction in the resource in many provinces. The occurrence of *tout tiang* in Lao PDR now seems to be limited to five provinces: Luang Nam Tha, Bokeo, Oudomxay, Houaphan and Phongsaly. Together, these provinces stretch over 61,812 km² and sustain 897,700 inhabitants, 25% of whom are estimated to be actively collecting *tout tiang* bark. About half of the land (31,715 km²) is classified as 'non-stocked forest' (fallow lands, grasslands etc., where trees will emerge later) as a result of shifting cultivation, with (mostly secondary) forests covering about 40% of the area (25,455 km²). The climber *tout tiang* grows only in the immediate vicinity of mountain streams in mature forests. These forests are classified in Lao PDR as upper mixed deciduous forests, characterised by more than 50% deciduous trees and bamboo, an average tree diameter of 20 cm to 30 cm diameter at breast height and tree height of 15 m to 20 m (Manivong and Sandewall 1992). In adjacent northern Thailand, where similar forests occur at elevations of 1,000 m to 1,800 m, they are referred to as hill evergreen forests, characterised by a predominance of members of the *Fagaceae* family (Gardner *et al.* 2000).

Figure 1. Location of the study area



Source: ESRI Data and Maps 2002.

The study area is formed by Tat Mouan village, which is located at $102^{\circ}03'20''$ E longitude and $20^{\circ}54'05''$ N latitude (Figure 1). The village lies in the north-east of La district in Oudomxai province and its land covers 3,796 ha. Tat Mouan lies about 28 km from the provincial capital, Oudomxai, and about 140 km from the Chinese border. The village consists of 38 households with 250 individuals, 113 of whom are females. The population growth rate is about 3%. The villagers belong to the Khamu ethnic group, one of the oldest ethnic groups in northern Lao PDR, whose language belongs to the Austro-Asiatic Mon-Khmer language family. While an ethnic minority on the national scale, the Khamu are by far the largest ethnic group in Oudomxay province (Simana *et al.* 1994). The village is located in a narrow valley where some flat land has been converted to paddy fields. The houses are simple: made of wood and bamboo, with roofing made of fibre, cement, iron sheets, wood or bamboo. Most of the households have enough rice for their daily needs all year round, as only 20% have a shortage of rice for two months of the year—quite a good ratio for northern Lao PDR. Villagers make up the shortage with tubers, bamboo shoots and many other edible products. They also sell forest products to buy rice. Poor families may have to borrow money to buy rice, which often leads to long-term debt because of sky-high local interest rates. The main sources of cash income for villagers are livestock and NTFP.

Activities of the IUCN-NTFP Project in Tat Mouan village

Over the last six years, the IUCN-NTFP Project has been working with Tat Mouan villagers to learn how to improve their income generation and resource management systems. The village was chosen as one of the project's pilot sites because of the abundance of NTFP in the area, the economic importance of NTFP for the village and the interest and willingness of the villagers to work with the project. Besides working on *tout tiang*, the NTFP project also assisted the village with the production and marketing of brooms from *khem* grass (*Thysanolaema*), domestication trials of cardamom (*Amomum*) and the spice *mak khene* (*Zanthoxylum rhetsa*), the organisation of a village rice bank, credit for irrigation expansion etc. This combination of conservation and development activities has added to the body of lessons learned, which knowledge is being used by the provincial and district authorities for extension throughout Oudomxay province (Nurse and Soydara 2001).

THE PRODUCTION-TO-CONSUMPTION SYSTEM

Natural distribution and characteristics of the species

Most of the land surrounding Tat Mouan village is covered by hill evergreen forest. Typical tree species are *Mai deng nam* (*Xylia kerrii*), *Mai ten* (*Duabanga sonneratoides*), *Mai sa ko* (*Anthocephalus chinensis*), *Mai khouang* (*Zanthoxylum rhetsa*) and *Mai ko* (*Castanopsis* sp.). Typical bamboo species are *Mai houak* (*Thyrsostachys siamensis*) and *Mai nor khom* (*Indosasa sinensis*). Most of these forests are secondary. They consist of a mosaic of regenerating forests of ages varying between 1 and over 100 years, as they have all been used under extensive (long fallow) shifting cultivation for centuries. Some patches on steep slopes may never have been cultivated and could be considered as primary forest.

Tout tiang grows only in a narrow band of moist and fertile sandy loam soil around streams, about 50 m to each side of a stream, at elevations of 400 m to 800m above sea level. Knowing the length of the streams we can get a reliable area estimate of the actual production area. There are 18 streams that flow around the village, providing a total production area of 269 ha, or 7% of the total village area, i.e., the forests delineated by the government as belonging to Tat Mouan village. *Tout tiang* grows in clumps of 7 to 10 stems each. The stems can grow to a length of 20 m to 30 m. It needs 40% to 50% shade and will therefore grow under medium tree canopy cover. This plant loves wet places and cannot stand droughts very well. No fungus or insect seems to attack this species.

The villagers of Tat Mouan have observed that ants and birds eat the *tout tiang* seeds, which are very small, like grass seed. These animals may be the main seed dispersers, if propagation from seed takes place at all. According to villagers, the climber seems to multiply itself mainly in a vegetative way from rootstocks. Once established, *tout tiang* naturally grows fast and regenerates rapidly. The new stem emerges from the root of the parent clump underground. In one year a young stem can reach up to 10 m in length, depending on climate and location. It grows more rapidly in the rainy season.

Harvesting practices

Villagers harvest *tout tiang* by cutting the stems 5 cm to 10 cm above the ground. The stem is then pulled away from the supporting trees. Harvested stems are cut into sections of 1 m to 2 m to facilitate transportation. *Tout tiang* can be harvested when it reaches three years of age and its stems have a thickness of 0.5 cm to 1.0 cm. It will regenerate within a period of three years. After transport from the forest to the collector's home, the bark is removed from the sapwood, cut into sections and then spread out to dry in the open air for about a week. The bark is dried until the moisture content is as low as 12% to 15%. The dried bark is then broken into smaller pieces for the convenience of stocking and transporting.

In the harvesting period of 1998-99, around 5,700 kg of dried bark was extracted from the village production area, which averages to 21 kg of dried bark, or about 63 kg of fresh bark, per hectare. Harvesting can take place all year round, but villagers primarily harvest in the dry season from January to April (January and February are the most productive months). This allows the harvesters to sun-dry the *tout tiang*. Assuming that all 38 households participate in harvesting, the average household would harvest 150 kg of *tout tiang* per season from around 7 ha. One person can harvest four clumps per day. If one hectare contains 50 to 75 clumps, the labour needed to harvest one hectare is 12 to 19 person-days. To harvest all 269 ha would require 3,000 to 5,000 person-days, or at least 50 to 85 harvesters over a period of two months.

High levels of harvesting have caused rapid depletion. Villagers estimated that in their area only 50 to 75 clumps per ha remain as compared to 150 clumps in 1995-96, which would mean a reduction of more than 50% in just three years. From the forest survey it would seem that the density is only 18 clumps/ha within the area along the streams, which would indicate that depletion is even worse than villagers have estimated.

A lack of harvesting skills and knowledge of the plant leads to *tout tiang* sometimes being uprooted because the bark is thicker around the roots. This destroys the plant and makes further regeneration impossible. Villagers have also cut the surrounding trees, which has affected both the ecosystem and the regeneration of *tout tiang*. Ecological knowledge about the species is still very limited, and the amount harvested currently depends on the amount requested by local buyers, which results in overharvesting of the resource.

From harvester to consumer

Villagers harvest *tout tiang* only when there is clear demand from middlemen, who in turn get orders from export companies that export the bark to China. Once they receive an order, the villagers organise a village assembly meeting to discuss the amount to be harvested and the rules by which villagers should harvest. The villagers harvest the *tout tiang* and then sell the dried bark to middlemen, who sell it on to export companies. Harvesters normally form teams of two or three persons from different households to undertake the harvesting and processing. The replacement costs for labour involved in collection, drying and packing the raw product add up to about US\$0.11⁶

per kilogram. The product is sold at US\$0.17 per kilogram, which means that village collectors make a net profit of about US\$0.06 per kilogram, or 50% over their labour investment.

Photo 1. Drying of tout tiang bark (Photo by J. Foppes)



Oudomxai province borders China, Vietnam and Thailand. Both the Chinese border crossing at Boten and the Thai border checkpoint of Houay Xay are only 100 km away. For *tout tiang* the main export destination is China, but small quantities may be exported to Vietnam. Transport is by road, on trucks or small hand tractors (Table 1).

In line with the orders from foreign companies, export companies buy the product from local middlemen and sell to foreign buyers. The export company sets the local price and pays all provincial taxes (there are no national tariffs in the case of *tout tiang*), which are often referred to as border handling costs. The profit made from the export of *tout tiang* to China at this point in

the marketing chain, is quite considerable. The export price is US\$0.33 per kilogram, or twice the farm-gate price.

The export company gets a quota from the local government to operate the export of NTFPs. The quota is in essence an agreed target amount for extraction with an agreed tax percentage to be paid to the government institution issuing the quota. Based on the quota, companies set the amount of product they expect to extract and provide advance money to local

Table 1. Routes of transportation and distances from Oudomxai to major markets

Routes	Length of route (km)	Means of transport	Cost of transportation (kip*/km)
Pakbeng-Bokeo/Thailand	100	Boat	100
Oudomxai-China	100	Truck	100
Oudomxai-Vietnam	170	Truck	120

*Average exchange rate in 2001: US\$1 = 9,000 kip.

Photo 2. Collector selling tout tiang bark to a middleman (Photo by J. Foppes)



middlemen to buy the *tout tiang*. Middlemen sometimes deal through other buyers, e.g., a provincial level middleman, who may make similar advances and agreements to buy products from a district level buyer, who in turn may make similar arrangements with a village level buyer. No specific information on the role of such middlemen in the marketing chain was obtained. It is also not visible from Lao PDR how the marketing chain continues past the exporter to its final destination, i.e., the buyer of incense sticks.

Some government institutions that play a role in the marketing chain of *tout tiang* are (1) the Provincial Agriculture and Forestry Office, which is responsible for issuing quotas and has the mandate to manage and promote agriculture and forestry activities including NTFP management, control and monitoring; (2) the District Agriculture and Forestry Office, which implements the policy and strategy of the provincial office at the village level, approves harvesting documentation and collects a forest resource tax of 3% of the farm gate prices; and (3) the Provincial Commerce Office, which collects an export tax of 5% and finally approves the export.

Processing

The only processing steps carried out in Lao PDR are sun-drying and packing in bundles for transport. The processing of the bark into glue, which is used to make incense sticks, is carried out as a home industry in China. It was impossible for the Lao researchers to investigate this part of the production process further; more research is needed to get the full picture.

Local regulations

To encourage sustainable management Lao PDR forestry law mandates that each village establish its own local rules and regulations for NTFP harvesting, producing and marketing. The local people also set the rules and regulations pertaining to forest management, which the village administration authority then approves. The local rules in Tat Mouan prescribe that only the villagers themselves are allowed to harvest and collect NTFPs in the village forest. Whether this rule has prevented outsiders from taking *tout tiang* is unknown. In any case, the rules have not prevented the rapid depletion of *tout tiang* resources.

In Tat Mouan there is a self-imposed 1% local tax on the sale of NTFPs, proceeds of which go to the village development fund. The villagers have used these funds for rural development including construction of a schoolhouse, water pipes installation and purchase of a generator. Funds were not used to reinvest in the resource.

Land allocation

The allocation of land is an attempt by the Lao government to clarify land use tenure rights. This process has been beneficial in delineating permanent agricultural land to individual families, especially paddy fields. But in the context of non-permanent land use, as in the case of swidden agriculture,

the process has not worked so well (Raintree and Soydara 2001). Some of the key issues related to land allocation can be summarised as follows:

- 1) The way the land allocation process has been implemented has led villagers to adopt shorter fallow cycles on a limited area close to the village. This practice reduces the yield of upland rice. So, in a way, this forced move leads to more hardship and poverty as well as increased soil erosion and loss of soil fertility in the affected area (Rodenburg and Phengkay 2000), driving poor families to intensify their collection of NTFPs to sell for cash to buy rice. People are forced to adopt resource depleting survival strategies instead of being encouraged to develop sustainable strategies.
- 2) Being afraid of land taxes and knowing that there is little follow-up to land allocation, local people often do not report swidden fields used, but reserve large tracts of land actually used for this purpose under vague categories such as 'regeneration forest', 'use forest', 'reserve forest' or 'protected forest'. In practice this means shifting cultivation is proceeding covertly.
- 3) The land allocation process does not address NTFP use regulations or intravillage use conflicts on NTFP extraction from shared forestland.

This is not to say that land allocation should be abandoned, but the above issues should be addressed as shortcomings of a process that could be improved. There is much potential for NTFP based land allocation processes, but they require more testing.

Quota policies for NTFPs

All trade in large quantities of NTFPs in Lao PDR is governed by a quota system. Officially, the provincial authorities set quotas each year for all exports from their province, to be approved by the national assembly. Quotas are set on the basis of requests from export companies. The main criteria for assessing the size of a quota are (1) the financial and technical capacity of the company to realise the proposed extraction and (2) the ecological assessment of the amount of product available for harvesting in the province. In practice, provincial and district staff do not have the skills, means or knowledge available to make adequate estimates of the second criterion. Therefore the quotas are mostly based on an assessment of the ability of the company involved to get the proposed quantities out of the forest and out of the country. Similar to the timber quota system, the system of approving these quotas is not transparent and therefore open to corruption (Castren 1999). The situation has worsened since 1999, when the responsibility for checking quotas has been 'decentralised' from the provincial level to the districts. At the moment, no government organisation in Lao PDR is mandated, or able, to provide an accurate cumulative record of NTFP exports from year to year. This lack of record keeping makes it difficult for anyone, including the government, to monitor trends in the production and trade of NTFPs.

The case of *tout tiang* illustrates the confusion caused by the quota system. Because *tout tiang* is little known, there are no national quotas for the product. There are district quotas, but these have not been publicised. The nearness of the collection area to the Chinese border and the ethnic ties between local

residents on both sides of the border (Lao Lue ethnic group) make it easy for Chinese companies to get approval for a quota at the local level through informal contacts with local authorities.

The present marketing system encourages depletive extraction instead of sustainable harvesting, since it is implemented without taking into consideration regeneration capacity. Besides, the system focuses on quantities, not on quality of the product, which drives prices down. The present quota system is open to corruption, prices remain low and village collectors have little chance to get a better grip on the marketing system. The product may become depleted in a few years.

Box 2. Consequences of the quota system for NTFPs

The most important consequences of the present quota system for NTFP exploitation at the village level are:

- There is no incentive for any stakeholder to consider the sustainability of the harvest as an important factor, as quotas are issued on the basis of the potential of the exporting company rather than the availability of the resource.
- Village communities are highly dependent on the companies who obtain the quotas.
- Both companies and the government aim for quantity, not quality of the product. This keeps prices low and makes it all but impossible for village communities to get a better price for a better quality product.

Trade and taxation policies between countries

Another area where policy influences NTFP trade is that of trade and taxation policies between countries. Countries buying NTFPs from Lao PDR—such as Thailand and China—raise little to no taxes on the imports of raw materials. Processed products, however, are taxed in the area of 30% to 40%. These ‘tax walls’ encourage the export of low-cost raw materials from Lao PDR and make it highly difficult for Lao entrepreneurs to add value to products by local processing. Examples of such tax walls were found to exist in Thailand for brooms from *khem* grass (*Thysanolaema*) and for *mak tao*, or tinned sweet sugar palm fruits (*Arenga*). Few data are available on the taxation of incense produced from *tout tiang* bark. In China and Lao PDR incense making is usually a home industry, requiring little mechanisation. Local Lao villages could produce incense without much difficulty, but it is harder to export incense than the raw product to China because it is difficult to find a market and there are export restrictions, e.g., import taxes levied by the Chinese authorities. In practice, Lao villages find themselves limited to producing raw materials for the Chinese incense home industry.

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

Trends in trade volumes

It remains all but impossible to obtain reliable data on the total national exports of *tout tiang* from Lao PDR. Until 1999, some export data were collected at the provincial level, but since then the task of keeping export records has been decentralised to the district level. As a consequence, it is impossible to get reliable estimates on NTFP exports from the Lao government for 1999 onwards. Overall there seems to have been a huge increase in the export of *tout tiang* over the last decade. Exports in 1999, however, were low—a probable explanation being that the 1999 exports were held up because of hidden trade conflicts and sold together with the next harvest in 2000. It is unlikely that high levels of exports can be sustained, as village surveys show a rapid depletion of available resources.

The role of *tout tiang* in the village economy

Whereas sales of *tout tiang* seem to have boomed on a national level in 2000, production in Tat Mouan dropped from five tonnes in 1999 to half a tonne in 2000 (Table 2). The reasons for this drop in production are reduced product availability in the forest and a landslide damaging the road to the village, which made it difficult for traders to visit as frequently as before. With the reduced availability, it is not surprising that *tout tiang* has lost importance for family cash income vis-à-vis other NTFPs.

Table 2. Production of *tout tiang* in Tat Mouan village, 1997-2001

	1997-98	1998-99	1999-2000	2000-01
Harvested amount (tonne)	5.9	5.7	0.6	0.6
Income (US\$)	2,135	2,063	253	190

From Rapid Rural Appraisal data collected in 1996, NTFPs seem to provide 80% or more of all cash income for the village of Tat Mouan. Cardamom was the most important NTFP at the village level in 1999-2000 (Table 3), but this may well have changed⁷. *Tout tiang* provided only 9% of the family cash income from NTFPs in 2001.

Project interventions in the production system

In 2000, as *tout tiang* supplies diminished rapidly, villagers in Tat Mouan requested support from the IUCN-NTFP Project in finding ways to improve the regeneration of *tout tiang*. Analysing the problems together, villagers and staff decided to experiment with methods to increase regeneration. Three methods were tried.

- *Seed propagation.* Seeds were sown, germinated, and then transplanted in plastic bags and kept for three to four months in the nursery before being planted in the field. Seed collection proved difficult because the seeds

Table 3. Income from NTFP for Tat Mouan (38 households), dry season 1999-2000

NTFP	Income (kip)	No. of households participating	Percentage of households participating	Income per participating household (kip)
Cardamom	14,013,000	38	100%	368,763
Brooms	1,876,500	24	63%	78,188
<i>Tout tiang</i>	1,714,200	27	71%	63,489
Handicrafts	919,000	7	18%	131,286
Paper mulberry bark	882,000	24	63%	36,750
Bitter bamboo shoots	764,000	9	24%	84,889
Galangal fruits, <i>makkha</i>	265,500	10	26%	26,550
Forest vegetables	260,000	9	24%	28,889
Grubs (insect larvae)	80,000	3	8%	26,667
Total	20,774,200	38	100%	546,689

Average exchange rate in 1999-2000: US\$1 = 7,624 kip.

are small and have to be collected before the pod dries and spreads its seeds. Germination rates were also low (60-70%). Because of the poor results, this method was discarded.

- *Cuttings*. Stems aged one to two years were cut into 20 cm lengths and put directly in plastic bags full of soil. They were then raised in the nursery for three to four months before being planted in the forest. Cuttings showed over 95% survival rate and grew fast. This method worked so well that it was chosen to establish new gardens and to increase the density of old natural stands. In two years more than 10,000 seedlings were produced. The villagers successfully replanted 2 ha of natural forest in 2000 and an additional 3 ha in 2001, resulting in a total of 5 ha of new plantations. They plan to continue replanting 2 ha to 3 ha each year in the wild and to establish home gardens for individual families.
- *Natural regeneration*. Remaining natural stands of *tout tiang* can be rehabilitated by selective harvesting. Sustainable harvesting means not uprooting any plants, harvesting only two or three stems and leaving at least one stem intact on each clump. This method will allow plants to regenerate quickly. Methods for sustainable harvesting are still being tested.

Both villagers and project staff feel excited about their collaborative research work. Neither the field workers nor the villagers had tried either method with *tout tiang* before, so the experiment was a collaborative learning process for all. It is expected that villagers will share *tout tiang* cultivated in the forest collectively, while individuals can grow it themselves in their home gardens and reap its benefits. Interestingly, two nearby villages have also started their own nurseries, following the success of the Tat Mouan experience.

Lessons

What lessons can be learned from the case of *tout tiang* for conservation and development?

- Uncontrolled market demand for the bark of *tout tiang* led to a rapid depletion of natural stands of this plant. Over three years, villagers observed a reduction of 75% to 90%.
- Participatory technological development is a useful technique to identify sustainable production systems. To be successful it is important that villagers and staff identify activities they can work on immediately and to show linkages between income generation and forest conservation. Activities should be based on local issues and problems, and experiments should be carried out in action research/learning mode. In the case of *tout tiang*, local people and project staff identified an effective and rapid method for establishing nurseries and plantations of *tout tiang* within one year. They also identified potentially effective sustainable harvesting systems and an accurate method for identifying suitable areas for enrichment planting and new plantations. Various criteria for monitoring the resource status were also identified: off-take per village and density of stands.
- Participatory technological development could be used to build a sustainable production system, with positive off-spins for forest conservation and the well being of the village community. Yet local communities need other incentives in the field of land tenure, market systems and capacity building to enable them to adopt truly sustainable production systems.
- Some issues of land access and tenure make it difficult for local communities to adopt sustainable management: (1) the present regulation leads to short-term rotating cycles on a limited amount of land, which reduces rice production, making local people poorer, not richer, by denying them the right to long-term rotating cycles; (2) fear of unfair taxation leads local people to hide land they use from the land allocation process; and (3) hardly any models exist to resolve conflicts on use of forest resources between neighbouring villages. These issues must be addressed to empower local communities to take responsibility for managing their forests.
- The current trade system has a number of flaws that work against sustainable production: (1) Chinese companies easily get approval for a quota at the local level through informal contacts with local authorities, but these quotas fail to take into account the availability and regeneration capacity of the natural resource; (2) without any records on trade volumes and prices it is almost impossible for the government or any other stakeholder to effectively monitor the trade, and (3) tax walls imposed by surrounding countries favour the export of raw materials from Lao PDR and discourage local processing. These issues need to be addressed to enable sustainable production for the long term.
- More capacity building and training is needed. Village communities need to learn how to produce in a sustainable manner. All stakeholders need more marketing and small business skills.

Possibilities for future development

Appropriate technologies for resource management and processing

The case of Tat Mouan shows that it is possible to improve natural stands and to plant new gardens of *tout tiang* rather easily using stem cuttings propagated in nurseries. It also shows that a sustainable harvesting system is possible, where about two-thirds of the stems are harvested. Local villagers need to have knowledge of sustainable harvesting techniques and be prepared to apply them. The feasibility of processing *tout tiang* bark into incense locally in Lao PDR should be investigated further.

Box 3. Sustainable production of *tout tiang* in Lao PDR

How much *tout tiang* could be produced in a sustainable manner in Lao PDR? A rough estimate of the production potential of the five northern provinces can be calculated as follows. In the case study area, 7% of the forest was suitable for *tout tiang*. The average yield of dry bark under depletive harvesting was 21 kg/ha/year, which dropped to almost zero in two years. Based on the villagers' estimates, with optimal management, sustainable harvesting could perhaps be maintained at 7 kg/ha/year. The total forest area in the five provinces covers 2,545,500 ha. The optimal theoretical yield could then be $2,545,500 \times 0.07 \times 7 = 1,247,295$ kg, or about 1,200 tonnes per year. This figure is based on the assumption that all forests are similar to the forests in the pilot village of Tat Mouan. Based on casual observations, the forests of Tat Mouan seem to be of more than average quality. Waiting for more detailed examinations, the Lao government would perhaps be safe to assume a sustainable maximum yield of *tout tiang* of around 400 tonnes to 500 tonnes per year. This amount could be maintained only if all villages throughout the five provinces rehabilitated *tout tiang* stands along the banks of all streams and all villages applied sustainable harvesting systems. Obviously that situation is still a long way off, but it gives us a goal to strive for.

Marketing

To prevent foreign buyers from continuing to control the market, Lao stakeholders in the *tout tiang* trade need to improve their marketing and enterprise skills. It would be helpful to learn Chinese and go to China to learn how the market operates. Government and private trade agencies need to supply local villagers with improved information on the market chain, what the end products are and who the final buyers are.

Government policies

The present marketing system drives local collectors to exhaustive harvesting. To adopt sustainable harvesting methods, local collectors need strong incentives.

The government could develop a quota system based on indicators of sustainable harvesting, e.g., the number of seedlings in a nursery, number of hectare replanted, visual checks on stand quality etc. Quotas could then be linked to producers in villages rather than to export companies. Companies could be asked to provide extension services to spread the practice of sustainable harvesting among villages they buy from. The government needs to develop supportive legislation for such systems at all levels. Adequate systems for monitoring quantities and trade prices should be set up. Government staff need to be trained to work with these systems.

Social arrangements

To promote sustainable harvesting, village NTFP user groups or committees could be established. These associations should have the goal to improve village income from sustainable NTFP harvesting. They should be given the right to sell *tout tiang*, registered by district authorities.

Conclusions

The case of *tout tiang* is a good example of the effects of increased NTFP trade on rural livelihoods and the environment in northern Lao PDR. It points out many of the resource and marketing issues that are occurring in one of the last frontiers of Asia.

The case of *tout tiang* shows how increased market demand can quickly erase an NTFP from the forest. It also shows that local communities have the capacity to solve such problems by experimenting with domestication techniques. As *tout tiang* became quite difficult to find in its natural habitat, local collectors looked for assistance to experiment with domestication of the plant in gardens. Such gardens have a good potential to improve rural livelihoods and forest management, as this climber grows fast and there is a steady market. Furthermore, Lao PDR could develop a sustainable incense industry based on *tout tiang* with positive effects on forest conservation and local economic development.

The rural population in Lao PDR could benefit greatly from the large potential of this and hundreds of other NTFPs, but a number of policy changes and much capacity building need to take place.

ENDNOTES

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6. Exchange rate 2001: US\$1 = LAK9,000.

7. For reasons yet to be understood, the price for cardamom dropped spectacularly from around US\$3.0 per kilogram to US\$1.1 per kilogram in 2001.

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