Chapter 3

Cardamom (*Amomum* spp.) in Lao PDR: the hazardous future of an agroforest system product

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Common names	Part of the resource used	Management	Degree of transformation	Scale of trade	Geographic range
Cardamom, Makneng	Fruit	Managed/ Cultivated	High	International	Large

OVERVIEW

Medicinal cardamom spontaneously sprouts anywhere in Lao People's Democratic Republic (PDR) under the cover of the forest canopy, at elevations upwards of 700 m. Wild cardamom gathering and domesticated cardamom planting take place in traditional agroforestry systems based on shifting agriculture. Cardamom is a non-timber forest product for which the harvesting process tends not only to maintain, but even to augment, yields without any damage to the local natural environment. Cardamom is exported to China and Thailand, where demand is high as it has been for more than a millennium. Curiously, cardamom is not used in the developed herbal medicine of Lao PDR. Cardamom offers the main cash revenue for upland farmers and is second to coffee in value as an agricultural export product. In the government's struggle to reduce or eradicate the practice of slash-and-burn with land allocation policies, traditional cardamom production is now threatened. Furthermore, the land allocation policies result in declining rice yields, thus increasing cash needs of farmers and stimulating both the harvest of wild cardamom from natural forests and intensified production of standardised varieties of cardamom in monocultures. The preference for imported standardised varieties in development projects seems to be leading to imported standardised cultivars being generally favoured over local varieties.

INTRODUCTION

Cardamom, of which there are several species in the genus *Amomum*, is an herbaceous, perennial plant within the family Zingiberaceae (the gingers). It attains a height of one to two meters and is commonly found in humid forest environments in certain parts of Southeast Asia. The seeds of medicinal cardamom (*Amomum* spp.) are highly sought after in Lao People's Democratic Republic (PDR) for traditional Chinese medicine, whereas edible cardamom (*Elettaria cardamomum*), which is valued world-wide as a cooking spice, particularly from the Middle East to India, is not found or known in Lao PDR. Medicinal cardamom is one of those rare forest products of Lao PDR that are produced in sufficient tonnage to easily enter export markets. All production is exported—indeed, there is no domestic consumption—primarily to Thailand and China. The export of Lao medicinal cardamom to China dates back perhaps a millennium. Even though official statistics probably reflect only one quarter to one half of the actual export volume of medicinal cardamom, it is still second to coffee in value as an agricultural export product.

Completely wild cardamom is still found in secondary forests in Lao PDR, but for the last 50 years, certainly, it has been domesticated (i.e., intentionally planted and cultivated), both in the forest and in newly established *ray*[2] (swidden). More recently cardamom has also been cultivated in village plantations, exclusively using cultivars imported from China. In 1997, it was estimated that no more than one third of cardamom production originated from plantations, the remainder being harvested from wild, naturally occurring forest populations. As rural development plantings are becoming productive, it is likely that in 2002 two thirds of the harvest came from plantations.

As a premier, export-oriented non-timber forest product (NTFP) Lao cardamom faces no marketing problems. Light in weight, greedy neither for labour nor for input (investment and chemicals) and environmentally friendly in its exploitation, cardamom has recently been touted as a 'miracle species' across a host of rural development projects. Nevertheless cardamom development in Lao PDR seems to be threatened by land use and tenure policies.

Medicinal cardamom allows us to study the relationship between agroforestry activities and the necessities of forest conservation, as well as the process of domesticating formerly wild-gathered NTFPs. In Lao PDR, such a study allows us to broach the crucial questions of land allocation and land use policies including forest regulatory zoning. Add the 'struggle' against the continued practice of slash-and-burn, and we can examine the aggregate impact of all these factors on the traditional way of life of upland populations.

Research area

Fieldwork on the production of cardamom was undertaken at three sites (Figure 1):

- in the north-east in the *tasseng* (an old, smaller administrative area) of Muang Peu, Viengthong district of Huaphan province, a gathering-only site in a remote mountain area on the Vietnamese border, where the

main ethnic groups—the Tai dai, Tai deng, Khamou and Hmong—practice shifting agriculture and where the population density is less than 3 people per km^2;

- in the far north in Phongsaly district, Phongsaly province, a mountainous area close to the Chinese border where gathering sites—and more recently plantations of imported cultivars—have to compete with shifting agriculture and opium eradication projects and where the population density is about 15 people per km^2; and
- in the south on the Bolovens Plateau in Champassak province, a dynamic and central coffee production area integrated into the international market and the site of long-time domestication of cardamom, where the main ethnic group is the Lao Loum and the population density is about 50 people per km^2, high for Lao PDR.

Figure 1. Map of the study site

Source: ESRI Data and Maps 2002.

THE PRODUCTION-TO-CONSUMPTION SYSTEM

Cardamom

Cardamom can be found throughout Lao PDR at elevations upwards of 700 m. It sprouts spontaneously under cover of the forest canopy. The botanical literature contains only superficial studies on wild cardamom. In the field, the basic distinction is made between green cardamom, *Amomum ovoidum*,

which has an ovoid seed capsule and small spines or thorns, and cardamom proper, which is less widely distributed and smaller and has a round, slightly wrinkled capsule containing red seeds. There also exists a 'black cardamom' in the northern region of Phongsaly, and in the south of the country another species occurs, *Amomum kravanh*, which is common in Cambodia.

(*Amomum villosum*)

Cultivated cardamom, with red fruits borne in a smaller capsule, has been encountered for the past 40 years on the Bolovens Plateau (Photo 1). It is closer to the so-called 'Chinese cardamom' (*Amomum villosum var. xanthoides*), a cultivar recently imported for rural development projects from the Xishangbanna Botanical Garden in southern China, about 60 km from the Lao border. The fruit may vary a lot from village to village, however, and identification remains difficult (Table 1).

All species of cardamom are happiest in secondary forests, near watercourses, at altitudes between 700 m and 1400 m. Cardamom demands consistent rainfall of about 100 days of precipitation annually and a highly humid environment. Notwithstanding the full sunlight in new *ray* fields, as on the Bolovens Plateau, cardamom prefers shady sites. The ideal temperature for cardamom is around 19°C to 22°C, and the plant does not tolerate temperatures below 12°C. The best soils for cardamom are those rich in organic material with a pH of between 5 and 7, fairly acidic to neutral (Zhou Shouqing 1993; Xishangbanna Tropical Botanical Garden 1999).

Photo 1. Cardamom on Bolovens plateau (Photo by J. Pollini)

Table 1. Cardamom in two villages on the Bolovens Plateau

Conditions	Ban Houaychiate, Pakxong	Ban Kouangsi, Bachieng
Altitude	1,000 m	350 m
Relative humidity	80-90%	60-70%
Mean temperature	27°C	25°C
Average rainfall	3,000-4,000 mm/year	2,000-3,000 mm/year
Size and appearance of cardamom fruit	Big, elongated, hairy, thick-skinned	Small, round, short hairs, thin-skinned
Dry weight of one *touque** of fruits	1.0-1.2 kg	1.5 kg
Quantity of capsules per *touque*	visibly more	visibly fewer

*One *touque* is equal to about 20 litres.
Source: Aubertin 1998.

The mature plant attains a height of 1.5 m to 2 m, with a foliage breadth of about 1 m. Its elongated, pointed leaves range in length from 15 cm to 40 cm and have a width of about 3 cm. The coveted seeds are about 3 mm in diameter, enclosed in an egg-shaped capsule about 2 cm in diameter. These are borne on stolons several centimetres below the soil surface. The roots are relatively shallow and rarely extend below a depth of 10 cm. Stoloniferous propagation occurs naturally. Certain insects are recognised as pollinators of cardamom species including *Apiscerana indica, A. dorsati* and *Nomia strigate*. The plant flowers from April to June.

One hectare of wild cardamom can yield about 50 kg of whole (i.e., in capsules) dried fruits. This is of course an extrapolation since under natural conditions there could never be a full hectare of forest entirely occupied by wild cardamom. A single plant yields approximately 50 capsules, amounting to about 10 g to 50 g per year. Under plantation conditions, the yield may attain 200 kg/ha/year, and Chinese farmers have obtained yields as high as 750 kg/ha/year. The feasibility of new cardamom cultivation projects is ordinarily predicated on the basis of expected yields around 100 kg/ha/year.

Cultivated cardamom plants produce their first fruits in their third year, and annually thereafter. The yield generally increases until somewhere between the 8th and 10th years, when normally a figure of 100 kg/ha/year is achieved, and then begins to diminish. It has ordinarily been the practice of cardamom cultivators to uproot or destroy plants upon reaching their 15th year and to replant the site with new cultivars, not necessarily including cardamom. This practice follows the traditional rhythm of long-fallow slash-and-burn. On the Bolovens Plateau within secondary forests, however, it is common to see cardamom plants that were planted as long as 40 years ago, but which are still yielding in the order of 20 kg/ha/year.

Gathering

Cardamom is harvested at the end of the rainy season, during the break just prior to the rice harvest (a period of labour availability), if weeding of cleared lands is finished. The entire village may participate in the harvest, which is done at the family level; for example, some 70% of the families in Muang Peu and some 30% of the families in Phongsaly are involved in picking capsules. In Lao PDR cardamom gathering is primarily the work of males, and in Muang Peu about 60% of the harvesters were men or boys. There are no special rites or ceremonies associated with the cardamom harvest.

In the less populated regions cardamom gathering takes place over two to four days per year. According to the time available to each individual and to the likelihood of encountering the best plants, villagers devote between half an hour and eight hours per day to seed-gathering. An individual harvester may amass, on average, between 2 kg and 3 kg per day, for a seasonal total of between 5 kg and 20 kg (Schlemmer 1999).

Often it is the village chief who signals that the time for harvesting cardamom has arrived and who organises the harvesting groups, but sometimes villagers also gather cardamom in a more dispersed manner because 'there isn't enough cardamom for everybody'. In another village, however, this same rationale may be given for a more collective mode of cardamom gathering.

Recently we observed at our three field sites a tendency towards premature harvesting of cardamom to avoid the possibility of neighbouring villages helping themselves first, although prematurely harvested fruits are smaller and of lower quality. Normally, villagers have customary harvesting rights within the village forest, but a new system of forest classification nominally prohibits harvesting within conservation zones, which are no longer under anyone's accountability or responsibility.

If the cardamom harvest is done carefully by using a knife to detach mature fruits, leaving in place undeveloped fruits and refrain from uprooting the plant, it remains uninjured and its capacity to produce new shoots is actually promoted. Harvesting and some rough weeding around each plant are the only conservation measures ordinarily taken. Thus cardamom is one of those rare species of NTFPs for which the harvesting process tends not only to maintain, but to augment the yield. Cardamom is also considered to be an excellent cover crop in terms of soil erosion protection and for its ability to choke out undesirable plant growth.

Culture

Cardamom culture requires neither particular onerous input nor much labour. The land simply needs to be prepared and then weeded from time to time. When the cardamom culture is established within *ray*, i.e., at the same time as the land is prepared for upland rice and various other vegetables on a parcel of land that has been slashed and burned, it is difficult to distinguish the specific labour requirements of cardamom. Studies show a 30 man-days/ha/year requirement for an average yield of around 30 kg/ha/year on the Bolovens Plateau. For cardamom under monoculture plantations, as promoted in development projects, approximately 100 man-days/ha/year are required (Table 2).

Table 2. Labour requirements for a cardamom plantation project in Phongsaly

	Man-days/ha/year
Planting seedlings	10
Weeding	60
Harvesting	30
Drying (with dryer)	1
Total	101

Source: Pelliard and Ducourtieux 2000.

For the cardamom projects in Phongsaly (i.e., in cardamom plantations established from the Chinese varieties) the Xishangbanna Botanical Garden in Yunnan supplied the initial cultivars, but thereafter the plantations used new shoots for extending the project. The Chinese varieties are considered less tolerant of full sun than the varieties planted on the Bolovens plateau. The plantation density norm is one plant per square meter, i.e., about 10,000 plants per hectare.

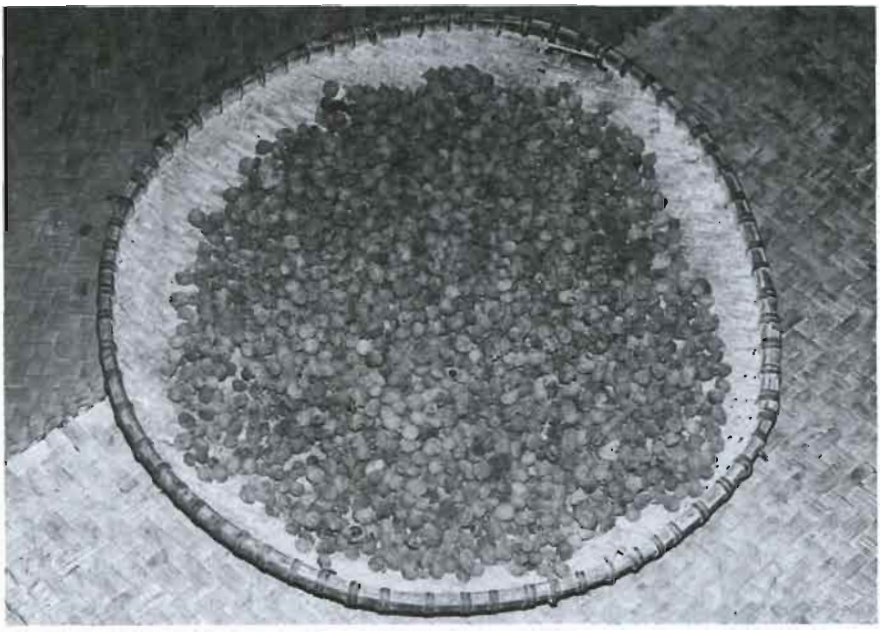
Propagation is either by cuttings or by planting seeds. For cuttings, a shoot about 20 cm in length, including the root, is prepared. Cuttings are planted in 1.5 m x 1.5 m spacing, but if the farmer grows rice on the *ray*, the spacing will be as wide as 4 m x 4 m. For seeds, a good quality cluster rich in mature fruits is chosen. The farmer removes the seed covers and lets the seeds dry for two to three days, then with one dry hand squeezes the fruit in

order to separate it from the seeds. The seed is planted in a plot previously prepared and sheltered from the sun. It is imperative to establish the nursery within the week following the harvest or successful germination is diminished. In fact the germination success rate declines with each additional day until it fails completely about a month after the seed has been gathered. If shoots are planted, fruits can be harvested after only three years compared to five years required for plants established from seed.

Processing

Gathering cardamom is undertaken from August to September, at the end of the rainy season but before harvesting the paddy. This arrangement allows for the adequate drying of seed capsules that is necessary for their preservation. Drying occurs in the village on the ground or on a tarpaulin in the sun, or the product is smoked on a metal sheet or on a bamboo platform. It takes 15 days of sun-drying to achieve satisfactory dryness. As drying is done during the rainy season, peasants consider it generally preferable to smoke the product. It still requires five to seven days for smoke-drying 50 kg of seed capsules. The ratio of fresh weight to dry weight is about 5:1; thus 5 kg of harvested capsules will yield 1 kg of dry capsules (Photo 2).

Photo 2. Dry red cardamom capsules (Photo by J. Pollini)



Every family that participates in the harvest will undertake their own drying. Apart from drying and bagging—and exceptionally the removal of the outer capsules—there is no local processing within Lao PDR. The manufacture of cardamom essential oil is done entirely in the importing countries.

Marketing

Producers market cardamom primarily in the form of dried capsules, although Korea buys a small quantity of decorticated cardamom seeds. Marketing follows immediately after the cardamom harvest during the two-month period at the close of the rainy season, which represents both a break in labour demand and a time at which producers are most vulnerable economically while cardamom capsules are most abundant. There exists little real possibility of storage to hedge against short-term price declines as the supply peaks (Saint-Pierre 1998). We did not observe any apparent difference in market price in relation to product quality.

The buying price for whole dried capsules varies between US$1[3] per kilogram around Huaphan in the north (far from communications and transport routes) to about US$3 per kilogram for cultivated cardamom originating in less remote regions, as offered by middlemen who come directly to the villages. There are many such middlemen and competition between them tends to keep prices steady. In general, it is the village women who negotiate cardamom sales. The middlemen sell to wholesalers, on whom they are dependent. Wholesalers sort the cardamom fruits, dry them for another two or three days and rebag them into 60 kg sacks. The export price hovers around US$5 per kilogram. On the Bolovens Plateau, the marketing chain for cardamom is essentially identical with that for coffee. The Chinese market has a high demand for cardamom and absorbs more than 1,500 tonnes annually from Lao PDR as well as another 1,000 tones produced domestically.

The system of quotas and trade licenses is difficult to understand, as regulations are applied most opaquely and in a highly diverse manner from province to province, and even district to district. It appears that the administration gives preferential licenses to buyers who provide certain financial incentives. As are all forest products, cardamom is nominally subject to a special excise tax of 3% for exported 'forest resources', even if the cardamom originates from plantations. Monopoly rights for marketing, and sometimes even producing, cardamom are handed out by the Lao provincial administration.

For upland families, the collection of cardamom is one of the many contributions to the ensemble of products exploited from slash-and-burn sites and secondary forests. The logic of its harvesting is contingent upon the valuation of labour. Trade does not so much depend on the availability of cardamom, but rather on the labour required for harvesting it. In forested areas the peasant economy is essentially a subsistence economy. The sale of cardamom and buffaloes is often the only actual source of cash. Such remuneration is hardly negligible, amounting to between US$3 and US$20, or 10% to 40% of total annual household cash income. While the harvesting of cardamom is done by a group, the resulting profit is generally paid to an individual.

Nevertheless, that income may sometimes be turned over, in whole or in part, to the village. In the region around Viengthong revenue flow from forest products often comprises the sole source of income for the village treasury.

Under plantation conditions, based upon an estimated land parcel size of 0.1 hectare per family leading to an annual production of about 10 kg of fruits, our study indicates a typical income of about US$50 per year. Nevertheless, the quantities of land and labour allocated to cardamom culture are subordinate, in the Bolovens, to those devoted to coffee and rice, and in Phongsaly, subordinate also to opium growing.

Usages and exportation

In its processed state as an essential oil cardamom serves numerous purposes in traditional Chinese herbal medicine. Alone or with other ingredients it is regarded as a curative for stomach pains and digestive disorders. While we sometimes find such medicines imported from China in the form of vials or gelatine pills of cardamom oil in Lao markets, for the most part the cultivators and gatherers of raw cardamom have little knowledge of what eventually becomes of their unprocessed product. Interestingly, cardamom does not figure in the highly developed herbal medicine of Lao PDR.

Lao cardamom production is exported in its entirety to China and Thailand primarily, but also to Vietnam, Myanmar and Korea. Export statistics are unreliable, however, to a fantastic degree. It appears that the authorities at the national level have no interest in establishing a credible database on cardamom exports, though provincial authorities gather a lot of information. Accordingly, while the countrywide exports of cardamom probably come close to 2,000 tonnes annually, the official customs records indicate a total of no more than 500 tonnes. The statistics from the Vientiane Chamber of Commerce presented in Table 3 may allow us to grasp a trend.

Table 3. Cardamom exports, 1995-1998

Year	1995	1996	1997	1998
Quantity (kg)	140,142	171,453	571,433	424,347
Value (US$)	630,639	829,611	3,333,359	2,376,343
Price per kg (US$)	4.50	4.84	5.83	5.60

Source: Adapted from Foppes and Ketphanh 1998.

TRENDS AND ISSUES—DEVELOPMENT AND CONSERVATION LESSONS

Cardamom is a plant associated with the traditional practice of slash-and-burn and its corollary, long-rotation fallow. It is characteristic of the plant community of secondary forests in Lao PDR. Cardamom gathering, no less than its culture, poses issues directly related to tenure and land use in the contexts of land

allocation and the definition of forest zoning, as are presently underway in Lao PDR. The study of cardamom production presents questions regarding the ownership both of the plants themselves and of the land on which they grow; and moreover, questions regarding agricultural and environmental policies that bear directly on upland populations.

Cardamom: a plant threatened by land use and tenure policies

The government's land use and land tenure policies, presented to the donor community as a token of its commitment both to environmental protection and to the emergence of private property, have amounted to a death sentence for a widely practised traditional agroforestry system. Land tenure formalisation individualises usufruct over fixed and definitive land parcels, thereby putting an end to the traditional upland villages and a flexible collective land management system.

The recent governmental strategy for the agricultural sector shows a clear distinction between 'modernising lowlands' and 'backward uplands', leaving the former freely subject to market forces but declaring the latter as duly within the scope of public intervention (MAF 1999). Within that scheme cardamom hardly plays any role at all. The agroforestry system practised by Lao upland farmers is ignored and its key element of slash-and-burn unreservedly condemned in order to meet the twofold objective of modern agriculture (i.e., irrigated rice fields) on the plains and preservation of forests in the mountainous region by supposedly protecting it from 'ethnic minorities'. Any economic development model so requiring sedentary and 'industrialised' agriculture is clearly maladapted to most upland ecosystems (Aubertin 2001). These interventions are actualised by a system of forest zoning, by the creation of National Biodiversity Conservation Areas (NBCA), by favouring private ownership, by prohibiting the practice of slash-and-burn and by the displacement of populations—i.e., ethnic minority highlanders—downslope towards the plains (Goudineau 1997). Such solutions seem to effectively put into question the very survival of these peoples.

Accordingly, 20 NBCA now cover more than 30,000 km^2 of Lao PDR, amounting to some 12.4% of its land surface. In the Viengthong district, two thirds of the land area is classified under some category of forest reserve. Nation-wide, under present forestry law, 8 million ha of land is classified as either Conservation Forest or Protection Forest. Thus, over 70% of the forested areas of Lao PDR are ascribed today under one or another categories of protected forest.

Otherwise, the process of land allocation goes on. It consists of distributing three land parcels per family for rain-fed or dry rice. With the former rotation calendar spanning 15 years, a farmer would typically have lands in every stage of regeneration, from new *ray* to well-forested and ready for initiating the next slash-and-burn cycle. With the present 'three parcels per family' rule, but without technical improvements in rice culture, we see both a decrease in soil fertility and an increase in the labour required for weeding (Jouve 1999). This new system is incompatible with the lifecycle of certain key NTFPs such

as cardamom and *benzoins*, which would spontaneously sprout on fallow fields and be productive from the 4th through 15th year following the rice harvest.

The system of forest zoning and the establishment of reserved and conservation forests and NBCA has not yet been translated into rights permitting upland communities both to exploit and to defend their protected zones; nor do the regulations recognise the previously practised agroforestry activities (Koning 2000). Peasants no longer have the right to collect NTFPs in protected forests. Numerous witnesses have attested that certain lands long since characterised by agroforestry practices have not figured at all in the new land allocation process. In this way, the cardamom-bearing forests themselves are now classified as conservation zones and thenceforth put off-limits to cardamom gathering. Even certain projects aimed at cultivating cardamom in older degraded forests have not moved forward after colliding with the prohibition of slash-and-burn necessary to open the clearings required for establishing young cardamom plants. This situation has engendered numerous conflicts between the government's new land laws and traditional land allocation and tenure rights. According to the latter the land belongs to the first person who clears it, idle pasturage and free gathering of NTFPs are authorised within forest clearings after the rice harvest and access to the village forest is reserved only for the inhabitants of that village.

A slash-and-burn species integrated into agroforestry systems

In Lao PDR the harvesting of NTFPs is inseparable from the traditional lifestyle of upland populations. In such villages more than half of the cash income comes from the sale of forest products, and the greater part of the animal protein supply is obtained from fishing and trapping or shooting small wildlife (Aubertin 1998; Foppes and Ketphanh 1998). The climatic and topographic conditions disfavour perennial agriculture. About 20% of the total land area of Lao PDR is comprised of plains, primarily the lowlands of the Mekong Valley, while the rest of its territory is 'mountainous', with slopes exceeding 12% and still largely forested. The population, about 80% rural, still lives for the most part on a subsistence economy.

The low human population density, about 20 inhabitants per km^2, allows for swidden-grown upland rice as the primary cereal crop, which, contrary to the dogma of the Lao authorities, by no means can be dismissed as archaic and predatory. In such an environment, resorting to slash-and-burn is a good choice. Given the limitations on land tenure and ownership and the difficulties in mobilising capital and labour, the production of dry upland rice is an adequate strategy for achieving both security and a good return on labour input. Indeed, swidden can be the most appropriate response to a milieu unable to support more intensive agriculture and needs to be considered on its own terms as an agroforestry system.

The ecology and economy of cardamom cannot be separated from the peasant agroforestry systems and the environment that these agricultural practices engender. The gathering of cardamom has been thoroughly integrated into the cycle of upland rice production. It is a swidden plant,

which is harvested as it matures during the emergence of secondary forest on fallow upland rice fields. The collection of 'wild' cardamom is done at the end of the rainy season on older fallow sites, as the final weeding of the swidden field is completed just before the rice harvest. The labour force's free time is allocated to cardamom gathering at exactly the period during which there otherwise is a critical gap in the availability of food and money with which to buy it. Cultivated cardamom, when planted at the same time as upland rice, can produce satisfactory yields for some 15 years during the long fallow period required to restore soil fertility.

Relations with the cultivation of opium and coffee

At all three studied field sites we observed that the investigation of cardamom production provides a key to understanding the entire productive system of upland farmers. In Phongsaly we noted an almost perfect concurrence between the culture of cardamom and the culture of opium. The added value of opium can reach US$1,200 per hectare per year. Pressed by American donors, however, the Lao government aims to eradicate opium. The cultivation of cardamom, which may contribute up to US$500 per hectare per year, appears as a possible alternative crop, and in any case it is a good indicator of the success, locally, of the antidrug struggle.

On the Bolovens Plateau, the same remarks are true in relation to coffee production. There we find cardamom plantations on soils disfavouring successful economic yields of coffee. The principal exporters of Bolovens coffee are also the buyers of cardamom, and they finance—on credit extended from coffee production—the 'cardamom projects' campaign. Cardamom thus benefits the same commercialisation networks as coffee does. Yet seeing how the price of coffee has recently crashed, following the glut of production, we can expect a land conversion in favour of cardamom.

Increasing commercialisation as a result of land policies

Despite the unfavourable factors described above there is a growth in the commercialisation of NTFPs owing in part to improved data management, the opening of penetrating roadways and the liberalisation of enterprise. We can analyse this phenomenon first as a response to new pressures on land use and land ownership. Three larger categories of such reactions have been noted:

First, because of the reduction in land area devoted to rice and the lower yield that followed the ensuing reduction of fertility, pressures have been growing on forest resources. Because less rice is being produced under the changed situation of limited land access and disabled long-fallow refertilisation, it has become necessary to buy rice in the market, which requires cash. We noted that overexploitation of resources arises out of competition amongst gatherers of certain forest products in regions where access rights are especially ill defined (e.g., wild cardamom in Phongsaly and Huaphan). As mentioned above, in order to counter the harvesting of cardamom by people from other villages, there has been a tendency to collect immature seed capsules.

A second response has been to play with the status of land. Gardens (*swan*, in Lao) and rice fields (*na*) have not been included in the lands subject to redistribution. They remain the property of their occupants and, unlike newly distributed land parcels, may be resold. When so called 'cultivated' or 'maintained in good condition' NTFPs are converted, legally if not horticulturally, into garden plants, their cultivation becomes a strategy to head off the consequences of land use and land tenure reform. Thus it is up to village chiefs and the proponents of NTFP projects to play the 'garden definitions game' with the officials in charge of land allocations. The cultivation of cardamom on slash-and-burn areas or within unburnt forests, thereby redefined as 'gardens', escapes the condemnation weighing on *ray* and cultivation within protected forests. Where such manoeuvres are successfully passed off, these gardens will be fine-and-well privatised. Thus they are not included in the lands being distributed and indeed added to the three land parcels allocated to each family.

Finally—once the land allocation process is executed--the domestication of NTFPs answers likewise to the need for perennial crops suitable for rice substitution. In development projects one is always looking for imported varieties to put into cultivation as new sources of revenue more apt to respond to the requirements of the market, rather than trying to domesticate or adapt indigenous biotypes. On such an occasion the method of appropriating outputs also changes: if we often observe the collective harvest and collective distribution of revenues from certain NTFPs 'belonging to the village', we have also seen the privatisation of both the revenues and the plants themselves, once they have become cultivated. Medicinal cardamom is thus in the process of becoming an agricultural commodity like any other, which simply needs a little more forest cover.

Closing arguments: a plant for sustainable development?

For the profitable exploitation of naturally occurring medicinal cardamom the forest cover needs to be maintained. Beyond that cardamom requires little additional care and local farmers even regard cardamom as weed tolerant. As we have seen, cardamom is one of those rare NTFPs for which harvesting and exploitation actually tend to favour its growth and development. The cardamom resource remains barely threatened so long as the forest itself is not destroyed. In the case of cultivated cardamom the situation is slightly different: here, it is necessary to prepare the land surface and to keep up a minimum of weeding. This would indicate sensitivity to competition from other species, all the more so when cultivation has been stoloniferous, where the young cardamom may easily be overwhelmed. In any case, cardamom is considered as benefitting subsequent cultivation of the site. It enables the quick preparation of the soil for planting while also choking out invasive weeds. Within a conceptual framework of sustainable development such ecological factors can easily be combined with the basic economic concerns of the highlanders to present medicinal cardamom as an ideal species. Nevertheless, as we will see, it's not so simple.

Issues regarding domestication

The transformation from wild plant to domesticated cultivar has practically never been observed within a gathering-dominant context, as in the case of Huaphan. The households we interviewed never expressed interest in domesticating cardamom. They well know that, because of land tenure policies, they would have to dedicate scarce land to cardamom. They would have to provide labour at fixed times and grow more dependent upon the cardamom buyers' requirements. Why would they renounce the income derived from wild cardamom during a period of local labour surplus? Indeed, the families given most to cardamom gathering are either the poorest ones—those already making their living from NTFPs because they have no alternative—or the better-off families that have land available to plant cardamom or enough labourers to gather wild cardamom from the forest.

Neither can domestication of cardamom be observed in the context of plantation cardamom projects. As project team leaders are looking for secure outlets they prefer buying seedlings produced at the Xishangbannna Botanical Garden. With these standardised seedlings they get concomitant guarantees that they will be able to sell their production to Chinese merchants. This choice leads to the replacement of local varieties of cardamom with standardised cultivars and so threatens the local varieties' very existence.

Measures to promote cardamom development

The measures to promote cardamom development are well identified. It is of utmost importance to assure tenure and usufruct rights for communities in order to prevent premature picking and squabbling between neighbouring villages. Small size and poor quality characterises cardamom fruits that are collected too early, and a differential pricing system, which duly rewards the better quality producers, appears absolutely indispensable. Because price negotiations are made individually, cardamom sellers associations could be mobilised in order to obtain quality-keyed prices. Finally better, more energy efficient technologies for drying harvested fruits and allowing at least some stockpiling to avoid production gluts, thus strengthening the producers' position in negotiations, could be introduced at a relatively modest price. Solar drying kilns are already being tested in Luang Namtha.

Government policies help or hinder?

The existing legislation is inadequate and vague on key issues like the right of access to the land, the nominal state monopoly over cardamom, the mechanism and application of production quotas and the unfavourable taxation system (Enfield *et al.* 1998). But above all, the Lao government's agricultural and economic policies seem to go contrary to the development of mountainous regions. How, then, with the government's condemnation of agroforestry systems can the objective of poverty reduction and forest protection be reached by establishing cardamom? How can upland communities organise

themselves towards exploiting and commercialising NTFPs without recognition of their rights and a guarantee over their tenure and usufruct?

The systems that we have been discussing here cannot be inscribed under 'natural evolution' where humans patiently improve the state of their resources and their milieu. These spring instead from ruptures caused by altering the legal status of the land, the resources, and the actors themselves. In every case the market has not been the sole determinant. We can interpret the systems undergoing mutation in response to external threats bearing essentially upon secure land tenure and ownership, and on the rights of upland populations more generally. These systems are sharply different in their social and historical determinants. The evolution towards intensification is due to a break up in the production systems. The latter comes from the restrictions on access to the land and from the condemnation of traditional practices, especially shifting cultivation. It is essential to note that such a rupture, paradoxically, is the result of governmental policies put forward in the name of the environment! These policies, implemented by a government that sets agriculture apart from forestry and ignores agroforestry systems, have the opposite effect of intensifying, on the one hand, the harvest of wild plants, while on the other hand, moving towards the cultivation of standardised varieties.

We must stress that it is impossible for us to put forward comparative advantages in terms of specificity of Lao cardamom to account for its development. If there are any comparative advantages, they would lie in the opportunity costs of land and labour compared to those in neighbouring countries. The cardamom boom in Lao PDR is rooted both in market expansion and the scarcity of land for cardamom production in Yunnan, China. As a result of the homogenisation of tastes and the process of globalisation, Lao medicinal cardamom is becoming a commodity like any other, seldom sought for its specific genetic or ecological characteristics. As it discloses the problems with land tenure, and with the rights of upland populations, our study of cardamom prove to be eminently political. The central issues remain, actually, the modes and norms of social regulations and national integration of forest dwellers as well as the control of natural resources, the ecological management of the landscape and the creation of wealth.

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ENDNOTES

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2. *Ray* is an area where the forest has been cut and burnt for temporary cultivation of rice and other crops. It is the cornerstone of shifting cultivation, a form of agriculture in which soil fertility is maintained by rotating fields rather than crops. New plots are usually cleared by slash-and-burn and cropped until soil exhaustion. The land is then left to regenerate naturally while cultivation is conducted elsewhere.

3. Exchange rate July 2000: US$1 = 7500 kips.

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