

## Chapter 56

# Rattan and Tea-Based Intensification of Shifting Cultivation by Hani Farmers in Southwestern China

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The forest cover in the Xishuangbanna Prefecture of China's Yunnan Province has decreased significantly, from 62.5% in 1950 to only 33.9% in 1985. According to the government census, the population has increased from 200,000 to nearly 800,000 over roughly the same time. Indigenous people, particularly swidden cultivators, are often blamed for destroying the forests of Xishuangbanna.

The concept of carrying capacity is often applied in measuring population densities in agroecosystems. However, the potential for indigenous technological innovation and institutional evolution to contribute to increased carrying capacity is often ignored. For instance, swidden farmers have often accumulated comprehensive indigenous technical knowledge about crop selection, cropping patterns, and crop and land rotations. They have also learned how to use different microenvironments and niches within swidden agroecosystems in response to changes in biophysical or socioeconomic conditions. In addition, they have developed practices for enhancing forest regeneration. They protect useful tree species through successive swidden cycles, combine annual crops with perennial tree crops, selectively weed their fields to preserve forest tree seedlings, and plant favored trees and plants for both economic and ecological benefits. As stated by Warner (1991):

The swidden cultivator's goal is not to destroy, but through clearing and then managing the regeneration of the forest, to obtain a continuous harvest of cultigens on the way to a new forest of rich diversity, containing stands of trees that are highly valued.

The Hani, who are also known as Akha, have cultivated rattan (*Calamus* spp.) in fallow fields for about one hundred years in Mengsong, and they have grown tea plantations in both natural forest and swidden fallows for about eight hundred years in Nannuoshan. That they began planting rattan in fallow fields in the first place was due to a scarcity of rattan in the wild, illustrating the fact that indigenous innovations in swidden cultivation are often triggered by resource scarcity. However, these Hani practices, now that they are mature and proven, can be extended into other degrading swidden systems.

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## Research Methods and the Study Area

This study involved the following methods:

- Key informant interviews. The traditional village chief and government officials were interviewed in group meetings in order to understand customary and statutory institutions, practices, and management of agricultural and forest lands.
- Household interviews. These were used to reveal the rationale underlying farmers' decisions on land use and management and to document indigenous technical innovations in swidden cultivation.
- Genealogical survey. The Hani have no written language, but a recitation of ancestral lineage can provide detailed information about a tribe's history. The history of the village, particularly that pertaining to conservation and cultivation of rattan, was related by older men and women during group discussions.
- Household sampling. A household questionnaire was used to gather data on cash income from nontimber forest products, animal husbandry, and cash crops.
- Participatory mapping. A group of local villagers was invited into the fields to assist with mapping local zones for different land uses and distribution of important resources, such as rattan and tea gardens.

Two Hani administrative villages, Mengsong, bordering Myanmar in Jinghong county, and Nannuoshan, in Menghai county, were chosen as case studies because of their cultural identity and because they were representative of local biophysical conditions. Both are in Xishuangbanna Dai Autonomous Prefecture.

Mengsong is composed of 10 natural villages, including nine Hani villages and one Lahu village. In 1992, they had a total population of 2,698 people, living in 540 households, and a total area of 100 km<sup>2</sup>. This made the population density 27 persons per km<sup>2</sup>.

Nannuoshan is composed of 12 natural villages, which had a total population of 3,726 in 710 households in 1992, and a total area of 88 km<sup>2</sup>. This made the population density 42 persons per km<sup>2</sup>. Nannuoshan's territory is covered mainly by evergreen broadleaf forest, but pine forest is interspersed through both study villages. Elevation ranges between 800 and 1800 m above sea level (asl).

### Social Structure

The Hani probably originated from central Yunnan about one thousand years ago (Ma 1983) but were forced by wars and land scarcity to migrate south, finally reaching the uplands of Northern Thailand and Myanmar by the early 20th century. According to the 1990 census, there was then a total population of about 1.2 million Hani, living mainly in the uplands of Yunnan. Most of them live in montane subtropical areas and practice subsistence farming on terraced paddies. The composite swidden system typically practiced by the Hani includes traditional tea gardens in forests, intensive paddy cultivation, home gardens, shifting cultivation, and grazing livestock.

The Hani are patrilineal and tend to live together in clans. The position of the village chief, or *zoema*, is either hereditary or filled through selection by the most knowledgeable and prosperous villagers. Although the village chief is often highly respected, that does not necessarily mean that he acts as a ruler. The chief makes decisions through consultation with members of the male clan, called the *pamou*, and heads of households. Thus, a communal committee consisting of the village chief, the headman or *palu*, and the heads of clans consults to deal with the daily affairs of the community, such as delineation of sanctuary forest boundaries or site selection for swiddening within the forest (Xu 1991; Xu et al. 1995).

The Hani are generally animistic in their beliefs, with a strong emphasis on the cult of ancestors, as evidenced by their strict protection of cemetery forests and

attribution of supernatural powers to familiar objects such as trees or animals (Lebar et al. 1964). They believe that any disturbance or violence inflicted on the supernatural, including ancestral spirits, will cause illness.

### ***Customary and Statutory Institutions on Forest Management***

Customary institutions play a very important role in forest resource management in Hani society. The Hani often classify all forest lands into swidden fields, or *dongya*, water source forests, village aesthetic forests or *puchang*, road protection forests, economic forests, cemetery forests, and holy forests. They have detailed regulations for management of their forest lands, including designation of swidden areas, fire protection, and punishment for illegal cutting. The regulations have a rather complex system of penalties, paid either in money or in goods such as pigs, according to the type of crime committed.

## **Results**

### ***Conventional Shifting Cultivation Systems, or Dongya***

The literal translation of *dongya* in the Hani language is “nonirrigated uplands.” The Hani practice a very diverse cultivation system in which they produce a mix of subsistence and cash crops under complex patterns of intercropping, crop rotations, and fallow management. The location of swiddens and the cropping patterns adopted depend on soil fertility, relief, distance from the houses, and even village arrangement. The Hani like to live at high elevations with pleasant lower temperatures. Swidden sites are opened at lower elevations, often within two hours’ walking distance, because the more fertile soils and warmer temperatures there provide better crop yields. The Hani prefer a 13-year fallow period, but this depends on the availability of land. Some useful trees are often carefully preserved in swidden fields to serve as shade trees during farming, as mother trees for seed dispersal, and to provide fodder, fruit, or timber.

### ***Rattan at Mengsong: From Open Access to Strict Protection***

According to ethnographic evidence, the Hani were among the earliest dwellers in Mengsong. They are thought to have lived there for 12 generations, or about 240 years. Before their arrival, the area was clothed in dense primary forest rich in rattan.

According to customary laws, all forested land and the products from it belonged to Dai headmen, who lived in the lowlands near Mengsong. The Hani, as later arrivals, did not own the land and its forests, but only had rights to use them. In return, they paid a tax to the Dai headmen in the form of wild game, rattan, and other valued products. Soon after their arrival at Mengsong, the Hani often gathered young rattan tips as a vegetable to exchange for rice with the Dai in the lowlands. This was a very important source of livelihood, particularly for the poorer sector of Hani communities. Usually, one basket of rattan tips was exchanged for about three kilograms of rice. Such was its value that overcollection eventually led to depletion of natural rattan stocks in surrounding forests.

As rattan resources declined under the onslaught of overcollection, a Dai headman in the lowlands, drawing on his power as ruler over minorities living in the uplands, designated forest areas with high rattan stocks as a sanctuary in which rattan collection was banned. The declaration of the sanctuary forest was made about 150 years ago and it is still respected, despite the fact the forest covers more than 200 ha, with an annual potential of 10 tons of cane production.

The customary regulations governing use of the rattan sanctuary forest, or *sangpabawa*, are as follows:

- Cutting any trees is strictly forbidden.

- Harvest of rattan canes or young shoots is prohibited. However, rattan seeds may be collected for cultivation, as well as medicinal plants and timber for coffins.
- The local community is allowed to collect small amounts of rattan to repair farm tools before the planting season.
- The Hani are also permitted to collect rattan for constructing swings during their *yeku* swing festival in July.
- Villagers may collect rattan as a binding material when building new houses, but they must first obtain permission from the community committee.
- Anyone violating the rules will be fined one pig and wine for a village feast.

### ***Rattan Cultivation in Swidden Falls***

The Hani swidden cultivators in Mengsong have interplanted rattan into their swiddens for about a hundred years, as a response to the scarcity of natural stocks. Their indigenous rice-rattan swidden agroforestry is called the *qaiya-aneya* system. When farmers open new swidden fields for upland rice, they interplant rattan seeds, particularly near remaining stumps. After several rice harvests, the land is left fallow and rattan cane can be harvested after 7 to 10 years. *Qaiya* refers to the grain crop or upland rice stage. This is often intercropped with tubers such as yams and taro and Cucurbitaceae such as *Cucumis hystrix* and *Benincasa hispida*. The main function of the *qaiya* stage, and the shifting cultivation system of which it is a part, is production of food crops.

Although the Hani have reportedly used more than 100 varieties of upland rice in the past, this number appears to have been reduced to about 25 at present. This degree of agrodiversity allows careful selection of different rice varieties to best fit different agricultural microenvironments, with varying soil fertility, moisture, slope, and altitude. The *qaiya* stage continues for two to three years, and when yields decrease, the food crops are rotated with rattan, bamboo, or even fruit trees. The Hani also plant perennial crops at the perimeters of their upland rice fields during the first cropping year. With these well established, the *qaiya* gradually evolves into *aneya*, a rattan and bamboo-based fallow (Weinstock 1983). About seven years later, the farmer can enjoy the cash income from harvesting both the rattan and the bamboo, while once more preparing to plant annual crops.

### ***Tea Plantations in Swidden Fields in Nannuoshan***

Tea gardens are the main land use resulting from fallow enrichment in Xishuangbanna. The original distribution of tea is believed to have centered on southwest China, northern Myanmar and northeast India. One of the oldest known tea trees is found in Nannuoshan. It is thought to be about 1,500 years old and has a diameter at breast height of 1.5 m. Oral history suggests that it was planted by ancestors of the Bulang, another ethnic minority in Xishuangbanna, before the arrival of the Hani.

The tea plantations in Nannuoshan can be classified into two main types: traditional and improved (see Table 56-1).

**Table 56-1.** Land Use in Nannuoshan

<i>Land Use</i>	<i>Area (ha)</i>	<i>% of Total Area</i>
Traditional tea gardens	320	3.6
Improved tea gardens	360	4.1
Active swidden fields	500	5.7
Paddy fields	302	3.4
Total cultivated area	1,482	17.0

*Source:* Nannuoshan administrative village, 1995.

### ***Traditional Tea Gardens***

Traditional tea gardens, in both natural forests and fallow fields, have been managed in Xishuangbanna Prefecture for hundreds of years by many ethnic groups, including the Bulang, Jinuo, and Hani. Both the Hani and the Bulang make room for tea planting by thinning out some shrubs in natural forests. Alternatively, they plant tea directly into swidden fallows at about 2 by 2.5 m spacings, or about 2,000 plants per ha. Useful tree species are often preserved as an upper story, including *Cinnamomum glanduliferum*, for food seasoning; *Docynia indica*, an edible fruit; *Schima wallichii*, for its timber and fire resistance; *Bauhinia variegata*, for its edible flowers; and *Castanopsis* spp., for their timber and nuts. In the middle layer of the forest, tea bushes, mixed with rattan, thrive in the shade of the upper canopy. Useful shade-tolerant plants, such as *Baphicacanthus cusia*, for its dye, and *Pandanus tonkinensis*, a source of fiber, can often be found in the understory. No chemical fertilizers or pesticides are used in traditional tea gardens. Management is minimal, usually amounting to weeding once a year and some pruning, and production is low. The cultivator always has secure rights to access and harvests all cash crops and trees that he manages in swidden fields or natural forests. The tea gardens are inherited by male members of the family.

### ***Improved Tea Gardens***

In the 1980s, with assistance from research technicians, local farmers began to plant tea in very compact rows along the contours of fallowed swidden fields. The shade trees recommended for interplanting were *Cinnamomum* spp., *Poullaria* sp., *Melia* sp., and walnut, at a density of 120 trees per hectares. Driven by increasing land scarcity, this model of improved tea garden has replaced most traditional tea gardens in Nannuoshan because of its superior production, although it depends on high inputs of chemicals and labor. The area covered by traditional tea gardens has decreased significantly, from 700 ha to about 320 ha. Because of the many “mother trees” growing in traditional tea gardens, they were easily converted into forests for firewood and timber production. The area of forest land has therefore increased as traditional tea gardens have been abandoned, and, because many swidden fields have been taken out of arable cropping and converted into improved tea gardens, Hani farmers have channeled some of their increased cash income into constructing more paddy fields and reestablishing their food security.

## **Discussion**

### ***Benefits from Intensified Fallow Management***

The Hani in Xishuangbanna Prefecture continue to depend for their livelihood and cash income on livestock and the cultivation and gathering of nontimber forest products. Table 56-2 shows that nontimber forest products such as tea, rattan, bamboo, mushrooms, and fruit account for half of the total cash income for the Hani in Mengsong. Pig husbandry is the biggest income earner, providing 42.4% of income. The actively cropped and fallowed swidden fields provide large quantities of forage, such as maize and banana stems, suitable for pigs. There is also a large demand for pig meat from workers who have settled in Mengsong but cross the border to work in mines inside Myanmar.

Table 56-3 shows that the household variation in rattan cultivation is greater than tea planting in the swidden fields. Cash income from tea is more stable and equitable than that from rattan.

Although the Hani in Mengsong have a long tradition of cultivating rattan in their swidden fields, there are only a few craftsmen in each village with the necessary skills to process it into handicrafts. Those families who lack the skills to make rattan stools and other handicrafts hand over their rattan canes to craftsmen for weaving and then receive half of the finished products back. Pieces of rattan furniture, and particularly rattan stools, are very popular gifts and property among the Hani. Rattan

stools and tables are commonly given by parents as wedding gifts to young couples. The stools are often buried with the dead as personal property. Therefore rattan has important cultural and symbolic value in Hani society. Due to constantly increasing market demand for rattan furniture, some farmers have started to plant rattan for commercial purposes. One farmer in the case study area harvested a total of 3,000 kg of rattan in 1988 and 1989, earning about US\$900.

Table 56-4 shows that rice yields from paddy fields are higher than those from swidden fields. When swiddens are opened from forest, their production is marginally higher than those opened from grasslands. The difference is more dramatic when measured in terms of working-day productivity. Rice paddies provide much higher returns to labor than upland swidden fields, particularly those opened from grasslands. The net income per working day ranks highest for tea picking when compared with that from either irrigated paddy or swidden fields.

**Table 56-2.** Sources of Cash Income for Hani in Mengsong, 1990

<i>Income Source</i>	<i>Units</i>	<i>Production</i>	<i>Price/Unit (US\$)</i>	<i>Income (US\$)</i>	<i>%</i>
Tea	kg	39,900	0.6	23,940	15.0
Fruit	kg	412,500	0.06	24,750	15.5
Rattan cane	kg	39,000	0.3	11,700	7.3
Bamboo	piece	23,180	0.4	9,272	5.8
Dry bamboo shoots	kg	2,240	0.4	96	0.5
Mushroom collection	kg	2,656	1.1	2,942	1.8
Rattan and bamboo processing	piece	5,496	1.4	4,894	3.1
Pigs	head	1,129	60	67,740	42.4
Cattle	head	171	80	13,680	8.6
Total income				159,814	100
Income per capita				US\$61 per capita	

**Table 56-3.** Household Sampling on Cultivation of Rattan and Tea in Mengsong Swidden Fields\*, 1990

<i>Parameters</i>	<i>Total</i>	<i>Average</i>	<i>CV (%)</i>
Population	181	5.84	32
Labor force	100	3.23	46
Productive rattan (clumps)	883	28.48	129
First harvesting year	320	11 years	36
Self-consumption of rattan (kg/year)	808	26.06	128
Productive tea	4,721	168.61	84

Note: \*Number of households = 31.

**Table 56-4.** Productivity of Different Activities, 1990

<i>Activities</i>	<i>Labor Input</i>	<i>Yield (kg/ha)</i>	<i>Productivity (kg/working day)</i>	<i>Income (US\$/day)</i>
Rice paddy	315 days/ha	2,985	9.5	1.34
Rice in grassland swidden	660 days/ha	2,235	3.4	0.48
Rice in forest swidden	375 days/ha	2,385	6.4	0.90
Picking tea (dry weights)	1 day/load	250	3.0	1.80

### *Ecological Sustainability*

In their farming practices, indigenous people often imitate natural ecosystems. The Hani practices of rattan and tea cultivation in swidden fallows are good examples. Both are well adapted to the local ecosystem. As well as swidden fallow tea cultivation, farmers in Xishuangbanna Prefecture have been imitating the natural ecosystem by planting tea in forests for more than 1,000 years. Within their traditional tea gardens, they have preserved shade trees with economic and cultural value. The forest structure of traditional tea gardens can be divided into three layers: the shade canopy, from 15 to 35 m high; the tea layer, from 2 to 8 m; and a ground layer that includes herbaceous plants and tree seedlings. The canopy provides conditions of ideal sunlight and humidity for growing tea. No chemicals are needed in traditional tea gardens because tree litter recycles nutrients and natural predators control insects.

As for rattan, Hani farmers in Mengsong report that it needs a minimum of 11 years to mature. Therefore, its cultivation in fallow fields is well matched to their traditional practice of a 13-year swidden cycle. Mature fallows, rich in rattan, provide both economic returns and good soil fertility when opened for the next cropping phase.

### *Capacity to Support an Increasing Population*

Changes in indigenous technical knowledge are inevitable, particularly when driven by population growth and increasing demands for cash. In Xishuangbanna, the extensive traditional tea garden is being replaced by a more productive and intensified version that relies on chemicals for both replenishment of soil fertility and pest control. Production from an improved tea garden can be six times higher than its traditional forerunner (see table 56-5). As a consequence of their relative inefficiency, many traditional tea gardens are being converted back into forest for timber and firewood production.

At one time, tea ranked as Yunnan's foremost agricultural product. It was exported, both domestically to other provinces in China and internationally to other countries in Southeast Asia. However, a recent slump in the international market for tea has seen a reduction in exports and tea has slipped down to fourth position on the table of Yunnan's agricultural products.

### *Extension, Conservation, and Knowledge Transfer*

The indigenous practice of rattan cultivation in swidden fallows, developed by Hani communities in Mengsong, has been successfully transferred to Mingzhishan administrative village of Simao Prefecture and other Hani communities through cross-farmer visits and training. After negotiating with the Bureau of Forest, permission was also granted for a trial replication of the technology on degraded state forest lands near a Bulang community in Menghai county, Xishuangbanna.

**Table 56-5.** Comparison of Traditional and Improved Tea Gardens in Nannuoshan

<i>Parameter</i>	<i>Traditional Tea Garden</i>	<i>Improved Tea Garden</i>
Planting method	random, scattered	contour planting
Management	extensive	intensive
Chemical fertilizers	none	1,500 kg/ha
Yield (dry)	250 kg/ha	1,500 kg/ha
Income	1,500 yuan/ha	9,000 yuan/ha

*Note:* Based on field interviews in 1993.

Wild rattan resources have been overharvested in both protected and unprotected areas of Yunnan, and it is now difficult to collect mature rattan seeds for propagation purposes. In response to this depletion, the Kunming Institute of Botany has developed tissue-culture technology for both field propagation of rattan and germplasm conservation.

#### ***Adoption: Ecological Niches***

Both rattan and tea cultivation are well adapted for integration into swidden agroecosystems in tropical mountainous areas. “Invisible” traditional tea gardens under the natural forest canopy in Xishuangbanna have contributed significant ecological and socioeconomic benefits, including control of soil erosion, biodiversity conservation, aesthetics, subsistence use, and cash generation.

Rattan, one of the most valuable nontimber forest products in Southeast Asia and southwestern China, is adaptive to a range of ecological niches in tropical areas because of the diversity of species and their respective ecologies. There are eight species recommended for planting at different elevations in Xishuangbanna (Chen et al. 1993). Five species recommended for altitudes lower than 1,000 m asl are *Calamus gracilis*, *C. aff. multinervis*, *C. wailong*, *C. rhabdocladus*, and *C. platyacanthus*, and those for higher elevations are *C. yunnanensis*, *C. nambariensis* var. *xishuang-bannanensis*, and *Plectocomiopsis himalayana*.

#### ***Adoption Constraints***

Indigenous and state resource management systems differ and clash in many areas. Indigenous systems of classifying forestlands are more resource based or function oriented, such as the rattan reserve forests, *sangpabawa*, or the aesthetic forests, *puchang*. The government, on the other hand, is more focused on controlling use of forest lands rich in timber. Many forest lands have been declared protected areas or state forests, meaning that, by law, local people are no longer allowed to collect or plant nontimber forest products in these areas. At the same time, planting these long term cash crops is no longer possible in swiddens because fallow periods have, in many cases, been reduced to the point where they are now too short. Scarcity of rattan seeds and seedlings is also a big constraint to the extension of this technology into new areas, and farmers without a tradition of cultivating rattan need to learn about its propagation, transplanting, and general management before committing their time to its cultivation. Because rattan is a relatively long-term crop, secure land tenure is also essential if farmers are to be encouraged to plant it in their fallows and forest lands.

### **Research Priorities and Experimental Agenda**

Future research should aim to answer the following questions:

- What are the inputs and outputs of rattan and tea-based fallows, in comparison to other on- and off-farm activities?
- What are the socioeconomic conditions conducive to adopting such fallow management systems?
- How do the products flow? Who receives benefits, and at what percentage, through the processing and marketing chain, and which marketing systems are most beneficial to smallholders?
- What kinds of technical and credit assistance are needed by local farmers?
- Does government policy on land tenure and marketing encourage or discourage the planting of rattan and tea in swidden fallows?

### **Conclusions**

Population growth, including in-migration, often leads to resource depletion. As reported in this chapter, the Hani have responded to these pressures by controlling



access to certain areas and imposing supportive sanctions. At the same time, they have intensified their management of swidden fallows. The integration of rattan and tea into fallows provides both environmental and economic benefits to local communities and holds promise for replication in other upland areas of Southeast Asia. However, these technologies have been developed under, and are dependent upon, local institutional arrangements for property rights and marketing. Therefore, as well as the benefits mentioned above, the integration of rattan and tea into fallows is also an intentional strategy to strengthen tenure security. Government policy impinging on these key factors may undermine the socioeconomic stability of rattan and tea production systems. When policies are being crafted with a view to encouraging a more sustainable use of upland resources, policymakers should first seek insights from indigenous institutions regulating resource management.

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