

CHAPTER 6

Taungya

The Taungya system in the tropics is, like shifting cultivation, a forerunner to agroforestry. The word is reported to have originated, as mentioned in Chapter 1, in Myanmar (Burma) and means hill (*Taung*) cultivation (*ya*) (Blanford, 1958). Originally it was the local term for shifting cultivation, and was subsequently used to describe the afforestation method. In 1856, when Dietrich Brandis was in Burma, then part of British India, shifting cultivation was widespread and there were several court cases against the villagers for encroaching on the forest reserves. Brandis realized the detrimental effect of shifting cultivation on the management of timber resources and encouraged the practice of "regeneration of teak (*Tectona grandis*) with the assistance of taungya," (Blanford, 1958) based on the well known German system of *Waldfeldbau*, which involved the cultivation of agricultural crops in forests. Two decades later the system proved so efficient that teak plantations were established at a very low cost. The villagers, who were given the right to cultivate food crops in the early stages of plantation establishment, no longer had to defend themselves in court cases on charges of forest destruction; they promoted afforestation on the cleared land by sowing teak seeds. The taungya system was soon introduced into other parts of British India, and later it spread throughout Asia, Africa, and Latin America.

Essentially, the taungya system consists of growing annual agricultural crops along with the forestry species during the early years of establishment of the forestry plantation. The land belongs to the forestry departments or their large-scale lessees, who allow the subsistence farmers to raise their crops. The farmers are required to tend the forestry seedlings and, in return, retain a part or all of the agricultural produce. This agreement would last for two or three years, during which time the forestry species would grow and expand its canopy. Usually during this period the soil fertility declines, some soil is lost to erosion, and weeds infest the area, thus making crop production nonremunerative, if not impossible. Figures 6.1 and 6.2 are photographs of a taungya plantation in two consecutive years in Thailand, and illustrate site-fertility decline.

Today the taungya system is known by different names, some of which are also used to denote shifting cultivation (as listed in Table 5.1): *Tumpangsari* in



Figure 6.1. The first year of establishment of a teak (*Tectona grandis*) and eucalyptus (not in the picture) plantation in the Forest Village Scheme (Thailand), with upland rice as the major agricultural crop.

Source: Nair (1989).



Figure 6.2. The second year of establishment of teak and eucalyptus in the same Forest Village Scheme as in Figure 6.1. The decline in soil productivity is already evident from the relatively low vigor of the rice crop in comparison to that of the first-year rice crop shown in Figure 6.1.

Source: Nair (1989).

Table 6.1. Soil properties of teak and mahogany nurseries compared with those of freshly cleared and burnt sites at Sapoba, Nigeria.

Soil properties	0 - 5 cm			5 - 15 cm			15 - 30 cm		
	1	2	3	1	2	3	1	2	3
pH(H ₂ O)	8.65	7.45	6.58	7.73	7.51	6.57	7.11	7.12	6.32
Loss on ignition (%)	6.16	4.14	4.32	4.06	3.06	3.52	3.23	2.66	3.28
Total nitrogen (%)	0.014	0.003	0.005	0.016	0.002	0.004	0.016	0.004	0.005
Available P (ppm)	52.10	34.80	28.40	49.30	18.80	18.00	40.10	12.20	14.90
Total exch. bases (meq 100 g ⁻¹)	14.23	6.65	6.01	10.00	6.11	4.01	4.28	3.81	3.18

1. Freshly cleared and burnt sites
2. Teak (*Tectona grandis*) nursery
3. Mahogany (*Swietenia macrophylla*) nursery

Source: Nwoboshi (1970).

Indonesia; *Kaingining* in the Philippines; *Ladang* in Malaysia; *Chena* in Sri Lanka; *Kumri*, *Jhooming*, *Ponam*, *Taila*, and *Tuckle* in different parts of India; *Shamba* in East Africa; *Parcelero* in Puerto Rico; *Consociarcao* in Brazil, etc. (for details see King, 1968). Most of the forest plantations that have been established in the tropical world, particularly in Asia and Africa, owe their origin to the taungya system (von Hesmer, 1966, 1970; King, 1979).

The taungya system can be considered as another step in the process of transformation from shifting cultivation to agroforestry. While shifting cultivation is a sequential system of growing woody species and agricultural crops, taungya consists of the simultaneous combination of the two components during the early stages of forest plantation establishment. Although wood production is the ultimate objective in the taungya system, the immediate motivation for practicing it, as in shifting cultivation, is food production. From the soil management perspective, both taungya and shifting cultivation systems are similar; agricultural crops are planted to make the best use of the improved soil fertility built up by the previous woody plant component (given that taungya plantations are established on cleared forest lands and not degraded agricultural lands). In shifting cultivation the length of the agricultural cycle can last only as long as the soil sustains reasonable crop yields. In taungya it is primarily dependent on the physical availability of space and light based on the planting arrangements of the trees.

In the classification of taungya, a distinction is sometimes made between "integral" and "partial" systems. Partial taungya refers to "predominantly the economic interests of its participants (as in some kinds of cash crops, resettlement, and squatter agriculture)," whereas integral systems "stem from a more traditional, year-round, community-wide, largely self-contained, and ritually sanctioned way of life" (Conklin, 1957). In other words, the concept of "integral taungya" is meant to invoke the idea of a land-use practice that offers a more complete and culturally sensitive approach to rural development. It is not merely the temporary use of a piece of land and a poverty level wage, but a chance to participate equitably in a diversified and sustainable agroforestry economy.

6.1. Soil management

There are numerous reports describing different taungya practices and the growth of different plant species in the system (Aguirre, 1963; Anonymous, 1979; Cheah, 1971; George, 1961; Manning, 1941; Mansor and Bor, 1972; Onweluzo, 1979; Jordan *et al.*, 1992; unpublished reports on the "shamba" system from the Kenya Agricultural Research Institute, Nairobi). Research data on changes in soil fertility and on other soil management aspects, however, seem to be scarce. Alexander *et al.* (1980) describe a two-year study on the Oxisols of Kerala, India (about 10°N latitude, 2500-3000 mm rain per year) where the greatest disadvantage of taungya was the erosion hazard caused by

soil preparation for the agricultural crops. The surface horizons became partly eroded and sub-surface horizons were gradually exposed. The addition of crop residues to the soil surface was found to be a very effective way of minimizing soil loss and exposure. In an agrisilvicultural study in southern Nigeria consisting of interplanting of young *Gmelina arborea* with maize, yam, or cassava, Ojeniyi and Agbede (1980) found that the practice usually resulted in a slight but insignificant increase in soil N and P, a decrease in organic C, and no change in exchangeable bases and pH compared with sole stands of *Gmelina*. Ojeniyi *et al.* (1980) reported similar results from investigations in three ecological zones of southern Nigeria and concluded that the practice of interplanting young forest plantations with food crops would not have any adverse effect on soil fertility. In contrast, a study at Sapoba, Nigeria (Nwoboshi, 1981) showed that intensive cultivation and cropping practiced in forest nurseries (second nurseries where the seedlings are retained for variable periods, sometimes up to three years, before they are planted out in the fields) depleted the fertility of the soil within a year or two (Table 6.1). Although trees in the field are usually planted at 6 to 12 times wider spacings than in nurseries, it was argued that the inclusion of arable crops in the plantation would have effects similar to those of frequent cultivation in nurseries with respect to the depletion of soil fertility.

It can be inferred from these reports that, in most taungya systems, erosion hazards, rather than soil fertility, are likely to pose the greatest soil management problems. The long-term effect of the practice on soil fertility will, however, largely depend on the management practices adopted at the time of the initial clearing as well as subsequent re-establishment phases. In any case, soil fertility and the related soil management practices are, perhaps, only of secondary importance in determining the continuation of the traditional taungya system. In most cases, the biological problems of continuing cropping under an expanding overstory tree canopy make it impossible to continue cropping after the initial two or three years.

6.2. Alternatives/improvements to Taungya

Several alternatives and improvements to taungya have been attempted in different places, most of them with the objective of providing better living and social conditions for the tenants. One of the most widely quoted examples is the Forest Village scheme in Thailand, which has generated several reports (e.g., Boonkird *et al.*, 1984). The philosophy of the scheme was to encourage and support farmers to give up shifting cultivation in favor of a more settled agricultural system, while simultaneously obtaining their services for the establishment of forestry plantations. Each farm family who agreed to take part in the scheme was provided with a piece of land of at least 1.6 ha within the selected village unit for constructing a house and establishing a homegarden. The farmers were also permitted to grow crops between the young trees in the forest plantation unit that they helped to establish according to the plans of the



Figure 6.3. The houses and the homegardens surrounding them in a Forest Village in northern Thailand.

Source: Nair (1989).

Forest Industries Organization (FIO) (Figure 6.3). The FIO then would appoint "development teams," of multidisciplinary experts for each forest village; the teams provided agricultural, educational, and medical services to the people of the village. The scheme has enabled the FIO to establish forest plantations at considerably reduced costs. Table 6.2 shows the cost of establishing FIO forest plantations with and without the forest village scheme. In the early 1980s there was a total of about 4,000 ha of taungya forest plantations under cultivation in the FIO scheme. Economic returns from the scheme varied depending upon various local conditions; a summary account of income from different regions of Thailand is given in Table 6.3.

The concept of the forest village has been tried, with varying degrees of success, in several other countries, e.g., Kenya, Gabon, Uganda, India, Nigeria, and Cambodia. Although it is more expensive (to the forestry departments) than the traditional practice of taungya, it is particularly suitable for countries with extensive natural forest resources and large numbers of shifting cultivators and landless farmers. Ideally, the system permits sustainable use of forest land for food production by landless people who would otherwise be engaged in forest encroachment.

Although the taungya system is often cited as a popular and mostly successful agroforestry approach to establishing forest plantations, it has also been criticized as labor-exploitative. It capitalizes on the poor forest farmer's need for food and his willingness (often out of helplessness) to offer labor for plantation establishment free of cost in return for the right to raise

the much-needed food crops for even a short span of time. The "improvements," such as the forest village scheme of Thailand, have not been very successful due to technical, socioeconomic, and institutional inadequacies. For example, practically no comprehensive research has been conducted on the

Table 6.2. Cost (US \$ per hectare) of establishing FIO forest plantation in Thailand with and without the Forest Village scheme.¹

	Without Forest Village		With Forest Village	
	Teak	Non-teak	Teak	Non-teak
<i>First year</i>				
Labor	205.60	235.05	71.20	82.07
Administrative cost	287.28	287.28	287.28	287.28
Fixed cost (house, machinery, etc.)	74.00	74.00	74.00	74.00
Stump or seedling and replanting charges ²	19.57	32.61	17.93	29.89
Forest Village expenses	—	—	168.29	168.29
Total	586.45	628.94	618.70	641.53
<i>Second year</i>				
Labor and/or reward	74.46	95.92	74.46	95.92
Stump/seedling	3.26	8.15	1.63	4.08
Total	77.72	104.07	76.09	100.00
<i>Third year</i>				
Labor and/or reward	56.79	66.86	56.79	68.86
Stump/seedling	1.63	4.08	0.82	2.04
Total	58.42	72.94	57.61	70.90
<i>Fourth and fifth years</i>				
Maintenance and protection per year	52.45	52.45	52.45	52.45
Total for two years	104.90	104.90	104.90	104.90
<i>Sixth to tenth years</i>				
Maintenance and protection per year ³	20.65	20.65	20.65	20.65
Total for five years	103.25	103.25	103.25	103.25
Grand total for ten years	930.74	1,014.10	960.55	1,020.58

¹ Daily wage rate per laborer = B38; 1US \$ = B23. (1983).

² Cost per teak stump = US \$ 0.03; cost per non-teak seedling = US \$ 0.04; replanting at the rate of 20% in "Without Forest Village" and 10% in "With Forest Village".

³ Thinning cost is not included as the output from thinning will cover the expenses involved.

Source: Boonkird *et al.* (1984).

Table 6.3. Area and total value of produce of the three agricultural crops grown in the forest scheme in Thailand in 1981.

Crop	Area of cultivation in plantation (ha)	Income (US \$)
Maize	1,661	163,568
Cassava	1,782	75,874
Kenaf	380	49,348

Source: Boonkird *et al.* (1984).

biological aspects of system improvement, resulting in a lack of technical information with respect to various aspects of system management. Moreover, sociopolitical factors have considerably influenced the scope and continuation of conventional taungya. The author was involved in a survey for ICRAF during 1978-1979 of the characteristics and the extent of distribution of taungya in different parts of the tropics, especially East Africa and South Asia. Several unpublished documents, including details of the legally binding agreements between the forestry departments and the farmers, were obtained. In most places these legal agreements were noteworthy more for the violations they caused than for compliance. In the course of time, the laws were repealed, diluted, or ignored. In some places, conventional taungya (and shifting cultivation) gave way to systematic settlement schemes such as the previously-discussed Forest Village Scheme of Thailand (Boonkird *et al.*, 1984); in others, taungya lands were eventually converted to agricultural settlements as in Kerala, India (Moench, 1991). Therefore, some forestry departments have become hesitant to lease lands to taungya farmers. In some countries, political or policy decisions have been made, due to increasing population pressures, to grant to the taungya farmers ownership rights to the land they used to farm according to the taungya system. The assumption is that, once the farmers obtain ownership rights to land, they would, in most cases, discontinue taungya and plant homegardens or other predominantly agricultural subsistence production systems. An interesting case in point is the transformation of the *shamba* system of Kenya. This system, which is a form of taungya, was adopted by Kenya's (Government) Forestry Department in the early 1900s in order to establish plantations throughout Kenya. Prompted by socio-political considerations, the government absorbed the taungya farmers into the civil service as regular employees of the Forestry Department in 1976. Once they were assured of their civil-service status and benefits, however, they were not obliged to farm, nor would land be allocated to them automatically (Oduol, 1986). Naturally, conventional taungya was no longer feasible in those circumstances. However, it is neither implied that taungya is the best form of land-use for those farms, nor that conventional taungya should continue for ever.

In summary, the taungya system, though still popular in some places as a means for plantation establishment, continues to be a relatively unimproved land-use practice.

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