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Second thoughts on secondary forests in Northern Thailand: the development potential of an underrated resource

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Abstract

Tropical secondary forests have not received as much attention as tropical primary forests. This is also true for the highlands of Northern Thailand, where secondary forests are widespread mainly as a result of swidden farming. Some of these forests are remarkably rich in species, most of which can be useful within the context of a traditional society. Due to large-scale land use changes, these secondary forests are in the danger of vanishing. In the face of some negative effects of these changes, it is argued that these secondary forests should be utilized within the context of forest management or agroforestry systems.

Keywords. Fallow forests, swidden farming, biodiversity, agroforestry, Thailand.

Tropical Secondary Forests: an Introduction

In comparison to the primary forests of the Tropics - especially tropical rain forests - tropical secondary forests have for a long time been neglected by both researchers and developers.

Tropical secondary forests were defined by Brown and Lugo, (1990: 3) as forests „formed as a consequence of human impact“. This characterization, however, is too vague in consideration of the complexity of human impact and its effects on forests. Broadly speaking, human impact may result in
- partial disturbance of a forest due to selective felling, grazing, etc.;
- the destruction of forest by clearance.

Because of the significant ecological differences that exist between forests recovering from clearance and forests recovering from disturbance, I would like to follow the recommendation by Corlett (1994) and restrict the term secondary forest to regrowth after clearance, referring to the forests of the first category as disturbed forest.

The deficit in our knowledge of tropical secondary forests and other secondary formations has already been deplored by P.W. Richards, author of the first comprehensive monograph on tropical rain forest:

> „Though many types of secondary vegetation from Tropical Rain forest have been described, they have seldom been closely studied and very few systematic observations have been made on the successions of which they are stages. It is unfortunate that this should be so, because no aspect of the ecology of Tropical Rain forest is of greater practical value or promises results of more theoretical importance. From the fragmentary observations available it is evident that these secondary and deflected successions are complex and vary greatly from place to place, depending on differences in the habitat and in its previous history“ (Richards, 1952: 377).

This neglect may to a large extent be due to the dismissal of tropical successions as a process of degradation and of tropical vegetation as useless brush by many observers. It is certainly also related to a preoccupation with tropical primary forests, which are considered as fragile and threatened ecosystems that must be studied before they are irretrievably lost.

The fact that secondary vegetation formations, especially secondary forests, cover large and ever increasing land areas in the Tropics has, however, caused many to have „second thoughts“ on secondary forests and to acknowledge that these forests must be managed and used in future. In response to this change of perspective and to the need to know more about tropical successions and tropical secondary forests, the literature on the subject has expanded considerably (Brown and Lugo, 1990).

The fact that the practical value of tropical secondary forests is also gaining recognition is attested to by the following statement in the 1998 annual report of the Center for International Forestry Research (CIFOR) in Bogor, Indonesia:

> „Secondary forests, which regenerate on native forest that has been cleared for ranching or agriculture, are an important focus of CIFOR research because of growing evidence that they help counter the loss of primary forest. Studies have demonstrated that secondary forests can be managed to provide many of the products that small-farmer households traditionally obtained from primary forests, while providing some of the environmental benefits of primary forests. The findings are leading to an interest in efforts to use policy and technical interventions to augment the value of secondary forests to farmers, thereby inducing them to maintain the amount of area devoted to secondary forests and delay its re-conversion to other uses“ (CIFOR Annual Report 1998).

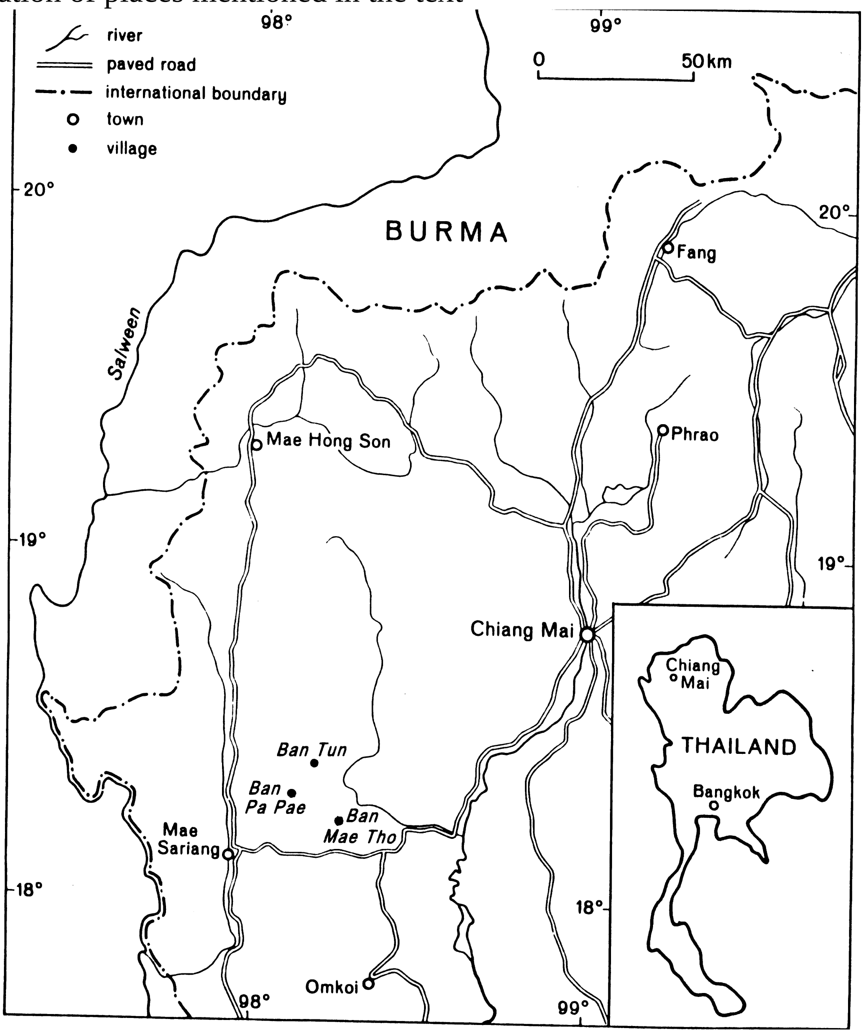
Fallow Forests of Northern Thailand

In the highlands of Northern Thailand - as in many parts of the Tropics, especially the seasonally dry Tropics - most secondary forests are mainly the result of swidden farming (Santisuk, 1988). Swidden farming - also referred to as „shifting cultivation“ or „slash and burn cultivation“ - is an ancient land use practice, which is characterized by the clearing and temporary cultivation of forested land that reverts to secondary growth when it is left to lie fallow. Secondary growth on fallow swiddens is therefore also referred to as „fallow vegetation“ or „fallow forest“.

Swidden farming in the hills of Northern Thailand is mainly practiced by ethnic minorities - the so-called „hill tribes“ - which have entered the country in several waves of migration. These minorities can be divided into a group of early immigrants (Lawa, Karen), who are living in Northern Thailand since several hundreds of years, and into a group of late immigrants (Hmong, Yao, Akha, Lahu, Lisu), who have started to migrate into Northern Thailand since the middle of the 19th century. These ethnic groups practice different types of swidden cultivation, which are also different with respect to their effect on the secondary succession on fallow swiddens (Schmidt-Vogt, 1997, 1999).

The official policy of the authorities in Thailand is to suppress swidden farming, which is considered as an extremely destructive form of land use and to encourage permanent farming or reforestation. The position of the government is grounded on a bias, which identifies swidden farming as a whole with the more destructive forms of this land use associated with the cultivation of the opium poppy. These cultivation systems have caused the conversion of forested land to ecologically poor grasslands in some parts of Northern Thailand. There are, however, other and more sustainable forms of swidden farming, which are based on a rotation of swidden fields and fallow forests. Some of these fallow forests are surprisingly rich in species and capable of playing a beneficial role in the geoecology of the region, where they occur. They also contain a large number of species, which are important within the context of the traditional economy of the farmer households. That forest regeneration on fallow swiddens is an interesting phenomenon worthy of the attention of a plant geographer was already noted in the first regional geography of Siam by Wilhelm Credner (1935). Since then, a number of studies on regrowth following swidden cultivation were carried out in the north of Thailand. The first survey of this kind took place in the course of an inventory of Thailand's teak resources by the German forester Loetsch (1958, 1962). 20 years later, floristics and biomass development during the first 3 years of succession on fallow swiddens of a Karen village near Mae Tho (see Fig. 1) were studied by Nakano (1978). At about the same time and in a nearby locality, the anthropologist Kunstadter and his team studied secondary formations on 4 to 10 years old fallow swiddens in the course of a comprehensive survey of the Lawa village Ban Pa Pae (Kunstadter, 1978, Kunstadter, Sabhasri and Smitinand, 1978, Sabhasri, 1978). The most recent study is a comparative survey of secondary vegetation on fallow swiddens of villages belonging to the Lawa, Karen, and Akha ethnic groups (Schmidt-Vogt, 1999). The Lawa village of Ban Tun has been selected to serve as a case study to illustrate the condition and the potential of fallow forests in Northern Thailand.

Figure 1. Location of places mentioned in the text



The Forest Fallow Economy of the Lawa of Ban Tun.

The village of Ban Tun is located in the western reaches of Northern Thailand, ca 60 km to the east of the Thai-Burmese border. Ban Tun (see Fig. 1) is inhabited by Lawa people - a small and ancient ethnic group, which has been able to remain sedentary in this region for the past 600 years because of its practice of a relatively sustainable form of swidden farming (Kunstadter, 1974, 1978). This type of swidden farming is mainly characterized by short cultivation periods of only one year duration and long fallow periods of up to 17 years.

The cultural landscape surrounding a traditional Lawa village consists of two categories of agricultural land:

- irrigated land for the cultivation of wet rice;
- swidden land for the cultivation of dry rice.

The greater part of the swidden land is covered by secondary vegetation in various stages of succession. A conspicuous feature of this landscape are the many remnant trees, which have been left standing on the cleared swiddens and which will be referred to as relict emergents. Relict emergents owe their existence to a clearing practice, which is characteristic of the Lawa people. According to Lawa tradition, one large tract of land - in the case of Ban Tun an area of about 60 ha - is cleared every year. Clearing the land is a communal event, which entails a division of labor according to gender: women are cutting all trees below a diameter threshold of 12-15 cm, men are climbing into the bigger trees that have been left standing in order to prune their branches. Brush and felled trees are left to dry on the ground for about 1 month and are then burned. Dry rice is planted right after burning (Schmidt-Vogt, 1997).

Secondary succession is setting in with the appearance of the first weeds even before the rice has been planted. While the rice is ripening, the fields must be weeded several times. The last weeding takes place about one month before the harvest. By the time of the rice harvest, the ground is again covered by a 5 cm tall layer of weeds and resprouting woody plants, which provides a cover of 50-90%. One year later, the most successful weeds - many of them invasive species such as *Chromolaena odorata* - have achieved dominance and form a two meter tall and almost impenetrable tangle of vegetation. This weed-dominated stage persists for up to 4 years. By that time, woody plants resprouting from roots and tree stumps have begun to emerge above the weeds and to gradually suppress them by shading. The succession then passes on through a scrub stage to the secondary forest stage.

The Fallow Forests of Ban Tun

In the course of my survey, I have studied these forests and compared them with the characteristics of secondary forests as they have been projected in the literature.

In the first version of his book on tropical rain forests, Richards (1952, pp. 379-382) lists the following features of secondary rain forests:

- secondary forest is lower and consists of smaller trees; occasional trees are usually found scattered through secondary forest;
- very young secondary forest is remarkably regular and uniform in structure, though dense and tangled, and difficult to penetrate; even-aged stands of one or a few woody species are quite common;
- at a later stage in the succession, an extremely irrregular structure is characteristic; gaps opening in the pioneer formation are occupied by climbers and slower growing trees which dominate the next phase of succession;
- floristic composition is characterized by an abundance of secondary species;
- secondary forest is poorer in species than primary forests and sometimes, but not always, dominated by a single, or a small number of species.

In the second edition of this book, Richards retains the statements concerning the structure of secondary forest, but revises the statement on species richness, writing that secondary forests do not necessarily have fewer species per unit area than primary forests (Richards, 1996: 462).

Whitmore (1986) added the following observations to this list: the scarcity of epiphytes, the gradual replacement of light-demanding pioneer species by shade-bearing late secondary species provided that seeds of such species are available as the succession continues, and the differences in the species composition between secondary forests above and secondary forests below 1,000 m.

Brown and Lugo (1990) emphasize the following characteristics of secondary forests:

- the number of plant species increases rapidly because plants regenerate by coppicing and root sprouting as well as from seeds, so that some secondary forests contain even more species than the primary forest, which they have replaced;
- total stem density is high, but there is a low density of trees with a diameter of more than 10 cm;
- basal area is low because of the large number of trees with a small diameter, but increases rapidly with age, the rate of wood production being higher in secondary forests than in primary forests.

On the swiddens of Ban Tun, secondary or fallow forests develop rapidly due to the practice of leaving stumps and root stocks in the fields, which provide woody plants that are capable of regenerating through sprouts with a competitive advantage over weeds and grasses. Coppicing trees have attained heights of 8 to 12 meters after ten years of forest development.

At Ban Tun, fallow forests are permitted to mature until they have attained a stand age of 15-17 years. Stands at this stage are structurally complex in the sense that they are composed of trees varying in height and diameter.Three types of trees forming three distinct layers can be distinguished:

- relict emergents from the previous stand with a height of more than 10 m in the uppermost layer;
- coppices of trees felled in the last swiddening cycle with a height of 8-10 m in the main canopy;
- seedlings and saplings, which have developed under the canopy of the coppicing trees, with a height of 4 m or less.

A similar structure was observed by Nyerges (1989) on fallow swiddens of Susu farmers in Sierra Leone.

With an average of 2,096 trees/ha, the fallow forests of Ban Tun are extremely dense. Basal area is variable depending on the number of relict emergents with a large diameter in each stand. The average basal area is 27.4 sqm/ha; maximum values, however, can be as high as 54.0, which is similar to the value of old growth forests in the same area.

Crown cover mostly exceeds 70%, but rarely approaches 90%, as one might expect considering the density of the forest stands. Even very dense stands have gaps in their canopies as a result of crown size and stem distribution. The tree crowns in secondary forests do not cover a large area on account of the growth strategy of successional trees to form a high and narrow crown in order to exploit a high light regime (Boojh, Ramakrishnan, 1982). Even the crowns of the relict emergents are smaller than expected because of the pruning during clearance. A more important cause for the existence of gaps is the uneven distribution of trees, which in some places form crowded clusters with a lot of overlap, while some places are almost treeless. This pattern results from the predominance of sprouting from stumps and root stocks, which tends to reproduce the distribution pattern of the previous forest, with a greater density of resprouting plants in the place of the former trees.

The fallow forests of Ban Tun are rich in tree species and not dominated by one or a small number of species. The most species-rich stands contain more than 30 species per 500 sqm in the tree layer alone.The total number or species occurring in the tree layer of all sample stands is 78. The most important species in terms of the ecological importance value, which was calculated according to the method of Curtis and McIntosh (1951), are *Schima wallichii*

(Theaceae), *Castanopsis armata* and *Lithocarpus elegans* (Fagaceae), *Aporusa wallichii* and *Glochidion sphaerogynum* (Euphorbiaceae), and *Shorea obtusa* (Dipterocarpaceae). The following families are also important with respect to the number of species by which they are represented: Leguminosae, Lauraceae, Anacardiaceae, Ebenaceae, Rubiaceae, Myrsinaceae, and Caprifoliaceae. The large number of tree species in these forests can be explained by the location of the study area at an altitude at or above 1,000 m, i.e. within a zone of transition, where lower montane forests are penetrated by floristic elements from forest types of lower elevations, i.e. seasonal rain forest, mixed deciduous forest, and deciduous dipterocarp forest. Penetration is enhanced by the frequency of fire in swidden environments. Normally, fire is not an important ecological factor in the lower montane zone, and it is due to the effect of swidden fires that swidden forests are characterized by a larger component of floristic elements from below than would be the case naturally.

Forest stands are characterized by a rapid increase in wood volume as indicated by the abundance of trees with small to medium diameters. The relatively small numer of trees with very small diameters is, however, evidence that these stands have already completed the very early stage of secondary forest development, when large numbers of new individuals are being recruited. If these forests remain undisturbed, this trend will continue and further forest development will consist mainly in the maturation of coppicing trees, and the filling in of gaps in the canopy by younger trees. The regeneration potential of these secondary forests must be excellent because of the large number of seedlings of many species in the ground layer. This conclusion is supported by Cheke et al. (1979), who reported large amounts of viable seed of secondary forest trees in the soil of forests above 1,000 m, which must have accumulated over a period of several years. Regeneration of secondary species from seed is, however, a highly complex issue, according to Whitmore (1983), because of the variable establishment requirements of these species.

The ecological quality of these forests, measured in terms of biodiversity and structural complexity, is therefore quite good and they apparently seem to be „capable of producing some of the environmental benefits of primary forests“ as was stated in the CIFOR report of 1998. More important with respect to the resource value of these secondary forests is the fact that they contain a large number of species, which are useful within the context of the traditional village economy.

In the course of my studies of fallow forests at Ban Tun I have also collected ethnobotanic information on the tree species occurring in these forests. From 78 species, 49 were desribed as useful, most of them for two or three different purposes. The wood of Fagaceae, especially that of *Lithocarpus elegans*, is highly valued as construction timber, but it must be noted that the size of representatives of these species in fallow forests is often too small and that trees from old growth forests are preferred for this purpose. The wood of trees from fallow forests is therefore used more commonly as firewood and for the making of fences or tools. The wood of *Quercus vestita* and *Q. kingiana* is preferred as fuel during the rainy season because it provides a long lasting fire. The wood of certain legumes is valued for the making of intricate tools, e.g. the wood of *Dalbergia stipulacea* for parts of the spinning apparatus. The bark of trees provides fiber for the making of strings (*Dalbergia fusca, Desmodium floribundum, Millettia pachycarpa, Spatholobus* spec., *Sterculia ornata, Thunbergia laurifolia*), for medical (*Cinnamomum aromaticum*) as well as decorative (*Dalbergia stipulacea*) purposes. Fallow forests are also an important source of food, mainly of fruit (e.g. *Elaeocarpus floribundus, Eugenia* spp., *Ficus* spp., *Litsea cubeba, Myrica esculenta, Oroxylum indicum, Phyllanthus emblica, Vaccinium sprengelii*) or of leaves (e.g. *Cratoxylon cochinchinense, Engelhardia serrata, Maesa indica*).

The Future of Fallow Forests in Northern Thailand

Because of the decline of swidden farming in Northern Thailand and its replacement by other types of land use such as reforestation, nature conservation, but more importantly permanent farming, fallow forests such as the forests at Ban Tun are in danger of vanishing. Two causes are mainly responsible for this development:

suppression of swidden farming by government authorities;
economic incentives

Government authorities in Thailand have been opposed to swidden farming for various reasons. In the 1960s, when opium cultivation was widespread and when some ethnic groups, e.g. the Hmong, were engaged in open insurrection against the government, swidden farmers and their way of life were regarded as a threat against the political stability of the kingdom's northern periphery. In the 1970s and even more conspicuously in the 1980s and 1990s, political reasons for counteracting swidden farming gave way to ecological reasons. Today, environmental degradation due to swidden farming is usually put forth as the main argument against a continuation of the swiddening way of life. Since then, swidden farmers have been partly persuaded and partly forced to mend their ways by changing their land use.

Economic incentives have been created by the construction of a road network in the hills of Northern Thailand since the 1960s. Road construction has created linkages between the highlands and the lowlands and has made lowland markets accessible for temperate crops such as cabbage and tomatoes, that can be grown as cash crops in the cool climate of the highlands. Attracted by the prospect of cash earnings, many farmers have transformed their land use practice either partially or completely from swidden farming with rice and other staples to permanent farming.

This development shall again be illustrated by the example of Ban Tun. Swidden farming continued undiminished until 1992. In 1993, a part of the swidden land was used for the cultivation of cabbage, which at that time was a successful commercial crop in terms of cash returns. Cabbage cultivation is more intensive than swidden farming: fields are permanent; they are cultivated for several years and left fallow for only 1-2 years. Cabbage cultivation requires fertilization, the application of herbicides and pesticides, and irrigation.

With respect to vegetation cover, the most important impact of the land use change from swidden farming to cabbage cultivation is a reduction in the area covered by secondary forests. There are other negative ecological consequences such as water pollution and soil degradation. The economic benefits, which had been the main reason for bringing about the land use change, were also not of a sustainable nature. By the year 1997, the price for cabbage had fallen dramatically due to overproduction and the villagers were already considering other options, such as the cultivation of fruit trees, e.g. lychees.

At this point, one should stop, however, and consider whether permanent farming with cash crops is really the only alternative to swidden farming. It has been shown that secondary forests as an integral part of swidden cultivation have been a source of many mertialsls that were useful within the context of a subsistence-oriented traditional economy. Now that the larger economic context is changing from a subsistence economy to a commercial economy, there may also be a new economic potential inherent in these secondary forests.

Sabhasri, who in the 1970s has carried out the one of the first surveys of secondary vegetation on fallow swiddens of the Lawa, made the proposal that the swidden farming system of the Lawa should be transformed into a forest management system for the production of firewood (Sabhasri, 1978). At that time the major obstacles in the way of such a development were the unresolved issue of landownership of the minorities and the lack of infrastructure for the transport of firewood. Landownership by minorities is still a contested issue, but the transport situation has improved significantly so that there are better opportunities today for marketing forest products than 20 years ago.

The sale of firwood is only one possibility among others to obtain a cash income from forest products. The secondary forests of Ban Tun contain a number of tree species, which are suitable for commercial utilization. For brevity's sake I want to mention *only Styrax benzoides*, which produces an aromatic resin. In Laos, a closely related tree species, *Styrax tonkinensis*, is cultivated for this purpose in agroforestry systems. This leads to the question which land use systems could be suitable for the commercial use of trees in secondary forests. There are several possibilities:

- the conversion of swidden farming systems to agroforestry systems, which could be similar in structure to the swidden fields with relict emergents of the Lawa;
- the supplementation of swidden farming with the management of fallow forests;
- the combination of swidden farming with forest management according to the taungya principle.

The future „Beyond slash and burn" - to quote the title of a book on a swidden cultivation system practiced in Eastern Kalimanta (Colfer et al., 1997) - is too often seen in terms of the enhancement of the agricultural aspect of swidden cultivation. The other option - intensified use of the secondary forest component of swidden farming systems - has been neglected so far and should receive more attention in the future.

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