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## Swidden farming in rain-green forests of mainland Southeast Asia

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**Abstract:** In terms of the period of crop planting and fallowing, three types of swidden farming have been noted- (1) short-term cultivation with long-term fallow, (2) short-term cultivation with short-term fallow, and (3) long-term cultivation followed by migration and abandonment. The first category is the most common type of swidden farming in the continental areas of Southeast Asia, in which upland rice is cropped for one year followed by fallowing the field for nearly ten years. Since upland rice seed is sown by maintaining a certain distance between the seeds using dibbling sticks, the surface of the soil is not disturbed. Further, the secondary forest is fully restored during the fallow period thanks to pioneer tree species and the regeneration of stumps through the sprouting of new branches. The second category is the early stage of the paddy field cultivation process or complementary swidden farming. Many of these fallow fields are bamboo forests. The third category is the swidden farming of the Mong, who live in the montane forest above 1,000m altitude. As commonly observed in Myanmar, Thailand and Laos, swidden farming in the monsoon zone ends with a single year of cropping. Here swidden farming in the rain-green forest of Karen village in the Bago Mountains and a Khmu village in northern Laos is reviewed.

**Key words:** Swidden farming, rain-green forests, Southeast Asia, short-term cultivation, long-term fallow.

### Rain green forest and Laurel forest

The greater part of continental Southeast Asia has a monsoon climate with a distinct dry season, and there is a wide distribution of monsoon forest, also known as "tropical seasonal forest." Compared with tropical rainforest, tree heights are lower, the layered structure is simpler, and leaves fall in the dry season, though only for a short period of time. Tropical seasonal forests are classified into three types according to the degree of dryness; (1) evergreen seasonal forest, (2) semi-deciduous seasonal forest, and (3) deciduous seasonal forest. There are no gigantic trees in an evergreen seasonal forest. Some tall trees lose their leaves in the semi-deciduous seasonal forest, as do almost all trees in deciduous seasonal forest. If the area is drier than this it becomes savanna. Aside from such seasonality in rainfall determined by latitude, there are also changes in rainfall that depend on altitude. High altitude areas have montane rainfall. Such an area develops a so-called "moss forest," i.e., an evergreen montane forest composed of oak and laurel trees of Fagaceae and Lauraceae. These trees are covered by moss. In the continental areas of Southeast Asia, the evergreen forest in upstream mountain land connects with laurel forests, while the evergreen forest in downstream lowland areas connects with tropical rain forests. Between them spread the monsoon forests, where leaves fall during the dry season and the scenery turns green all at once with the arrival of the rainy season. In May, the southwest monsoon brings rain from the Indian Ocean, which very rapidly turns the landscape in these areas to green. Because of the vivid impression this change creates on people, monsoon forest is also called "rain-green forest". The "Thai cultural sphere" spreads from this monsoon forest zone to the laurel forest zone. This cultural sphere extends to six countries-Vietnam, Laos, Thailand, Myanmar, India, and China straddling the great rivers that flow down from the Tibetan Plateau; the Mekong, the Salween, and the Brahmaputra, as well as their watersheds. In this region, the altitude of approximately 1,000m divides the landscape like a borderline, with mixed deciduous forest and dry dipterocarp forest spreading in the lower part, and evergreen montane forest in the upper

part. The domain of the Thai cultural sphere overlaps with the transitional zone of rain-green forests and laurel forests. In the continental areas of Southeast Asia, the most common type of swidden farming has been the one-year crop of upland rice in the rain-green forest zone. On the other hand, various types of crop rotation methods are observed in swidden farming performed in the laurel forest zone. Although the relations between the ethnic groups and their livelihood activities or their ways of making use of the environment are not fixed in any way, let us take a look at the general picture as it has been in the northern part of Myanmar, Thailand and Laos up to now.

In Laos, people are classified into three categories; *Lao Sung* (highland Lao), *Lao Theung* (midland Lao), and *Lao Lum* (lowland Lao). Although the actual habitation areas are intricately interwoven, simply stated, the highland Lao sustain their livelihoods by swidden farming (poppy farming in the past) in the evergreen montane forest zone, the hillside Lao by swidden cultivation of upland rice and the gathering of forest products in the mixed deciduous forest zone, and the lowland Lao by lowland rice cultivation in paddy fields in the flatlands.

As in Laos, the separation of mountain dweller habitation primarily by altitude was also clearly observed in northern Thailand until the 1960s. There have been different types of swidden farming, including the poppy fields of the Mong in evergreen montane forest, the swidden farming of the Karen, ranging from evergreen montane forest to mixed deciduous forest, and complementary swidden farming by lowland Thais. In terms of the period of crop planting and fallowing, three types of swidden farming have been noted; (1) short-term cultivation with long-term fallow, (2) short-term cultivation with short-term fallow, and (3) long-term cultivation followed by migration and abandonment.

The first category is the most common type of swidden farming in the continental areas of Southeast Asia, in which upland rice is cropped for one year followed by fallowing the field for nearly ten years. Since upland rice seed is sown by maintaining a certain distance between the seeds using dibbling sticks, the surface of the soil is not disturbed. Further, the secondary forest is fully restored during the fallow period thanks to pioneer tree species and

the regeneration of stumps through the sprouting of new branches. The second category is the early stage of the paddy field cultivation process or complementary swidden farming. Many of these fallow fields are bamboo forests. The third category is the swidden farming of the Mong, who live in the montane forest above 1,000m altitude. Until recent years, the Mong grew poppies (*Papaver somniferum*) and maize for a long period in one place, followed by abandonment and the clearing of new swiddens elsewhere. The Mong, who are highland dwellers, lived on maize originating from the new continent, and cultivating poppies. It would be reasonable to consider that this type of long-term cultivation is a technique of permanent cultivation originally introduced from China.

There are three types of agriculture in the mountain areas of northern Myanmar; monsoon *taungya*, grassland *taungya*, and irrigated hill terraces. A monsoon *taungya* is cultivated for one year only, and then fallowed for 12 to 15 years. In a grassland *taungya*, after practicing a crop rotation of maize, buckwheat, millet, wheat and barley, the land becomes grassland fallow.

Leach has described this as follows; 'When *taungya* and hill terraces are both cultivated by the same community, as is often the case, the people concerned seem usually to regard *taungya* cultivation as the more rewarding. On the other hand, since terraces can be cultivated year after year with little or no fallow period, relatively dense local aggregates of population are possible. Hill terraces are thus usually found associated with unusually large communities on permanent sites. The real advantage of hill terrace systems seems to be military and political rather than economic.' (Leach 1954) This is a notable point in the comparison of swidden fields and paddy fields, and in my opinion is a viewpoint that leads to the notion of agricultural intensification which argues that intensification is achieved at the cost of labor productivity. As commonly observed in above-mentioned northern areas of Myanmar, Thailand and Laos, swidden farming in the monsoon zone ends with a single year of cropping. All activities, including site selection, clearing, burning, sowing, weeding, control of agricultural damage by wild animals, and harvest are performed in one year. These peoples have repeated the process of "select, cut, burn, sow, raise, protect and reap" year after year, with the arrival of the dry and rainy seasons.

#### **Karen swidden farming in the Bago mountains**

In the Bago Mountains, located between Mandalay and Yangon in Myanmar, the Karen people practice swidden farming in mixed deciduous forests. Let us take a look at the content of their activities.

**Site selection:** When the dry season comes, a field is selected for burning. They do not perform swidden farming within one kilometer of the area surrounding the village since this area contains water conservation forest and areas for collecting fuel wood. The people choose a "cold" area with black soil, avoiding ridges because the soil there is "hot." The people say places where Thai-wa bamboo (*Bambusa tulda*) grows are suitable for swidden

farming because these places are relatively flat and the soil is clayish.

When they find a place that seems suitable, they take a handful of soil back to their house, put it under their pillow and sleep. If they have a good dream, the place is satisfactory, and if they see a bad sign in a dream, they will seek another candidate site.

"Evil spirit, please go away. We are going to work in this place for food, to support my wife and children. May no mischief happen here. We will work to the last." These are the Karen words offered at the ritual of *Ta mawa hku*.

**Cut and clearing:** In December, the mountain area becomes much colder. The large leaves of teak trees become wet with the night dew, which drops like rain. The drops hit the parched leaves on the forest floor making a thudding sound. Clearing begins in the cold season, around mid-January. Clearing is a man's work. The men cut trees starting from the lower part of the slope, using a woodman's hatchet. Chataung-wa bamboo (*Bambusa polymorpha*) and Tin-wa bamboo (*Cephalostachyum pergracile*) are clumping bamboos whose multiple culms from sympodial rhizome stand as if bundled together. The Karen people cut them from the outside. They cut big trees at about two meters above the ground, not at ground level. They prop the cut bamboo stems against the tree like a ladder and cut the tree using the bamboo to stand on.

A newly-cleared swidden field will be left as it is to dry. Daytime temperatures become hotter after the Chinese New Year in February, and the hot season arrives in March. Generally in February the Karen make firebreaks of three meters in width around cleared fields in order to prevent the forest fires from invading the field. The people sweep away fallen leaves and sticks so that the forest fire cannot spread to the field from outside.

**Burning of slush:** The hottest season in the year is around the time of the Water Festival in April. The fields are burned at this time of the year. Burning starts from around 1 p.m., the hottest time of the day. The result of the burning greatly affects the crop. Two or three days after the burning, the people gather the residual woods and conduct a second burn, and then begin to build a temporary field hut in the field.

**Seed sowing:** In May, a southwest monsoon wind brings rain and the parched land turns to green all at once. This is the period of the year when you can get a real sense of the meaning of the name "rain-green forest." With the arrival of the rainy season, the Karen strike holes in the soil with a dibbling stick and drop seeds into the holes. The dibbling stick is made of bamboo and has holes bored in it so that it makes a popping sound when the people strike the ground with it. It is a digging stick with a clapper.

The Karen raise three varieties of upland rice; non-glutinous early maturing variety, non-glutinous late maturing variety and glutinous medium maturing variety. Other than sesame, chili pepper and cotton, their main cash crops, they also grow millet, sorghum, maize, Job's tears, sugarcane, common beans, pigeon peas, cassava, konjac, cucumbers, melons, pumpkins, eggplants, okra, tomatoes, *Indigofera* spp., hibiscus, tobacco, bananas, as well as flowering plants such as feather cockscomb (*Celosia argentea*) for ornamental and ceremonial use.

**Raise weeding:** Rains not only raise crops, but also grow thick weeds. Weeding begins just after sowing, and is carried out three times up to the end of September. Weeding is a hard work.

**Protect agricultural damage caused by wild animals:** The Karen make a fence around the swidden field by September to prevent wild boars that eat upland rice and barking deer that eat chili peppers from entering the field. The swidden fields are surrounded with the bark of the Shaw-ni (*Sterculia villosa*).

Clappers are used to scare deer away. The rope for the clapper is also made from Shaw-ni (*Sterculia villosa*, *S. versicolor*).

**Harvesting:** The harvest of the early maturing rice begins in November, and the harvest of the late maturing rice is completed in December. The grain is threshed at the field hut and stored in a rice granary. Feather cockscomb flowers bloom in the swidden fields around the time of the rice harvest, turning them into flower gardens.

**Fallowing:** Shortly after the fallow period has started, *Chromolaena odoratum* and *Thyrsanolaena maxima* begin to grow. The fallow land is covered by these grass in the first one or two years. Following these grass, bamboo species recover. Species such as Chataung-wa bamboo and Thai-wa bamboo are usually seen in fallow land. When you walk around in this kind of bamboo forest, all around the area you will see small piles of soil made by digging the surface. These are the work of the lesser bamboo rat (*Cannomys badius*), called *bwi* in Karen and *pwi* in Burmese. The soil they have dug out to make their nesting holes is piled up by the entrances. The lesser bamboo rat digs underground tunnels from the entrance and scrapes out soil at regular intervals. In this way, they breed in the nest holes in the ground, eating bamboo roots and bamboo shoots. There are also traces of digging by wild boars on the ground. The ground in the fallow areas, especially those of young fallows, looks as if it has been cultivated. The cultivation power of animals plays a significant role in the recovery of fertility in fallow land. Unlike the Japanese word *shinkan* (“the hushed silence of the forest”), fallow forest is in fact quite a lively world where animals are very active.

Regeneration of new branches begins from the pollards of trees such as *Xylia xylocarpa* (Burmese iron wood) which were cut well above the ground when clearing the field. The height of these trees exceeds that of bamboo after about ten years have passed after cutting. The biomass of trees recovers to a level roughly the same as that of bamboo. The secondary forest, where bamboo and trees are mixed in this way, is a suitable area for swidden farming because clearing is easy and the biomass burns well.

The transition of the vegetation that covers the land after swidden farming, from grass, to bamboo and then to trees, is the process of secondary succession. Swidden farming involves the troublesome work of weeding. Swidden fields require weeding at least three times in the first year. In the second year, as much as three times the amount of weeds will grow compared to first year. It therefore saves trouble and is more rational to allow secondary succession proceed and wait for the weeds to be defeated by the

bamboo and trees covering the ground and darkening the forest floor instead of fighting a losing battle against weed infestation.

#### **Khmu swidden farming of the northern Laos**

The Khmu people produce upland rice in swidden fields below an altitude of around 1,000m. After a single crop in the first year, the field is fallowed for six or more years. They produce upland rice for self-consumption and earn cash by producing and gathering forest products.

In the swidden fields of the Khmu people of northern Laos, Siam benzoin (*Styrax tonkinensis*), a pioneer species, is the dominant species in fallow forests. Khmu people collect benzoin resin in the seventh and eighth year of fallowing, following which they clear the forest and carry out swidden farming in the ninth year.

Siam benzoin, a tree found in the mountain areas of northwestern Vietnam and northern Laos, provides benzoin resin, a raw material for perfumes and medicine. In particular, northern Laos has been known as a production area of Siamese benzoin since old times. Siam benzoin is a fast-growing, indigenous species and becomes the dominant species especially in a fallow forest after swidden farming. Benzoin resin has been produced in fallow land after swidden fields have been used to produce rice.

Here I would like to present the case of a village in Louang Phabang Province in northern Laos. Many of the secondary forests surrounding the village are fallow swidden fields consisting of Siam benzoin trees. The people clear the fields to be burned from the end of December to February, and burn the fields from the end of March to April. This burning breaks the dormancy of Siam benzoin seeds that have fallen to the ground during the previous autumn. When May comes, bringing the rain, the people sow upland rice seeds keeping a certain space between them. They also grow cassava, sesame, chili pepper, Job's tears, rattan, feather cockscomb and other plants in the swidden fields. At the time when the upland rice grows to around 30cm, Siam benzoin seedlings of about 5cm in height can be observed almost everywhere around the swidden field. Weeding is carried out three times. At the same time, the people carefully keep the seedlings. By the time the upland rice is harvested, the Siam benzoin have grown to about head height. The extraction of benzoin resin is conducted in the seventh and eighth years. The field is then cleared and swidden farming is carried out again in the ninth year.

Burning of the field facilitates germination, and Siam benzoin will grow as a pioneer species in fallow fields. They are felled after their resin is collected, and a new cycle of swidden farming begins. Here the combination of Siam benzoin and swidden farming is advantageous for two reasons; (1) the characteristics of the trees as a pioneer species, i.e., Siam benzoin are light demanding species, and their germination is facilitated by burning, and (2) regeneration is required because the resin can be extracted only for two years.

In northern Laos, cardamom and rattan as well as benzoin resin are gathered in the fallow lands after swidden farming. Lac and eaglewood are also produced on fallow

lands. The fields greatly contribute to the livelihood of swidden farmers as a “productive fallow.”

### Strength of Water and Fire

In the rainy season, green paddy fields can be seen in intermountain basins. The rainy season from May until around October is the season for farm work. From November until around April is the dry season when the people carry out the clearing and burning of swidden fields. In the continental areas of Southeast Asia, paddy farming and swidden farming have been practiced to the rhythm of the monsoon climate in which rainy and dry seasons are repeated alternately. The “Thais,” who cultivate paddy fields, may sometimes perform complementary swidden farming in side valleys and the areas between mountain foothills and arable flat land. On the other hand, mountain dwellers sometimes cultivate paddy fields. In this sense, “Thais” and mountain dwellers form a continuum.

The Chinese character “畑” is a *kanji* unique to Japan, composed of “火” (fire) and “田” (field). While a paddy field (*suiden*, “水田”) is called *ta* (“田”), an upland field is made by burning away the vegetation on the ground and is called a *hatake* (“畑”). It is said that in ancient China, an area of land burned in order to carry out hunting by surrounding an area of forest was called “火田,” which later came to mean a swidden field.

In order to create the conditions necessary for crops to grow, people change the environment by borrowing the strength of water in paddy fields, or fire in upland fields.

In swidden farming, before cultivating upland rice, people burn the field to restore the conditions to those of an early stage of succession. During the fallow period, the recovery of secondary forest is left to the natural process of succession. When the forest has recovered, the fields are cleared and burnt again, and upland rice will be grown. This process of succession, taking ten or more years for each cycle, has been repeated in swidden farming.

A paddy field maintains the conditions of the early stage of hydrarch succession by inundation. In this way, the conditions of an early stage of succession are restored by the strength of fire in the case of swidden farming, and by water in the case of a paddy field.

There are four major types of succession process; (1) xeric succession, (2) hydrarch succession, (3) psammophytic succession and (4) halophytic succession. Swidden farming falls into the first category, and paddy cultivation into the second category.

Swidden farming repeats the process of disturbance and succession in which forests are burned and then recover on the land formerly cultivated. Therefore, the forests where swidden farming is practiced are, unlike the case of monoculture plantation, not uniform, forming an uneven patchwork of swidden fields, young fallow land, old fallow land and deep forests. This uneven patchwork provides diverse habitats for plants and animals, and this diversity has brought about the possibilities for various products.

### Forest Products from Fallow Land

People of the continental areas of Southeast Asia have been connected with the external world through the trade in forest products. These products have been gathered to port cities located along the rivers.

For example, among the exports of the ancient kingdom of Lan Xang, particularly important were gold, lac and benzoin resin. These forest products were transported across mountain passes carried on the backs of people, horses and oxen, shipped down rivers to port cities such as Ayutthaya, and then exported to Europe and beyond from the Coromandel Coast on the far side of the Indian Ocean. The products conserved well, and were therefore able to travel long distances, were easy to transport, and were lucrative. For centuries, people in northern Laos have lived self-sufficient lives practicing swidden farming, supplemented by cash income from forest products.

The mountain area of continental Southeast Asia that leads to Yunnan and Assam is also the origin of tea plants. In northern Thailand, northern Laos and the Shan State of Myanmar, people produce chewing tea, known as *miang* in Thai, and “lahpet” in Myanmar. The people chew the tea leaves, which are fermented after steaming the raw leaves. In *miang* tea gardens, the tea plants are planted under the tall shade trees of the mountain forest. In these tea gardens, the gathering of firewood for steaming tea leaves was combined with grazing forest for the draft oxen used for shipping the chewing tea. Here the grazing inside the forests has prevented wildfires from invading the field areas in the dry season.

Kingdon Ward (1960), who conducted field study in the Mishmi Hills of Assam, in search of wild species, has written as follows; ‘*Camellia sinensis* is a plant of the foothills, not of the plains. Is it not significant how its cultivation, even its very existence, seems to cling around places where the much-travelled Tai race is, or has been or could have been? The long road of their migrations is still bordered with tea-bushes. Will anyone claim that this is coincidence?’ Almost all of these tea gardens are developed in former swidden fields. We can consider that the planting of tea and eaglewood imitates the last stage of secondary succession. The Thai cultural sphere, spreading from rain-green forests to the laurel forest zone, is a world where mountain ranges are decorated with a patchwork of disturbances and successions of swidden fields that produce various forest products.

**Note:** This paper is a revised version of Takeda, S. (2011) Swidden Farming and Monsoon Forests of Mainland Southeast Asia: A Patchwork of Disturbance and Succession. *Journal of Agroforestry and Environment* 5.

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### References

- Leach, E.R. 1954. *Political Systems of Highland Burma: A study of Kachin social structure*, G. Bell and Sons, London.
- Kingdon-Ward, F. 1960. *Pilgrimage for Plants*, George C. Harrap and Co. Ltd, 1960, London.