Fallow Period and Transition in Shifting Cultivation in Northern Thailand Detected by Surveys of Households and Fields

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Fallow Period and Transition in Shifting Cultivation in Northern Thailand Detected by Surveys of Households and Fields

Takashi MASUNO* and Kazunobu IKEYA

National Museum of Ethnology, 10-1 Senri Expo Park, Suita, Osaka 565-8511, Japan

Abstract The purpose of the present study was to analyze the changes in the location of shifting cultivation fields, mainly of upland rice fields, in northern Thailand. Practically, the authors examined the land use history of two households in a Yao (Mien) community from 1980 to 2005. Rotational use, in which the same field is reused at an interval of several years, was confirmed in nine cases based on the annual changes in the location of upland rice fields. The duration of the average fallow period was similar for both households, namely, 5.0 years and 4.5 years after the late 1980s. The actual fallow period was highly variable, however, depending on the fields. A distribution of 1-10 years and 1-13 years was apparent in the fallow period for each household. The time when each household stopped using the fallow system differed depending on the strips of field, and the year when this first occurred was 1995 for one household and 1999 for the other. Our results underscored the variety of the processes involved during the transition from the shifting cultivation system to the permanent system for field cultivation or forestry, depending on both households and strips of field.

Key Words: GPS, land use history, permanent farming, slash-and-burn farming, upland rice

Introduction

Approximate duration of the fallow period for shifting cultivation in northern Thailand has been determined for different communities through a series of interview studies: 8-9 years for the Lawa in the 1960s (Kunstadter, 1967); five years for the Karen in the 1970s (Nakano, 1978); ten years for the Lahu and Hmong in the same decade (Keen, 1978); and 17 years for the Lawa and 1-8 years for the Akha in the early 1990s (Schmidt-Vogt, 1998).

These researchers, however, did not investigate differences in the fallow period among households in a community and among fields cultivated by a single household, except for a study conducted for 32 strips of field in the Karen in Thailand in 1968, which revealed differences in the duration of the fallow period for each strip of field (Hinton, 1978). Some authors also recorded the fallow period of fields in countries neighboring Thailand. For example, in one village in Myanmar, a fallow period of 12-18 years predominated among all the shifting cultivation fields from 2002 to 2004 (Takeda *et al.*, 2006). In one district of northern Vietnam, in 40% of upland rice fields the duration of the fallow period exceeded 15 years, whereas in another district, in 70% of the fields, the duration of the fallow period was less than 12 years (Pandey and Minh, 1998). In a village in Luang Prabang province in northern Laos, in 39 of 68 upland rice fields the duration of the fallow period was 1-3 years and in 12 fields, the duration of the fallow period exceeded six years in 2003 (Nakatsuji, 2004).

The purpose of the present study was to analyze the changes in the location of shifting cultivation fields, mainly of upland rice fields. We studied the land use history of two households in a Yao (Mien) community consisting of 20 households from 1980 to 2005. For this purpose, we reconstructed the land use history of each strip of field on a household basis, and determined the duration of the fallow period and changes for each household and field.

Materials and Methods

Study site and households

The present study was carried out in Pha Daeng village, located on a hillside, 950 m above sea level, in Phayao Province, northern Thailand, which borders on Laos (Fig. 1). Almost all the residents in the study village were Yao. The population of the study village in 2004 consisted of 128 people in 20 households. All the households were engaged in agricultural work and cultivated their fields (Fig. 2). In the present study, individuals with the same domicile were treated as members of a single household.

According to our study, only eight out of the 20 households of the community under study had

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* Corresponding author
masuno_takashi@goo.jp

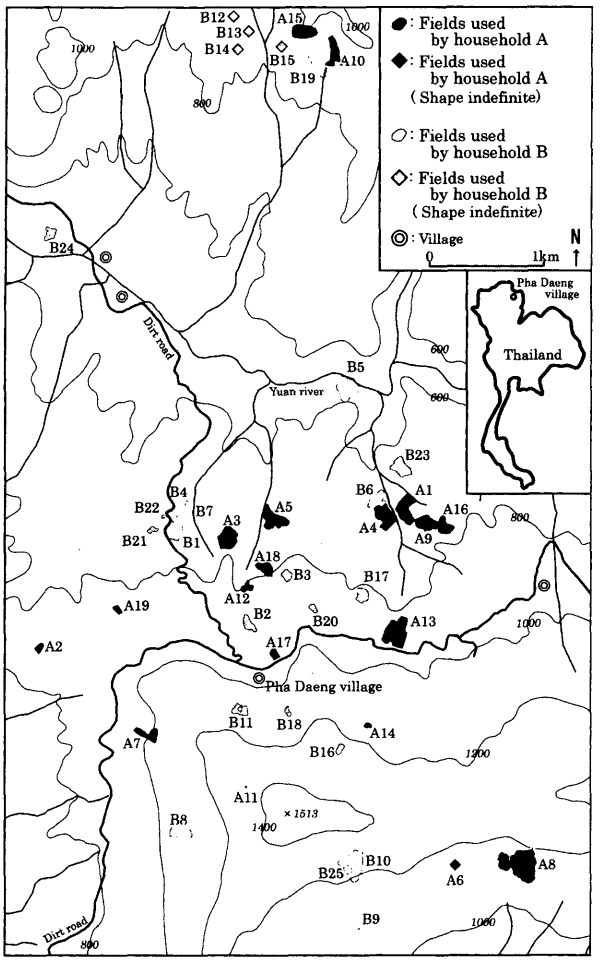

Fig. 1 Study site and distribution of fields cultivated by households A and B (1980–2005).
Note: Borrowed fields are excluded.
Sources: Interviews with cultivators and field measurements using handheld GPS.

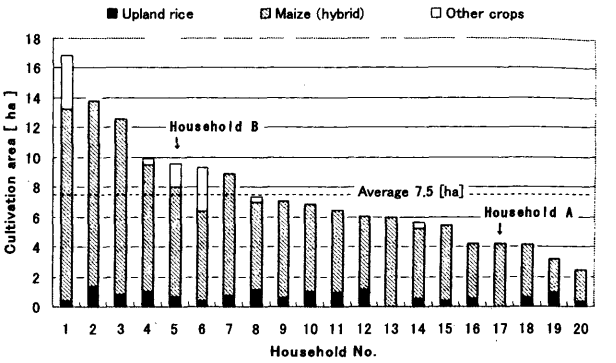

Fig. 2 Areas cultivated by each household in Pha Daeng village (2005).
Source: Field measurements using handheld GPS.

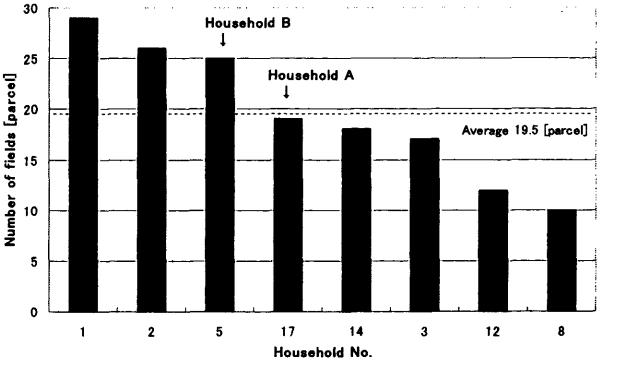

Fig. 3 Approximate number of fields cultivated by eight households in Pha Daeng village (1970s-2005).
Note: These eight households had resided in the village from the 1970s to 2005. The fields corresponded to those in which each householder had acquired the right of land use. Household No. refer to Fig. 2.
Source: Interviews with individual householders.

maintained their residence from the 1970s to 2005. Fig. 3 shows the approximate number of fields cultivated by these eight households (1970s to 2005). The average number of fields was 19.5 parcels per household. We selected two households for intensive study: household A (19 parcels), which used less than the average number of fields for the village and household B (25 parcels), which used more.

Data collection

Farmers accompanied us to the sites of their fields, which we identified and measured by using a handheld global positioning system (GPS). We also assessed the period during which the sites were cultivated, based on information about the family history.

We used the following method for investigating the family history. First, we asked cultivators about the approximate order of field utilization to determine the year of field cultivation. Secondly, we determined who had been engaged in cultivation in each field. Thirdly, we interviewed cultivators about the year of utilization in the greatest possible detail. Fourthly, we determined the life history of each member of each household, including date of birth, year of death, wedding year, years of leaving and returning to the village, years of admission to and graduation from school, and years of memorable accidents or events. Documentation of the dates of birth of the members of the houses written in Chinese characters was available. Finally, we determined the year of field utilization by using information about the cultivators of each field through interviews, and the life history of household members.

Changes in farming practices

Farmers in the study area had switched from shifting cultivation to permanent farming. The following is a brief outline of upland rice (*Oryza sativa*) farming

by the shifting cultivation method in the study area in the 1980s. First, around March, after cutting the forest trees using a hatchet or an ax, the farmers dried the site in the sun. They burned it around April and after the rains started to fall in May, they sowed seeds with a dibble stick. Thereafter, they removed weeds manually until harvest around October, when the rains partially abated.

In contrast, presently, the economy of the village is mainly based on farming of hybrid maize (*Zea mays*) as a cash crop, combined with upland rice as a subsistence crop. Some villagers grew opium poppies until the 1990s and have tried to grow wet rice, cotton plants (*Gossypium* sp.), soybean (*Glycine max*), rice bean (*Vigna umbellate*), and ginger (*Zingiber officinale*).

The primary factors underlying the transition from shifting cultivation to permanent farming included the creation of a village boundary between the village under study and the neighboring village in 1987, the establishment of a forest conservation area to manage the watershed area by the Royal Forest Department from 1991, and the introduction of herbicides and chemical fertilizers by the villagers in the 1990s.

Fig. 2 depicts the total area of arable land cultivated by each household in 2005, showing that hybrid maize was cultivated in the majority of arable land, and that although upland rice was also cultivated in part, the areas differed for each household. The average cultivation area of the village was 7.5 ha per household. Households A and B cultivated 4.2 ha and 9.6 ha, respectively. Household A used less than the average area for the village, whereas household B used more. Household A grew upland rice almost every year, but unlike in 2005. This was because the household had achieved a good harvest in 2004 and had a large stock of rice in the granary hut. As a result, it became unnecessary to grow upland rice in 2005.

All the households practiced permanent farming by using almost all the areas available for each household.

Field distribution

Since the land around the village belonged to the Thai government, the villagers did not have land tenure in law. In the village under study, however, the farmer who initially cleared an area of woodland was customarily qualified to own the right to use the newly cultivated field and this right never expired, even during the fallow period. This right was recognized within other village communities, including the neighboring village. Moreover, land use rights were considered as property.

Fig. 1 shows the distribution of the fields used by households A and B from 1980 to 2005. Household A used 19 sites around the village and household B, 25 sites. Their fields were scattered from 500 m to 1300 m above the sea level. In terms of direct distance, the fields were generally scattered 2-3 km away from the village, with the farthest field about 5.6 km off. To reach remote fields such as A8, A15, B9 and B12, ascent and descent of a hill slope was necessary. When the villagers cultivated these remote fields, they constructed a small hut near the field in which they stayed.

During the 1980-2005 period, household A had cleared eight parcels of land (A3, A8, A10, A14, A15, A17-19) for cultivation, while household B had cleared 12 parcels (B9, B12-19, B21, B22, B25). Before clearing, the vegetation in these parcels comprised woodland in 15 parcels, bamboo forest in three, and bush land in two (Figs 4 and 5). This clearing continued until 1997 for household A and until 1989 for household B. This fact indicates that abundant unused land remained around the village under study at least until the 1980s.

Results and Discussion

Fallow period and changes depending on households and fields

Changes in location and fallow period of upland rice fields

Fig. 6 shows the changes in the location of the upland rice fields cultivated by household A. Although in 1981 the fields were located 5.6 km north of the village, in 1983 the site was located 2.2 km northeast. In 1984, it was even closer to the village (about 2 km away). Rotational use took place during 1986 and 1993, 1987 and 1998, 1988 and 1995, 1988 and 1999, and 1990 and 2004 (Fig. 6).

Fig. 7 shows the changes in the location of the upland rice fields cultivated by household B. The fields were located 2.3 km south of the village in 1980. From 1981 to 1983, the household used fields located about 5.5 km north of the village. Thereafter, in 1986, they moved closer to the village, 1.6 km northwest. Rotational use was apparent between 1987 and 1991, 1993 and 1999, 1996 and 2004, and 1998 and 2000 (Fig. 7).

The distance between the village and the fields differed consideraly depending on the fields. One of the reasons why households A and B cultivated remote

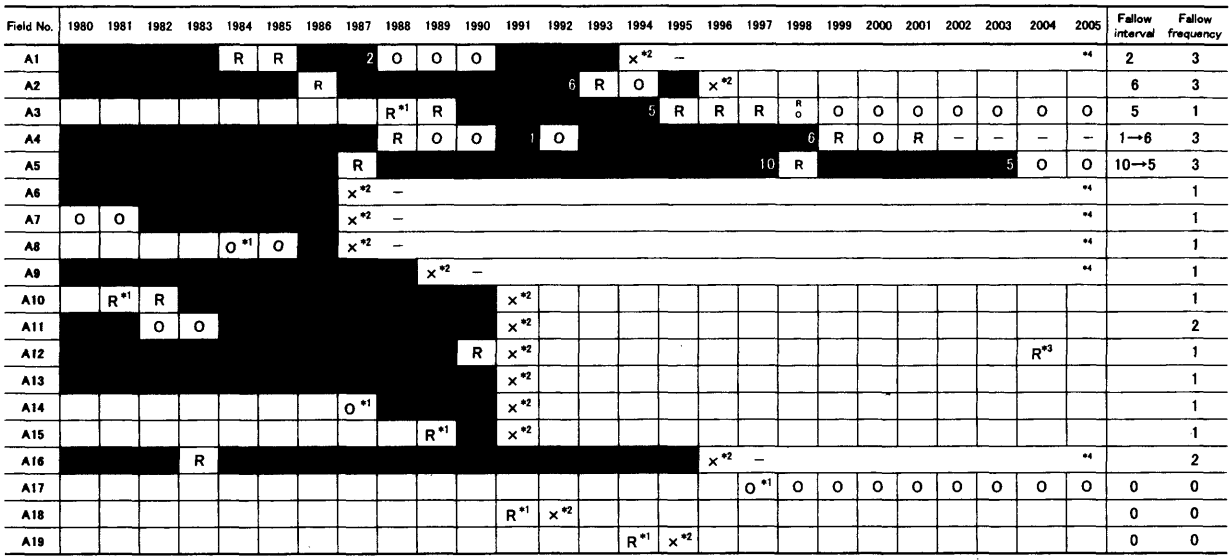

Fig. 4 Fallow and cultivation period of fields operated by household A (1980-2005).

■ : Fallow (the number indicates the duration of the fallow period), □ : Unused land, × : Household A lost its land use right, R : Upland rice, O : Other crops, — : Cultivated by the other household.

*1 Before clearing, vegetation in fields consisted of woodland (A8, A10, A14, A17 A18), bamboo forest (A3, A19), or bush (A15).

*2 Household A lost its land use right due to the creation of a border between the study village and the neighboring village (A6-8), the establishment of a forest conservation area (A2, A10-15, A18, A19), or other reasons (A1, A9, A16).

*3 An Officer of the Royal Forest Department gave household A the permission to cultivate the land for one year because a forest fire had burned out the vegetation there.

*4 Others cultivated the field, but how it was used is unknown.

Note: "Fallow" indicates land where nobody is engaged in cultivation but someone could insist on the right of land use for cultivation. "Unused" indicates land where nobody is engaged in cultivation and no one can insist on the right of land use. The forest conservation area is classified into unused area. Borrowed fields are excluded.

Sources: Information from cultivators in each field and interviews with them, as well as life history of household members.

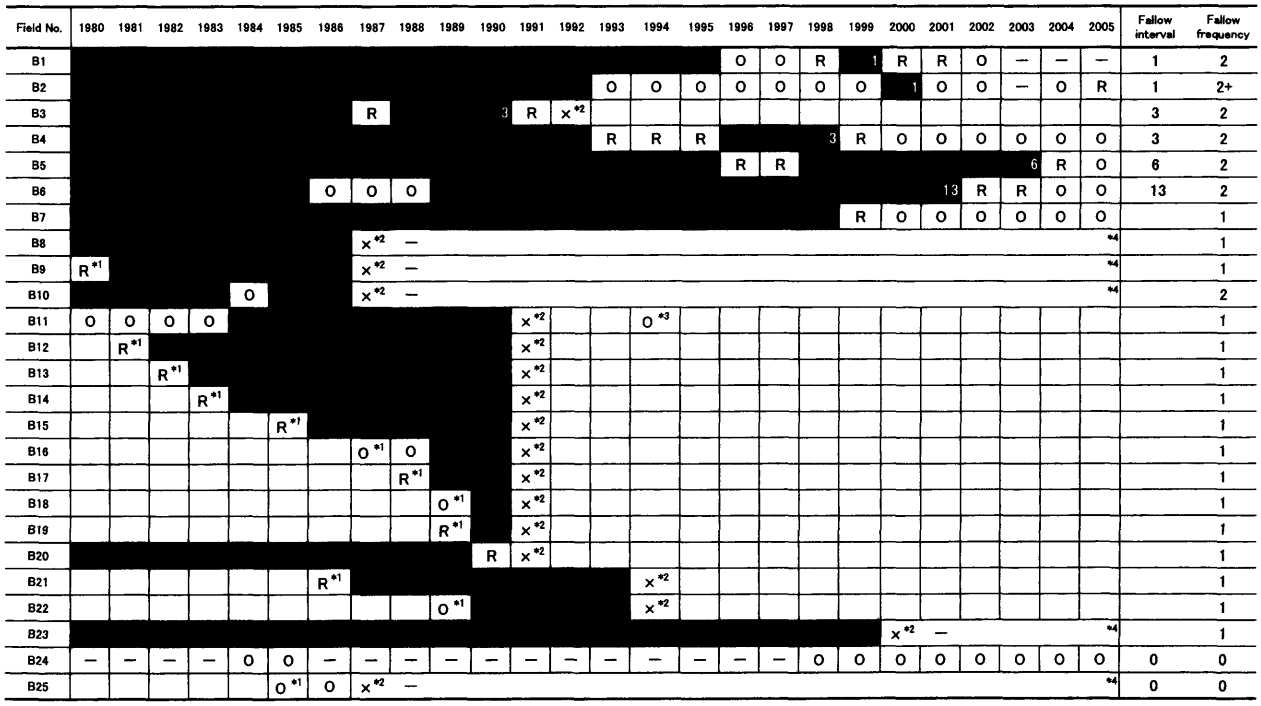

Fig. 5 Fallow and cultivation period of fields operated by household B (1980-2005).

■ : Fallow (the number indicates the duration of the fallow period), □ : Unused land, × : Household B lost its land use right, R : Upland rice, O : Other crops, — : Cultivated by the other household.

*1 Before clearing, the vegetation in fields consisted of woodland (B9, B12-16, B18, B19 B21, B25), bamboo forest (B22), or bush (B17).

*2 Household B lost its land use rights due to the creation of a border between the study village and the neighboring village (B8-10, B25), the establishment of a forest conservation area (B3, B11-B22), or other reasons (B23).

*3 Household B did not obtain the permission for use of this field from the Royal Forest Department.

*4 Others cultivated the field, but how it was used is unknown

Note: "Fallow" indicates the land where nobody is engaged in cultivation but someone could insist on the right of land use for cultivation. "Unused" indicates land where nobody is engaged in cultivation and no one can insist on the right of land use. The forest conservation area is classified into unused area. Borrowed fields are excluded.

Sources: Information from cultivators in each field and interviews with them, as well as life history of household members.

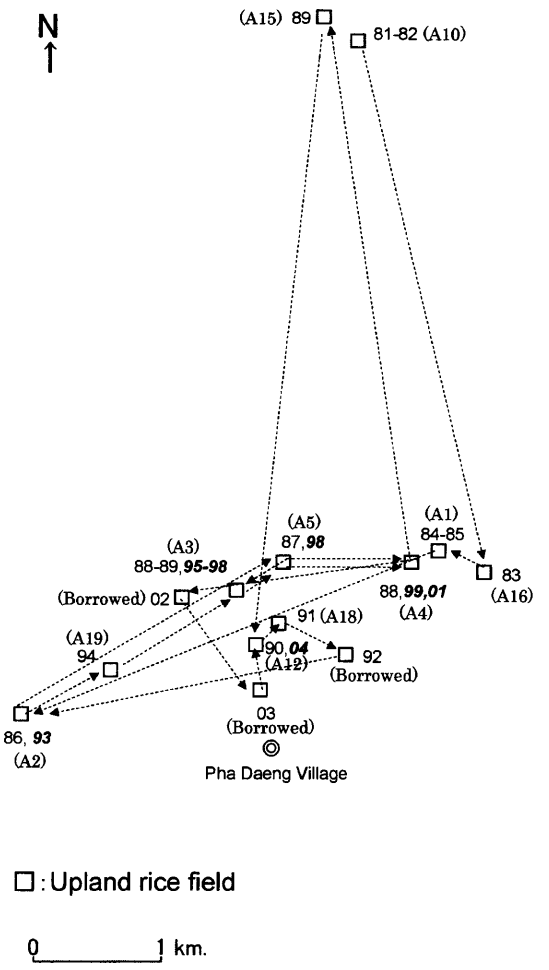

Fig. 6 Yearly changes in location of upland rice fields cultivated by household A (1980–2005).
Note: Numbers indicate the years of the utilization. Labels shown in parentheses indicate field No. or field borrowed from other household. Numbers in italics indicate rotational field use. No upland rice fields were cultivated in 1980 or 2005. Upland rice fields cultivated outside the village in 2000 and 2001 are excluded.
Sources: Interviews with cultivators and field measurements using handheld GPS.

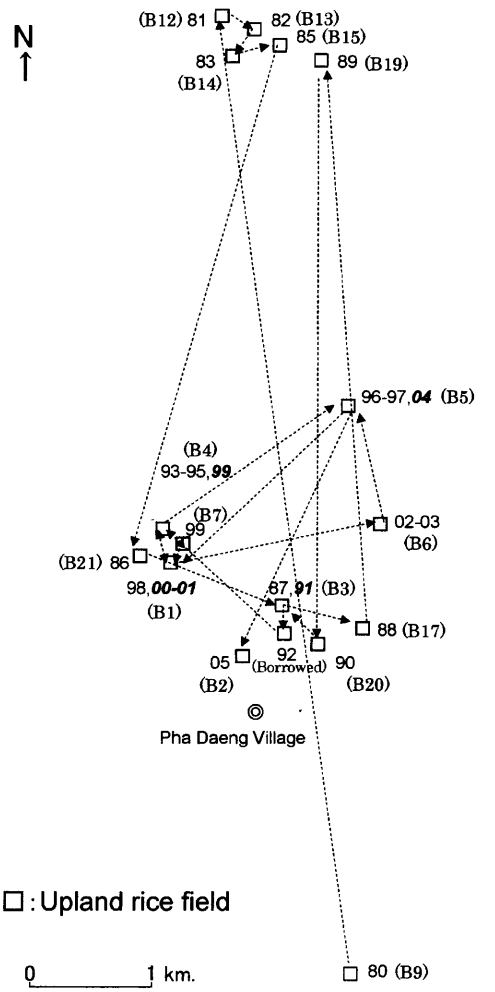

Fig. 7 Yearly changes in location of upland rice fields cultivated by household B (1980–2005).
Note: Numbers indicate the years of the utilization. Labels shown in parentheses indicate field No. or field borrowed from other household. Numbers in italics indicate rotational field use. No upland rice field was cultivated in 1984.
Sources: Interviews with cultivators and field measurements using handheld GPS.

fields was that they sought land for which nobody claimed ownership of land use rights.

Nine cases of rotational use of upland rice fields were confirmed, five by household A and four by household B. The main reason for changing the location of upland rice fields was that repeated cultivation resulted in the disturbance of the growth of upland rice due to the presence of weeds.

Members of households A and B recognized that it was desirable to cultivate upland rice for one year. They also recognized, however, that upland rice can be cultivated repeatedly for about two years. Household B had never carried out repeated cultivation of upland rice before the introduction of herbicides in 1993. Crops other than upland rice were sometimes grown in repeated cultivation under the shifting cultivation system. These crops were newly introduced, including cotton plants and hybrid maize. It appears that since the villagers had not developed a method for growing these crops, they tried to grow them by repeated cultivation.

Another major reason was that both households A and B cleared new fields to obtain their right of land use.

Fallow period depending on households and fields

Fig. 4 shows the land use history of household A, in relation to all the fields (19 sites) used during the

period 1980-2005. The land use history is classified into three categories: fallow, cultivated and unused land. "Fallow" refers to land where nobody is engaged in cultivation but where someone could insist on the right of land use for cultivation. "Unused" refers to land where nobody had been engaged in cultivation and no one could insist on the right of land use. The forest conservation area was classified into unused area.

1. Fallow practice. Of the 19 sites, fallow practice was noted at 16 locations, and not in the remaining three. At the 16 locations with fallow practice, the fallow period was identifiable in five locations, which corresponded to the time after the late 1980s. In two of these, the fallow period was identified twice. The fallow period ranged from one to ten years, with an average of 5.0 years.

Fig. 5 shows the land use history of household B in relation to all the fields (25 sites) used during the period 1980-2005. Similarly, of the total 25 strips of field, fallow practice was noted in 23 strips. Of the 23 sites with fallow practice, the fallow period was identifiable in six, which corresponded to the time after the late 1980s. In each of these, the fallow period was identified only once. The fallow period ranged from one to 13 years, with an average of 4.5 years.

The average duration of the fallow period, therefore, did not differ appreciably depending on the households. However, the fallow period which we were able to identify corresponded to the time after the late 1980s. Since the duration of the average fallow period was calculated by using the identifiable fallow periods only, the possibility of underestimating of the average fallow period in both households A and B could not be ruled out.

We next specifically investigated the fallow periods adopted by households A and B (Figs 4 and 5). In household A, as stated above, the duration of the fallow period was 1-10 years. Closer examination of the five strips of field showed that the duration of the fallow period was one year in one case, two years in one case, five years in two cases, six years in two cases, and ten years in one case. Of those, in two cases, fallow of the same field occurred during different periods of time.

Similarly, in household B, the duration of the fallow period was 1-13 years. Closer investigation of the six strips of field showed that the duration of the fallow period was one year in two cases, three years in two cases, six years in one case, and 13 years in one case. All of these corresponded to the fallow practice in different fields.

2. Right of land use. Household A lost its right of land use for 15 parcels (Fig. 4), due to the creation of a village boundary with the neighboring village (three parcels), the establishment of a forest conservation area (nine parcels), the allocation of fields for their relatives (two parcels) and the conflict in land use right with the household in the neighboring village (one parcel).

Household B lost its right of land use for 18 parcels (Fig. 5), due to the creation of a village boundary with the neighboring village (four parcels), the establishment of a forest conservation area (13 parcels) and the allocation of field for their relatives (one parcel). The new forest conservation area accounted for 22 of the total 33 parcels lost by both households together.

The cases of the two households described above suggest that even if the duration of the fallow period per strip of field was different for the majority of the fields, both households adopted fallow periods of one year and six years. Additionally, the establishment of the forest conservation area exerted a considerable effect on the land use history of the two households.

Changes in duration of fallow period

We found that household A stopped using the fallow system for three strips of field: A3 in 1995, A4 in 1999 and A5 in 2004. Similarly, household B stopped using the fallow system for five strips of field: B4 and B7 in 1999, B1 in 2000, B6 in 2002 and B5 in 2004.

In one case (A 4), the duration of the fallow period of a field cultivated by household A increased from one year in 1991 to six years between 1993 and 1998, and in another case (A5) it decreased from ten years to five.

In household A, the fallow was abandoned at different times from 1995 to 2004, and during the 1993-1998 period, the time when the fallow was abandoned and the time when the duration increased overlapped each other depending on the fields. In household B, the fallow was abandoned at different times from 1999 to 2004.

Changes in location of cultivated upland rice fields

Zinke *et al.* (1978), who studied the Lawa in northern Thailand, described the distribution and land use history of the shifting cultivation area managed by the whole village from 1958 to 1968, and reported the rotational use of the same area at an interval of ten years. They illustrated the distribution of each strip of

field within the area during those years, especially in terms of the shifting cultivation area used in 1967 (Zinke *et al.*, 1978). Nakano (1978) also described a large swidden district administered by a village in northern Thailand. In this study too, although the distribution of the shifting cultivation fields during a certain year was reported, changes in the location of the fields had never been reported on a household basis. In our present study, however, we confirmed the rotational use of nine fields, based on the changes in the location of the fields where upland rice was cultivated.

Differences in fallow period depending on the households and fields and reasons

As stated above, in several previous studies, interviews had been used to determine the duration of the fallow period in shifting cultivation fields in northern Thailand. In those studies, however, the differences in the fallow period depending on the households within a community and between fields cultivated by the same household had not been investigated.

Our current study showed that the fallow period differed between households and fields. To identify the fallow period adopted by specific household, the average fallow period, which varied with the fields should be determined.

One of the reasons why fallow period varied with the fields was that households A and B were not constantly engaged in rotational shifting cultivation. Cultivation of newly cleared fields affected the fallow period of their other fields. The forest policies stated above also made it difficult for households A and B to adopt a rotational use of their fields. Besides, fallow period is needed for the recovery of vegetation and soil conditions in shifting cultivation. It is likely that the period and process of vegetation recovery differed for each shifting cultivation field, implying that the fallow period also varied in each field.

Hinton (1978) reported that 36 Karen households in 1968 cut down vegetation on 32 strips of land, in which the duration of the fallow period was 3-10 years for 20 strips, over ten years for seven strips, and unknown for five strips. In 1999, two households in our present study had cut down the vegetation on three strips of land, in which the fallow period was 3-10 years for two strips and over ten years for one strip (Figs 4 and 5). These data imply a similar trend in the fallow period, and underscore the importance of studying the fallow period in each strip of a field rather than approximating the fallow period for each community through interviews.

Decrease in duration of fallow period and reasons

Some authors have described a decrease in the duration of the fallow period in countries neighboring Thailand. In one village in southern China, the duration of the fallow period was 7-10 years during the 1980s and five years in 2000 (Fu *et al.*, 2005). In one hamlet in northern Vietnam, the duration of the fallow period was 5-8, 4-5 and 3-5 years during the 1988-1994, 1995-1999, and 2000-2003 periods, respectively (Nguyen *et al.*, 2004). In some villages in northern Laos, the duration of the average fallow period was 38, 20, and five years in the 1950s, 1970s and in 1992, respectively (Roder *et al.*, 1994). No authors have indicated any decrease in the duration of the fallow period in northern Thailand. Land-use analysis by using global information systems (GIS), however, has revealed a village in which the area of shifting cultivation decreased sharply between 1987 and 1992 (Fox *et al.*, 1995), and cases of disappearance of shifting cultivation areas were observed during the period 1976-1984 (Kanazawa *et al.*, 2006).

Our study showed that although the time when the fallow was abandoned was different in each field, the year when the fallow was initially abandoned was specific to certain fields for each household, as households A and B stopped using the fallow system in 1995 and 1999, respectively. In addition, for household A, the year when the fallow system was abandoned was the same as the year in which permanent farming methods were introduced; for household B, this year did not coincide with the introduction of permanent farming methods because the farmers had already switched to permanent farming in 1993.

The creation of a village boundary in 1987 and the establishment of a forest conservation area from 1991 decreased the number of the fields that could be cultivated by households A and B. This decrease could be a factor in the decrease in the duration of the fallow period. The creation of a village boundary and establishment of a forest conservation area made it difficult to identify the fallow period in the present study. It is also the possible that a change in the village population affected the fallow period.

Both households A and B introduced herbicides and chemical fertilizers in 1995 and 1993, respectively, suggesting that this introduction coincided with the

initial disappearance of the fallow system. That fact also suggests the possibility that the disappearance of the fallow system might be related to the introduction of herbicides and chemical fertilizers by both households. Herbicides and chemical fertilizers were introduced for sustaining permanent farming and also for enhancing the productivity.

Our results underscore the variety of the processes involved during the transition from shifting cultivation to permanent farming or forestry, which differed depending on both households and strips of field. These results were obtained by conducting a land survey using a handheld GPS. This survey method was useful for the reconstruction of the fallow system of shifting cultivation.

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