THREE-YEAR MONITORING OF SHIFTING CULTIVATION FIELDS IN A KAREN AREA OF THE BAGO MOUNTAINS, MYANMAR

TAKEDA Shinya[1] , SUZUKI Reiji [1]and Hla Maung Thein[2]

1 Graduate School of Asian and African Area Studies, Kyoto University, Kyoto 606-8501, Japan

2 Forest Department, Yangon, Myanmar

E-mail: takeda@asafas.kyoto-u.ac.jp

Abstract

We conducted a field survey in SN village, in the Bago Division of Myanmar. Through GPS mapping, interviews, and participant observation, we examined the present state of shifting cultivation in a Karen area by focusing on the vegetation in fallow lands and fallow period lengths. In 2002, 59 households (HHs) opened 60 plots for shifting cultivation. The village itself covered an area of 3970.62 ha (A). The 60 plots covered 161.46 ha (B1), corresponding to an average plot size of 2.69 ha. In 2003, 62 HHs opened 65 plots for shifting cultivation, which covered 141.10 ha (B2) total with an average plot size of 2.17 ha. In 2004, 74 HHs opened 75 plots for shifting cultivation, with an aggregate area of 179.91 ha (B3) and an average plot size of 2.40 ha. Based on these Figureures, the potential maximum numbers of fallow years were 24.6 (A/B1) for 2002, 28.1 (A/B2) for 2003, and 22.1 (A/B3) for 2004. During the first fallow year, the land was covered with *Eupatorium odoratum*, which was replaced by bamboo (*Bambusa polymorpha* and *Bambusa tulda*) over several years. After 12 years, tree species such as *Xylia xylocarpa* gradually dominated the fallow lands. Despite the potential fallow periods, the actual fallow periods were only 17.9 years in 2002, 15.1 years in 2003, and 12.8 years in 2004. This difference may have occurred because lands left fallow for 12 to 18 years are covered with trees and bamboo. These lands can be easily cleared and they provide good burning material for shifting cultivation.

Keywords: Karen area, Shifting cultivation, Taungya, Fallow period, GPS mapping

INTRODUCTION

The taungya system of agroforestry originated in Myanmar (Burma). Taungya, stemming from the Burmese terms taung (hill) and ya (cultivation), means temporary cultivation of hilly land and is practiced in the Bago Mountains, the homeland of the Karen people. During the 19th century, teak plantations based on the taungya system were established in reserved forests in the Bago Mountains by the colonial government, and Karen areas were demarcated where the Karen people could freely practice shifting cultivation [Takeda 1992; Bryant 1996; Tani 1998; Suzuki 2004]. The taungya system and shifting cultivation in the Karen area are known worldwide, but few field studies have been conducted in the Bago Mountains because of their inaccessibility.

We used GPS mapping, interviews, and participant observation to examine the present state of shifting cultivation in the Karen area by focusing on the vegetation in the fallow lands and fallow period lengths. At the same time, we attempted to correlate field observations and household (HH) survey data with remotely-sensed data on land use and changes in land cover.

RESEARCH SITE AND METHODS

The field survey was conducted in SN village, part of the Toungoo district in the Bago division of Myanmar. We visited the village in December 2001 and March 2002 for preliminary observations and GPS mapping. During 3–10 November 2002, 2–11 November 2003, and 4–10 November 2004, we conducted intensive surveys. For each shifting cultivation plot and its corresponding HH, we conducted GPS mapping, made field observations, and interviewed the head of the HH using a simple questionnaire. Our research team used GPS receivers (GARMIN GPSIII PLUS) with external antennae. By applying the average position of GARMIN GPSIII PLUS, our estimated accuracy was within 5 m for every waypoint. We traced the boundaries of the shifting cultivation plots by marking waypoints every 20–40 m (Figure 1). After returning to the village camp, the GPS waypoint data were transferred to a laptop computer with Map Source software. GPS waypoint data were processed using Arc GIS software and integrated with satellite images.

Figure 1 – Tracing the boundaries of the shifting cultivation plot

GPS MAPPING OF SHIFTING CULTIVATION PLOTS

Data related to the 2002, 2003, and 2004 shifting cultivation plots were entered into a GIS (Figure 2). The village boundary was estimated by interviews and a forest compartment map from the Forest Department. The map indicated dense forest cover within 1 km of the village. This forest is kept for headwater and fuel collection, and the shifting cultivation sites were distributed within 1 to 7 km from the village. Bigger plots tended to be located at more distant sites from the village.

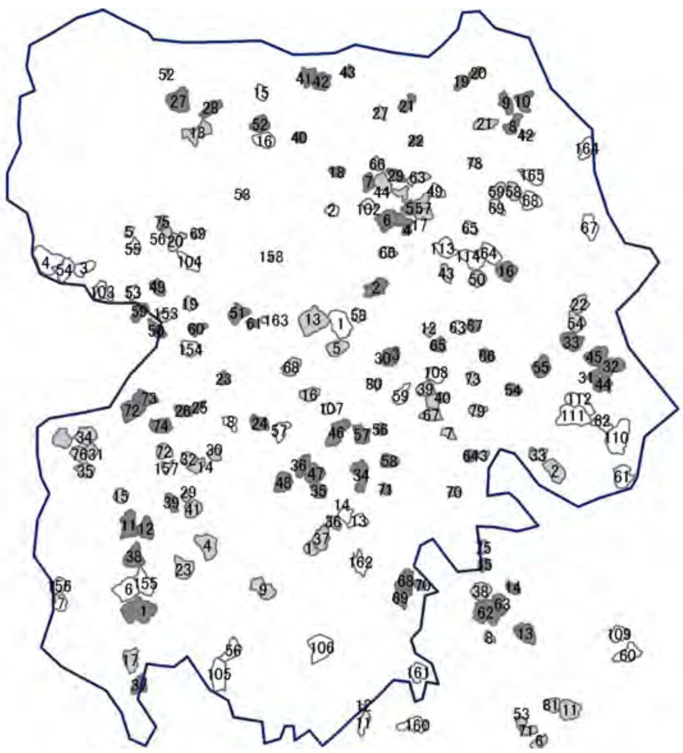

Figure 2 – Shifting cultivation plots from 2002 (white), 2003 (grey), and 2004 (black)

The area covered by a shifting cultivation plot depends mostly on the availability of male labor for clearing the site during the dry season. If males are not available, a HH cannot open its site for cultivation. This happens especially when villagers suffer from malaria. Villagers recognize the size of their shifting cultivation plots by the numbers of rice seed baskets needed for sowing, and this measurement is correlated quite closely with the plot areas measured by GIS.

SN village consists of four subgroups, each with its own territory for shifting cultivation: Group A cultivates the east area, Group B cultivates the west area, and groups C and D cultivate the south area. A GIS-based map shows the changes in location of shifting cultivation sites over 3 years. In 2002, 64 HHs comprising 355 people lived in SN village. Among those 64 HHs, 59 opened 60 shifting cultivation plots while 5 HHs did not conduct shifting cultivation. The village covered 3970.62 ha (A), while the cultivation plots covered 161.46 ha (B1) total, with an average plot size of 2.69 ha. In 2003, 62 of 68 HHs opened 65 plots for shifting cultivation. The total area of the plots was 141.10 ha (B2) with an average plot size of 2.17 ha. In 2004, 74 HHs opened 75 plots for shifting cultivation, and the aggregate plot size was 179.91 ha (B3), corresponding to an average plot size of 2.40 ha.

Based on these Figures, the potential maximum numbers of fallow years were 24.6 (A/B1) for 2002, 28.1 (A/B2) for 2003, and 22.1 (A/B3) for 2004. The lengths of the fallow periods for the current year were recorded during the interview process. The size of each plot was determined from the GIS. Based on these two data sets, the average fallow period length for each site was calculated as follows:

$$\text{Average fallow period length for current year} = \frac{\Sigma\,(\text{area} \times \text{fallow years})}{\text{Total shifting cultivation area for current year}}$$

Despite the potential fallow periods, the actual average fallow period lengths were 17.9 years in 2002, 15.1 years in 2003, and 12.8 years in 2004. In each year, a 12- to 18-year fallow period predominated, which may have occurred because fallow land covered with trees and bamboo over 12 to 18 years is easy to open and provides good burning material for shifting cultivation.

LINKING FIELD OBSERVATIONS AND SATELLITE IMAGES

Fallow land was covered with *Eupatorium odoratum* during the first year, which was replaced by bamboo (*Bambusa polymorpha* and *Bambusa tulda*) over several years. In the Karen language, this young fallow land (less than 12 years) is called Tikla-asa.

After 12 years, tree species such as Pinkado (*Xylia xylocarpa*) gradually dominated the fallow lands. Many trees were grown by coppice and pollard (Figure 3). This old fallow land (greater than 12 years) is called Tikla-abo in Karen. Fallow land at this stage is good for clearing during the next shifting cultivation period as the mixture of bamboo and trees provides good material for burning.

Figure 3 – Coppice and pollard trees in fallow areas

Figureure 4 shows the landscape for the current year's shifting cultivation (bottom), young fallow land (middle towards right), and old fallow land (top towards left).

A high-spatial-resolution digital image of SN village was taken by the IKONOS satellite on 11 January 2004. It covered a 121 km^2 area (11 x 11 km). We attempted to link our field observations and HH survey data to the IKONOS image. Figureure 5 shows the IKONOS image for the current year's shifting cultivation, last year's shifting cultivation area covered with *E. odoratum*, young fallow land covered with bamboo, and old fallow land with a tree canopy.

In addition to considering the vegetation recovery at different fallow stages, we attempted to link the various field observations and HH survey data to the IKONOS image. Field observations include such measures as regeneration of teak by shifting cultivation and animal traps in and around shifting cultivation fields.

Figure 4 – Current year's shifting cultivation, the young fallow area and old fallow area

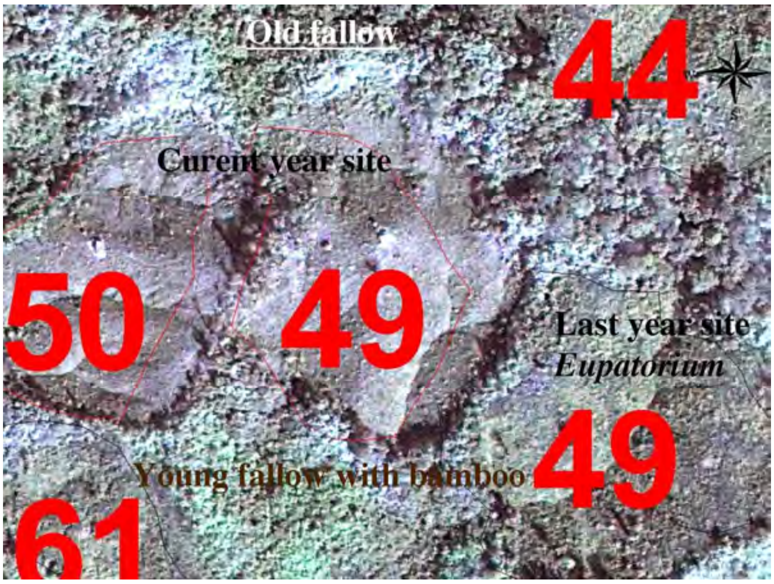

Figure 5 – IKONOS image of the current and previous year's shifting cultivation areas and young and old fallow areas

CONCLUDING REMARKS

We are still working to correlate our field observations and HH survey data with the remotely sensed data. In doing so, we hope to show the dynamics of land use and changes in land cover at the HH level. Satellite images from different years are also available for this research site and will be incorporated into our work (images listed as satellite, sensor, resolution, and date): QuickBird, Pan/Mul, 0.6 m/2.4 m, Dec. 2005; Landsat, ETM+, 30 m, Jan. 2003; TERRA, ASTER, 15 m, Dec. 2002; TERRA, ASTER, 15 m, Mar. 2001; Landsat, ETM+, 30 m, Nov. 2000; Landsat, ETM+, 30 m, Apr. 2000; Landsat, ETM+, 30 m, Dec. 1999; Landsat, TM, 30 m, Jan. 1989; Landsat, MSS, 80 m, Jan. 1988; Landsat, MSS, 80 m, Dec. 1985; and Landsat, MSS, 80 m, Jan. 1974. With this data set, we will attempt to reconstruct past land use and analyze its influence on present forest conditions.

REFERENCES

Bryant, R. L. 1996. *The Political Ecology of Forestry in Burma 1824-1994*. Honolulu: University of Hawaii Press.

Suzuki, R., S. Takeda, and S. K. Keh. 2004. The Impact of Forest Fire on the Long-term Sustainability of Taungya Teak Reforestation in Bago Yoma, Myanmar, *TROPICS* 14(1): 87-102.

Takeda, S. 1992. Origins of Taungya. In Jordan, C. F., J. Gajaseni, and H. Watanabe. eds., *Taungya: Forest Plantations with Agriculture in Southeast Asia*. Wallingford: CAB International, pp. 9-17.

Tani, Y. 1998. Sanchimin to Ringyou Seisaku: Myanma Renpou Bago Sanchi ni okeru Karen Jin no Yakihata ni taisuru “Shinrinson” Seido no Eikyou (Forest People and Forest Policy: the Effect of Forest Village Policy on the Karen of Pegu Yoma, Burma), *Southeast Asian Studies* 35(4): 224-245.