

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Forest Department



**Livelihood diversification and farmers' preference for permanent
croplands in undulating hilly areas**
(Case Study: Ywangan Township, Southern Shan State, Myanmar)



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ရှမ်းပြည်နယ်တောင်ပိုင်း၊ ရွှင်မြို့နယ်ရှိ တောင်ပေါ်နေဒေသခံပြည်သူများ၏
အသက်မွေးဝမ်းကြောင်းမှုပုံစံအမျိုးမျိုးနှင့် အမြဲတမ်းစိုက်ပျိုးမြေများအပေါ်
အလေးသာမှုအား လေ့လာခြင်း

ဒေါက်တာဖြူဖြူလွင်၊ ဦးစီးအရာရှိ

Mamoru Kanzaki, Kyoto University

စာတမ်းအကျဉ်းချုပ်

ဤသုတေသနသည် ရှမ်းပြည်နယ်တောင်ပိုင်း၊ ရွှင်မြို့နယ်ရှိ တောင်ပေါ်နေ ဒေသခံပြည်သူများ၏ အသက်မွေးဝမ်းကြောင်းမှုလုပ်ငန်းများ ပြောင်းလဲလာခြင်းကြောင့် မြေအသုံးချမှုပုံစံများ ပြောင်းလဲလာခြင်းကို ဆက်စပ်လေ့လာထားခြင်းဖြစ်ပါသည်။ အဓိကမြေ အသုံးချမှုပုံစံပြောင်းလဲခြင်းအနေဖြင့် တောင်စောင်းဒေသများတွင် ယခင်က ရွှေ့ပြောင်းတောင်ယာ စိုက်ပျိုးခြင်းအား အဓိကလုပ်ကိုင်ခဲ့ကြပြီး ယခုအခါ အဆိုပါမိရိုးဖလာ လုပ်ငန်းအားစွန့်လွှတ်ကာ အမြဲတမ်းစိုက်ပျိုးသီးနှံဖြစ်သည့် လက်ဖက်ခင်းများ တည်ထောင် စိုက်ပျိုးလာခြင်း၏ နောက်ခံအခြေအနေများအား လေ့လာတင်ပြထားပါသည်။ ဒေသခံများ၏ လက်ရှိအသက်မွေးဝမ်းကြောင်းမှုပုံစံများ၊ နှစ်ပေါင်း (၃၀) ခန့်အတွင်း ပြောင်းလဲလာမှု အခြေအနေများနှင့် မြေအသုံးချမှုပုံစံ ပြောင်းလဲလာခြင်းများအား အသေးစိတ် လေ့လာနိုင်ရန်အတွက် နမူနာအိမ်ထောင်စု (၁၅၀) စုအား အင်တာဗျူးမေးခွန်းလွှာများဖြင့် လေ့လာ စစ်တမ်းကောက်ယူခဲ့ခြင်း ဖြစ်ပါသည်။ လက်ရှိကာလတွင် အဓိကအသက်မွေးဝမ်းကြောင်း လုပ်ငန်းနှင့် အဓိကဝင်ငွေအရင်းအမြစ်အဖြစ် အမြဲတမ်းစိုက်ပျိုးမြေဖြစ်သည့် လက်ဖက်ခင်းများ တည်ထောင်ခြင်းကို လုပ်ကိုင်ဆောင်ရွက်လျက်ရှိပါသည်။ အဆိုပါ လက်ဖက်စိုက်ခင်းများ ကျယ်ကျယ်ပြန့်ပြန့် စိုက်ပျိုးခြင်းမပြုမီက ရွှေ့ပြောင်းတောင်ယာလုပ်ငန်းဖြင့် အဓိက အသက်မွေးဝမ်းကြောင်းကြကြောင်း လေ့လာသိရှိရပါသည်။ မြေအသုံးချမှု ပြောင်းလဲခြင်းအနေဖြင့် လက်ဖက်စိုက်ပျိုးသူများ၏ ၈၁% ခန့်သည် ၎င်းတို့၏ မူလ ရွှေ့ပြောင်းတောင်ယာများအား အမြဲတမ်းစိုက်ပျိုးမြေဖြစ်သည့် လက်ဖက်စိုက်ခင်းများအဖြစ် ပြောင်းလဲ ခဲ့ကြခြင်းဖြစ်ပါသည်။ တောင်သူများ၏ အမြဲတမ်းစိုက်ပျိုးမြေအပေါ် အလေးသာမှုအနေဖြင့် နောက်ခံအကြောင်းရင်းများစွာရှိပါသည်။ အဆိုပါ အကြောင်းရင်းများသည် နိုင်ငံ၏မူဝါဒများ၊ ဒေသခံပြည်သူများ၏ လူမှုစီးပွားရေး အခြေအနေများ၊ ဒေသ၏ မြေမျက်နှာသွင်ပြင် အခြေအနေများစသည့် အချက်များနှင့် ဆက်စပ်နေပါသည်။ လက်ဖက် ထုတ်ကုန်များ၏ ဈေးကွက်လိုအပ်ချက်မြင့်မားလာမှုကြောင့် ဝင်ငွေများပြားစွာ ရရှိလာခြင်း၊ လူဦးရေ တိုးပွားလာမှုကြောင့် စိုက်ပျိုးမြေ အကန့်အသတ်

ရှိလာခြင်း၊ ရွှေ့ပြောင်းတောင်ယာနှင့် အမြဲတမ်းစိုက်ပျိုးမြေများနှင့် သက်ဆိုင်သော အစိုးရ၏မူဝါဒများ အစရှိသည့် အကြောင်းရင်းများကြောင့် အဆိုပါဒေသတွင် ရွှေ့ပြောင်းတောင်ယာများ ပပျောက်သွားပြီး အမြဲတမ်း စိုက်ပျိုးမြေများအဖြစ်သို့ လုံးဝပြောင်းလဲလာကြခြင်းဖြစ်ကြောင်း လေ့လာသိရှိရ ပါသည်။

Livelihood diversification and farmers' preference for permanent croplands in undulating hilly areas

(Case Study: Ywangan Township, Southern Shan State, Myanmar)

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Abstract

This study examined the transition in land-use change from shifting cultivation to permanent cropland in relation to the changes in livelihood of the residents. In-depth interviews were conducted with 150 respondents to explore their current livelihood patterns and the transitions in their livelihoods and land-use changes that occurred over the previous three decades. Permanent cropland in the form of tea orchards was the predominant livelihood and a major income source for the local residents; this implied that shifting cultivation had been the main livelihood option before the cultivation of tea trees became widespread. As land-use transition, 81% of hill orchard owners transformed their shifting cultivation sites to hill orchards, cultivating mainly tea trees (*Camellia sinensis*). The farmers' preference for tea orchards reflected many political, socio-economic, and topographic factors. Increasing market demand for tea leaf products, the scarcity of land as a result of population increase, and government regulation of shifting cultivation collectively resulted in the permanent disappearance of a shifting cultivation landscape, which was replaced by tea orchards.

Keywords: *Camellia sinensis*, hill orchards, land-use change, livelihood transition, tea orchards

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1. Introduction

For centuries, shifting cultivation has been a traditional agricultural practice and one of the dominant land-use systems in tropical forested landscapes (Mertz et al., 2009). Shifting cultivation is characterized by high spatiotemporal dynamics of actively cultivated fields and variably aged fallows (Hurni et al., 2012). The majority of the people practicing shifting cultivation belong to ethnic groups that are generally categorized as ethnic minorities, tribal people, hill tribes and indigenous peoples (FAO, IWGIA and AIPP, 2015). Shifting cultivation could be a sustainable land-use system because forests were not permanently disappeared and can recover again as a form of fallows. However, in many parts of the forest-agriculture frontiers of the tropics, particularly in Southeast Asia, shifting cultivation landscapes are rapidly being transformed to other land-use types (Liao et al., 2015). Recent studies implied that agricultural expansion was, by far, the leading land-use change associated with deforestation in most cases (Geist and Lambin, 2002). There were integrated underlying factors in changing land-use pattern from shifting cultivation. Fox et al. (2009) point out that suppression on ethnic minorities, government policy, development of commercial agriculture, urbanization, ownership conflicts and complex landscape nature of shifting cultivation are the main causes that underlie disappearing shifting cultivation practice across Southeast Asia.

Under population pressure, market development of commercial crops and government policy, the livelihood pattern of shifting cultivators changed to other livelihood systems especially to permanent agriculture in highland areas of Southeast Asian countries (Schmidt-Vogt et al., 2009). As most of the studies related with shifting cultivation in Myanmar were abundant in mainland region especially mountainous areas of Bago yoma (e.g. (Chan et al., 2016; Maung and Yamamoto, 2008; Mon et al., 2010; Takeda et al., 2005), information about other regions; such as Shan State and Chin State where shifting cultivation had been the most dominant livelihood system; were still limited. Therefore, this study was conducted with a main goal of providing fundamental information about the dynamics of livelihood and land-use patterns of local people in Shan State as a case study of Ywangan Township located in southern Shan state in eastern Myanmar. Information from this study will be beneficial for

policy makers in formulating development policies as well as a valuable reference for future research endeavors.

Three specific objectives of this study were as follows; (1) to observe the current livelihood strategies of local communities living in hilly areas; (2) to explore the patterns of land-use transition in relation to livelihood changes of local communities; and (3) to discuss the underlying factors triggering that major land-use change in this region.

2. Materials and Methods

2.1 Definitions and terms

The definitions of the different types of forest administration followed *The Forest Law, Myanmar* (1992). Terms and definitions of croplands were adapted from *The Farmland Law* (2012).

As to the categorization of forested lands, there are two legally types under *The Forest Law, Myanmar* (1992); (1) reserved forest for production, and (2) protected public forest constituted mainly for conservation purpose. Apart from those two types, other forested areas fall under the category of unclassified forest legally termed as “Land at the disposal of the Government” (*The Forest Law, Myanmar*, 1992). On land at the disposal of the Government, Forest Department can constitute reserved forest or protected public forest if necessary for conservation, protection or production of forest products (*The Forest Law, Myanmar*, 1992) whereas the Settlement and Land Records Department can issue land-use certificate to do agricultural business for persons and organizations (as described in *The Vacant, Fallow and Virgin Lands Management Law* 2012) or to subsistence farmers according to *The Farmland Law* (2012). About 22% (235.16 km²) of the total land in this study area was under the categories of reserved forest and protected public forest secured by law and kept under permanent forest cover exclusively managed by Forest Department of Myanmar (unpublished data, Forest Department, 2015). Local people usually access unclassified forests within their territories under two types of customary land tenure; communal and private. Local communities took control of communal forests as their common property. Under private land tenure in this area, individual households have exclusive rights to access those customarily designated forests and therefore owners can extract forest resources. In general, people who used to practice shifting cultivation most likely possess privately own forests formed from

their previous fallows, and maintained those forests mainly for extraction of firewood as well as for later conversion to croplands.

In addition, forested areas where local people used to practice farming: shifting cultivation and orchard, were mostly located in unclassified forested areas where people have customary rights to access those lands as well as can get legally recognized land-use certificate to practice agriculture. The orchard here means the garden land cultivating permanent crop (*The Farmland Law*, 2012), cultivating mostly tea tree (*Camellia sinensis*) but some areas intercropped with other fruit trees especially orange, avocado, lemon and grapefruit. In this study, most of the orchards were established scattered across forests in undulating hilly regions so those are termed as hill orchards or tea orchards. Local people also cultivate tea trees and perennial fruit trees in their settlement areas, then those areas are termed as home garden. Upland field means non-irrigated field located extensively in relatively flat areas where people cultivate annual crops especially vegetables (including cabbage, cauliflower, tomatoes, potatoes) and oilseed crops (including niger seeds, peanuts and sesame). Lowland paddy field means irrigated or rainfed fields growing only paddy. In contrast to shifting cultivation, the other croplands are sedentary, meaning that local people cultivate crops in those lands permanently without allowing forests to recover. Off-farm jobs in this study mean jobs other than cultivating in their owned croplands, and primarily consist of wage labor, grocery store, remittances from other household members, government staff and trading agricultural products.

2.2 Study Area

The study was conducted in highland area of Ywangan Township located in Taunggyi District, Southern Shan State of the Republic of the Union of Myanmar. It extends between 20° 49' 35" N to 21° 23' 44" N latitudes and 96° 20' 14" E to 96° 42' 3"E longitudes covering the area of 1071.63 km². The altitude ranges from 593 m to 2375 m above sea level (a.s.l.) (Figure 3-1). During 11 years (2003 – 2014) observation at Ywangan city (altitude at 1275 m), the annual average temperature was 22.5 °C with 1978 mm of mean annual rainfall (unpublished data, Township Department of Agriculture, 2015).

Out of 28 village tracts in the whole township (which comprised 125 villages), 23 village tracts (including 111 villages) were included in our focused study area. About 90% of total population of the whole township resides in this highland area, accounting for population

density of 66 persons/km² (Population census 2014, Township General Administration Department). The major ethnic group is Danu people and their major livelihood is farming (Department of Population, 2015).

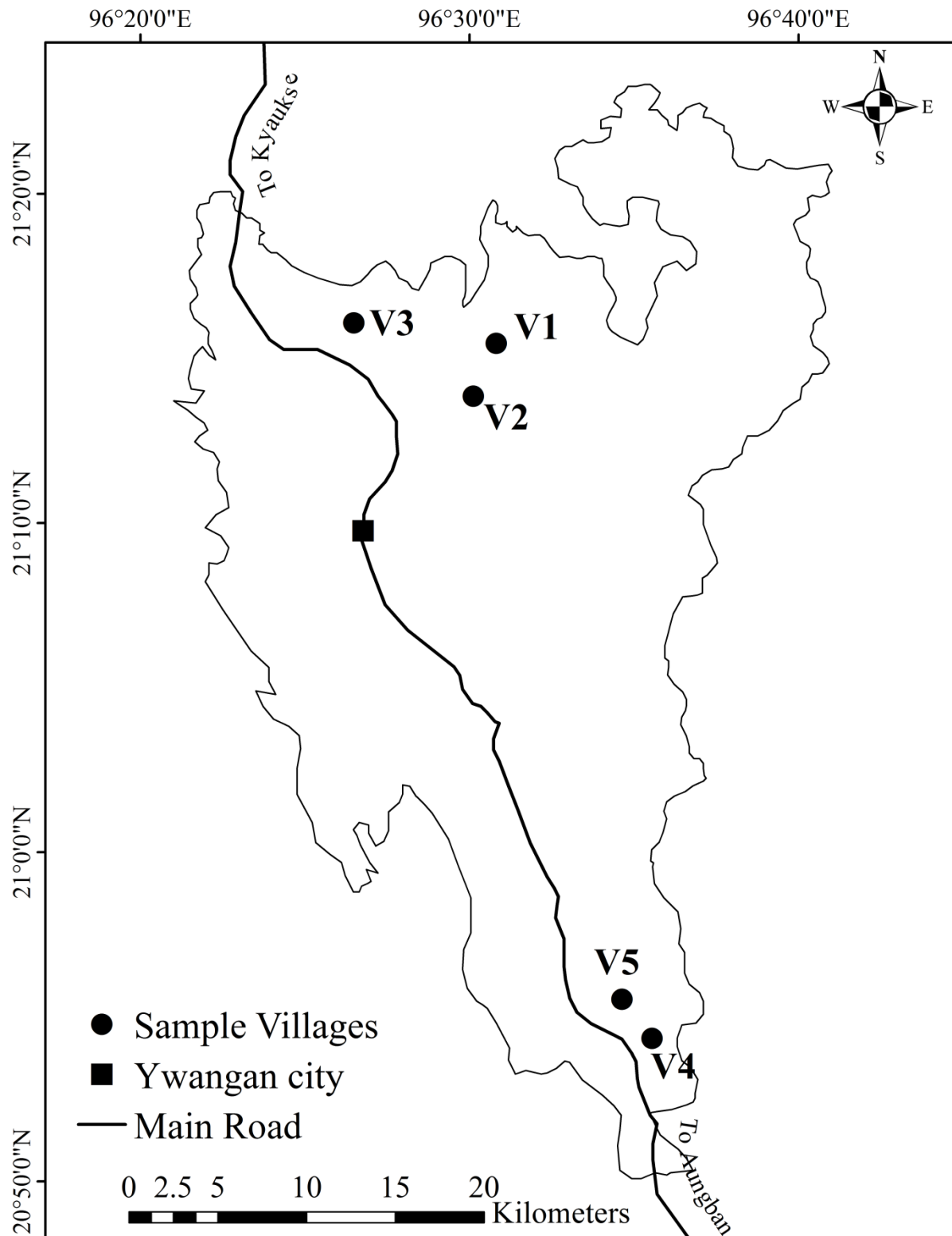


Figure 1. Location map of the study area and sample villages (V1-V5); Ywangan Township, Southern Shan State, Eastern Myanmar

2.3 Selection of study site and study villages

In this highland area, undulating hilly area and relatively flat area could be distinguished by slope degree ranging from 5 to 30 degrees. By field surveys and by land-use/land-cover classification (Lwin & Kanzaki, under review), undulating hilly area was mostly dominated by permanent croplands mostly found as tea orchards. Flat areas were mostly governed by lowland paddy fields and upland fields. As land-use transition was primarily occurred in undulating hilly areas (Lwin & Kanzaki, under review), those areas were targeted to detect the changing pattern of local livelihood. Local people residing on this type of landscape historically practiced shifting cultivation, but nowadays have transformed those areas to hill orchards.

We selected two research areas as northern site and southern site. Three villages from northern site and two villages from southern site were sampled in this study (Table 1). The average population growth rate for those sample villages was about three times compared to the previous period of about 50 years (personal interview). The southern villages were located closer to the market towns than northern ones (Figure 1 and Table 1).

Table 1. A brief profile of sample villages

Characteristics	Northern site			Southern site	
	V1	V2	V3	V4	V5
Elevation (m)	1410	1403	1542	1375	1377
Distance to market town (km)	73	70	60	31	33
Households	212	190	222	363	161
Population	962	932	880	1755	693
Sample households	34	25	30	32	29
Sampling intensity (%)	16	13	14	9	18

2.4. Data collection and analysis

Data were collected from October to November 2016. For sampling of households from five villages, participatory group discussions with village heads, village committee members and aged persons were conducted. As almost all of the households from the sample villages cultivated tea, I applied purposive sampling to include all households ranging from poor to better-off, with the assistance of group discussions. In total, 150 households were

sampled for intensive household survey. From each household, I asked household head as respondent. Only when household head is not available, I interviewed another adult from household members. Accordingly, respondents represented with 81% male and 19% for female with average age of 45 years. The family size ranged from 2 to 12 averaging 5. Although 3% of the household heads were graduates, 39% of the total sample households included graduate members, mostly young generations. Some graduate household members usually work in other cities, contributing households' total income as off-farm jobs.

A semi-structured questionnaire was used to interview each respondent. Information gathered were (1) socio-economic and demographic factors, (2) current livelihood patterns and different income sources, (3) cropping calendar for each crop, (4) annual gross income from each different income sources by recalling the income during previous year, and (5) detailed information relating to trends of transformation to orchards. Those collected data were mainly shown by descriptive statistics. As for comparative analyses, chi-squared (χ^2) test for categorical variables, and non-parametric Mann-Whitney U test for continuous variables were applied. To detect the transitions of livelihood pattern, it was assumed that old-aged households more likely to have changed their livelihood patterns because they were around when shifting cultivation were the major livelihood option in this area. The ages of household heads were separated into two groups (< 50 years and > 50 years), and only old-aged group to evaluate transition of livelihood. All analyses were performed using SPSS statistical software v.20. Figures were prepared in Microsoft excel.

3. Results

3.1 Different types of land holdings

There were 4 different types of land hold by farmers. They were lands for cultivating crops including (1) tea orchard/hill orchard, (2) upland field and (3) home garden, and (4) privately owned forest for firewood extraction. From this survey, the average cultivable land excluding privately owned forests were 2.34 hectares.

Distribution of number of households (%) in categories of area for each type of land holding were shown in figure 2. Followed by chi-squared tests, significance difference was detected for upland fields ($\chi^2 = 86.775$, $P = 0.000$), and privately owned forests ($\chi^2 = 13.843$, $P = 0.003$). About 92% of households from northern site had no upland fields whereas 46% of households from southern site had no privately owned forests. Apart from

those two types of lands, other types of land holdings; tea orchards and home gardens showed no significant difference between two sites ($P>0.05$) (Figure 2).

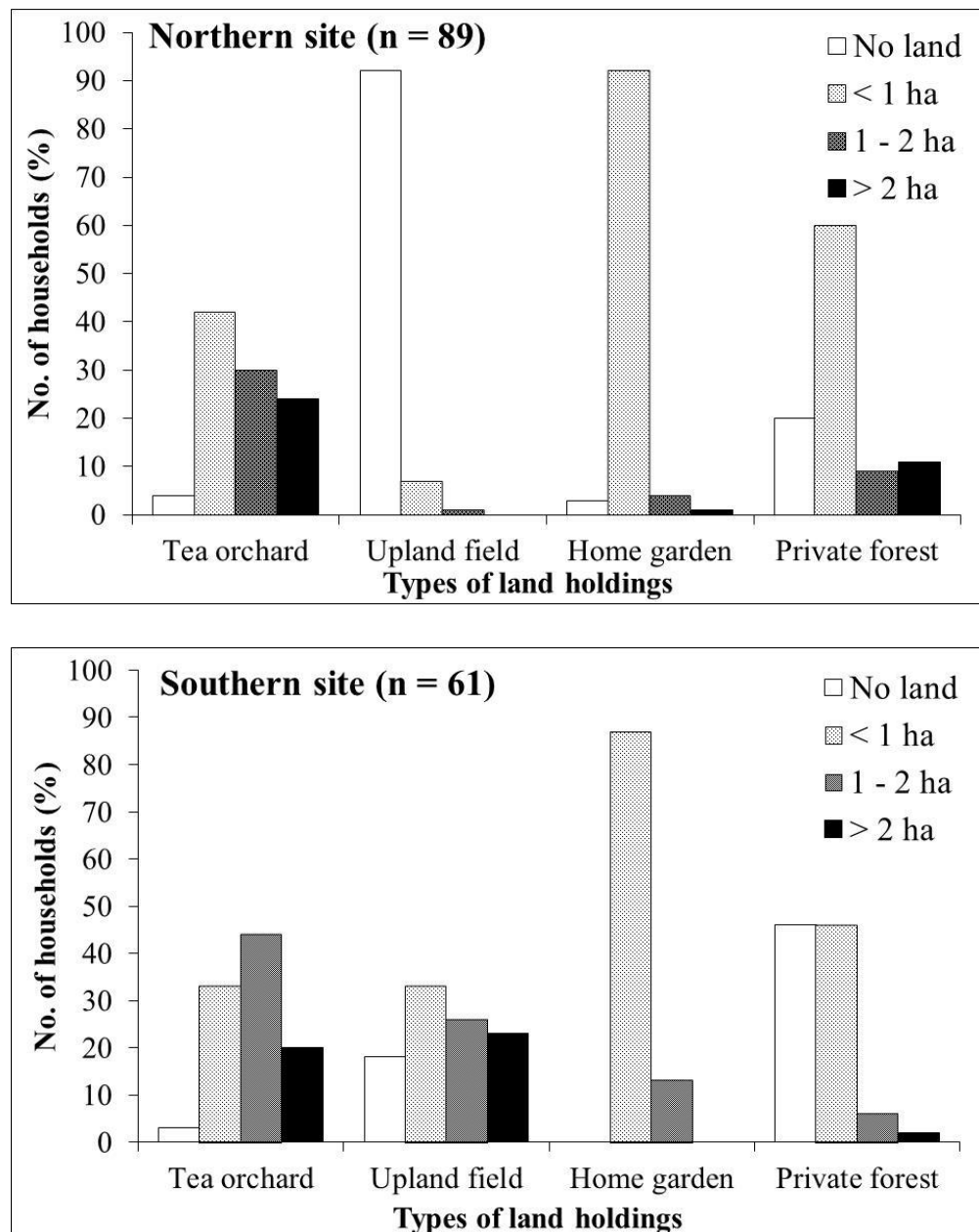


Figure 2. Distribution in different types of land holdings; (a) northern site (n = 89), and (b) southern site (n = 61)

Descriptive statistics (mean, standard deviation and median values) of four different land holdings were described in Table 2. Mann-Whitney test revealed that significant difference

was detected for total cultivated land, upland field and forest land at $P < 0.001$ between northern site and southern site (Table 2). People from northern site owned total cultivable lands and upland fields significantly lower than for people in southern site but possessed larger areas of forest lands (Table 2).

Table 2. Descriptive statistics of total cultivated lands and different types of land holdings; P-values showed significance by Mann-Whitney U test and SD means standard deviation

	Northern site (n= 89)	Southern site (n = 61)	U	P
Total cultivated land in ha (tea orchard + upland field + home garden)				
Mean ($\pm$ SD)	1.85($\pm$ 1.62)	3.05($\pm$ 1.59)		
Median	1.42	2.83	1259	0.000
Tea orchard (ha)				
Mean ($\pm$ SD)	1.44($\pm$ 1.52)	1.40($\pm$ 1.17)		
Median	1.11	1.21	2541	0.504
Upland field (ha)				
Mean ($\pm$ SD)	0.04($\pm$ 0.15)	1.16($\pm$ 0.95)		
Median	0	0.81	567	0.000
Home garden (ha)				
Mean ($\pm$ SD)	0.38($\pm$ 0.32)	0.48($\pm$ 0.37)		
Median	0.28	0.40	2374	0.182
Privately owned forest (ha)				
Mean ($\pm$ SD)	0.77($\pm$ 1.23)	0.31(0.54)		
Median	0.40	0.12	1798	0.000

3.2 Current livelihood combination patterns

As the main income sources, four kinds of livelihood types were identified; (1) tea orchard, (2) upland field, (3) off-farm jobs and (4) livestock rearing. Across the study area, eight different combinations of livelihood options were found (Figure 3). By chi-squared test, proportion of households employing eight different livelihood combination options significantly differed between two sites ($\chi^2 = 104.21$, $P < 0.001$). It was found that all households employ orchard. About 18% of all sample households conduct only tea cultivation in orchards for their living. As indicated in figure 3, households from northern site

were more reliant on four types of livelihood combination; (1) only tea orchard, (2) combination of tea orchard and off-farm jobs, (3) combination of tea orchard, off-farm jobs and livestock rearing, and (4) combination type of tea orchard and livestock rearing. Higher number of households from southern site engaged to the other livelihood combination types; (1) combination of tea orchard and upland field, (2) combination of tea orchard, upland field and off-farm jobs, (3) combination of orchard, upland field and livestock rearing, and (4) combination of all four kinds of livelihood types (Figure 3).

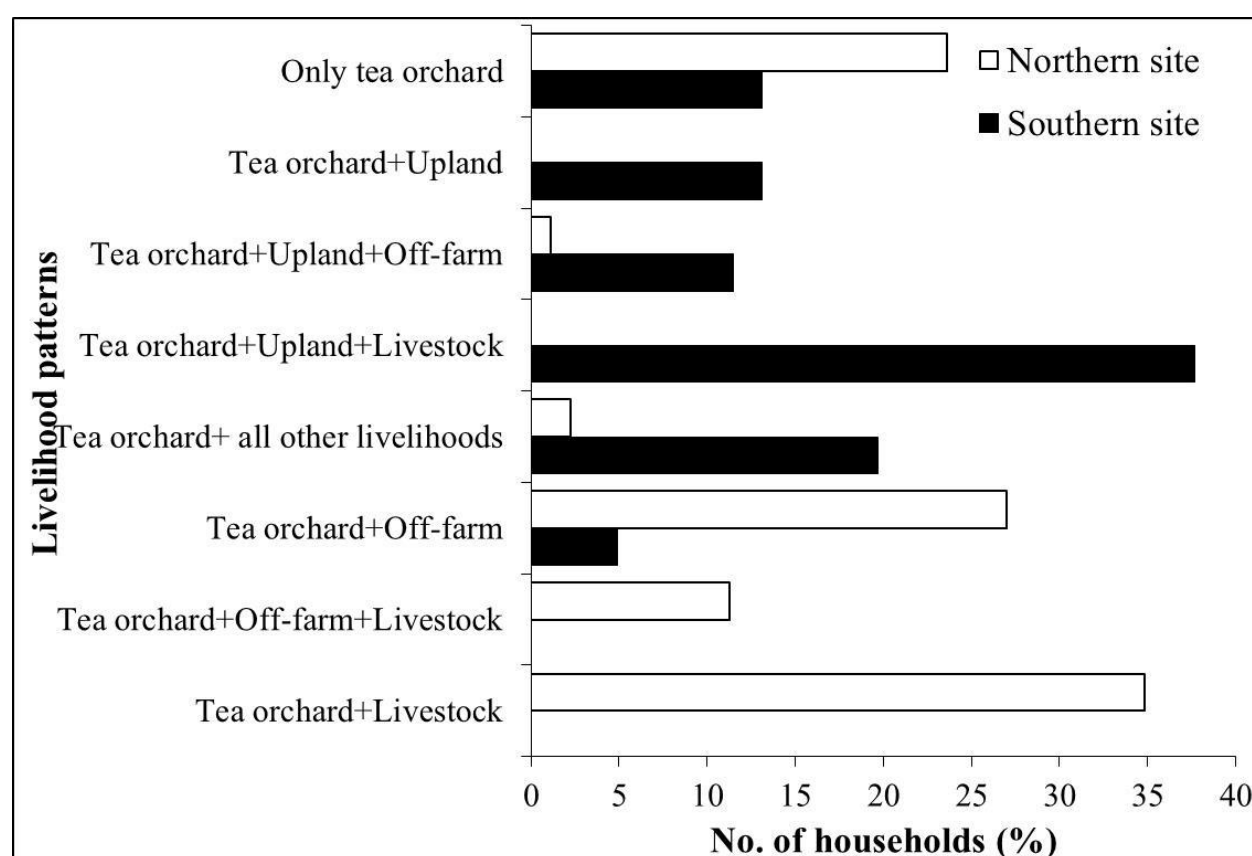


Figure 3. Different livelihood patterns engaged by households from hilly region in Ywangan township, Shan State, Myanmar (n = 89 for northern site, and n = 61 for southern site)

Figure 4 showed the aggregated results of income share (%) by each livelihood type dominated in this area. The average annual gross income of all respondents (n = 150) was 3321 USD. But the average annual gross income of households from northern site (2872 USD) was significantly lower than for households from southern site (3975 USD). In both site, tea orchard contributed the highest proportion to the total income, accounted for 59% in

northern site and 50% in southern site. In northern site, income from off-farm jobs was the second highest contribution to total income (35%), followed by upland field (3%) and livestock (3%) as the lowest proportions of income share. On the other hand, income share (%) from upland field was found as the second highest contribution (35%) in total income of households from southern site, followed by off-farm jobs (12%) and livestock (3%). As aggregated results for both sites, tea orchard was found as the most important income source (contributed 55% of total gross income), followed by off-farm jobs (23%) and upland field (19%).

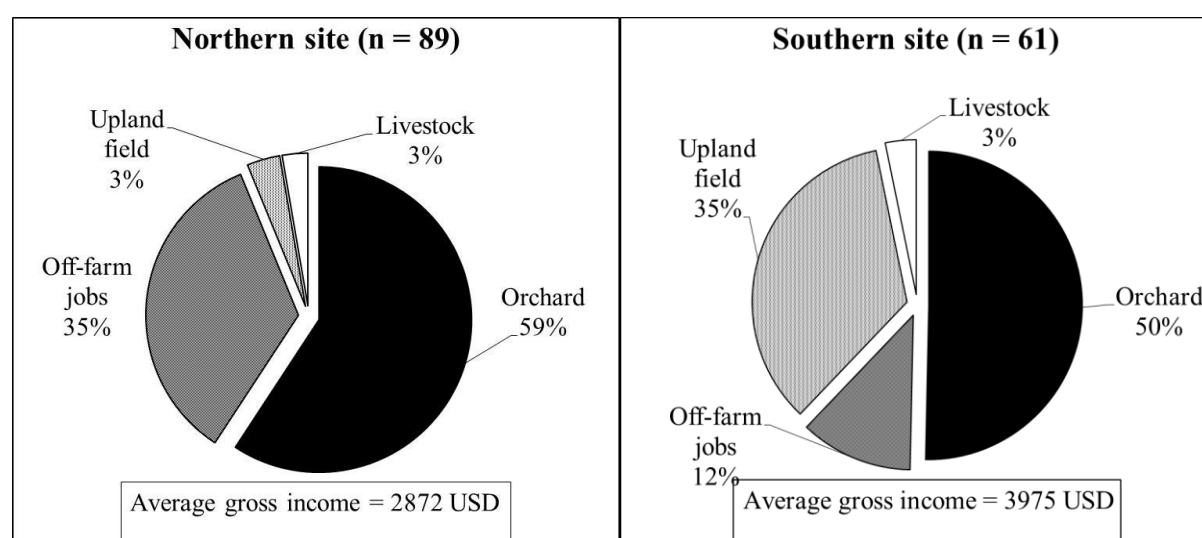


Figure 4. Overall average income share (%) by each occupation engaged by households from hilly region in Ywangan township, Shan State, Myanmar

3.3 Previous livelihood patterns

Figure 5 summarized nine different livelihood combinations of old-aged household group before tea cultivation was not dominant in this area. About 76% of households from northern site and 39% of households from southern site primarily were reliant only on shifting cultivation as their major livelihood. Since previous decades, local people operated orchards cultivating permanent crops especially *Cordia wallichii* whereas the current type of orchard cultivates mainly tea trees. But number of households who used to engage those two kinds of orchards was higher in northern site than for southern site (Figure 5). On the other hand, households from southern site had highly engaged in upland fields.

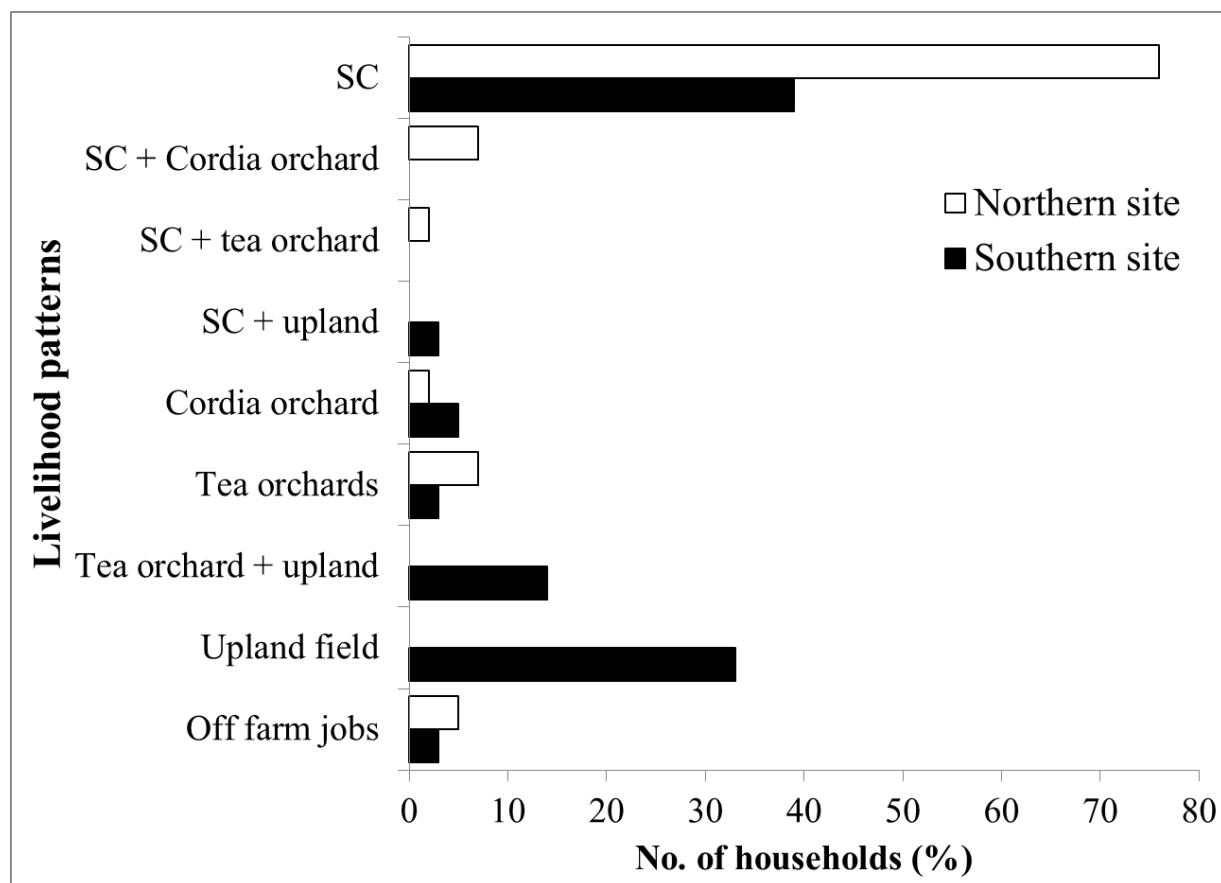


Figure 5. Previous livelihood patterns engaged by households (age $\geq$ 50 years) from hilly region in Ywangan township, Shan State, Myanmar (n = 42 for northern site, and n = 36 for southern site)

3.4 Land-use transition from shifting cultivated landscape to hill orchard

As livelihood transition, 65% of old-aged household group from both sites primarily engaged in shifting cultivation before three decades. The current livelihood combinations indicated that tea orchard was the major livelihood option as well as the most important income source in both northern site and southern site. Currently, there were no households engaged in shifting cultivation, and shifting cultivation landscape have completely disappeared from this area. But the area of tea orchard in undulating hilly area significantly increased by 47% during 28 years from 1988 to 2016 (Lwin & Kanzaki, under review). Therefore, it was apparent that those newly established tea orchards were mostly transformed from shifting cultivated areas where local people had practiced previously. Therefore, origin and previous land-use of currently practicing hill orchards were investigated. Among all 150 sample households, 144 households owned tea orchards; establishing orchards within forested areas of hilly regions whereas other 6 households cultivated tea trees in their home gardens. As the sources of their tea orchards, 70% of respondents (101 households)

mentioned that those lands which they currently utilized for tea orchards were inherited from their ancestors mainly from their parents. Thirty percentages of households responded other sources; 9% of households self-cleared lands themselves primarily for cultivation while only 4% bought those lands from others. For 13% of households, they inherited some areas of orchards from their parents while they bought some plots from others (Table 3).

Table 3. Sources of lands that households established tea orchards in forested areas

Sources	Northern site		Southern site		Total	
	No. of hhs	%	No. of hhs	%	No. of hhs	%
Inherited from their parents	50	59	51	86	101	70
Self-cleared	13	15	0	0	13	9
Bought	4	5	1	2	5	4
Both self-cleared and bought	2	2	0	0	2	1
Both self-cleared and inherited	4	5	1	2	5	3
Both inherited and bought	12	14	6	10	18	13
Total	85	100	59		144	100

Out of the 144 tea orchard owners surveyed, only 120 respondents could provide the timing of transformation and previous land-uses of tea orchards. Among the above-mentioned 120 respondents, 7 respondents indicated that their currently cultivating tea orchards were the same land-use type since those were established. Figure 6 showed the period and pattern of land-use transition. Before tea cultivation was not common in this area, there were three major land-use types in place of current tea orchards; shifting cultivation, *Cordia wallichii* orchard and upland field. The result revealed that 19 households had already started transforming from those three land-use type to tea orchards before 1980 (Figure 6). Out of 113 households, 92 households (81%) converted their shifting cultivated areas to tea orchards while other households transformed from previous upland fields and *Cordia* orchard. As shown in figure 6, the conversion of shifting cultivated areas to orchards sharply rose up around 1996.

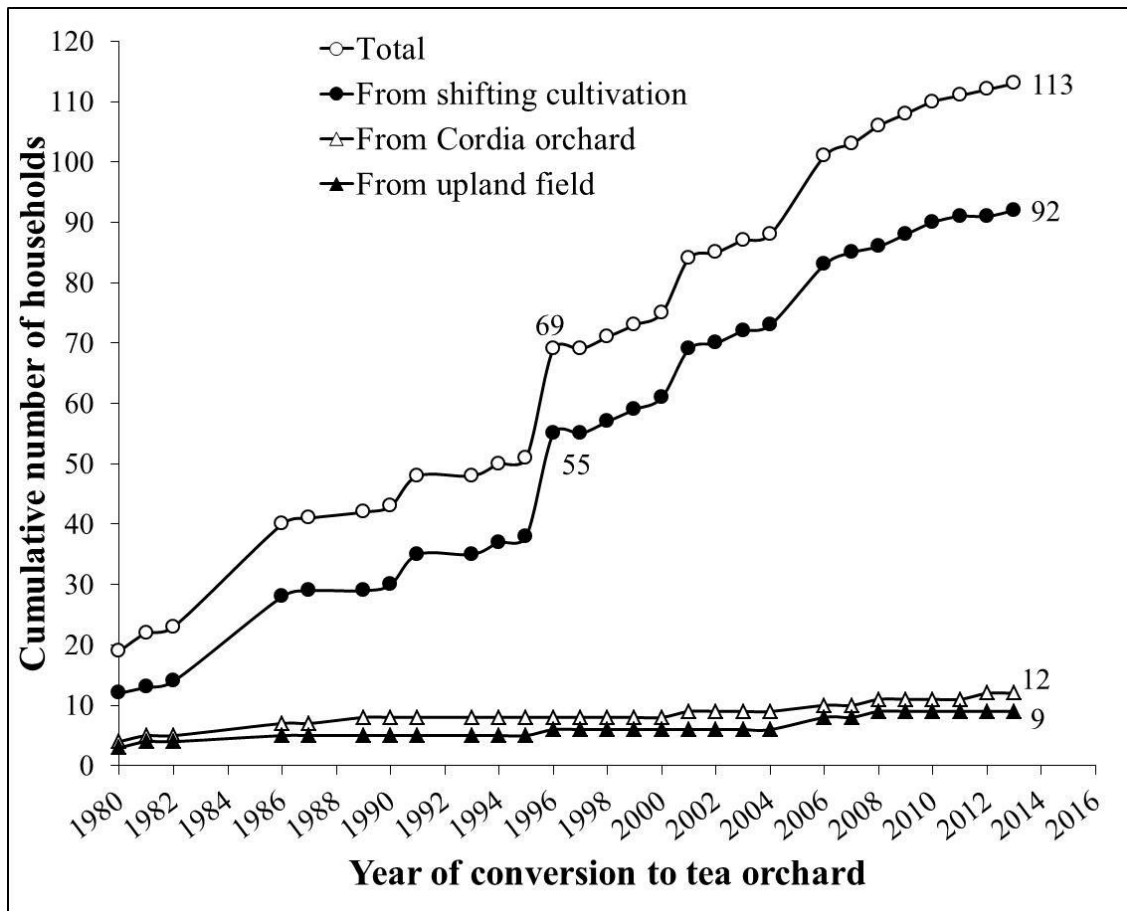


Figure 6. Period and pattern of land use transitions to hill orchards

4. Discussions

4.1 Livelihood pattern of local communities in hilly region

The results indicated that the major livelihood pattern of local communities differed between northern and southern sites of the township. It probably reflected the differences in topography and market access of the two regions. As topography of northern site composed of mainly undulating hills and lowlands, cropping pattern of local people had been shifting cultivation but tea orchards nowadays. While topography of villages from southern site also composed of relatively flat areas (Table 1), upland field cultivating annual cash crops was one of the main livelihoods. The differences in distance to markets influenced the cropping pattern of local communities. The primary market town of northern site was more farther away whereas villages from southern site were located in proximity of market places (Table 1). Cultivating vegetables in upland fields was a common livelihood type in southern site. In northern site where gentle slopes for upland fields were less available, off-farm jobs became the second most important livelihood option. Although some people in this area own

livestock, it is not a significant livelihood option because it accounted for only 3% to the overall income.

Among four different livelihood types, tea orchards provided the greatest contribution to the total annual income at both sites. This result is related with the differing in cropping intensity and harvesting frequencies of each crop. Tea is a perennial crop and the respondents state that it can survive for about 100 years. People usually harvest tea leaves from April to November, i.e, ca, eight months per year. The rest is the time when tea trees shed their old leaves and starting to produce new shoots. The average harvesting frequency for a month is three times and, in turn, 24 times per year. But it differed from one household to another depending on the productivity of tea trees. I found that harvesting intensity of tea leaves in this area ranged from 7 to 32 times with the average of 19 times per year. The crops cultivated in upland fields were annual cash crops and people usually cultivate two different crops per year. In this study, the average annual gross income per hectare per year from hill orchard was 1484 USD while that of upland field was accounted as 1256 USD. However, the respondents mentioned that the initial cost of cultivation and inputs such as labor, pesticides and fertilizers was higher for upland field. For that reason, people preferred tea orchard as their primary livelihood depending on higher income, workability and topography.

4.2 Transition from shifting cultivation to tea orchard

The major change of livelihood was from practicing shifting cultivation to tea orchard. In addition, the main source of land-use transition was conversion of shifting cultivation site to tea orchard. Actually, shifting cultivation is characterized by high spatiotemporal dynamics of active cultivation fields and the different aged fallows (Hurni et al., 2012). According to customary land tenure in this area, people have property right to manage the lands utilized for the whole shifting cultivation cycle. In previous study, I found that people transformed forests to croplands during 28 years, resulted in the increase of cropland areas by 47%. The conversion of forests to croplands was most likely occurred in undulating hilly regions where local people used to practice shifting cultivation (Lwin & Kanzaki, under review). In accordance with this, local people transformed their shifting cultivated sites including active cultivation fields and fallow forests to tea orchards nowadays.

Transition from shifting cultivation to tea orchard accelerated after 1996. This is resulted from the integrated impact of external and internal factors. The underlying causes of

land-use change in this study are similar to widespread decline of shifting cultivation in upland Southeast Asia at large promoted by expansion of markets for commercial crops, and a complex of wider political, social, and cultural trends (Cramb et al., 2009). In Myanmar, state regulations against practice of shifting cultivation had started since colonial time with Government policies (Springate-Baginski, 2013). Myanmar Forest Policy which was enacted in 1995 aimed “to discourage shifting cultivation which are causing extensive damage to the forests” as one of the objectives for improving forest sectors (Ministry of Forestry, 1995). Even shifting cultivation gradually decreased, it did not result in the decrease of deforestation.

Another possible cause of land-use transition is the rise of demands for tea leaves. The respondents state that the market demand for tea leaves started from about 20 years ago when Myanmar government launched a campaign ‘visit Myanmar year 1996’ to promote tourism and the accessibility was improved to connect to the mainland areas of Myanmar. The population increase was also a factor. The number of households in the study villages increased about three times of the number of 50 years ago. The resulting land scarcity promoted the change from shifting cultivation to permanent cropping.

Transitions from shifting cultivation to permanent crops also happened in other Southeast Asian countries (Schmidt-Vogt et al., 2009). In Laos, transition pattern was found as conversion to rubber plantations, to timber tree plantation such as teak and eucalyptus, and permanent annual crop fields. In Thailand, transition resulted in permanent fruit tree orchards, and annual crop fields. In Vietnam, previously shifting cultivated sites became converted to fruit tree orchards, timber tree plantation and annual crop fields. Other transition patterns included conversion to tea orchards, oil-palm plantations, pastures, protected areas, logged forests and flower gardens (as cited in Schmidt-Vogt et al. 2009).

While livelihood diversification was found in this study, tea orchard had become the common agricultural activity. The results also indicated that shifting cultivation landscape completely disappeared in this area and changed to tea orchards. This result suggests that conversion of remnant forests to croplands is a likely trend as population size continued to increase and accessibility via roads will be developed. In this regard, well-adjusted policy instruments of conservation and development should be considered for sustainability of remnant montane forests and rural livelihoods.

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