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Traditional Knowledge on Shifting Cultivation of Local Communities in Bago Mountains, Myanmar

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Abstract

Shifting cultivation is a kind of traditional practice which is characterized by a cultivation phase, involving slash and burn of primary or secondary forest, and crop cultivation for one year, followed by a fallow phase. In Myanmar, forest dependent communities, particularly Karen and Chin ethnic groups, have practiced shifting cultivation for a long time and it was observed that their cultivation methods are based on the traditional knowledge transferred from their ancestors. This paper discusses the traditional knowledge involved in the processes of how local communities have practiced shifting cultivation in S Village, Bago Mountains, Myanmar. In exploring local communities' traditional knowledge on shifting cultivation, qualitative research tools, including participatory focus group discussions, key informant interviews and field observation were employed. It was found that traditional communities avoid the choice of water resource areas and very steep slope areas as shifting cultivation plots. Moreover, after harvesting their crops, they abandoned shifting cultivation plots, as fallow land, for over 15 years, which local people said to recover the forest vegetation for cultivation again. In the traditional shifting cultivation system, it was noticed that villagers select shifting cultivation sites according to sites' potential for high yield of paddy and other associated crops with low environmental impact/damage following their traditional knowledge and practices. However, further research about whether traditional shifting cultivation system causes forest degradation and deforestation is still necessary.

Keywords: traditional knowledge, shifting cultivation, local communities, forest, Myanmar

မြန်မာနိုင်ငံ၊ ပဲခူးရိုးမရှိ ဒေသခံများ၏ ရွှေ့ပြောင်းတောင်ယာစိုက်ပျိုးခြင်းစနစ်နှင့် ပတ်သက်သည့် ရိုးရာဓလေ့၊ ဗဟုသုတများ

ဒေါက်တာဇကေရီဖြူဖြူသက်၊ ကထိက
သစ်တောနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာတက္ကသိုလ်

စာတမ်းအကျဉ်း

ရွှေ့ပြောင်းတောင်ယာစိုက်ပျိုးခြင်းဆိုသည်မှာ သဘာဝတော (သို့) ပြန်လည်ဖြစ်ထွန်းလာသော သစ်တောများကို ခုတ်လှဲမီးရှို့ခြင်းအပါအဝင် တောင်ယာသီးနှံများကို တစ်နှစ်ကြာ စိုက်ပျိုးခြင်းနှင့် ထိုတောင်ယာကွက်များအား အနားပေးခြင်းတို့ ပါဝင်သော ရိုးရာဓလေ့အရ စိုက်ပျိုးသည့် နည်းစနစ်တစ်မျိုးဖြစ်ပါသည်။ မြန်မာနိုင်ငံတွင် သစ်တောများတွင် မှီခိုနေထိုင်ကြသော ကရင်နှင့်ချင်းလူမျိုးများသည် ၎င်းတို့၏ မိဘဘိုးဘွားများထံမှ လက်ဆင့်ကမ်းရရှိခဲ့သည့် ရိုးရာဓလေ့၊ ဗဟုသုတများကို အခြေခံသော စိုက်ပျိုးနည်းစနစ်များကို အသုံးချကာရွှေ့ပြောင်းတောင်ယာ စိုက်ပျိုးခြင်းကို လွန်ခဲ့သောနှစ်ပေါင်းများစွာ ကတည်းက လုပ်ကိုင်ဆောင်ရွက်ခဲ့ကြပါသည်။ ဤစာတမ်းသည် မြန်မာနိုင်ငံ၊ ပဲခူးရိုးမရှိ “S”ကျေးရွာတွင် ရှိသော ဒေသခံများ၏ ရွှေ့ပြောင်းတောင်ယာ ဆောင်ရွက်ခြင်းလုပ်ငန်းစဉ်တွင် ပါဝင်သော ရိုးရာဓလေ့၊ ဗဟုသုတများကို ဆွေးနွေးထားပါသည်။ထိုရိုးရာဓလေ့ဗဟုသုတများကို လေ့လာ သိရှိနိုင်ရန်အတွက် အုပ်စုဖွဲ့ဆွေးနွေးခြင်း၊ ထိုကျေးရွာရှိ အရေးကြီးပုဂ္ဂိုလ်များကို ဆွေးနွေး မေးမြန်းခြင်းနှင့် ဆွေးနွေးမှုမှရလာသော အချက်အလက် များကို တိုက်ဆိုင်စစ်ဆေး နိုင်ရန် ကွင်းဆင်းဒေတာကောက်ယူခြင်းများ ဆောင်ရွက်ခဲ့ပါသည်။ ဒေသခံများသည် ရွှေ့ပြောင်း တောင်ယာ စိုက်ပျိုးမည့်အကွက်များ ရွေးချယ်ရာတွင်ရေအရင်းအမြစ်များနှင့် နီးသောနေရာ များ၊ အလွန်မတ်စောက်သော ဆင်ခြေလျှောနေရာများကို အထူး ရှောင်ကြဉ်ကြကြောင်း တွေ့ရှိရပါသည်။ ထို့ပြင် တောင်ယာသီးနှံများ ရိတ်သိမ်းပြီးနောက် ထိုတောင်ယာကွက်များ အတွင်း သစ်တောသစ်ပင်များ ပြန်လည် ပေါက်ရောက်လာနိုင်စေရန် ရိုးရာဗဟုသုတအရ အချိန်ကာလ(၁၅)နှစ်ကျော်ကြာ အနားပေးကြကြောင်းလည်း သိရှိရပါသည်။ရိုးရာဓလေ့အရ ရွှေ့ပြောင်းတောင်ယာ

စိုက်ပျိုးခြင်း နည်းစနစ်တွင် ဒေသခံများသည် ၎င်းတို့၏ ရိုးရာ ဓလေ့၊ ဗဟုသုတများကို လိုက်နာပြီး ပတ်ဝန်းကျင် ထိခိုက်မှုဖြစ်စေနိုင်မှုများကို ရှောင်ကြဉ်ကာ တောင်ယာစပါးနှင့် အခြားတောင်ယာသီးနှံများ အထွက်နှုန်းကောင်းစေမည့် နေရာများကို ရွှေ့ပြောင်းတောင်ယာ အကွက်များအဖြစ် ဦးစားပေးရွေးချယ်၍ လုပ်ကိုင်ဆောင်ရွက်ကြ ကြောင်း တွေ့ရှိရပါသည်။ သို့သော်လည်း ရိုးရာဓလေ့အရ ရွှေ့ပြောင်းတောင်ယာ စိုက်ပျိုး ခြင်း နည်းစနစ်သည် သစ်တောအတန်းအစား ကျဆင်းခြင်းနှင့် သစ်တောပြုန်းတီး ခြင်းတို့ကို ဖြစ်ပေါ်စေသည့် အကြောင်းရင်းတစ်ခု ဟုတ်မဟုတ်ကိုမူ နောက်ထပ် သုတေသနများ ပြုလုပ် ဆန်းစစ်ရန် လိုအပ်သေးကြောင်း ထောက်ခံဆွေးနွေးထားပါသည်။

Traditional Knowledge on Shifting Cultivation of Local Communities in Bago Mountains, Myanmar

1. Introduction

In tropical and sub-tropical countries, uncontrolled use of the forest such as shifting cultivation and overexploitation of timber led to the development of forestry policies and regulations that aimed at preventing deforestation and forest degradation since early 19th century (Parviainen 2015). However, cultural values and traditional knowledge (hereafter TK) were overlooked in scientific exploration and formation of sustainable forestry policies and regulations (Agnoletti and Santoro 2015). The reason is probably because the rights of indigenous and local people will infringe on scientific research by regulating access to their knowledge and resources in the policies and management (Mauro and Hardison 2011). Nevertheless, indigenous people repeatedly claimed their rights to TK for the cultural survival, and the principle is gradually being recognized in international law starting with the Decision IV/9 of the Conference of the Parties (COP) of the Convention of Biological Diversity (CBD).

According to CBD Article 8(j), TK refers to the knowledge, innovations and practices of indigenous and local communities, which have been acquired, developed and passed down through generations, based on experiences that evolved over centuries and that were adapted to the unique conditions of a specific local culture and environment, including practices in agriculture, fisheries, health, horticulture, forestry and environmental management (Segger and Phillips 2015). TK emerges from the accumulation and adaptation of experiences of many generations of people living in a specific environment (Berkes et al. 2008; Montagnini 2017). Traditional groups around the world gained their knowledge about the natural resources they utilized (Berkes 2000; Huntington 2011; Uptery et al. 2012). Such knowledge makes an important contribution to informing new scientific approaches for sustainable management, and is increasingly recognized as a source of information relevant for the conservation, management and sustainable use of natural resources (Gadgli et al. 1993; Colding 1998; Charnley et al. 2007; Uptery et al. 2012). The inclusion of their local TK in CBD and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) offers a path for sustainable development which aligns well with the objectives of international agreements (Segger and Phillips 2015; Kohsaka 2015). TK also plays an integral role in the achievement of the SDGs agenda, particularly for SDG 15 (life on land), which inevitably influence forest and forest-related livelihoods including shifting cultivation (Katila et al. 2019) and in the development of proper policy-making (Thompson 2015).

Shifting cultivation, called "*Shwe Pyaung Taungya*" in Myanmar, in which cultivators slash and burn the primary or secondary forest, and plant, in the first year since the plot/ land was cleared, a variety of crops for subsistence and for commercial purposes. In the second year, cultivators do not plant the crops again, but weed out the land in preparation for the remaining chilli and cotton, planted in the first year. After harvesting the crops, the plot is left as fallow for vegetation to recover and for the soil to regenerate naturally. In Myanmar, about 2 million families who are living in mountainous areas of Kachin State, Northern and

Eastern Shan State, Bago Region and Chin State have relied on the forests and earned their living from shifting cultivation (FAO 2016).

The shifting cultivation divides the opinion of scholars, government officers and community development organizations in terms of its impact on forest degradation. Seidenberg et al. (2003) reported that shifting cultivation is often blamed for deforestation in tropical upland areas. Nath et al. (2005) claimed that shifting cultivation alone is not the main cause of deforestation, soil erosion or fertility and biodiversity loss as thought earlier. Gafur et al. (2003) also stated although upland soil loss due to shifting cultivation is high in the cultivation period, it returns to near normal levels already in the first year of fallow after one-year cultivation, because of the rapid establishment of secondary vegetation cover. However, Mukul and Herbohn (2016) wrote that shifting cultivation has been causing large-scale deforestation and forest degradation in tropical forest-agriculture frontiers. In this study, shifting cultivation has been maintained in the same area for a long time because the cultivators knew a traditional way of sustainable shifting cultivation system, which is adequate for their livelihood, and included the sustainable management of forests. Their traditional knowledge in shifting cultivation seems to have low impact in terms of forest degradation and soil deterioration.

In Myanmar, shifting cultivators, particularly from Karen and Chin ethnic groups, have engaged in shifting cultivation for a long time (Win 2004; Win and Win 2015) and it was thought that their cultivation practices benefit from the traditional knowledge received from their ancestors. Since such traditional knowledge become important as a source of information for sustainable forest management, this paper discusses the traditional knowledge of local communities on the shifting cultivation based on field survey conducted at local communities living in the Bago Region of Myanmar, with the aim to understand and share the traditional knowledge of shifting cultivation of the Karen ethnic group.

2. Materials and Methods

2.1.Study Area

This study was conducted at the compartment number 49, 50, 51, 52, 53 and 55 in Pyu Kun Reserved Forest nearby S Village, Bago Mountains, Myanmar located at latitude 18° 51’ - 18° 54’ N and longitude 95° 51’ - 95° 54’ E (Fig 1). The Bago Mountains range extends approximately 450 km in length from north to south, and 80 km from east to west, with an elevation of approximately 250 – 450 m asl (Watson 1923). The Bago Mountains range is located between the watershed areas of the Ayeyarwaddy River and the Sittaung River. In the mountainous area, the vegetation is characterized by mixed deciduous forest, with *Tectona grandis* L.f. and other commercial broad-leaved species such as, *Xylia xylocarpa* (Roxb.) Taub., *Pterocarpus macrocarpus* Kurz, *Dalbergia spp*., and *Diterocarpus spp*., as being dominant (Thein et al. 2007). The mean annual rainfall was 1074 mm, ranging from 809 mm to 1395 mm over a 10-year period (2007-2016), measured at the weather station of Pauk Kaung Township, in which the rain occurs during the rainy season from May to October. The mean annual temperature was 29.7°C over a 10-year period (2007-2016) and during a 10-year period, the maximum temperature was 43 °C and minimum temperature 15 °C. Most of the area consists of tertiary sandstones and shale with a soil type classified as Ultisols (Suzuki et al. 2007).

2.2.Data Collection and Data Analysis

Data collection for this study was conducted from October to November 2016, and from February to March 2017. In order to define the criteria for choosing the shifting cultivation sites based on the local community's traditional knowledge, focus group discussions, key informant interviews and field observation were applied. Focus group discussions (FGDs) were conducted two times with groups of over ten people, such as elder people, youth, men, and women with different occupations with the intention to include different ages, genders and occupations. To verify the information collected from FGDs, key informant interviews were conducted with three people (one village chairman and two elder persons), taking into consideration their long-term good knowledge and experience of traditional shifting cultivation system. This preliminary assembling of information allowed for the selection of the shifting cultivation plots based on the topography and bamboo status for the study, according to the way of vegetation clearing, crops planting, and the agricultural calendar for traditional shifting cultivation and fallow period.

In order to check the topography and the status of bamboo density based on the traditional criteria which details were shared during the FGD, 5-year, 8-year and 15-year fallow stands, degraded old growth forests (DOGFs) and old growth forests (OGFs) were observed with six replications (Fig 1). Each plot had 0.1 ha (40 m x 25 m). DOGFs and OGFs are the forest stands that had never been subjected to shifting cultivation, but DOGFs had been used for other purposes such as fire wood collection, bamboo cutting and the harvesting of non-timber forest products, among others. It is important to note that outsiders encroached these DOGFs for illegal logging.

Slope percentage was also calculated by using the slope tools of spatial analyst tools in Arc Map 10.6 (http:// desktop.arcgis.com/en/arcmap/10.6/tools/apatial-analyst-toolb0x/ slope.htm).

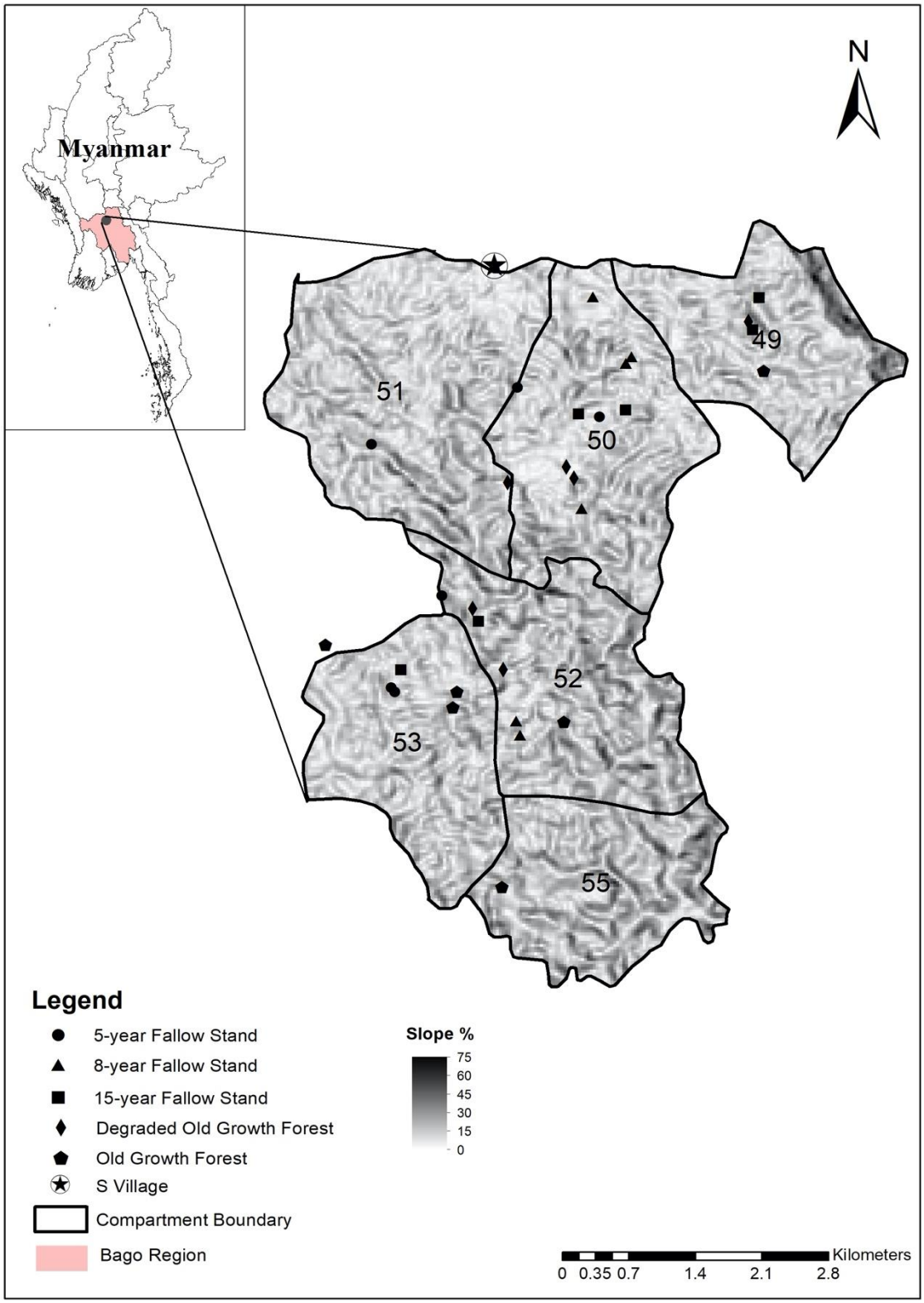

Figure 1. Location of S Village in Bago Mountains, Myanmar

(Note: ●,▲,■ refer to the location of sample plots with different fallow stands and numbers are the compartment numbers of Pyu Kun Reserved Forest.)

3. Results and Discussions

3.1. History of Study Area

This study area is located in Pyu Kun Reserved Forest, Bago Mountains, which is one of the reserved forests belonging to Pauk Kaung Township. In 1884, the Karen village was established for the local Karen people staying around the study area, and shifting cultivation had been allowed for this population (Fukushima et al. 2007). In 1962, the Karen village of 3.971 ha was established as S Village. In 2002, there were 370 Sgaw-Karen people (68 households) living in this village (Takeda et al. 2007). At that time, the village was transferred to along the road and then the population started to increase. The livelihood of these Karen people almost completely relied on shifting cultivation for home-consumption. In 2017, there is a total of 89 households and a total population of 502 inhabitants in this village. The population number has gradually increased since 2002 with the absence of alternative livelihood opportunities, leading to an increase of the dependence on shifting cultivation.

3.2. Local Approach for Choosing the Shifting Cultivation Sites

Most cultivators in S Village follow the traditional way of shifting cultivation, in accordance with the result of FGD and responses of three key informants. They normally select shifting cultivation plots by considering the criteria of bamboo and vegetation density, slope condition and distance of natural water sources, according to the traditional knowledge transferred from their ancestors (Table 1).

Table 1. List of criteria used by local people for choosing the shifting cultivation sites, based on traditional knowledge transferred from their ancestors

No.	Topic	Description
1	Vegetation Status	Selection of areas occupied with high bamboo density
2		Avoidance of areas with high abundance of woody trees
3	Topography	Avoidance of mountain top areas
4		Avoidance of valley areas
5		Avoidance of very steep slopes
6		Avoidance of natural waterways' vicinity areas

3.2.1. Vegetation status

Bamboo abundant area. Shifting cultivators usually select the area where bamboos are crowded and bamboos allow for easily burning the vegetation after clear cutting and drying (Table 2). Best burning benefits include having more ash, which is a good fertilizer for the crops and having less weeds in the rainy season.

However, plot number 6, 14 and 15 with less number of bamboo culms were also used for shifting cultivation. The reason why these plots were selected might be connected to the fact that they are located near to the village as it takes only 1 to 2 hours on foot to reach these plots. Moreover, these might be the new ones due to the land limitation for shifting cultivation.

***Woody area*.** Shifting cultivators tend to avoid the areas where woody trees are abundant because more labour is needed, it takes more time for drying, and the burning is less efficient than the bamboo abundant areas. Especially, they avoid the teak forest areas for the shifting

cultivation because the forest where many teaks grow well, have a dry soil which they consider as a soil of inadequate/ low quality.

3.2.2. Topography

Mountain tops. Normally the tops of mountains were avoided during the selection for shifting cultivation plots based on the traditional way, as cultivators consider that soil erosion will happen with the lack of vegetation in the tops of mountains.

For example, the DOGF plot number 19 with high bamboo density was not used for shifting cultivation because it was located on top hill (Table 2).

However, plot number 9 although located on the top hill was selected because of the high density of bamboos in the area, which cultivators consider to be good for crop production and its potential high yield would better respond to the higher demand after the population increase.

Valley. Shifting cultivators completely discard valley areas – i.e. the low areas between hills or mountains where typically a stream flows - for shifting cultivation plots due to the difficulty to grow the upland rice and the low yield of upland rice in these areas according to their former experience.

It was verified that DOGF plot number 21 with high bamboo density was not used for shifting cultivation because that plot was located at the valley (Table 2).

Slope. Shifting cultivation is not practiced in the steep slope where land slide erosion is prone to happen and where it is difficult to plant the crop through digging with sharp bamboo poles.

However, plot number 1 and 2 with steep slopes were chosen for shifting cultivation because these plots had a very high density of bamboo culms. High bamboo density makes the plots easy to burn and get more ash, which becomes fertilizer. Therefore, high bamboo density is important for shifting cultivation which never use chemical fertilizers.

3.2.3. The vicinity of natural water way

Traditional shifting cultivators usually avoid the places, which are close to natural waterways such as perennial streams and seasonal streams. They believe that nature will definitely punish them back if they destroy nature.

It was proved that some DOGFs in compartment number 50 were also conserved by the local people because these plots were situated in water resource areas of the stream, which had been used for cooking and drinking water (Table 2). Takeuchi et al. (2017) also mentioned that in Borneo, one of the most important reasons for conserving communally reserved forests (CRFs) was to maintain it as a water catchment forest in order to obtain the drinking water from it.

In addition, it was also found in Figure 1 that one DOGF plot in compartment number 49 was situated between two 15-years fallow plots, but local people did not select this DOGF for shifting cultivation. The reason was that the villagers considered it to be a taboo forest, which was traditionally and culturally protected, and a negative impact to the community was expected if the forest was cut for shifting cultivation. It was similar to some CRFs of Borneo, where human intervention was considered to be taboo due to spiritual beliefs (Takeuchi et al. 2017).

Table 2. The plot data of various fallow stands, degraded old growth forest (DOGF) and old growth forest (OGF)

Plot No	Study Sites	Compartment No	Time taken from Village (hour)	Bamboo (No of culms/ 0.1 ha)	Topography			
					Top Hill	Valley	Water Resource Area	Slope %
1	5-yr Fallow Stand	51	2.5	566	x	x	x	25
2	5-yr Fallow Stand	52	2.5	496	x	x	x	23
3	5-yr Fallow Stand	53	3.5	509	x	x	x	16
4	5-yr Fallow Stand	53	3.5	574	x	x	x	5
5	5-yr Fallow Stand	50	1.5	448	x	x	x	8
6	5-yr Fallow Stand	50	1	150	x	x	x	3
7	8-yr Fallow Stand	50	1	468	x	x	x	5
8	8-yr Fallow Stand	50	1	708	x	x	x	6
9	8-yr Fallow Stand	50	1	303	o	x	x	13
10	8-yr Fallow Stand	52	3	749	x	x	x	6
11	8-yr Fallow Stand	52	3	569	x	x	x	10
12	8-yr Fallow Stand	50	1	332	x	x	x	18
13	15-yr Fallow Stand	52	3	514	x	x	x	9
14	15-yr Fallow Stand	49	2	75	o	x	x	21
15	15-yr Fallow Stand	49	2	181	x	x	x	16
16	15-yr Fallow Stand	53	3.5	319	x	x	x	3
17	15-yr Fallow Stand	50	1.5	553	x	x	x	13
18	15-yr Fallow Stand	50	1.5	608	x	x	x	17
19	DOGF	50	2	369	o	x	o	18
20	DOGF	50	2	46	o	x	o	10
21	DOGF	52	3	426	x	o	x	21
22	DOGF	52	3	217	o	x	x	11
23	DOGF	49	2	57	o	x	x	14
24	DOGF	50	1	66	o	x	x	2
25	OGF	52	3	169	o	x	x	20
26	OGF	55	4	116	x	x	x	10
27	OGF	53	3.5	72	o	x	x	24
28	OGF	53	3.5	53	o	x	x	10
29	OGF	49	2	179	o	x	x	5
30	OGF	Near 53	3.5	177	x	x	x	13

“o” means the plots are located on top hill, valley or water resource area.

“x” means the plots are not located on top hill, valley or water resource area.

3.3. Time Management of Shifting Cultivation

The shifting cultivators use all the whole one-year seasons to match with the procedures of shifting cultivation system. They habitually used only one year for cultivation, and they never used fertilizers, pesticides and modernized ploughing machines in their plots. After cultivation, they abandoned the plots up to until when the soil and vegetation get back in good condition.

3.3.1. Way of clearing vegetation

If there a big woody tree stands within the limits of the selected shifting cultivation plot, shifting cultivators in this village do not fell that tree. Instead they cut the branches in order to avoid shade for the planted crops. The felling direction of vegetation such as small trees and bamboo clumps is the slope downward position; hence the cultivators start to clear-cut from the lower part of the slope in order to have an overlaying of the felling vegetation to downward direction. Otherwise, it would be more dangerous for shifting cultivators and less efficient for burning.

3.3.2. Planting the crops

Table 3 described the agricultural calendar for shifting cultivation of the Karen people. In the shifting cultivation plots, their principal crops are upland rice (*Oryza sativa L.*), sesame (*Sesamum indicum L.*), cotton (*Gossypium hirsutum L.*), and chilli (*Capsicum Frutescens L.*), mixed with various vegetables such as cucumber (*Cucumis sativus*), pumpkin (*Cucurbita maxima*), okra (*Abelmoschus esculentus*), roselle (*Hibiscus sabdariffa*) etc. During the year, these crops are mainly planted for subsistence and for keeping enough seeds for sowing in the next year, and for sharing with other shifting cultivators who could not obtain an excess of seeds. Also, a small amount of chilli and cotton are cultivated for trade. The various vegetables are planted for consumption during the stay in the temporary hut of shifting cultivation plots. The cultivation period for all crops is only one year.

At the end of winter, which occupies the cool and dry weather, they select the sites for shifting cultivation and when the weather becomes hot and dry, they slash and burn. At the onset of the rainy season, when it gets warm and humid, they plant the crops, and during rainy season they weed in three times. After rainy season, the weather becomes cool and dry and they harvest their crops in the winter.

Table 3. Agricultural calendar of shifting cultivation in S Village

Activities		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Selection and clearing shifting cultivation plot													
Cutting trees and bamboos													
Burning the dry slash													
Piling and re-burning the incompletely burned slash													
Construction of temporary hut													
Planting paddy, sesame, cotton, chilli and vegetables													
Monthly weeding													
Harvesting	paddy												
	sesame and chilli												
	vegetables												
	cotton												

Cool and dry weather

Warm and dry weather

Hot and dry weather

Warm and humid weather

3.3.3. Fallow Period

The most critical factor that governs the sustainability of traditional shifting cultivation is the length of the fallow period (Abizaid and Coomes 2004). In this study, after the cultivation period has finished, cultivators leave the plots for a long fallow which can last more than 15 years. Nobody comes back to the plot until when cultivators think that the vegetation cover and soil fertility reached a good quality enough to start again the shifting cultivation. Takeda et al. (2005) also described that fallow land covered with trees and bamboo over 12 to 18 years can be easily opened and provides good burning material for shifting cultivation.

Most people perceived that shifting cultivation rarely causes forest degradation if the fallow period is long enough in order to allow the recovery of vegetation. In Myanmar, the fallow period in Chin State was 10 years in the early 1960s (Galay 1967; Win 2004; Win and Win 2015), in northern Shan State was 10 – 12 years in 1970s (Win 2004; Win and Win 2015) and in Bago Region 15 – 20 years (Win and Win 2015). In this study, the shifting cultivation system consisted of a short cultivation period of one year, followed by a long fallow period of 15 years, that cultivators believe to be enough time for the adequate recovery of vegetation that allows to sustain continuous shifting cultivation. However, the fallow period may be reduced in the future due to population growth and land limitation.

4. Conclusions

In the traditional shifting cultivation system, the Karen people in S Village purposely chose the shifting cultivation sites that permit them to earn enough yield of paddy without deforestation and soil degradation. The cultivators never cut the teak forest and they also left the other species' big trees to regenerate after the slash and burn process. Moreover, they never practiced the shifting cultivation on very steep slopes and usually avoided the upstream watershed areas according to the traditional knowledge acquired from their ancestors even though they lacked specialized knowledge related to the environmental conservation. In their traditional way, they abandoned the shifting cultivation plots after harvesting their crops, as fallow land for over 15 years, which is considered the time long enough to reach the status of natural vegetation. In this regard, local communities perceived that shifting cultivation following the traditional knowledge rarely caused forest degradation and deforestation. It was found that their traditional knowledge has supported the maintenance of sustainable forest, water, soil and crop productivity. However, further research is still needed in order to clarify whether traditional shifting cultivation system causes forest degradation and deforestation.

This study also demonstrated that although cultivators followed to a great extent the criteria for conducting shifting cultivation based on traditional knowledge, some conditions did not follow the criteria of their traditional rules, such as selecting shifting cultivation plots on steep slope and inside areas of low bamboo density, because of population growth and land limitation. In the future, the fallow period might also be reduced from 15 years. Therefore, further research is needed in order to verify about which kinds of alternatives are suitable to keep the sustainable forest management and also to enhance the livelihood of the villagers.

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