

Community knowledge and attitude towards regional developmental requirements in remote townships of Chin state, Myanmar

—A questionnaire on sustainability and subsistence to overexploitation of natural resources—

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Abstract

In this study we examined the knowledge and awareness of 200 respondents in two local townships, Mindat and Kanpetlet in Chin state of Myanmar, regarding local environment issues and development requirements. Results indicated differences in knowledge and level of awareness between the two townships particularly regarding issues such as the reduction in fallow period, forest dependence, promoting tourism, protecting local identity and family planning requirements. These differences were found to be mainly due to the differences in economic and social status of the respondents between the two townships. Respondents in Mindat earn more and their education level is higher than in Kanpetlet. They are much more aware of natural environmental changes. In Kanpetlet, forest dependent subsistence is higher and the fallow period in shifting cultivation is shorter than in Mindat. Introducing effective cultivation practices with the required resources and knowledge will facilitate to increase their income while conserving the environment. The respondents have quite different opinions on the development requirements for increasing their earnings and uplifting their living standards.

1. Introduction

Swidden cultivation is a traditional form of agriculture, which has been practiced for more than a thousand years in the mountainous regions of mainland Southeast Asia, i.e., Cambodia, Laos, Myanmar, Thailand, Vietnam, and China's Yunnan province (Spencer, 1966)^[1]. However, with the recent sharp increase in population, the fallow period of shifting cultivation fields has been shortened greatly. The fallow phase allows soils to stabilize and gives forest vegetation an opportunity to regrow, accumulate

biomass, and provide various non-timber forest products. Moreover, if the fallow phase is long enough, there is considerable opportunity for both carbon sequestration and biodiversity conservation (Wangpakapattanawong et al, 2010)^[2]. Conversely, shortened fallow phases often allow the predominance of herbaceous weeds and grasses, eventually resulting in soil degradation (Delang, 2013)^[3]. Today, shifting cultivation is considered a major driver of deforestation and forest degradation; up to 1991, it had accounted for 61 % of the overall tropical forest

destruction on a global scale (Karthik et al., 2009)^[4].

The southern Chin Hills in western Myanmar are mountain ranges that are generally north-south-oriented (Figure 1). Their altitude varies from 1,500 m to 3,000 m. (Hartmann, 2013)^[5]. NatmaTaung National Park (Mount Victoria), encompassing 722.6 km² of verdant mountainous landscape in Chin Hills, forms the heart of the park at 3,053 m above sea level (Fujikawa, 2009)^[6]. The Chin hills are rich in biodiversity with many endemic floral and faunal species, including some endangered ones. In the southern Chin Hills, there are about 160 villages spread out over four townships: Mindat, Kanpetlet, Paletwa and Matupi. People living in this region have their own unique traditions, which are still fairly distinct from those of other states. They make their living mostly or solely using the rich resources of the surrounding forests (Fujino et al, 2013)^[7]. In the northern Chin Hills, traditional swiddens, where villagers cultivate maize and foxtail millet as the staple food, have become scarce under population pressure. As a result, the fallow period has shortened and per capita arable area has lessened. No village livelihood can be sustained without non-and/or off-farm earnings (Takahashi, 2007)^[8]. The same situation occurs in the southern Chin Hills. Recently, by construction of paved road leading to the city portion, distribution economy has become more popular in some township.

We carried out a questionnaire survey about sustainability and subsistence in relation to the overexploitation of natural resources in two townships, i.e., Mindat and Kanpetlet, of southern Chin state in Myanmar. These two represent different levels of regional developments, different population densities and different natural environmental conditions due to human impact.

2. Methodology

2.1. Study area

Mindat

Mindat is situated in the Mindat district of southern Chin State about 4,860 feet above sea level. The township is located between latitudes 21.19 and 21.47, and longitudes 93.23 and 94.29. The township has 46 village tracts and 497 villages. There are 5,828

households with a total population of about 41,569. The population density is 10 to 15 persons per sq. km.

Kanpetlet

Kanpetlet is a small township located in the Mindat district of southern Chin state, which is probably the smallest town in Chin state. It is located about 54 km away from Mindat about 8,040 feet above sea level. It comprises 3,386 households with a total population of 20,837, of which 10,127 are males and 10,710 females. The population density is less than 10 persons per sq. km. There are 26 village tracts and 117 villages, of which only about 13 have access to roads and the remaining have to rely on walking to travel from one place to another. Our survey was carried out in four villages of Kanpetlet: Yeloung pan (39 households), Sawlaung (32 households), Makyautarr (38 households) and Ottopho (35 households). Kanpetlet is still unspoiled by the modern world and its people still maintain a traditional way of life. Kanpetlet is the gateway to the third highest peak in Myanmar and NatmaTaung (Mt. Victoria, 3,053 m) National Park.

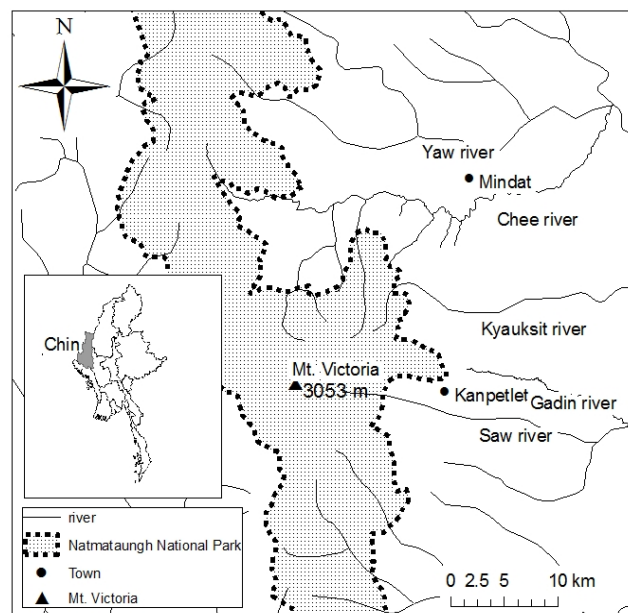


Figure 1. Map of the southern Chin Hill

2.2. Survey techniques

Questionnaires were distributed by the local staff of the forestry department of the Ministry of Forestry, Myanmar. We educated four local members of the forestry department staff about our research objectives of conducting the survey on 1st of March 2013 and they distributed the questionnaires among the local people during 2nd and 3rd weeks of March 2013. All the government staffs are coordinating with the governors of the villages on village development activities in this region. Specially, forestry department staff takes the leading role in environmental conservation activities which directly influence the livelihoods of the local people. As they take similar responsibilities with the governors for the village development, they are respected people in the villages, which facilitated our access to the villagers.

Hundred pretested questionnaires were distributed in each township. They were distributed in four villages of Kanpetlet and in 11 villages of Mindat. Households were randomly selected from the ledger maintained by the village chairman. The questionnaires were filled out by the head of each household with the assistance of the forestry department staff.

The questionnaires included questions to collect data on the respondent's socio-demographic background, to test their knowledge regarding the environmental issues in their surrounding environment and to identify the most important development activities in different sectors as required by the local people.

3. Results

3.1. Characteristics of the sample populations (Table 1)

The results show that the educational levels of local people are comparatively higher in Mindat than in Kanpetlet. The percentage of uneducated people in Mindat is nearly 50 % of that in Kanpetlet, and the

middle-school-educated population of Kanpetlet is twofold that of Mindat. The age distributions of household heads are almost the same in both townships, as more than 75 % of the respondents in both townships are from 26 to 55 years of age.

3.2. Characteristics of the households (Table 2)

The percentage of people with high income is higher in Mindat, where 71 % earn more than 250,000 Kyat/year; this is only 47 % in Kanpetlet. For the majority of the Kanpetlet respondents (76 %), their main income source is shifting cultivation; the share of shifting cultivation in total income in Kanpetlet is low compared with that in Mindat. Furthermore, the number of income sources is higher in Kanpetlet (3-4) than in Mindat (1-2). The fallow period in shifting cultivation is comparatively shorter in Kanpetlet (5-6 yr) than in Mindat (7-8 yr), and the income from an acre of shifting cultivation land is higher in Mindat. Although the Mindat respondents live closer to the forest, their dependence on forest products is lower and the percentage of the population practicing alternative cultivation methods is higher than that in Kanpetlet.

3.3. Knowledge of and attitude towards regional environmental issues

Shifting cultivation (Tables 3 and 4)

The results show that almost all the respondents in Kanpetlet and Mindat have better knowledge regarding the negative effects of shifting cultivation on the environment such as soil erosion. However, majority of the Kanpetlet people seem to lack awareness of the issue on the reduction in the number of fallow years. According to their knowledge, there is no reduction in the number of fallow years in Kanpetlet, and they maintain a fallow period of about 5 years.

Table 1 Age class, Educational level, Number of members in family

Age class (years)	Mindat		Kanpetlet		Educational level	Mindat		Kanpetlet		No. of family members	Mindat		Kanpetlet	
<=25	8		5		Not gone to school	15		38		1- 5	31		38	
26-35	26		29		Primary school	36		33		6-10	65		53	
36-45	36		33		Middle school	31		17		>10	4		9	
46-55	17		22		High school	17		12						
>55	13		10		University degree	1								

*All the values are in percentages (%)

Table 2 Characteristics of the household

	Mindat	Kanpetlet		Mindat	Kanpetlet
<i>Annual income (Kyat/yr)</i>			<i>Fallow period</i>		
<250,000	29	53	5-6	0	86
250,000 - 499,999	33	29	7-8	79	14
500,000 – 749,999	27	12	9-10	22	0
>750,000	11	6			
<i>Main income source</i>			<i>Share of shifting cultivation in total income</i>		
Shifting cultivation	46	76	<25%	48	18
Wage labour	19	16	25%-50%	6	50
Other cultivations	35	9	51% - 75%	14	32
			>75%	31	0
<i>Number of income sources</i>			<i>Shifting cultivation income per acre (Kyat/Acre/yr)</i>		
1-2	86	0	<50,000	15	52
3-4	12	100	50,000-149,999	58	48
>4	2	0	150,000–249,999	23	0
			>250,000	4	0
<i>Forest product collection</i>			<i>Capital asset ownership</i>		
Food material	6	100	Cows	7	32
Fire wood	51	100	Buffalos	0	6
Medicinal material	0	0	Poultry	67	78
			Goats	33	3
<i>Distance from home to forest</i>			Bicycles	2	1
<= 1km	78	0	Motor bike	16	15
1-3 km	6	31	Car	0	0
3-6 km	1	0	Tractor	0	0
> 6km	1	69	Farm equipment	0	1
			Other	0	0
<i>Size of shifting cultivation land</i>					
<1 acre	0	2			
1-3 acre	42	73			
3-6 acre	1	4			

In Mindat, the respondents have a different opinion as all of them agree that the number of fallow years has been reduced, although they maintain a fallow period of about 8 years. They state that the increase in population, land scarcity and ease of clearing lightly fallowed lands are the main reasons for the reduction in the number of fallow years in the region.

For respondents of Kanpetlet, financial difficulties, difficulties in finding required resources and materials, and lack of assistance and advice are the main limitations of shifting in to new cultivation methods. In

Non-timber forest product (NTFP) extraction (Table 5 and 6)

In both townships, the respondents mentioned only firewood collection and food material collection for home consumption and none of them use NTFP as an income source. According to opinions regarding forest resource availability, people in both townships seem to know the negative impacts of excessive forest product extraction and agree that the quantity of forest resources available for collection has been reduced; while in fact, 52% of the Mindat respondents strongly

Table 3 Knowledge on effects of shifting cultivation & willingness to shift to new cultivation methods

		Strongly agree	Agree	No idea	Disagree	Strongly disagree
<i>Shifting cultivation is badly effecting on the environment</i>	Mindat	61	39	-	-	-
	Kanpetlet	23	77	-	-	-
<i>Shifting cultivation is increasing soil erosion</i>	Mindat	61	39	-	-	-
	Kanpetlet	21	79	-	-	-
<i>No. of fallow years are reduced than earlier</i>	Mindat	35	65	-	-	-
	Kanpetlet	-	12	44	44	-
<i>Shifting to new cultivation methods: will protect land and soil</i>	Mindat	57	43	-	-	-
	Kanpetlet	2	46	52	-	-
<i>will increase crop production</i>	Mindat	13	78	-	-	-
	Kanpetlet	23	77	-	-	-
<i>will increase income</i>	Mindat	17	74	-	-	-
	Kanpetlet	38	60	-	-	-

*All the values are in percentages (%)

Table 4 The limitations to shift to new cultivation methods

Limitation		Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
<i>Financial difficulties</i>	Mindat	57	17	22	-	-
	Kanpetlet	98	-	-	-	-
<i>Don't have the required knowledge</i>	Mindat	22	30	22	17	-
	Kanpetlet	-	10	10	2	4
<i>No proper advices and assistance</i>	Mindat	22	35	17	13	13
	Kanpetlet	-	13	85	-	-
<i>Hard to find resources and materials</i>	Mindat	4	17	35	26	13
	Kanpetlet	-	75	4	6	-
<i>Just do not want to</i>	Mindat	-	4	-	35	52
	Kanpetlet	-	-	-	-	2

*All the values are in percentages (%)

Table 5 Opinion towards forest resource availability

		Strongly agree	Agree	No idea	Disagree	Strongly disagree
<i>When the number of people in the region increases, the availability of natural resources reduces</i>	Mindat	43	57	-	-	-
	Kanpetlet	-	100	-	-	-
<i>It is important to reduce dependence on natural resources to protect the natural environment</i>	Mindat	26	70	4	-	-
	Kanpetlet	6	92	2	-	-
<i>Quantity of forest resources available for collection has reduced</i>	Mindat	52	43	-	4	-
	Kanpetlet	7	90	3	-	-

*All the values are in percentages (%)

agree with that statement. (Table 5)

Both respondent groups prefer to reduce or stop forest product collection, if they are given some alternatives. According to the ranking of reasons for the willingness to reduce forest product collection, for both groups, requirement of forest conservation is the main reason, which is followed by difficulties in forest product collection, time consumption and selling difficulties in accordance to with priority (Table 6).

3.4. Opinion on current environmental conditions (Table 7)

The respondents were asked to respond comment on the current situation of different environmental factors such as forest cover, number of plant and animal types, number of landslides per year, river water level and the amount of water available for agriculture in accordance to their view. In Kanpetlet almost all the respondents observed a reduction in forest cover; however, the Mindat respondents have a much stronger opinion on forest cover reduction as 74 % have selected “reduced a lot” from the given answers. However, the majority of the Kanpetlet respondents doesn’t have an opinion regarding the changes in the number of plant and animal types and the number of landslides per year whereas the Mindat respondents observed a reduction, decrease and an increase in these factors, respectively. Both respondent groups have observed a reduction in river water level and the amount of water available water for agriculture than earlier (Table 7).

3.5. Prioritizing the development requirements for the community and environment (Table 8a-f)

Respondents in both groups consider that abiding to the rules on protected areas, using alternative cultivation methods other than shifting cultivation and educating people on the importance of environmental conservation are very important factors to be considered in environmental protection. Minimizing forest product extraction is not considered as a very important factor by the majority of the respondents in both townships. Furthermore, enhancing the laws on environment protection is not considered as a very important factor by nearly 50% of the Mindat respondents and by all of the respondents in Kanpetlet (Table 8-a).

Regarding the changes required for the improvement of subsistence and employment facilities in the region, providing some material support for agriculture is the most important support required by the Kanpetlet respondents. However, in Mindat, in addition to material support on for agriculture, training on effective agricultural practices, increased vocational training facilities, and improved market facilities for their products are also considered as very or most important improvements relevant to this category. Promoting tourism is not considered by the Kanpatlet respondents as an important option to increase

Table 6 Reasons for the willingness to reduce forest product collection

Difficulty		Rank 1	Rank 2	Rank 3	Rank 4
<i>Forest conservation</i>	Mindat	87	4	-	-
	Kanpetlet	96	-	-	-
<i>Time consuming</i>	Mindat	-	22	35	26
	Kanpetlet	-	17	40	-
<i>Collection is difficult</i>	Mindat	4	30	39	9
	Kanpetlet	-	42	17	-
<i>Selling is difficult</i>	Mindat	-	30	13	43
	Kanpetlet	-	-	-	10

*All the values are in percentages (%)

Table 7 Opinion on current environmental conditions

Limitation		Increased a lot	Increased	No change	Reduced	Reduced a lot	No response
<i>Forest cover</i>	Mindat	-	-	4	22	74	-
	Kanpetlet	-	-	-	85	12	3
<i>Number of plant types</i>	Mindat	-	-	13	52	22	13
	Kanpetlet	-	-	2	15	-	83
<i>number of animal types</i>	Mindat	4	9	-	52	30	5
	Kanpetlet	2	10	-	-	2	86
<i>Landslides per year</i>	Mindat	17	74	-	-	4	5
	Kanpetlet	10	2	2	-	-	86
<i>River water level</i>	Mindat	-	13	-	43	35	9
	Kanpetlet	-	-	2	83	-	15
<i>Water available for agriculture</i>	Mindat	-	4	-	48	43	5
	Kanpetlet	-	-	-	81	2	17

*All the values are in percentages (%) and bold is more than 50 percent

Table 8 Prioritizing the development requirements for the community and environment.

a) Environment protection

		Most important	Very important	Important	Some important	Least important	No response
<i>Abide the rules on protected areas</i>	Mindat	43	43	13	-	-	1
	Kanpetlet	63	8	27	-	-	2
<i>Do alternative cultivation methods other than shifting cultivation</i>	Mindat	43	57	-	-	-	-
	Kanpetlet	31	52	15	-	-	2
<i>Minimize forest product extraction</i>	Mindat	17	35	39	9	-	-
	Kanpetlet	-	25	63	10	-	2
<i>Educate people on importance of environment conservation</i>	Mindat	57	30	13	-	-	-
	Kanpetlet	40	42	15	-	-	3
<i>Enhance the laws on environment protection</i>	Mindat	22	30	39	-	4	5
	Kanpetlet	-	2	38	2	-	58
<i>Other</i>	Mindat	-	-	-	-	-	-
	Kanpetlet	-	-	-	-	-	-

**All the values are in percentages (%) and bold is more than 50 percent

their employment facilities or income; however, the Mindat respondents identify promoting tourism as an important way to improve their livelihood.

In Kanpetlet, the improvement of road facilities is the most important infrastructure development required by

the respondents. Improving electricity power supply, communication facilities and road facilities seem to be equally important development requirements for the Mindat respondents. Having a public space for social interaction also seems to be important for the Mindat

Table 8 (Continued) b) Subsistence and employment

			Most important	Very important	Important	Some important	Least important	No response
<i>Training courses on effective agricultural practices</i>	Mindat		61	22	17	-	-	-
	Kanpetlet		4	8	67	-	-	21
<i>Increase vocational training facilities</i>	Mindat		30	43	26	-	-	1
	Kanpetlet		10	48	13	10	-	19
<i>Provide material support on agriculture</i>	Mindat		43	35	22	-	-	-
	Kanpetlet		85	6	8	-	-	1
<i>Improve market facilities for products</i>	Mindat		61	17	22	-	-	-
	Kanpetlet		6	40	33	-	-	21
<i>Promote tourism</i>	Mindat		9	35	35	17	-	4
	Kanpetlet		-	-	2	10	-	88
<i>Other</i>	Mindat		-	-	-	-	-	-
	Kanpetlet		-	-	-	-	-	-

**All the values are in percentages (%) and bold is more than 50 percent

Table 8 (Continued) c) Infrastructure and basic services

			Most important	Very important	Important	Some important	Least important	No response
<i>Improve road facilities</i>	Mindat		65	26	4	-	-	5
	Kanpetlet		81	-	10	-	-	9
<i>Create or improve a public space for social interactions</i>	Mindat		9	43	39	4	4	1
	Kanpetlet		-	-	4	8	-	88
<i>Electricity power supply</i>	Mindat		43	43	9	-	-	5
	Kanpetlet		35	33	4	8	-	20
<i>Improve communication facilities</i>	Mindat		52	35	13	-	-	-
	Kanpetlet		29	27	35	-	-	9
<i>Other</i>	Mindat		-	-	-	-	-	-
	Kanpetlet		-	-	-	-	-	-

**All the values are in percentages (%) and bold is more than 50 percent

people, which is not considered as an important facility by the Kanpetlet people.

In relation to educational facilities, improving environmental education for children and adults is considered very important by the Kanpetlet respondents, whereas establishing more schools and improving education on effective family planning are also considered very important by the Mindat respondents.

For the Kanpetlet people, improving access to clean water supply is very important whereas for the Mindat respondents creating or improving health care facilities is equally important as improving water facilities. Improving sanitary facilities is not as important as other health care facilities in both townships.

Activities to improve the local identity and local traditions are not considered as particularly important in both townships. However, protecting traditional

Table 8 (Continued) d) Education

		Most important	Very important	Important	Some important	Least important	No response
<i>Establish more schools</i>	Mindat	43	39	13	-	4	1
	Kanpetlet	4	12	79	-	-	5
<i>Improve environmental education for children</i>	Mindat	39	39	22	-	-	-
	Kanpetlet	-	75	15	2	-	8
<i>Improve environmental education for adults</i>	Mindat	35	30	35	-	-	-
	Kanpetlet	77	19	-	-	-	4
<i>Improve education on effective family planning</i>	Mindat	30	35	35	-	-	-
	Kanpetlet	4	10	4	-	-	82
<i>Other</i>	Mindat	-	-	-	-	-	-
	Kanpetlet	-	-	-	-	-	-

**All the values are in percentages (%) and bold is more than 50 percent

Table 8 (Continued) e) Health and security

		Most important	Very important	Important	Some important	Least important	No response
<i>Create or improve health care facilities</i>	Mindat	48	43	4	-	4	1
	Kanpetlet	12	25	60	-	-	3
<i>Access to clean water/Water supply</i>	Mindat	35	61	4	-	-	-
	Kanpetlet	27	56	12	-	-	5
<i>Improve sanitary facilities</i>	Mindat	9	35	43	-	4	9
	Kanpetlet	4	37	52	-	-	7
<i>Others</i>	Mindat	-	-	-	-	-	-
	Kanpetlet	-	-	-	-	-	-

**All the values are in percentages (%) and bold is more than 50 percent

local values, passing on cultural traditions and values to the younger generations, and promoting the image of the community with its special identity are considered much more important than other activities.

4. Discussion

Income and Education level

Mindat and Kanpetlet are geographically located 54 km apart in Chin State. According to the results the Mindat respondents are more educated than the Kanpetlet respondents. Furthermore the annual income level is higher in Mindat than in Kanpetlet. However, in both townships, the average annual income is far below the per capita income of Myanmar, which is around 1,144 US \$ (1,115,400 Kyat as of 2013). The

low education level of the Kanpetlet people could be due to the low household income which forces them to go for earning at a younger age. Rasul (2003)^[9] quoted that shifting cultivators also deserve an improved quality of life, including better educational opportunity for their children, which is not possible given the low return being provided by their land-use practices.

Although the main income source of the majority of people in Kanpetlet is shifting cultivation, the share of shifting cultivation in their total income is less than that in Mindat. One reason behind this could be the variety of income sources they are involved in. All the Kanpetlet people have 3 or 4 income sources such as shifting cultivation, wage labor, other cultivation methods and receiving incentives. However, in Mindat,

Table 8 (Continued) f) Local identity and traditions

		Increased a lot	Increased	No change	Reduced	Reduced a lot	No response
<i>Protect traditional local values</i>	Mindat	35	26	35	4	-	-
	Kanpetlet	4	17	75	-	-	4
<i>Pass the cultural traditions and values to the younger generation</i>	Mindat	26	30	39	4	-	1
	Kanpetlet	12	2	27	-	-	59
<i>Promote the image of the community with its special identity</i>	Mindat	22	26	48	4	-	-
	Kanpetlet	2	23	62	-	-	13
<i>Celebrate more cultural and traditional activities</i>	Mindat	4	4	30	30	26	6
	Kanpetlet	-	2	33	-	-	65
<i>Promote wearing typical textiles</i>	Mindat	9	17	26	30	13	5
	Kanpetlet	-	21	69	2	-	8
<i>Promote typical foods</i>	Mindat	17	4	39	26	9	5
	Kanpetlet	-	8	37	-	2	53
<i>Other</i>	Mindat	-	-	-	-	-	-
	Kanpetlet	-	-	-	-	-	-

*Bold is more than 50 percent

majority (86 %) of the people have only one or two income sources.

Therefore, even if the percentage of people involved in shifting cultivation is low in Mindat, their share of shifting cultivation in total income is much higher. The other reason for the lower share of shifting cultivation in total income could be the annual shifting cultivation income per acre. Shifting cultivation offers little opportunity for improving the people's quality of life, as the return per unit of land and labour is very low because of the low level of technology and input use (Rasul, 2003)^[9].

Although shifting cultivation gives low returns per unit, the annual income per acre of shifting cultivation land is comparatively much lower in Kanpetlet than in Mindat, which influences the lower share of shifting cultivation in the total income of the Kanpetlet people. This difference could be a result of the difference in the length of fallow period in the two regions, which is around 5 years in Kanpetlet and around 8 years in Mindat. Neba (2009)^[10] reported that slash-and-burn cultivation with short fallow periods of 1 to 5 years results in a savannization process. Furthermore, the

shortened fallow phases are often unsustainable, allowing the predominance of herbaceous weeds and grasses and eventually soil degradation (Luohui L. et al, 2009)^[11] as herbaceous fallows are limited in their ability to accumulate biomass and restore soil fertility (Delang et al, 2013)^[3]. Therefore, in Kanpetlet, shifting cultivation lands should be giving lower yields per unit area than those in Mindat owing to poor soil conditions. However, although the fallow period is much longer in Mindat than in Kanpetlet it can still be considered short. Luohui et al. (2009)^[11] have shown that shortening the fallow phase to less than 10 years has led to the arrested succession of weeds and land degradation. The limitation of tree growth in short fallows (<10 years) might be due to the high competition with weeds in the field (Metzger, 2003)^[12]. Therefore, the fallow period should be long enough for trees to regenerate, because without the chance for woody species to develop, soil fertility may not be restored, as trees are necessary to maintain soil nutrients (Delang et al, 2013)^[3].

Population pressure

In Chin State, the overall population increase from 1990 to 2009 is nearly 32 % which is very sharp. The population densities of Kanpetlet and Mindat are less than 10 and between 10-15 heads/sq km^[13], respectively. The researchers generally agree that population pressure is a major cause of the reduction in fallow period. Fujikawa (2009)^[6] observed that a sharp increase in the population in the region has changed the sustainable way of living by markedly shortening the fallow period, making it difficult for forests to recover completely to their original conditions. However, in Kanpetlet, although the population density is lower the fallow period is also shorter. This could be mainly due to the lack of knowledge and awareness of Kanpetlet people regarding the issues on shifting cultivation as the majority of the respondents do not agree with the statement that the number of fallow years has been reduced in the region; on the other hand, the Mindat respondents who are practicing 8 fallow years agree that the fallow period has been reduced. Another reason for the shorter fallows in Kanpetlet could be the distance of the two regions from Natma Taung national park. Kanpetlet, the Gateway to Natma Taung, sits on a ridge at 1200m (Fujikawa, 2010)^[14] next to the pine forest that borders the national park itself. However, Mindat is situated quite far from the national park area. Therefore, the Kanpetlet people may have limited area for shifting from one field to another owing to the national park being a protected land area. Owing to the increase in the population to be fed with limited resources such as land there is an increase in pressure to shifting cultivators to produce more on limited land. In such a situation, if one considers the cropping phase as production to meet the rising demand, the intensification pressure would result in the extension of the cropping phase and the shortening of the fallow phase (Luohui, 2009)^[11]. Steadily growing population combined with expanding government control over common property resources, including forests, has in many ways compelled shifting cultivators to shorten the fallow period (Rasul, 2003)^[9].

Non timber forest products

Excessive non timber forest product (NTFP) collection is also a major human impact on natural

forests in Chin State. The illegal procurement of some economic plants such as medicinal orchids by villagers has resulted in some wild orchids facing extinction (Fujikawa et al. 2009)^[6]. However, according to the survey results in Kanpetlet, all the respondents collect firewood and food materials from the forest for home consumption, while in Mindat only about 50% of them collect fire wood for home consumption. Because of the increased population density, shifting cultivation has been unable to meet even the subsistence requirements of the people (Rasul, 2003)^[9]. In Laos, nearly a quarter of the food requirement of shifting cultivators is met by fruit, meat and tubers collected from the forest (Delang, 2006)^[3]. Similarly, as the Kanpetlet people have a very low total income, they depend on NTFPs for some of their household needs such as food and firewood. As the respondents are aware that extracting medicinal orchids and other scarce plant materials is prohibited in the region either they are not involved in illegal procurement or they are reluctant to give the real details regarding NTFP collection. Although none of them mentioned the extraction of products other than firewood and food materials, some of them may be involved in it as Fujikawa (2009)^[6] reported that the large demand by neighboring countries contributes to some of the local people illegally procuring valuable medicinal herbs, mainly orchids, from the forest which has resulted in the extinction of some of the wild orchids. However, both of the respondent groups seem to have proper knowledge of the importance of protecting forest resources and are willing to prevent NTFPs collection in the presence of alternatives. Encouraging local people to cultivate NTFPs instead of simply procuring them from the forest will enable forest conservation as well as generate new cash income for the people.

Natural environmental changes

The difference in opinion between the two townships regarding the current situation of different environmental factors could be due to the difference in their consciousness on environmental issues. The Mindat respondents are much more aware of natural environmental changes than the Kanpetlet respondents. Maslow's (1954)^[15] hierarchy of needs explains that

people who struggle in meeting their survival needs such as food and firewood cannot give attention to higher level needs such as conservation. As mentioned above, the Kanpetlet respondents are much poorer than the Mindat respondents and hence are still in a struggle to fill their survival needs. Therefore, they have less concern to the changes in their surrounding environment. The difference in their education level could also be another reason for the difference in their consciousness.

Although Kanpetlet is the gateway to NatmaTaung National Park, the majority of the population is distributed in rural villages (79 %) away from the township. They have very limited or poor access to facilities in the town area. Therefore, the respondents seem to have little knowledge of eco-tourism in the region. Therefore, they do not identify it as an important factor for improving their employment opportunities. However, Mindat is currently attracting tourists and local people are earning additional income through tourism. Therefore, they know the importance of promoting tourism to attract more tourists.

Local identity

Furthermore, both respondent groups do not seem to think that improving and protecting their local identity and their traditions are very important things to be considered in regional development. However, the Mindat respondents are ahead of the Kanpetlet respondents in their understanding of the importance of their special local identity, which could be due to their higher education level. Chin people have their own unique traditions, which are still fairly distinct from those of the surrounding areas; these traditions serve as one of the reasons why domestic and overseas tourists visit this region (Fujikawa, 2009)^[6]. Therefore, it is important to educate them on how the unique environmental features of the region and their traditions attract tourists into the region, which could be used as an income source for them. However this option is two sided as with the increase in income due to tourism, local traditions could slowly disappear.

5. Conclusion

Mindat and Kanpetlet respondents have quite

different opinions on the development requirements for increasing their earnings and uplifting their living standards, some of which could be due to the differences in their education level and income level. Although they identify financial difficulties, lack of materials and proper training facilities as limitations to shift to new cultivation methods, they are still not ready to change from their traditional way of farming. However, the Mindat people would prefer to shift to other income sources and more advanced cultivation practices, if given the required resources and knowledge. The Kanpetlet people are still living a very rural life with minimum infrastructure facilities compared with the Mindat people. Very poor road facilities to other villages keep them isolated from other areas. Therefore, the respondents identify improving road facilities as the most important infrastructure development requirement for their region over other facilities. However, the Mindat respondents think that improving road facilities, electricity power supply and communication facilities is equally important to develop their region.

To reduce human impact on the environment and to develop the region, the most important thing would be to introduce ways to improve their existing cultivation system such as cultivating NTFPs during fallows as the people are still reluctant to change from their traditional way of living. In the meantime, basic infrastructure facilities such as roads could be developed to open new income sources such as eco-tourism. Introducing effective cultivation practices with the required resources and knowledge will enable the people to supplement their income while conserving the region.

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Abstract (Japanese)

本研究では、ミャンマー・チン州に位置する2つの集落、ミンダット(Mindat)とカンペレ(Kanpetlet)に住む200名余りの住民に対し、現地の環境問題と開発要件に関する知識と意識を調査した。焼畑農業における休閑期間の減少、森林資源依存性、観光の促進、地元のアイデンティティの保護および家族計画の要件について、2つの集落間にはこれらに関する知識と意識のレベルに違いが見られた。これは集落間に生じている回答者の経済的・社会的地位の違いを反映している。ミンダットの回答者はカンペレよりも収入が多く、教育レベルも高い。環境の変化に対する危機感も高かった。一方、カンペレでは森林資源依存性がミンダットよりも高く、焼畑農業における休閑期間もより短くなっていた。非木材林産物(NTFPs)を栽培することに対しても消極的であった。これら2つの集落は収入と生活水準を上げることについても異なった意見を持っていた。

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