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Jhum cultivation in Khagrachari hill district of Bangladesh- a subsistence farming practices in ethnic minorities

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Abstract: *Jhum* cultivation (slash-and-burn agriculture) with upland rice as the major crop is the pre-dominant land-use system in the hilly regions of the Chittagong Hill Tracts (CHT) of Bangladesh. With low population densities and moderate expectations, this system may have ecologically sound and adapted to the resource available. *Jhum* cultivation is changing rapidly, partly because of population pressure and partly because livelihood strategies are diversified to include permanent cultivation of cash crops. Fast population growth have resulted in shorter fallow cycles and consequently increased soil erosion in hills with loss of soil fertility. Realizing these key roles of skill/experience and fallow periods in *Jhum* cultivation, the ongoing research activities explored to know the status of the *Jhum* farmers in these aspects. The initial findings of this research effort are summarized and discussed in this paper. It was observed that *Jhum* farmers had been practicing shifting cultivation with an average fallow periods of 3.2, 2.6 and 2.5 years, respectively for the landless, small and medium farmers. Almost all of the selected farmers felt that the fallow period has been consistently shortening and productivity of the fields has been declining. The present average of the 2-3 years fallow period is too short for the vegetation regeneration and to regain soil fertility.
Keywords: *Jhum* (Slash-and-burn) cultivation, Khagrachari hill district, fallow period and farming experience.

Introduction

In Chittagong Hill Tracts (CHT) slash-and-burn agriculture, a kind of swidden or shifting cultivation in hills locally known as *Jhum chash* has been recognized as subsistence food production system for ethnic minorities, namely *Chakma*, *Marma*, *Tripura*, etc. For centuries, the ethnic minority communities have been practicing *Jhum* cultivation and this term has also been adopted in fishing, hunting and harvesting of forest products. *Jhum* cultivation and forest are still central role player to the traditional societies as their primary sources of food, shelter, medicine and other products and services (Ahmed and Gabby, 1996).The intimate relationships between the ethnic minority and the hill farming system have enriched their ethnobotanical knowledge through ages (Khisa, 1997a; 1997b). The CHT shares border with the Arakan and Chin states of Myanmar, and Tripura and Mizoram States of India and consists of three hill districts of Rangamati, Khagrachari and Bandarban and it covers an area of 13, 295 km^2, about 10% of the country. There are twelve ethnic communities living in the region who are traditionally all swidden cultivators, although some of them are also used to and still occasionally do engage in hunting, fishing, gathering and herding activities. The *Chak*, *Khyang*, *Khumi* and *Moru* who lives mostly on the ridge-tops, are still largely swidden cultivators. The *Chakma*, *Marma*, *Tangchangya* and *Tripura* who live on the gentle slopes and river valleys engage in swidden cultivation. In 1960 hydroelectric dam was constructed in the Karnaphuli River at Kaptai village of Rangamati hill district, inundating about 20,000 ha or 40% of the prime agricultural land in the CHT. This has thoroughly changed the ecological as well as socio-economic scenario of the region and the ethnic communities. About 100,000 ethnic communities' peoples were displaced by the reservoir who were spread in the other parts of CHT and compelled to take to *Jhum* cultivation on the hill slope. Until the early 1960s, this practice was not considered to be very detrimental to the hill ecology. Population growth along with rapid deforestation has reduced the fallow period from 10-20 years to 2-3 years. The present average of 2-3 years fallow period is too short for the regeneration phase of the cultivation and to regain soil fertility. Although there is a substantial volume of literature on the hill farming systems in abroad (Agalawatte and Abeygunawardena, 1993 for the Sri Lankan experience; Araki, 1993 for Zambia; Goswami, 1980 for India; and Sunderlin, 1997 for Indonesia), research on indigenous farming systems in Bangladesh has been strikingly limited (Hassan and Muzumder, 1995; Hossain *et al*., 1985; Ishaq, 1971). However, according to expansion of modernization in development of CHT, the farmers have recently shifted the importance from shifting or *Jhum* cultivation to permanent cultivation. Accordingly, a study to understand the agro-status of *Jhum* cultivation in farming systems of CHT is much required. The current study is, therefore, an attempt to deal with this issue, highlighting peoples' local farming practices and experiences on *Jhum* cultivation especially for understanding inter household variation in *Jhum* cultivation, fallow periods, and farming experience in particular.

Materials and Methods

The research was conducted in Baghaichari muk village, Khagrachari Hill District of Bangladesh. The village is situated at a distance of 30 km to the northeast of the district headquarters (Fig. 1) in the year of 2004 and 2006. Data were collected from 50 *Jhum* farmers using open structured questionnaire. In addition, semi-structured questionnaires were also used with selected *Jhum* farmers and field observations were conducted as well. About 75% of their populations are dependent upon forest resources for their livelihood. Among the population, the Buddhists are in a majority.

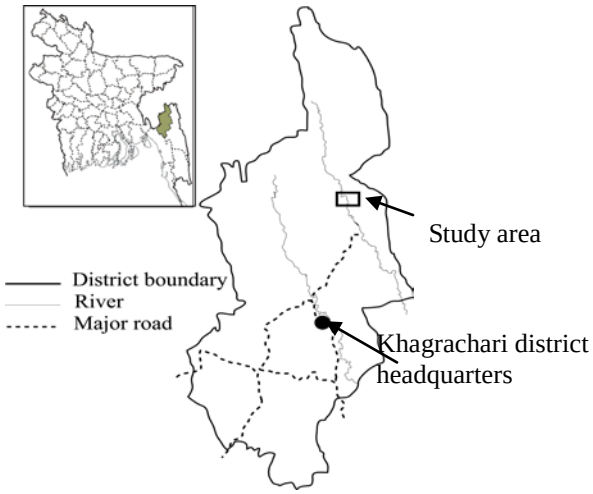

Fig. 1 Location of the study village

The village lengthened 500 m from north to south and 3 km from east to west, and the Mayani River runs through its western part. The village of Udal Bagan and a paved road is located to the South, and a reserve forest is located to the East (Fig. 2).

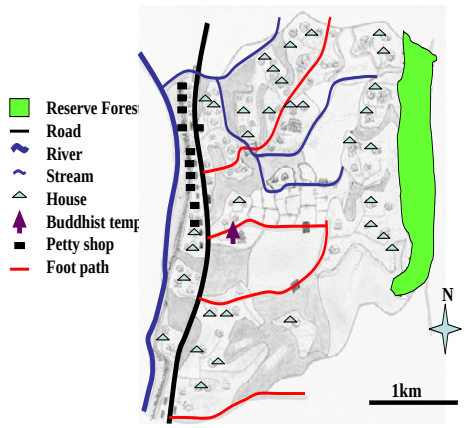

Fig. 2 Map of Baghaichari muk village

The distance between the village and the fields differed considerably depending on the fields. Few fields are about 30km away, a 3 days journey by boat and foot (Fig.3.). One of reasons why farmers sought fields in such remote land is that for which nobody claimed ownership of land use rights. Three distinct cropping seasons existed in this area. The summer season starts in March and April and is characterized by high temperatures and humidity with occasional thunderstorms and cyclones.

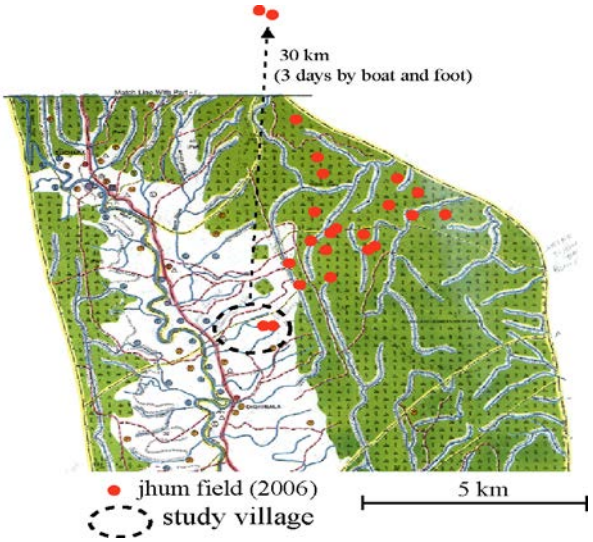

Fig. 3 Study village and *Jhum* conducting area

The rainy season starts in May and ends in October, and winter starts in November and ends in February (SRDI, 2002). Based on long-term records (1961-1990) obtained from the Rangamati Weather Station, rain starts in February, gradually increase until July, and then decrease. About 90% of the total rainfall occurs during six months from May to October. The highest (627mm) and lowest (4mm) of rainfall occur in the months of July and January, respectively. Maximum 33^0c and minimum 20^0c temperatures were recorded in April and January.

Results and Discussion

Jhum cultivation systems in the study village

The CHT is mostly comprised of hills and very limited flat lands. *Jhum* farming is a labor intensive agricultural system. Most of the labor comes from the family members. Side by side, it requires little capital because very little external inputs are needed. Mostly *Jhum* cultivation is conducted in the reserve forest, usually far from the village. The major steps of *Jhum* cultivation, which include land selection, land preparation, sowing and planting, weeding, pest management, harvesting, threshing and storing.

Land selection: Land selection is done during the month of February. Soil fertility, degree of hill slope, accessibility and distance from the villages are the main consideration for the selection of land for *Jhum*. Cultivator determines soil fertility from the soil color and growth of the bushes. Black colored soil and lands with vigorous growth of vegetation are considered as fertile land suitable for *Jhum* cultivation. Accessibility and closeness of the *Jhum* land from the homestead are also considered while selecting land. A *Jhum* cropping calendar of the study village is given below.

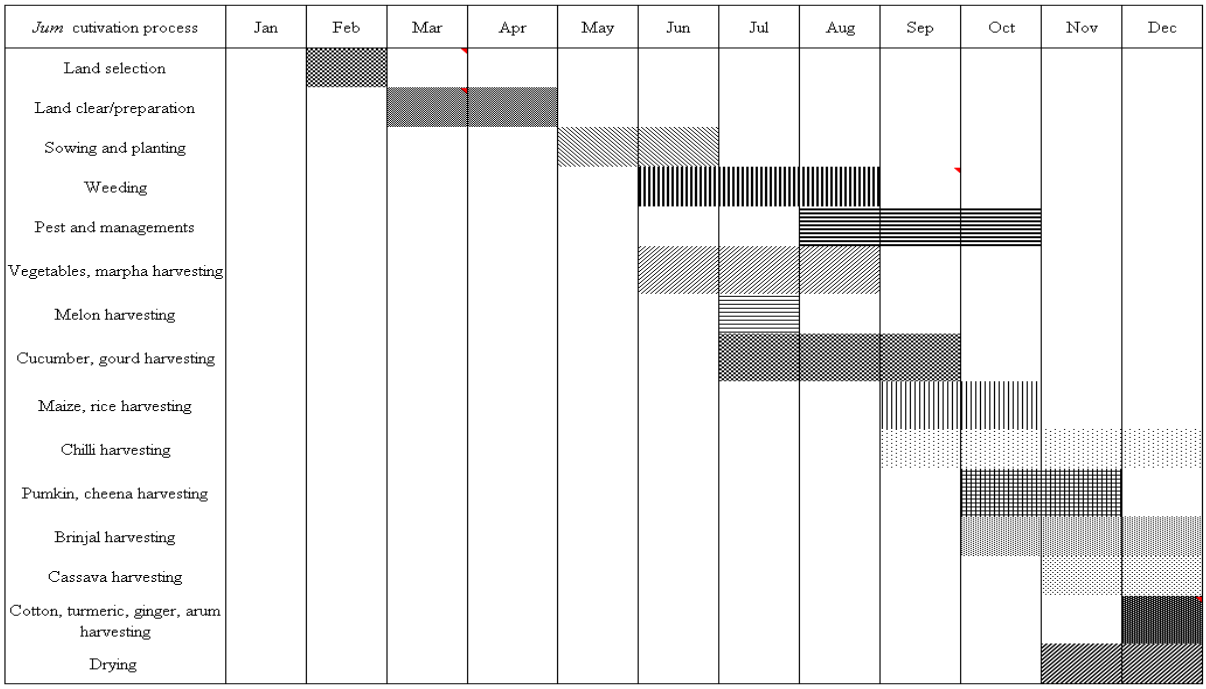

Fig. 4 *Jhum* cropping calendar followed by the farmers of the study village

Land preparation: Land preparation usually starts from March. First, the standing vegetation are slashed and allowed to dry during the dry period. The dried vegetation and the fallen logs are burnt in the month of April and May. The partially burnt or unburned logs are then dragged out of the *Jhum* land and piled up. Some of these woods are used to create fences to keep wild animals away from the *Jhum* land. The land is ready for crop establishment at the first shower, which usually occurs in April or May.

Sowing and planting: Sowing commences as soon as the monsoons starts and the ground is saturated, generally in the months of May and June. A narrow hole, about three inches deep, is dug with the blunt square end of a *tagol* (knife); a handful of mixed seeds of rice, vegetables and cotton etc. are then placed in the hole to complete the process. The quantity of rice seed is greater than that of other types sown by this process, as rice is the staple food and cultivator aim to maximize growth of this crop. Creepers, including pumpkin, sweet potato, sweet gourd, and watermelon, are raised in mounds some distance away.

Weeding: *Jhum* requires minimum weeding. Weeds are controlled manually by using the *tagol*. Two to three times weeding are necessary. Each and every cultivator in turn helps his or her neighbor in weeding.

Pest managements: Among the insect pests rice bugs *(Leptocorisa acuta)* are reported to be major pest. But vertebrate pests such as rat, wild pig, deer, monkeys and jungle fowl also cause considerable damage. Thus, cultivators built small house locally called *Tong ghor* in the *Jhum* field for guarding the crop against these vertebrate pests. The wild pigs and deer may seriously damage the young rice plants. On the other hand rats, monkeys and jungle fowl cause serious damage to ripening crop. Now a day the most notable change is the use of pesticide and chemical fertilizers by some farmer to improve production.

Crop harvesting: Harvesting begins at the ripe. The first crop to ripe is maize in mid-July, followed by melons and different varieties of vegetables. Rice and other grains are ready for harvest in September, and cotton, the final crop, is collected in October. The rice panicles are harvested and brought to the temporary house in the *Jhum* field. A special kind of knife locally called *chari* is used for harvesting rice panicles. Rice straws are cut from the base and leave in the *Jhum* field for few days. Yield of *Jhum* crops are found to vary between years and between *Jhums*. It was noticed that distribution of rainfall was the most important factor on which production largely depends. The next important factor is the weed management.

***Jhum* rice threshing and storing:** Threshing of *Jhum* rice is usually done by foot. In some cases sticks are used. Rice is usually stored as unhusked paddy either in the gunny bag or storing container made of bamboo *(Turong/gola/dol*).

***Jhum* cycle:** An average *Jhum* cycle before creation of Kaptai Dam was 10 to 20 years or even more. Such longer cycle usually did not cause serious damage to soil and soil fertility. But acute shortages of plain cultivable land as a consequence of inundation by Karnafuli Lake and population pressure due to birth and immigration from plain area shortened the fallow period. This has resulted in declining soil fertility, lower yields and quick soil erosion resulting in soil degradation. In addition, cultivator took the opportunity to cultivate *Jhum* in one to two seasons while establishing orchard or planted forest.

***Jhum* crops:** *Jhum* cultivator produce almost everything whatever they need. Large numbers of cereals, vegetable, pulse, oilseed, spices, fruits and

fiber crop were found to grow in the *Jhum* fields and rice was always the main crop. It was noticed that about 30 crops, were grown in *Jhum chash*. Cultivators use many traditional varieties for each of the above mentioned crops. In the past 15 to 20 crops used to be grown together, which used to supply almost all the necessities of food and fiber. At present 5 to 8 crops were usually grown in a *Jhum* field. Besides, few *Jhum* cultivators were more interested to produce cash crops like ginger and turmeric rather than paddy, which was the common feature throughout the CHT.

***Jhum* rice varieties:** During field survey, 2006 about 22 types of *Jhum* rice varieties were found to grow in the *Jhum* fields. Some of the conventional varieties were glutinous but most of them were non-glutinous rice. Generally glutinous rice were used for making cakes and sometimes for own consumption.

Table 1 Different type of crops grown in the *Jhum* field

Jhum crops names	Scientic name	No. of *Jhum* households			Total
		Landless	Small	Medium	
Crops					
Maize	*Zea mays*	5	15	4	24
Vegetables					
Marfa	*Cucumis sp*	12	25	9	46
Indian spinach (green)	*Basella alba*	10	25	9	44
Cucumber	*Cucumis sativus*	10	24	8	42
Barbati	*Vigna sp*	9	24	8	41
Eggplant	*Solanum melongena*	11	20	8	39
Okra	*Abeloschus esculentus*	10	20	9	39
Kumra	*Largernaria sp*	8	15	9	32
Snake gourd	*Trichosanthes anguina*	8	10	7	25
Rib gourd	*Luffa acutagula*	6	7	5	18
Bitter gourd	*Momordica charantia*	8	5	2	15
Hill gourd	*Lagenaria siceraria*	6	5	4	15
Aroid	*Colocasia esculenta*	6	3	4	13
Spices					
Chilli	*Capsicum spp.*	12	28	10	50
Ginger	*Zinbiber officinalis*	5	25	10	40
Turmeric	*Curcuma longa*	4	25	10	39
Pulses					
Arhar	*Cajanus cajan*	9	18	5	32
Fruits					
Banana	*Cajanus cajan*	7	4	5	16
Water melon	*Citrullus lanatus*	3	4	5	12
Mask melon	*Cucumis melo*	7	8	6	21
Fibre					
Cotton	*Gossypium sp*	4	13	8	25

Source: Survey in 2006

Note: Figures in parentheses indicates percentages

Table 2 Common *Jhum* rice varieties grown in the field

Name of the variety	Characterstics	No. of *Jhum* households			Total
		Landless	Small	Medium	
Horin binni	It is sticky and generally used for making local rice cakes	9	18	10	37
Kamarang dhan	Moderate taste	11	15	8	34
Gallong dhan	Moderate taste	12	13	9	34
Lanka pora dhan	Moderate taste	8	16	7	31
Uttose binni	It is sticky and generally used for making local rice cakes	9	13	8	30
Binni dhan	It is sticky and generally used for making local rice cakes	9	10	9	28
Kamarang binni	It is sticky and generally used for making local rice cakes	8	11	7	26
Laxmi binni	It is sticky and generally used for making local rice cakes	9	10	7	26
Dop chodai dhan	Moderate taste	5	12	8	25
Guri dhan	Moderate taste	5	10	9	24
Torkee dhan	Moderate taste	4	11	9	24
Angu dhan	Non glutinous, good taste	6	8	9	23
Kobrock dhan	Moderate taste	7	9	6	22
Marry dhan	Moderate taste	6	8	7	21
Patti dhan	Moderate taste	7	9	5	21
Pattiya dhan	Moderate taste	5	9	7	21
Madhu maloti dhan	Moderate taste	7	6	5	18
Mon ange dhan	Moderate taste	6	5	7	18
Ame dhan	Moderate taste	3	8	6	17
Badheia dhan	Moderate taste	4	6	5	15
Longur dhan	Moderate taste	4	6	3	13
China IRRI	Modern rice	2	6	5	13

Source: Survey in 2006

Note: Figures in parentheses indicates percentages

Cultural and religious norms in *Jhum* cultivation

The ethnic communities in the CHT select their *Jhum* lands based on certain religious believes. Usually, a farmer bathes, dresses in clean clothes, and offers prayers before seeking out a *Jhum* site. If a suitable site was found, she/he collected a lump of soil for a dream test. The soil sample was placed in a sacred place beside the pillow or bed within the house. That night, after bathing and changing into clean clothes, the farmer retired and awaits a dream. If the dream was favorable (e.g., large fish, water, fruit, women wearing white clothing, flowers, or corn fields), the land was selected for cultivation. If the dream was unfavorable (e.g., deer, tigers, elephants, goats, snakes, insects, wild boar, dogs, or fire), the local priest was contacted to arrange for special prayers or sacrifices of poultry or other animals to find suitable land for *Jhum* cultivation.

Relationship between household of farm size categories and *Jhum* farm lands use types in the study village

Farmers were classified into four farm size categories based on their landholdings such as (1) landless farmers (own no lands) (2) small farmers, (a farm holding having an operated area of less than 1.01 ha) (3) medium farmers, (a farm holding having an operated area of 1.01-3.03 ha) (4) large farmers, (a farm holding having an operated area of 3.03 ha and above) (BBS, 2001).

Table3. Relationship between household of farm size categories and *Jhum* farm land use types in the study village

Farm size categories (ha)	Total		Homestead land		Paddy land		Riverside land		Registered hill land		*Jhum* land		
	H.H	Area (ha)	H.H	Average area (ha)	H.H	Average area (ha)	H.H.	Average area (ha)	H.H	Average area (ha)	H.H	Area (ha)	Average area (ha)
Landless	12 (5)	0	0	0	0	0	0	0	0	0	12 (100)	6.87	0.57
Small (<1.01)	163 (66)	59	160 (98)	0.38	75 (46)	0.73	9 (6)	0.19	8 (5)	0.56	28 (17)	20.0	0.72
Medium (1.01-3.03)	61 (25)	102.02	61 (100)	0.51	55 (90)	0.82	21 (34)	0.33	12 (20)	1.52	10 (16)	6.0	0.60
Large (>3.03)	11 (4)	50	11 (100)	0.93	11 (100)	1.88	6 (55)	0.80	7 (64)	2.49	0	0	0
Total	247 (100)	211	222 (90)	1.82	136 (55)	3.07	36 (15)	1.32	27 (11)	4.56	50 (20.24)	32.87	1.89

Source: Household survey in 2004 and 2006

Note: Figures in parentheses indicates percentages

Table 3 shows that there were 12 landless farmers who had no land of their own (5% of the total households) and most of them were daily laborers and *Jhum* cultivators. They cultivate about 6.87 ha of *Jhum* land. On an average each landless farmers have occupied 0.57 ha *Jhum* land area. The average farm size of the small farmers (163 HH) has been found to operate 0.72 ha for the *Jhum* cultivation. In a same way, medium (61 HH) farmers have been found to operate 0.60 ha under *Jhum* cultivation and the large farmers (11HH) were not practicing in *Jhum* cultivation at all. Total land operated by small and medium farmers were 20 ha and 6 ha, respectively.

The results indicates that the *Jhum* cultivation was practiced more (in regards to land area) by landless (0.57 ha) farmers than that of small (0.72 ha) and medium (0.60 ha) farmers where as large farmers were not practicing. This might be due to possessing of more paddy land (average 1.88 ha) by large farmers. It has also found that landless, small and medium households attempted to overcome the land scarcity by adopting *Jhum* cultivation, though *Jhum* lands were far away from their living village (about 10-12 km) and some lands were located more remote areas and it had taken time 2 or 3 days to reach there.

Difference of farming types between permanent farming and shifting cultivation in the study village

The Table 4 indicates that 65% of no *Jhum* farmers are holding the paddy land comparison to *Jhum* farmer having only 14% of paddy land. In addition, the average total lands owned by *Jhum* farmers (0.49 ha) are half of that under permanent farming (1.0ha).

Table 4. Difference of farming types between permanent farming and shifting cultivation in the study village

Farming types	HH	Homestead land		Paddy land		Riverside land		Registerd land		Average total area (ha)
		No. of HH	Average area (ha)	No. of HH	Average area (ha)	No. of HH	Average area (ha)	No. of HH	Average area (ha)	
Permanent farming	197	184 (93)	0.33	128 (65)	0.69	34 (17)	0.38	24 (12)	1.50	1.00
Shifting cultivation (*Jhum*)	50	36 (72)	0.28	7 (14)	0.47	1 (2)	0.40	2 (4)	1.80	0.49
Total	247	220	0.32	135	0.68	35	0.39	26	1.53	0.92

Source: Survey in 2006

Note: Figures in parentheses indicates percentages

Relationship between farm size categories with *Jhum* farming experience and fallow period in the study

Table 5 indicates that the landless farmers are more experienced (average 7 years) than small and medium farmers whereas large farmers have no experience in the *Jhum* farming. This might be as landless farmers have no paddy land so they were confined to *Jhum* only. The landless farmers are doing *Jhum* farming with an average 7 year of experiences in comparison to small and medium farmers. Among the landless farmers *Jhum* farming experience of the study village found to range minimum 2 years to maximum 32 years. Landless farmers keep the land fallow due to want of cash money. During the fallow period they work as daily laborer in the paddy of large farmers. After managing a handsome amount of money within one or two years working as daily laborer, they again return to the *Jhum* land for its cultivation.

Table 5. Relationship between farm size categories with *Jhum* farming experience and fallow period in the study village

Farm size categoies (ha)	Total H.H	*Jhum* land (ha)		*Jhum* farming experience (years)			Fallow period (years)		
		H.H	Average area (ha)	Max.	Min.	Average	Max.	Min.	Average
Landless	12 (5)	12 (100)	0.57	32	2	7	3	2	3.2
Small (<1.01)	163 (66)	28 (17)	0.12	20	3	4	6	3	2.6
Medium (1.01-3.03)	61 (25)	10 (16)	0.09	15	1	3	4	3	2.5
Large (>3.03)	11 (4)	0	0	0	0	0	0	0	0
Total	247 (100)	50 (21)	0.78	67	6	14	13	8	2.8

Source: Survey in 2006

Note: Figures in parentheses indicates percentages

This category of farmer also sells out part of their *Jhum* product, the paddy to use the money to rent-in the paddy land of a year or so. As a result fallow period among the landless farmers appears more or longer (3.2 years). Small and medium categories of farmers have the tendency to grow more ginger or turmeric than rice and other vegetables as these two crops are more remunerative. These small and medium farmers thus have a less tendency to keep fallow land rather than to grow biennial spices like ginger and turmeric. As they grow more remunerative crops they have fewer tendencies to keep the land fallow. As a result fallow period among the small and medium farmers appears less. It is only 2.6-2.5 years.

Conclusion

The ethnic minorities in Chittagong Hill Tracts (CHT) region are centered on the hills and their resources. Slash-and-burn agriculture with upland rice as the major crop was the predominated land use system in this region. However, the present farming systems in the study village show that dependence on *Jhum* cultivation is not so large. One of reasons might be the agro-ecological setting of the village and another is the farmers' socio-economic capability on their farming. From the viewpoint of agronomy, it is noticed that, over the last 50 years, average fallow periods have been reduced drastically. There is an urgent need to identify deterioration in soil fertility and productivity of crops under the reduced fallow periods.

Jhum cultivation is practiced more (in regards to land area) by the landless farmers than the small and medium farmers, whereas the large farmers are not practicing it. It can be considered that the landless, small and medium households have attempted to overcome the land scarcity by adopting *Jhum* cultivation. This may be due to possessing of more paddy land by large farmers and paddy cultivation be more economic-profitable and productive than *Jhum*. The landless farmers were more experienced (average 7 years) than small and medium farmers where as large farmers had no experience as because they were not involved in *Jhum*. It is remarked that recently introduced mono-cropping of aroids, turmeric and zinger in hill slopes without proper soil and water conservation measures might make the hill agriculture system more unsustainable.

Land degradation along with the lack of appropriate *Jhum* cultivation technology may be leading to a sharp decline in productivity of lands in the CHT region. Ultimately the farming system, especially *Jhum* cultivation, is becoming fragile. On the basis of the

present study, it could be concluded that more than 70% of the population or landless and small farmers of this region is losing sustainability of their subsistence farming due to over-depending *Jhum* cultivation. The decline of the existing farming practices is of major concern.

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