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A comparative study of *Jhum* land crop productivity and farmers coping strategies in *Jhum Chash* system at Khagrachari hill district of Bangladesh

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Abstract: The present paper aims to compare the yield, production cost and gross profit of *Jhum* crops with that of plain land paddy and also to find out the locally adopted coping strategies of *Jhum* problems in socio-economic aspect, specially the utilization of Non Timber Forest Products (NTFPs). The rice production systems in *Jhum* (shifting cultivation) land area in the study village are undergoing dramatic variations. Due to construction of Kaptai Dam and privatization of the hill lands, the problem of loosing plain land has occurred with the resettlement program for the ethnic minority, particularly, the Chakma. This drastic social change in the Chittagong Hill Tracts has created *Jhum* land shortage in the hill, ultimately resulting in shorter fallow period. Result revealed that there is a great yield difference among *Jhum* rice, plain land and riverside planted rice. This variation is due to the cultivation of crops in *Jhum* land in a mixed pattern with subsistence level of management, whereas plain land rice and riverside land get the maximum management. Although the *Jhum* farmers are intended to grow plain land rice more but they can not, due to severe land shortage with some other edaphic problems. They are also trying to cope with this sort of problems. In the *Jhum* land, crops are grown in a mixed way and the number of crops are more than that of plain land (where only mono rice crop is grown) and it has been found that the total gross profit for one hectare of *Jhum* rice in one year is about 36310 Tk., which is rather low in comparison with plain land rice (gross profit is about 72040 Tk. in one hectare of land in one year).
Key words: *Jhum* (Shifting) cultivation, crop productivity, farmers' problem and coping strategies.

Introduction

The ethnic communities of Chittagong Hill Tracts region in Bangladesh have been living on slash-and-burn agriculture for centuries (Millat-e-Mustafa *et al*., 2002). *Jhum* (shifting) cultivation is still central to the traditional societies as their primary source of food, shelter, medicine and other products and service (Ahmed and Gaby, 1996). The symbiotic relationship between the ethnic minority and the hill farming system (*Jhum* cultivation) enriched their ethnobotanical knowledge through ages (Khisha, 1997a; 1997b). They live on the gentle slopes and river valleys and engage both in *Jhum* and in plough agriculture with irrigation, some of them also engaged in market-orientated teak plantation and horticulture.

The ethnic communities are facing serious poverty because they only have less productive land for *Jhum* after the relocation. Moreover the population increased and frequent conflicts over the land with migrated people from the plain areas of Bangladesh have resulted severe decrease in per capita cultivated land area. About 50 to 60 years ago, they used to keep fallow their land for more than 10-13 years. However, as there is no more new land for cultivation, the fallow period has presently been shortened to 3-4 years and even somewhere only one year. Because of shortening fallow periods, soil fertility is declining, which has caused a decline in the yield of the crop.

Due to the substantial decrease of cultivable land for *Jhum*, people virtually tend to shift to paddy cultivation. The farmers are mainly engaged in *Jhum* cultivation as well as some are involved in plain land rice cultivation. Rice is mainly grown in the valleys, which is very much limited. Modern rice production technologies have been adopted in the valleys. But, so far very little or nothing has been attempted for the improvement of rice production system in the *Jhum* cultivation. Thus rice cultivation in the valleys is becoming more profitable than *Jhum* cultivation. But the main problem is the lack of available land with some other problems. So they are bound to do *Jhum chash* facing some problems and they are also trying to cope with these problems. The current study aims to compare the production cost and yield of *Jhum* crops with that of plain land paddy and also to find out the locally adopted coping strategies of *Jhum* problem in socio-economic aspect.

Materials and Methods

The study site is located in Baghaichhari muk village of Dighinala Upazila in the CHT region of Bangladesh, about 30 km away from the Khagrachari District headquarters (Fig. 1). The field survey was done in November, 2008-February, 2009 taking 50 households (practicing *Jhum* cultivation). Field observations were also conducted. After collection all the data were compiled and analyzed by computer program MS-excel.

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

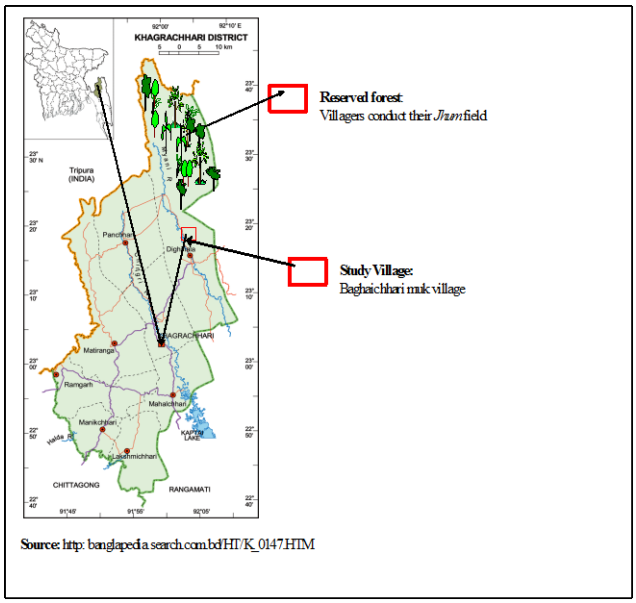

Fig. 1. Khagrachari district map & location of the study area

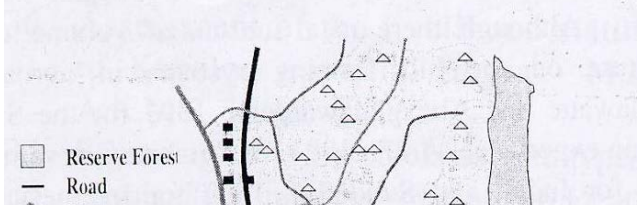

Fig. 2. Map of Baghaichari muk village

Three distinct cropping seasons existed in this area. The summer season starts in March and ends in April and is characterized by high temperatures and humidity with occasional thunderstorms and cyclones. The rainy season starts in May and ends in October, and winter ranges from November to February [SRDI, 2002] Based on long-term records (1961-1990) obtained from the Rangamati Weather Station, monsoon rain begins in February and gradually increases until July, and then decreased. About 90% of the rainfall occurred during the rainy season from May to October. The highest (627mm) and lowest (4mm) amounts of rainfall occurred in the months of July and January, respectively. The hill soils are mainly yellowish brown to reddish brown-loam, which graded into broken shale or sand stone at a variable depth, usually between 0.25-1.0 m. The valley soils are mainly acid loam and clays subjected to seasonal flooding (FAO, 1988 b).

The distance between the village and the *Jhum* cultivating plots differed considerably depending on the location of the fields. Some plots are 30km away from the village, a 3 days journey by boat and foot (Fig. 3). One of the reasons of having such a remote land is that may be nobody claimed ownership of land use rights.

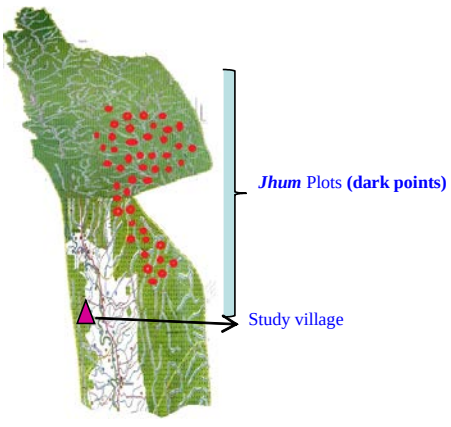

Fig. 3. Showing position of *Jhum* plots

Results and Discussion

Yield comparison of crops in different land: The Table 1 indicates the yield of different crops in *Jhum* land, paddy land and riverside land. It has been found that the rice production is much higher in the plain land area (4500 kg/ha) rather than *Jhum* land (1235 kg/ha) because of intensive care and management of plain land paddy. Also there is a great difference in vegetables yield between *Jhum* land and riverside land, where yield is high in riverside land area. Actually, this is due to a kind of subsistence management practice in the *Jhum* land for the vegetable production which cause this low yield rather than riverside land. From the interview with the farmers it has been found that though the yield is low in *Jhum* land they are bound to do *Jhum* practicing due to shortage of paddy land and riverside land.

Comparative cost of production between *Jhum* crops and plain land paddy

Material cost: The material cost of *Jhum* rice and plain land rice production has been shown in the Table 2. It has been found that in the *Jhum* land, crops are grown in a mixed culture and the number of crops are more than the plain land (where only single crop rice is growing), but the total material cost for *Jhum* land crops is rather low (3365 Tk.) than that of plain land paddy (5700 Tk.). It might be due to the requirements of input in plain land paddy cultivation is higher (60 kg rice seed/ha) compared to *Jhum* land (27 kg seed/ha) and also the unit price for *Jhum* rice seed is rather low (27 Tk/kg).

Non material cost: Table 3 indicates the comparison of non material cost between *Jhum* land crops and plain land paddy for one hectare of land. It has been found that in case of *Jhum* crops the total material cost for one ha land is 3386 Taka but for plain land paddy, it is 12260 Taka. This is might be *Jhum* crops are growing in a subsistence level giving less input and management for *Jhum* crops production. So, the total input cost for one hectare of *Jhum* land = (Material + Non-material cost) = (3365 + 3840) Tk. = 7205 Tk; Paddy land= (Material + Non-material cost) = (5700 + 12260) Tk = 17960 Tk

Comparative average income between *Jhum* crops and plain land paddy in one hectare of land: The average income from different *Jhum* crops and rice from plain land has been shown in the Table 4 which indicated that the gross income is rather low (43515 Tk/ha) from *Jhum* crops than that of plain land rice where the average income is about 90000 Tk from one hectare of land. So, from this table we can see that although the numbers of crops are more in *Jhum* land rather than plain land paddy, gross income is lower in *Jhum*. This is due to the low production of *Jhum* crops under subsistence management. So, we can calculate the gross profit as: For one hectare of *Jhum* land = 43515-7205 = 36310 Tk, For one hectare of paddy land = 90000-17960 = 72040 Tk., From the previous Tables results and calculation, it has been found that the plain land paddy cultivation is more profitable than the *Jhum* cultivation. From the personal interview of the farmers it has also found that they are interested to cultivate wet rice in plain land. However, *Jhum* cultivators can not cultivate wet rice, because they do not have any more plain land for extensive rice cultivation in plain land. That is why they

are doing *Jhum* land cultivation facing some other problems.

Table 1. Comparison of yield of crops (kg/ha) among *Jhum*, plain land and riverside land in CHT region

Jhum land		Plain land		Riverside land	
Crops	Av. yield (Kg/ha)	Crops	Av. yield (Kg/ha)	Crops	Av. yield (Kg/ha)
Jhum rice	1235	T-Aman, T-Aus & Boro rice	4500	T-Aus rice	2500
Turmeric	1108			Potato	2000
Ginger	104			Tomato	2000
Chili	100			Eggplant	1100
Sesame	200			Chili	400
*Other vegetables	250			Bitter gourd	200
				Sweet gourd	200

Source: Field survey, 2008, * Indicates different vegetables like cucumber, Indian spinach, eggplant, okra, snake gourd, arhar etc**.**

Table 2. Comparison of material cost between *Jhum* crops and plain land paddy in one hectare of land

Material cost for different crops in one hectare of *Jhum* land						Material cost for one hectare of plain land paddy				
Items	Operational (HHs)	Operational HHs (%)	Av. amount required (Kg/ha)	Unit price (Tk/kg)	Total cost (Tk/ha)	Operational (HHs)	Operational HHs (%)	Av. amount required (Kg/ha)	Unit price (Tk/kg)	Total cost (Tk/ha)
Rice seed	50	100	27	31	837	235	100	60	40	2400
*Fertilizer	22	44	19	12	228	235	100	100	30	3000
Pesticide	7	14	1 Bottle***	100	100	235	100	3 Bottle	100	300
Turmeric	40	80	350	6	2100	-	-	-	-	-
**Other vegetables	50	100	-	-	100	-	-	-	-	-
Total					3365					5700

Source: Field survey, 2008, * Fertilizers are Urea, TSP and MP which are used in a mixed pattern for *Jhum* land, ** Indicates different vegetables like cucumber, Indian spinach, eggplant, okra, snake gourd, arhar etc., *** 1 bottle pesticide (ripcord) is sold by 100 Tk in the study area. 1 Tk. = 1.32 Japanese yen.

Table 3. Comparison of non material cost between *Jhum* crops and plain land paddy in one hectare of land

Average non material cost for *Jhum* land (Tk/ha)				Average non material cost for plain land paddy (Tk/ha)				
Items	Av. no of hiring laborers	Labor cost (Tk/day)	Av. cost (Tk/ha)	Items	Cost for power tiller/ machine (Tk)	Av. no of hiring labor	Labor cost (Tk/day)	Av. cost (Tk/ha)
Land preparation (cutting)	10	120	1200	Land preparation by power tiller	2000			2000
Paddy sowing	3	120	360	Rice transplanting		20	120	2400
Paddy harvesting and processing	5	120	600	Fertilizer application		3x 2	120	720
Fertilizer apply	2	120	240	Weeding		12	120	1440
Weeding	2	120	240	Harvesting		10	120	2400
Turmeric planting	3	120	360	Processing	1500	15	120	3300
Turmeric harvesting and processing	5	120	600					
*Other vegetables	2	120	240					
Total			3840					12260

Source: Field survey, 2008, * Indicates different vegetables like cucumber, Indian spinach, eggplant, okra, snake gourd, arhar etc.

Farmers' problems in the *Jhum* land area

In our field study we have found several problems of the *Jhum* people which has been summarized as follows-

1. Land shortage: Due to the increase of the population in the hilly area along with limited land for the each family and also there is no provision of buying the hilly land from the government, land scarcity is increasing every year.

2. Shortened fallow period and decline of soil fertility: In our previous results (2003-2004), we found that the fallow period was 2-3 years. But when we conducted the field survey again in 2008 the fallow period became shorter and some farmers kept the land fallow only for one year and also some farmers did not keep their land as

fallow at all. That is they are bound to do the *Jhum* cultivation almost every year without fallow.

Table 4. Comparison of average income between *Jhum* crops and plain land paddy in one hectare of land

Income from *Jhum* land				Income from plain land paddy			
Crops	Av. yield (Kg/ha)	Price (Tk/kg)	Gross income (Tk/ha)	Crops	Av. yield (Kg/ha)	Price (Tk/kg)	Gross income (Tk/ha)
Rice	1235	17	20995	Rice (grain)	4500	20	90000
Turmeric	1108	9	9972				
Ginger	104	37	3848				
Chili			2500				
Sesame			2700				
*Other vegetables							
Total			43515				90000

Source: Field survey, 2008, * Indicates different vegetables like cucumber, Indian spinach, eggplant, okra, snake gourd, arhar etc.

Table 5.1. Types of bamboo collected from the deep forest

Local name	Scientific name	Use	Price
Mitinga bash	*Bambusa tulda*	House post, construction and cottage industry	28-30 (Tk/piece)
Dolu bash	*Schizostachyum dullooa*	Cottage industry and container	26-27 (Tk/piece)
Parbo bash	*Melocanna baccifera*	Construction and house thatching	20-22 (Tk/piece)
Kalisuri bash	*Gigantochloa andamanica*	Garden fencing	

Source: Field survey, 2008

Table 5.2. List of the timber yielding trees collected from the deep forest

Local name	Scientific name	Use
Gamari	*Gmelina arborea*	House pillar and furniture (1 cft =200 taka are sold in the market)
Jarul	*Lagerstroemia flos-reginae*	House pillar and furniture (1 cft =250 taka are sold in the market)
Koroi	*Albizia* spp.	House pillar and furniture

Source: Field survey, 2008

Table 6. Different types of Non Timber Forest Products (NTFPs) collected from the deep forest

Local name	Scientific name	Use	Price (Tk/kg or piece or bundle)
Amaloki	*Enblica officinalis*	Fruits are edible.	20 (Tk/kg)
Bedagi	*Calamus tenuis*	Stems are edible.	20 (Tk/kg)
Begul biji (natural)	*Solanum torvum*	Green fruits are cooked. as vegetables	10 (Tk/kg)
Barta	*Artocarpus lacucha*	Fruits are edible.	
Mushroom (natural)		Fruits bodies are edible.	180-200 (Tk/kg)
Mitinga bash	*Bambusa tulda*	Young shoots are cooked as vegetables.	20-30 (Tk/kg)
Jarbo kochu	*Colocasia sp*	Petioles are cocked as vegetables.	5 (Tk/piece)
Parbo bash	*Melocanna baccifera*	Young shoots are cocked and taken vegetables. Sliced shoots are dried and preserved.	15-20 (Tk/kg)
Kaogolo	*Garcinia cowa*	Fruits are edible.	
Kochu	*Aglaonema sp.*	Petioles and leaves are taken as vegetables.	10-12 (Tk/bundle)
Lenon pata		Leaves are used as vegetables.	3-5 (Tk/ bundle)
Tara		Inner stem are taken as vegetables.	10-15 (Tk/ bundle)
Katal dingi	*Drypoteris filix-mix*	Inner stem are taken as vegetables.	8-10 (Tk/ bundle)
Dingi shak	*Curcuma longa*	Leaves are taken as vegetables.	5 (Tk/ bundle)
Jarbo kola	*Musa sp*	Inner parts of pseudostem and flowers are cocked as vegetables.	5 (Tk/ bundle)

Source: Field survey, 2008

3. Declining crop productivity: As the fallow period decreased dramatically and it has got a tremendous impact on land fertility and productivity as well. About 50-60 years back farmers used to get 100 *Ari* yield from 1ari seed (1 *Ari* =10kg) whereas, now they are getting the yield from the same amount of land is 40-50 *Ari* from 1 *Ari*. So, the productivity has been declined to half of the previous yield. (Source: Field survey, 2008)

4. Less capital: The *Jhum* farmers do not have the sufficient capital in order to extend their farm land.

Coping Strategies

Facing the above problems the *Jhum* farmers are trying to get some alternative to cope those problems and I have found the following strategies they are trying to do-

1. Using fertilizer in order to get more production.

For getting more yields they are using different mixed fertilizers in the course of their *Jhum* cultivation which has been shown in the Table 2.

2. Working as daily laborer

Both the male and female members of the family who does not have sufficient land for cultivation are working as daily labor to the farm of others or near local market.

3. Collecting bamboo, tree branches or timber from deep forest and sell in the market

The farmers go to the deep of the forest and collect different forest products to sell in the market in order to have some cash. The list of bamboo and timber trees has been summarized in the table 5.1 and 5.2

4. Collecting different Non Timber Forest Products (NTFPs) especially wild vegetables from forest and sell in the market

The different Non Timber Forest Products have been shown in the Table 6. These kinds of products play an important role for earning money to the *Jhum* farmers.

5. Broom sale in the local market.

Some peoples collect brooms from the forest and use it to clean their own house and also they sell these brooms to the local market for earning the money.

6. Catching fish from the stream and sale in the local market

There are some small streams running through the hills. The local people catch fish with traditional fishing gears from those streams to meet up their protein requirements and sometimes sale in the market to get some cash.

From the previous results it can be mentioned that the plain land paddy cultivation is a profitable farming system for the local people though *Jhum* farmers want to cultivate more plain land but they could not due to shortage of land and capital. For this reasons they are compelled to practice *Jhum* cultivation facing with some problems.

To cope those problems they are also following some alternative strategies especially different Non Timber Forest Products collection from the deep forest and sell them in the market. So, the forest products from *Jhum* field are one of the best ways to recover their income source.

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