ISSN 1819-1894

Asian Journal of Agricultural Research

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Asian Journal of Agricultural Research 5 (2): 109-114, 2011
ISSN 1819-1894 / DOI: 10.3923/ajar.2011.109.114

Impact of *Jhum* Cultivation on the Agro-ecology of Mountains and Socio-economy of Tribal peoples

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ABSTRACT

Jhum cultivation, popularly known as slash and burn is the most prevalent form of cultivation in the hills of tropical Asian countries including Bangladesh. Jhuming involves cutting patches forests of the mountains in January to March, left on the hill slopes for one month for drying and burning of the dried plants. Small holes are made throughout the sloppy fields and seeds of different crops are sown in the holes in April. Crops are harvested in succession as they ripe between July to December. This study examines the impacts of *jhum* cultivation on the management of soil and water resources, biodiversity, forest productivity and socio-economic conditions of the *jhum* cultivators (tribal peoples). A vast area of land comes under *jhum* cultivation every year in tropical Asia. The *jhum* cultivation lead to decline of productivity by 50%, the yields are almost equal to the input values and the farmers are experienced food shortage of 2 to 6 months every year. The *jhum* farmers adopt new occupations to support their livings. An amount of 100 to 250 metric tons of topsoil per hectare are depleted per year due to *jhum* cultivation. The rotation cycle of fallowing has been reduced from 7-8 to 3-4 years especially in Bangladesh. The forest birds, arboreal mammals and plants were disturbed significantly and a few species are found in the second-growth habitats created by *jhum* cultivation. The reasons for this mountain degradation were identified as government policies in classifying *jhum* fallow lands as wastelands or degraded forest which made end of community ownership. Creation of reserve forests, nationalization of *jhum* land by the government and planned resettlement of plain land peoples into hills are also the reason for mountain degradation and as a consequence of which the jhumias are moving to the marginal lands.

Key words: *Jhum* cultivation, tribal peoples, agro-ecology, fallow period

INTRODUCTION

The *jhum* cultivation or shifting cultivation, popularly known as cultivation of slash and burn, is the most prevalent form of cultivation in the hilly areas of tropical Asian countries. It involves cutting of patches forest in the month of February to March burning of the slashed, dried vegetation after one month and then sowing of crop seeds in April in small holes made throughout sloppy fields. Harvesting of the crops is done in succession as they ripe between July to December. Usually rice, maize, millets, sesame, cotton, ginger, cucumber, pumpkin and melon etc are grown. It is carried out on different plots by shifting the place of cultivation after 1-2 years after which the

land is abandoned and allowed to regenerate. The fallow quickly recovers into secondary forest from coppies, underground rhizome, root suckers and the soil seed bank (Mantel *et al*., 2006). The crop mix of perennial and season crops in *jhum* cultivation allows phased harvesting ensuring food security throughout the year and also provides needed diversity for nutrition and food preferences (Chhauchhuak, 2004b). The life and culture of the ethnic peoples of hill areas depend to a great extent on *jhum* cultivation. In a study at Temenggor Lake, Malaysia it was observed that the tribal peoples (Orang asli) of the area also practice jhum cultivation and their jhuming practices are affected by the establishment of dams on the lake (Karim and Mansor, 2010; Mansor, 2010). The International Centre for Integrated Mountain Development (ICIMOD) recognized *jhum* cultivation as good practices in term of farming, forestry, soil and water conservation and bio-diversity management (Kerkhoff and Sharma, 2006). However, the intensity of jhuming varies with changing condition of rainfall, topography, accessibility and density of population (Raman, 2000). It differs from settled cultivation (e.g., terrace cultivation) in many aspects such as ecological, economic and socio-cultural condition (Arunachalam *et al*., 2002) (Table 1).

In Bangladesh, *jhum* cultivation is practiced in the hill areas of Chittagong Hill Tracts (CHTs). The CHTs are located in the southern part of Bangladesh bordering with India and Myanmar and are the home to 11 different national communities. Chakma and Tongchonga tribal community belief that they have to put *jhum* soils (as sacred soil) on the feet of the goddess in every religious occasion.

Table 1: Characteristics of *jhum* and settled cultivation (e.g., terrace cultivation)

Factor	*Jhum* cultivation	Terrace cultivation
Ecological factors		
Biodiversity	High	Low
Regeneration	Natural	Artificial/Managed
Forest cover	High	Very less
Dispersal	From surrounding natural vegetation	Man made
Nutrient enrichment	Burning of slash returns nutrients	No such return of nutrients
Nutrient loss	High through top soil	Low
Pathogen/Disease attack	Less risk	More risk
Irrigation	Rainfed	Rainfed
Soil fertility management	Poorly managed	Moderately managed
Tillage	No tillage	Minimum tillage
Economic factors		
Labour use	Intensive	Systematic and more in number
Inorganic fertilizers	Not used	Used to some extent
Monetary input-output ratio	High (1.80)	Low (1.43)
Production/Yield	Low	High
Land required	Large (extensive cultivation)	Less (Semi-intensive cultivation
Gross return	High (1.9 times)	Low
Socio-cultural factors		
Cultivation procedure	Slashing and burning followed by cropping	Proper land preparation in terraces, then cropping
Cropping pattern	One rotation	More than one rotation
Harvesting pattern	Successive harvests	Single harvest
Cultural value	raditional value	Less cultural value
Local adaptability	More	Less
Sustainability	Diversity conserved	Diversity not conserved

Source: Modified from Arunachalam *et al*. (2002)

Lying between latitude 21°11-23°45 N and longitude 91°42-92°42 E, the region occupies an area of about 1.8 m ha which constitutes about 12% of the total land of the country. The total population is 1,05,500 and 53% of the population are tribal (ACFOD, 1997; BBS, 2000). In India it represents the area of the north-western Himalayas, north Kashmir, covering Ladakh and Gilgit districts with an area of 15.2 m ha, occupying 4.7% of the total geographical area (329 m ha) of the country.

This study examines the gradual changes occurred in government policies which affected *jhum* cultivation in hills and impacts of *jhum* cultivation on the management of soil and water resources, biodiversity, forest crop and productivity and socio economic conditions of *jhum* cultivators of tropical Asia with special reference to Bangladesh.

Gradual changes in jhuming areas of CHTs: In the *jhum* cultivation areas i.e., CHTs significant changes have had occurred in land-use over several centuries which can be categorized as Pre-British colonial period, British colonial period, Post-colonial period and Independence of Bangladesh period (Rasul and Thapa, 2007). These changes give an idea about the impacts on the mountains and the socio-economic conditions of the *jhum* cultivators (Table 2).

Table 2: Changes occurred in land-use and socio-ecological aspects during different historical periods

Period	Changes occurred in CHTs
Pre-British colonial period (Before 1760)	• Covered with dense forest with valuable trees • Shifting cultivation was practiced in certain patches by the tribal peoples to meet subsistence requirements only. Fallow period was 15-20 years • Settlements were small and scattered. • Major cash crop was cotton • Trading continued between CHTs and plains
British colonial period (1760-1947)	• Extortion of high taxes by the central government from the tribal peoples made them frustrated and conflict started with the government and *Jhum* peoples • CHTs became economically isolated and trade links were cut off • Due to continued negligence and isolation, tribal peoples were more attached to sifting cultivation • British government regarded shifting cultivation as 'primitive' and destructive land-use • A vast area of CHTs was declared as reserved forest and shifting cultivation was restricted there. As a result, plough cultivation gained acceptance to some extent • Government started to receive revenues from forest through invited traders. Indiscriminate exploitation of forests for timbers and the practice of shifting cultivation severely affected the forest resources
Post-colonial period (1947-1970)	• Intensification of land-use started due to construction of hydroelectric dam. About 22000 ha land were inundated and 100000 peoples were displaced. The displaced peoples moved to upper hills and started *Jhum* cultivation • Government declared more forestlands as reserve forest from where no forest products were allowed to collect and *Jhum* cultivation was prohibited • Due to increase in population pressure the government encouraged lowland peoples to migrate to CHTs. The increase in number of *jhum* cultivators and decreased area for *jhum* cultivation forced the farmers to reduce the fallow period of 3 to 4 years (Table 3) • For rehabilitating the degraded land the government provided five acres of land per household for horticulture-based farming • Government abolished the special status of CHTs in 1960 which facilitated lowland peoples to migrate to hill areas

Table 2: Countinued

Period	Changes occurred in CHTs
Independence of Bangladesh period (after 1971)	• Government continued resettlement of lowland peoples to CHTs. As a result the population density increased (e.g., 84 km^2 in 1991) • Government declared about 50,000 ha of forest as reserve forest and 4000 ha was leased out for rubber cultivation in 1992. All these situations forced the *jhum* farmers to reduce the fallow period • For meeting up the increased demands, the peoples started intensive cultivation using chemical fertilizers and pesticides but it accelerated the extent of soil erosion exceeding 100 tons/ha/year • Illegal logging by the influential businessmen in collaboration with the officials of Forest Department and expansion of agricultural lands to reserve forest continued.

Source: Modified from Rasul and Thapa (2007)

Table 3: Trend of reduction in *jhum* cycle (fallow period) in CHTs over centuries

Year	Fallow period	Reasons for reduction of fallow period
1860	20-25 years	Adequate fallow period due to less population pressure
1890	10-12 years	Because of declaring of reserve forest
1960	5-6 years	Because of construction of hydroelectric dam, many lowland peoples moved to high hills
2000	3-4 years	Because of resettlement of plain land peoples on the high hills

Source: Modified from Chhauchhuak (2004a)

Impacts of *jhum* cultivation: The degradation of land and forest resulting from shifting cultivation are the serious threats to the people of CHTs of Bangladesh. Among the other ill impacts, invasion of exotic weed species in the jhuming areas is of vital importance. Obviously, weed invasion is influenced by the ecology of the target area (Karim and Mamun, 1988; Karim *et al*., 1999). The effects of *jhum* cultivation on soil and water resources, forest productivity, biodiversity and socio-economic conditions of the *jhum* cultivators are enumerated below:

- Over last decade, the crop productivity has been declined to 50% even after using fertilizers and pesticides to some extent (Mantel *et al*., 2006). The yields were almost equal to input values. Rice yield reduced from 303 kg ha^{-1} in 1900 to 96kg ha^{-1} in 1960. Zaman *et al*. (2002) noted better growth and yield of ginger under zero tillage and mulch in hilly areas of Bangladesh
- An amount of 100 to 250 metric tons of topsoils per hectare are depleted per year due to *jhum* cultivation in CHTs. The nutrient status of the soil has been reduced to a great extent
- The farmers experienced food shortage of at least for 2 to 6 months in a year
- To sustain the livelihood of the *jhum* cultivators, the farmers adopted alternate occupations such as wage labor, animal husbandry, cultivation of annual mono crops and extraction and selling of forest products
- Hill cutting during *jhum* cultivation has favored occurrence of landslide and accumulation of eroded soil caused siltation and floods in adjoining lakes
- Protection and repair of drainage basins for conservation of ecological resources including water needed large amounts of financial input (Uddin *et al*., 2000)
- Due to frequent shifting from one land to other the ecology of the area has been affected badly. It has created forest canopy gaps which are evident from barren hills. Due to insufficient soil disturbance different weed species occupied the canopy gaps. The degree of land cultivation surely affected the emergence of different weed species (Karim and Ahmed, 1997)

- The forest area has reduced to 828745 ha in 1990 from 1215636 ha in 1980
- Due to repeated slashing and burning, forest species were replaced by secondary vegetation such as shrubs, exotic weeds and hardy grasses (Arya, 2000). Some of the native species have been disappeared. Obviously ecosystem of mountains is an important determinant of vegetation (Atamov *et al*., 2006)
- Transformation of tenurial regimes from common property in which everyone gets a share, to private property, resulted in landlessness and poverty
- Many tribals have migrated to other countries and from one region to another region within the hill areas
- The forest birds arboreal mammals and plants were disturbed greatly by *jhum* cultivation and only a fraction of the species is found in the second-growth habitats created by *jhum* practice

CONCLUSION

The *jhum* cultivation in the hilly region of Bangladesh is a serious threat to the farmers of *jhum* cultivation areas. Although *jhum* cultivation is a non-viable resource-utilization practice in Bangladesh, the tribals are clinging to this practice to sustain their livelihood due to their religious faith on it and non-availability of timely employment avenues. Propitious cultural and religious ceremonies are carried out evoking blessings of super-natural powers and to enhance bonding of the communities. It is obvious that nationalization of land and forest, creation of reserve forest, abolishing the customary rights of tribals on land and forest, frequent displacement of indigenous people, construction of hydro-electric dam and resettlement of low-land peoples into CHTs have had several impacts on use and management of land and forest resources of CHTs. Therefore, the government should consider this matter carefully. The following measures should be undertaken to mitigate the burning issues of *jhum* cultivation:

- Arable land could be provided to the tribal people by the government for carrying out agriculture and also to settle in the area
- Agro-forestry projects should be initiated to make the jhumias self-sufficient
- Encouragement should be given for cooperative efforts for carrying out forest-based activities, i.e., basket making, cane furniture making, honey collection etc
- Marketing facilities should be provided for making all these agro-forest business viable
- Steps to be taken for forming village forest communities for the protection and development of degraded forests
- Employment opportunities and income generation on a regular basis should be given by equitable distribution of wasteland among the tribals
- Access to information on successful land management approaches and technologies, both traditional and scientific, should be provided so that the land managers can select the viable options for specific location
- Active participation of local peoples in the developmental intervention should be ensured in order to find out alternative land uses for sustainable hill farming
- Implementation of total literacy campaign should be undertaken by the governmental policies and strategies

ACKNOWLEDGMENTS

The authors are grateful to Professor Dr. Abdur Rahman Sarkar, Department of Agronomy, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh for his critical reviewing the

article for necessary amendments. Financial supports from the Universiti Sains Malaysia, Penang, Malaysia through RU grant 304/PBiologi/650454/4109 for publishing the article is gratefully acknowledged.

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