



RESEARCH ARTICLE

Practices of Shifting Cultivation and its Implications in Mizoram, North-East India: A Review of Existing Research

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ABSTRACT

This paper reviews the practices of shifting cultivation and its implications in Mizoram, North-East India. Mizoram has been remaining isolated from the main stream of development for the centuries. Agriculture is the main occupation of the people. About 80% population is engaged in its practices. Shifting cultivation is dominant in the highlands. The lowlands and valleys are characterized by the permanent wet rice cultivation. The data about the area under shifting cultivation is not unanimous. It varies from 18% of the total geographical area to 28%, according to the various studies carried out by the scholars. Out of the total net sown area, shifting cultivation covers about 38.64%. Rice is the main crop. However, its production meets only 25% of the total rice consumption. Shifting cultivation has doe impacts on the society and the environment. It is the main socio-economic activity of the highlanders. Meanwhile, it has negative impact on the forest and landscape. During the recent past, the fallow period of shifting cultivation has been reduced to 2-3 years. Therefore, the production and per ha yields of crops has largely been decreased. Further, the shifting cultivation areas have also been reduced to 58.1% from 1997-98 to 2010-11. As a result, 1.4% forestland increases in Mizoram, between 1991 and 2011. This study relies mostly upon the collection of secondary data and review of existing research. Field observation of some shifting cultivation areas of Aizawl and Mamit districts was carried out that has enhanced the interpretation of data.

Key Words: *Shifting cultivation, forest, implication, livelihood, Mizoram*

INTRODUCTION

The term 'shifting cultivation' refers to 'slash and burn' agriculture and nomenclature as 'Jhum' or 'Jhuming' cultivation in North-East India (NEI). It is variably termed as rotational bush fallow agriculture, swidden cultivation, or slash and burn cultivation, and is an ancient form of agriculture still common in many parts of the humid tropics (Raman, 2001a). It is highly diverse land use system. It has been evolving since 10,000 BC in a wide range of distinct socio-economic and ecological conditions. Shifting cultivation spreads from mountains to lowland ecosystems and from tropical forests to grasslands (Spencer, 1966a). There is no universally accepted definition of shifting cultivation. The most complex and multifaceted form of agriculture, shifting cultivation is a practice, consists of cyclic nature, under which selection of fields, clearing them, drying and burning debris for the cultivation of cereals is carried out. Selecting forest patches and clearing vegetation from it, takes place generally in the months of December and January. The herbs, shrubs, twigs and branches are burnt in February and March. In the months of April and May, seeds are shown. Generally, seeds include cereals, vegetables and oil seeds. The farmers continue the practices of shifting cultivation on the current sites for a few years and then agricultural fields are abandoned. They shift their agricultural fields to the other forest area. After few years gap, they again come back to the previous fields. This goes continue.

Mizoram is economically backward region. Its economy is mainly dependent on the traditionally cultivating cereal crops. About 80% people are engaged in agricultural practices. Rice is the main food-grain. The total consumption of rice in Mizoram is 1,80,000 MT whereas, it produces only 44,950 MT rice (25%). Under the traditional agriculture,

shifting cultivation is dominant mainly in the highlands. Wet rice is grown in the lowlands and the valleys. During the past decades, 58.1% area under shifting cultivation in Mizoram has been decreased (from 68,114 ha in 1997-98 to 28,562 ha in 2010-11). Meanwhile, the area under wet rice cultivation has been increased by 28.4% (from 9,446 ha to 12,130 ha) in 2010-2011. The share of shifting cultivation in net sown area was calculated about 38.64 % during the recent past. The fallow cycle under shifting cultivation has been decreased from 20-25 year to 2-3 years. It is now more intensive and frequent. Therefore, it has put excessive burden on the land thus, soil fertility has been reduced. As a result, the production and per ha yields of cereal crops and vegetables have been decreased considerably.

In Mizoram, the economic life of the people has always been centered on shifting cultivation. It is their way of life. The crops grown are mixed. The principal crop is paddy. Others are maize, cucumber, beans, arum, ginger mustard, sesame and cotton. Some pulses like cowpea, rice beans and French beans are cultivated under shifting cultivation. The main thrust of this study was to illustrate the practices of shifting cultivation and its implications in Mizoram. It suggests certain strategies for sustainable shifting cultivation.

GEOGRAPHICAL AND SOCIO-ECONOMIC BACKGROUND OF THE STUDY AREA

Mizoram state is one amongst the eight sister states of NEI. The others are Sikkim, Meghalaya, Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura. The whole area has a tremendous diversity in the natural and cultural realms. Climatic conditions vary from the sub-tropical humid to temperate. Mizoram is an eastern extension of the Himalaya. It lies in the extreme east part, making international boundaries with Bangladesh in the west and Myanmar in the east. Manipur in the northeast and Assam and Tripura in the north and northwest delimit it. Lying in the south of the Brahmaputra River, it forms part of the Northeast hill states bio-geographical zone (Stattersfield *et al.*, 1998). A landlocked state, Mizoram is extended between 21° 58' - 24° 35' N and 92° 15' - 93° 29' E. It covers an area of 21087 km². According to the Census of India 2011, total population of Mizoram was 10, 91014. Literacy rate was noticed 91.85%. Sex ratio was registered 975 and density of population was 52. Average height of the state is 1000 m. Blue Mountain is the highest point (2065 m). There are eight districts and 26 administrative blocks in the state.

The term 'Mizoram' refers to the land of the highlanders. The mountainous part of it is nomenclature as 'the rolling hills'. Here, economy is based upon the production of biomass based agriculture. Further, most of the agricultural practices are carried out through shifting cultivation. It is characterized by the dominance of subsistence crops. Crops are mostly grown during the monsoon season on the gentle to steep slopes without terracing of fields. Vegetables and fruits are also grown and consumed domestically. Commercial uses of these crops are largely negligible. Some small proportion of agricultural lands is spread in the lowlands, where permanent agricultural is practiced. Mostly, wet rice is cultivated. Shifting cultivation has a tremendous impact on the socio-economy and on the environment. Being as a main source of livelihoods of the poor rural people, it has negative impacts on the environment. It is mainly due to clearing and burning of forests.

Mizoram enjoys with rich biodiversity. It is one amongst the mega biodiversity hotspots of the world. Natural vegetation comprises of tropical evergreen in the lower altitudes and semi-evergreen on the upper slopes (Champion & Seth, 1968). The marginal farmers generally clear vegetation for agriculture during January and February. The slash dries on the hill slopes and is burned during March-April. Prior to the onset of pre-monsoon rain, sowing operations are carried out. Generally, each family inter-crops 15-20 crop species in a plot of 1-4 ha in area (Raman, 2001b). The average annual rainfall is 2150 mm. It occurs mostly between June and September by the southwest monsoon. The winter (Oct-Jan) is a cool dry season with few rainy days. Summer (March-May) is largely hot and dry with occasional thundershowers and pre-monsoon rains in April-May. Temperature accedes to 32° C during April and May and after occurrence of monsoon rain, temperature recedes slowly. During winter, average temperature remains 9° C. The sky remains clear and the days are sunny during the four months of winter.

Land use pattern of Mizoram in 2008-2009 was elaborated. Out of the total geographical area (21087 km²), 75.6% area is forest cover. Total cropped area is 5.5%. Net sown area is registered only 4.9%. Irrigated area is 0.5%. Area under horticulture is 1.9%. Fallow land other than current fallow is 8.1% whereas current fallows (*Jhum* land) is 1.9 only. Land not available for cultivation is 6.6%. Land under miscellaneous tree-crops (not included in net sown area) is 2.5%. Cultivable waste land is 0.5%.

PRACTICES OF SHIFTING CULTIVATION AS A MAJOR SOURCE OF LIVELIHOODS

In NEI, shifting cultivation occupies about 85% area out of the total cultivated land (Singh and Singh, 1992). Singh and Ramakrishnan (1982) observed that shifting cultivators comprise of 82 per cent of the rural main workers and few urban main workers also involved in shifting cultivation. In Mizoram too, shifting cultivation is the main source of livelihood for the poor rural people. Maithani (2005a) observed that shifting cultivation is widely practice in Mizoram, the main occupation of the populace and a major source of economy. The data regarding the number of families involved in shifting cultivation are not accurate. According to a study carried out by Maithani (2005b), there were about 58,000 families (approx. 25% population) involved in shifting cultivation. The other study (GBPIHED 2006) says that there were 50,000 families involved in shifting cultivation. Similarly, about 1500 government employees were indirectly engaged in its practices as their secondary activity. After the 1980's, the area under shifting cultivation was decreased. It was mainly due to the major efforts of the state government to encourage settled cultivation. The efforts were also comprised of to increase food production through settled cultivation and through launching of a new land use policy (NLUP).

Area under shifting cultivation was illustration from 1997-1998 to 2006-2007 (Table 1). Percentile of area under shifting cultivation was calculated. The base year was 1997-1998. In 1997-98, area under shifting cultivation was 68,114 ha. It was reduced to 28,562 ha, which was -58.1%. During different years of the corresponding period, only in 1998-1999, small area under shifting cultivation was increased (0.4%).

Table 1: The area utilized for *Jhum* during last 10 years

Year	Area under <i>Jhum</i> in Ha	Changes in %
1997-1998	68,114	--
1998-1999	68,392	0.4
1999-2000	36,285	-53
2000-2001	35,798	-47.4
2001-2002	40,305	-40.8
2002-2003	41,356	-39.3
2003-2004	43,447	-36.2
2004-2005	40,969	-39.9
2005-2006	40,100	-41.1
2006-2007	41,465	-39.1
2010-2011	28,562	-58.1

Source: Statistical Hand Book of Mizoram, 2012

There has been an ambiguity in terms of reporting area under shifting cultivation. A report of the Inter-Ministerial National Task Force on Rehabilitation of Shifting Cultivation Areas (GBPIHED 2008) reveals that annual area under shifting cultivation in Mizoram was 63,000 ha. Kumar (2012) reported that during 2004-2005, area under shifting cultivation was 64536 ha whereas Pachuau (2009) in his study of Mizoram denotes that 40969 ha land (50% of the total cropped area) was under shifting cultivation, during the same period (2004-05).

IMPLICATIONS OF SHIFTING CULTIVATION

There are two schools of thought, advocating about the impact of shifting cultivation on socio-economy and on the environment. The scholars of the first school advocate that shifting cultivation is a wasteful method that degrades natural landscape through soil erosion and depletion of forests. According to the Government of India's report of 1995, 'shifting cultivation is a major cause of land degradation that has constantly declined the agricultural productivity and thus income of the farmers. Whereas, the other scholars believe that it is a major source of livelihood of the people and a way of life to them. Scientific studies have been consistent, suggesting that there is optimal utilization of natural resources in the shifting cultivation regime, which is helpful for the stability and sustainability of agriculture in the mountains (Ramakrishna, 1993; Sharma, 1992). It becomes an imperative that controlling shifting cultivation will not only improve the ecological quality but also will enhance crop productivity.

SOCIO-ECONOMIC IMPLICATIONS

Studies defer in terms of economic productivity of shifting cultivation as some observed it is productive and vice versa. The economic productivity of shifting cultivation may be assessed though assessing the number of people supported by it. It is relevant to say that shifting cultivation is productive as its practices have been quite productive in many areas supporting relatively large populations (Thrupp *et al.*, 1997). In Mizoram, according to the Agriculture Department Report (2009-2010), more than 20% population is engaged directly and indirectly in shifting cultivation. It is the major source of livelihoods for them. In the tropical regions of Kalimantan, Indonesia, shifting cultivation supports 23 people/sq km, which is more than twice the number supported by commercial cultivation. Similarly, shifting cultivation of the Mayans in Mesoamerica supports 100-200 people/sq km. Shifting cultivation helps to conserve the rich cultural diversity as *Jhum* is interwoven into the culture and tradition of more than 200 tribal races, inhabited in the north-east region (Tripathi, *et al.*, 2003 a). Shifting cultivation, in its traditional form, contributes to conservation of agrobiodiversity. It represents an effective form of land use. It utilizes space optimally. About 60 varieties of crops are cultivated in a given time and space.

Shifting cultivation has also adverse impact on economy. From the productivity point of view, some researchers have largely termed shifting cultivation as unproductive and uneconomical. It was mainly due to the high frequency and intensity of shifting cultivation. During the past decades, the fallow period of shifting cultivation was long. Therefore, it was not so unsustainable (Luoga, 2000a). However, due to increased population pressure, high demand of cereals and growth of urban markets for forest products, fallow period for shifting cultivation has been reduced from 20-25 years to 2-3 years (Luoga, 2000b; Mwampamba, 2009; Nduwamungu *et al.*, nd). A Study from the Agro-Economic Research Centre of the NEI has compared per ah yields of shifting cultivation, varied between 8 quintal/ha in Mizoram and 12 quintal/ha in Assam. Other study says per ha yield of paddy was 17.7 quintal. It was 19.59 quintal/ha for the other crops in 2004-05.

ECOLOGICAL IMPLICATIONS

The implication of shifting cultivation on the ecology has long been a serious concern for the agriculture scientists, scholars, economists and anthropologist. Deforestation caused by shifting cultivation is often viewed as one of the most important environmental problems of Southeast Asia (FAO, 1995). In Mizoram, the studies on ecological impact of shifting cultivation have also been carried out by Tawnenga (1990), Tawnenga & Tripathi (1996) and Tawnenga *et al.*, (1997). Clearing forests for shifting cultivation can contribute to climate change, biodiversity loss, reduced timber supply, flooding, siltation, soil degradation and change of forest vegetation from primary to secondary and eventually to grassland (Holden, 2001). Clearing of forests and burning them for shifting cultivation are the main reason of deforestation (Monela and Abdallah, 2007; Zahabu, 2008). The loss of vegetation cover increases the incidence of soil erosion. Mostly in the hilly areas, soils are the most susceptible

to erosion (Shoab *et al.*, 1998; Sfeir- Younis and Dragun, 1993). In Mizoram, the cycle of shifting cultivation has been reduced from 20-30 years to 3-4 years. It has accentuated soil erosion and loss of nutrients from top soil. About 16.84 metric ton of soil/ha has been lost/year. It is therefore, the fertility of soil has been reduced. This has resulted in low production and per ha yields of cereal crops from the shifting cultivation.

According to a study, about 40% of the land surface of the earth was converted into croplands and permanent pastures by early 1990s (WRI, 1996). More than 6% area under tropical forests was converted into shifting cultivation between 1980 and 1990. Singh and Marzoli (nd) observed that about 10% of forestland was converted into shifting cultivation in Asia during the same period. On the basis of data given in FAO and other sources, it is estimated that each year approximately $1.9-3.6 \times 10^6$ ha land of primary close forests, $3.4-40 \times 10^6$ ha land of secondary close forests, and $6.9-21.9 \times 10^6$ ha land of secondary open forests are being lost due to shifting cultivation (Detwiler and Hall, 1988). So far, about 2.7 million ha land has been affected and each year about 0.45 ha land falls under shifting cultivation. In Mizoram, 1.5 % of total area is being affected by shifting cultivation, annually (Maithani, 2005b) that costs about Rs. 1 billion forest resources loss (Lalkhana, 1985).

The adverse effects of shifting cultivation on the environment are well established scientific facts. Biologist, foresters and conservationists have noticed the effects of shifting cultivation on biodiversity in the tropical forests (Raman, 2000). FAO (1957) reveals that shifting cultivation was identified long time ago as a threat to tropical forests. Many scholars believe that shifting cultivation effects are very destructive (Rao & Hajra, 1986; Lal & Prajapathi, 1990; Tiwari, 1991; Dwivedi, 1993). These conclusions are based on the scientific data and experiments conducted world-wide (FAO, 1984; Tawnenga *et al.*, 1997). Air pollution due to lashing and burning, loss of fauna and flora and other ecological implications are very common in the areas where shifting cultivation is practiced.

In contrast to the above-cited adverse impacts of shifting cultivation, some studies have shown that shifting cultivation is quite sustainable to restore ecology. A report from the Ministry of Environment and Forest (1997) shows that 1700 sq km area was gained from shifting cultivation mainly comprises of scrubby vegetation. This growth also helped in checking soil erosion from the hilly slopes. Forest clearance alternating with long fallow period's mimics natural, small-scale high-intensity disturbances in forests and may be a sustainable form of land use (Andrade & Rubio-Torgler, 1990). It may enhance biodiversity in the landscape by creating new habitats (Gadgil & Guha, 1992; Kricher & David, 1992). Mizoram state noticed 1.4% increase in forestland from 1991 to 2011. In 1991, the total forest area of Mizoram was 18853 km². In 2011, it increases upto 19117 km². Meanwhile, many neighboring states such as Nagaland and Manipur received decrease in forest land (7% and 3.4% respectively).

INITIATIVES AND STRATEGIES FOR CONTROLLING SHIFTING CULTIVATION

The National Mission on Greening India has proposed different activities for rehabilitation of shifting cultivation areas (MoEF, 2010). The major rehabilitation activities are: (1) providing employment opportunities and income generation to the marginal farmers who are engaged in shifting cultivation. These opportunities can be provided through the proper utilization of land resources to control on shifting cultivation. Various schemes of the Government under the tribal plan will have to pump in sufficient resources for proper reclamation and development of the wasteland. Agro-forestry practices can assist them. It helps to increase food and fodder, and protects the existing forest where unemployed and poor people earn their livelihoods (Elevitch and Wilkinson, 2000). (2) Prompt efforts should be made to involve the community people in carrying out forest-based activities. It should be made commercially viable by providing proper marketing facilities. This activity will reduce pressure on shifting cultivation practices. It will also enhance the opportunity to community people to involve in non-timber based forest products. (3) Degraded forestland should be protected and developed through formation of the village forest committees. These committees can divert the farmers from shifting cultivation. Suitable incentives should be

provided to them at the time of harvesting. (4) The mountain eco-systems of NEI with shifting cultivation practices should be made ecologically sound. Shifting cultivation can partially be replaced to farm forestry through formulating an eco-development plan for ecological sustainability. (5) Land resource management will make shifting cultivation sustainable. Further, improve sustainable yields, changes in technology, innovative policy and better transportation facilities will all together contribute sustainability of shifting cultivation. (6) The forests in surrounding of a hill village are considered as 'support area'. Forest provides firewood, fodder, timber, water and animal bedding to the farmers. The marginal farmers are mainly dependent on forest resources. They do not want to move from their natural habitat. (7) Specific policies, keeping specificities of mountain niche in view, should be framed and implemented to avoid any discrepancies in practicing shifting cultivation. (8) Terracing fields, promoting cultivation of vegetables, fruits and high value crops, and proper use of timber and non-timber forest products may substantially contribute to sustainable practices of shifting cultivation.

DISCUSSION AND CONCLUSIONS

Review of existing research on shifting cultivation reveals that shifting cultivation is prevalent mostly in the tropical countries. It is largely practiced in the central countries of South America, Central African countries and South and Southeast Asian rainforest countries. About 300 to 500 million people were engaged in shifting cultivation during the 1980s (IFAD, IDRC, CIIFAD, ICRAF & IIRR, 2001a). It is observed that about one billion people (22 % of the total population of the developing world in tropical and subtropical countries) rely directly or indirectly on some form of shifting cultivation (IFAD, IDRC, CIIFAD, ICRAF & IIRR, 2001b). A study conducted by Brown & Lugo (1990) denotes that in South and Southeast Asian rainforest regions, large tracts of secondary forests have been created, cultivated and maintained under shifting cultivation. In India, the practice of shifting cultivation is significant in the states of south – Kerala, Andhra Pradesh and Karnataka; east – Orissa; and northeast –Sikkim, Meghalaya, Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura (Deb, 2013). About 5 million tribal families in India are practicing this system on 4.37 million ha of land (Sahu *et al.*, 2005). Many researchers have studied the practices of shifting cultivation from different angles. Similarly, the various organizations at the national and international level have attempted to document the shifting cultivation practices in northeast India (Ramakrishnan, 1992a; Sachidananda, 1989). The total estimated area under the shifting cultivation in the north-eastern states is 1.98 million ha, which is 87 % of the total shifting cultivation area in the country (Satpathy *et al.*, 2003). At least 100 different indigenous tribes and sub-tribes comprising more than 620,000 families in the region depend on shifting cultivation for their subsistence livelihood (Ramakrishnan, 1992b). There are changes in the cropping pattern under shifting cultivation in north-east India. In earlier days, cropping was done for a year, with the season beginning from the month of April to September (Mishra, 1981). However, nowadays, the farmers cultivate their crops in two seasons. In changing scenario, harvesting of crops is done in different periods for different crops as they are sown at different times.

Over time, shifting cultivation has gradually been replaced by more intensive forms of land use in Asia and elsewhere (Spencer, 1966b). In mountain regions of Nepal, shifting cultivation had been completely replaced by intensive sedentary agriculture by the end of the nineteenth century. Similarly, in the mountains of northern Thailand and peninsular Malaysia, and on the islands of Java and Bali in Indonesia, shifting cultivation has been largely replaced by sedentary commercial agriculture over the last few decades (Turkelboom *et al.*, 1996; Suraswadi *et al.*, 2000). It is reported that horticultural cash crops, such as rubber, oil palm, cocoa and coffee are extensively planted by smallholders as an outgrowth of shifting cultivation in many parts of the world (Raintree, 1987). In Sabah region of Malaysia, the farmers have introduced tree cash crops like Rubber and Coffee in their shifting cultivation plots (Miyakuni, 1999). In north-east India, mostly in Nagaland, land under

shifting cultivation has continuously been replaced by agro-forestry and tree based land uses (NEPED and IIRR, 1999).

Several organizations and researchers have made attempt to evolve viable alternative land use models to replace the shifting cultivation to minimize its adverse ecological impact (ICAR, 1985; NEPED & IIRR, 1999; Okigbo, 1984). They also recommended that policies must address issues of land tenure security, research and extension and their impacts on traditional shifting cultivation practices; market development and commercialization of niche products of shifting cultivation; strengthening and capacity building of customary institutions; credit policies in situations where common property regimes apply; and coordination among the different government agencies that have responsibilities for various aspects of shifting cultivation (Kerkhoff & Sharma, 2006). The National Forest Commission (MoEF, 2006) recognizes the distinctive nature of problems and the existence of a high proportion of forests and biodiversity in NEI.

This study shows high variability in data, relating to the area under shifting cultivation. The number of population engaged with shifting cultivation is also variable. Existing research also shows ambiguity on these data. It is therefore, the implications of shifting cultivation could not accurately be analyzed so far. One of the reasons may be the dynamic nature of shifting cultivation. However, its large-scale impacts on socio-economy and on the landscape cannot be denied.

Shifting cultivation is not only the major source of livelihoods; it is a way of the life. Socio-economic development of the people, those are engaged in the shifting cultivation and living in the highlands, are fully dependent on its practices to carry their livelihoods although, per ha yield from shifting cultivation crops is not sufficient.

The high growth of population, particularly in the areas where shifting cultivation is practiced, has put tremendous pressures on land. The extension of cropped land on the marginal mountain niche for increasing food production has also reduced the forest and grassland areas. Further, high soil and land degradation was due to high intensity and frequency of shifting cultivation.

The crop cycle of shifting cultivation has become more frequent and intensified. As a result, the fallow land cycle has been reduced to 2 – 3 years. Earlier it was 20 – 25 years duration. It is therefore permitting the land to return to natural condition (Patro and Panda, 1994). Due to reduced fallow land cycle, ecosystem resilience has reduced considerably. Frequent shifting cultivation from one land to other has affected the landscape ecology. The fragmentation of habitat, local disappearance of native species and invasion by exotic weeds and other plants are some of the other ecological consequences of shifting cultivation.

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