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Impact of Jhum Cultivation on Forest Ecosystem and Environment Management Policies in Meghalaya, India

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ABSTRACT

Shifting or jhum cultivation is one of the primary causes of deforestation in tropical areas. In Meghalaya, increasing human population density like in other states of India has resulted in the practice of unsustainable form of jhum that includes shortening of the fallow period of jhum cycle. This unsustainable form of jhum cultivation leads to soil degradation, soil erosion, loss of forest vegetation and threatens the survival of valuable flora and fauna. The study area is one of the richest reservoirs of plant diversity of North-East India as well as India. The decreasing fallow period from 15-20 to 2-3 years has a negative impact on the environment sustainability in Meghalaya which reduced the quality of soil. The overall reduction in the forest, mainly due to jhumming can severely affect the viable forest habitat of the endangered fauna. This study reveals the effects of short jhum cycle period on current forest ecosystem.

Key words : Jhum cultivation, Deforestation, Soil erosion, Fallow period

Introduction

Ihum cultivation is one of the traditional methods for cultivation in hilly areas. In this system land under natural vegetation, usually forest land is cleared by slash and burn, cropped with common arable crops for a few years and then left unattended after harvesting. Deforestation by contrast and slash and burn method normally causes increase of CO, and GHGsfrom soil and vegetation and leads to a change in runoff and local climate (Tinker, 1996). A recent study in Northern Thailand which aimed to assess the ecological foot print of a traditional shifting cultivation community found that shifting cultivation farms, including active and rehabilitating fields aged 1 to 10 years, have due to burning emitted 1745.33 tons of CO₂ (NIPT, 2009). Some studies suggest that using jhum method may also be associated with poor crop yields and rapid soil degradation (El Moursi, 1984) (Christanty, 1986). Forest felling and burning has significant local impacts on nutrient cycles and soil organisms, which can have long-term effects on quality and recovery of forest site (Ewel, 1981). North East of India occupying more than 84% (0.76 m ha) of land out of 0.94 m ha of India which includes both current jhum (53%) and abandoned jhum (47%) (NRSC, 2011) and about 0.44 million tribal families are dependent on this for their livelihood (Yadav, 2013). This practice resulted in burning phytomass (including forest floors) in this region which is more than 8.5 million tonnes annually (Choudhury, 2015). Therefore, the region is experiencing colossal loss of vegetation cover and top fertile soils through severe erosion from steep slopes. Nearly 30% area of the region is categorized as severely eroded with a potential erosion rate of 40-80 t/ha/year (Mandal, 2013). The practice of jhum cultivation is reported to account for 60 % forest losses worldwide each year (Lele, 2008). About 0.45 million families in North-East India annually

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TAMULI AND BORA

cultivate 10,000 km² of forest, whereas total area affected by jhumming is held to 44,000 km² (Lele, 2008). Now-a-days, with increasing anthropogenic pressures are negatively affecting the native forest viability in Meghalaya. Increasing rates of jhum cultivation have led to increased fragmentation of intact, native forests and the implications of such changes in forest landscape patterns. The main difference between jhum cultivation of current practices is that when compared to the past decades in Meghalaya, there is an increase in the scale and shortening of fallow period. With rapid increase of human population, the period of jhum cycle has decreased from 15-20 years to about 2-3 years. Short jhum cycle makes the land unsuitable for agriculture and leads to considerable loss of soil nutrients through runoff and leaching (Borthakur, 1976).

Methodology

The present study is carried out with both primary and secondary data. The relevant information for study were collected mainly from secondary sources available in publications and reports of various government departments, various libraries and academic institutions, Published and unpublished data pertaining to land and forest resources, and their various goods and services were collected from journals, theses and technical reports. However, some information was collected from conducting random sample survey at villages using focus group discussion.

Study area

The state of Meghalaya is situated in the North-East corner of India, which stands between 25 °05' N to 26°41' N and 89°47' E to 92 °30' E. The total geographical area of the state is 22,429 sq. km (2011 census). The state comprises mainly three regions, i.e. (1) Jaintia hills region- which consist of two districts, i.e. East Jaintia Hills, West Jaintia Hills, (2) Khasi hills region- which consist of four districts, i.e. East Khasi Hills, West Khasi Hills, South West Khasi Hills, Ri-Bhoi, (3) Garo Hills region- which consist of five districts i.e. North Garo Hills, East Garo Hills, South Garo Hills, West Garo Hills and South West Garo Hills.

Results and Discussion

Due to unplanned traditional practices in forestry sector, especially the widespread use of jhum cultivation creates tremendous pressure of exploitation under the state of Meghalaya. Jhumias clear and burn the old forest growth over a piece of land to get fertile land for raising agricultural crops for one or two years and then move on to clear a new forest land. This system is responsible for deforestation, soil degradation, smog etc. The system might have been sustainable at one level. But the rapidly increasing population pressure, migration, industrial development etc. have changed the environment in the region.

Impacts on soil

Jhum cultivation practices cause tremendous loss of



Fig. 1. Locational map of study area



Fig. 2. Cutting and burning process injhum cultivation

natural vegetation. After 1 or 2 years of cultivation, farmers leave the cultivation area as fallow land and before the natural plants grow to cover the surface, the soil is exposed to climatic element like sun rays, rainfall etc. Slowly soil aggregates are dispersed and pores are closed with particles which results higher rates of runoff. Meghalaya is the most wet place of the world and the average rainfall is about 2818 mm. Mainly slope and elevation are the important factors that affect soil erosion. The characteristics of slope and elevation of Meghalaya is medium to high degree. Deforestation reduces water caused erosion by intercepting rainfall, increasing water infiltration on associated "soil fertility" island, intercepting runoff at surface level and stabilizing soil with root (Bochet, 2004). Soil pH increases after burning due to a liming effect of the ash and then decreases gradually through time due to leaching. Ash caused dramatic increases in exchangeable calcium, magnesium, and potassium after burning. These are followed by a gradual decrease during the cropping period due to leaching and crop uptake. After burning the crop fields emitted carbon, sulphur, and nitrogen presents in the vegetation and it has little effect on soil organic matter. The available phosphorus level of a soil increases upon clearing and burning as a result of the phosphorus content of the ash. Clearing and burning also cause significant changes in the soil

micro flora. For controlling soil erosion, vegetation is one of the important factors. Due to removal of vegetation and topsoil exposure into the air soil erosion takes place. Sedimentation and run-off processes in the jhum fields can cause a net soil loss and it also affects soil fertility. Soil run-off mostly increases on sloping lands and occurs mainly in the first year after burning, particularly if slash-and-burn is followed by heavy rainfall (De Bano, 1998). Heavy rainfall in fellow areas may lead to sedimentation, runoff from higher elevation and steep slopes. Jhum cultivation plays animportant role in soil degradation, forest and biodiversity fragmentation in Meghalaya.

Forest loss

The state of Meghalaya is one of the richest botanical regions of India. Large amount of cutting and burning activities during jhum cultivation is the major biotic interferences in the study area. The burning activity has directly affected the rich plant diversity and caused forest land degradation, habitat destruction and solely depleted the biodiversity. With the help of land use and land cover it is very easy to understand status of land. As per the 1979 report of the North Eastern Council in the Indian state of Meghalaya, a total of 4116 km² land was practiced for jhumming of which 760 km² was used

TAMULI AND BORA

at one point of time every year by 68000 jhumias, i.e. families involved in jhumming (DSWC, 1995). In 2000, Shifting Cultivation Area of Meghalaya was 2,086.77 km² and in 2010 it is 448.99 km². The change between 2000 and 2010 is - 1,637.78 km, which is -78.48% (Statistical Year Book-2014). Vegetation and land characteristics of the study are heavily influenced by jhum activities which have greatly amplified in recent decades with increase in human population, resulting in several fragmentation of previously undamaged forest tracts. Reduction of native forest cover is a major impact of slash-and-burn. High labour cost and energy input involved in trace cultivation, and absence of other viable alternatives implies that the majority of population continues to depend on shifting cultivation for their livelihood (Yadav, 2012).

Impact on water resource

The major water resources of Meghalaya are the rain, springs and streams. The level and geographic distribution of these resources depend largely on the amount of rainfall, its distribution during the year and the agricultural region. Deforestation of huge area and soil erosion leads to a lower capacity of the soil to hold water. This fact could lead to disruption of water supply for human consumption and for agriculture, lowering of water quality and deterioration of terrestrial sedimentation. Sometimes flashfloods also occur in the lowland areas.

Impact on wildlife

Asian elephants are mostlyfound in the forests of the Meghalaya region. Elephants providevital ecological rolefor maintenance and conservation forest. Conserving elephants would also serve to conserve many other wildlife species; thus, elephants appropriately serve as an "umbrella species" (Fleishman, 2001). In India, Asian elephants are present in their highest densities and numbers in Garo Hills of Meghalaya (Santiapillai, 1990). Because of the increasing human population, human - elephant conflicts are also increasing. People are using land for agricultural purpose and on the other hand, elephants are losing their habitation area. If elephants and their habitat are to be conserved, elephant-human conflicts are to be reduced. But short-cycle of jhum cultivation will never help to conserve the forest area Meghalaya. Several reserve forests were known for supporting large numbers of the endangered western hoolock gibbon (Hoolock hoolock), which have gradually decreased in past two to three decades and havebecome locally extinct from these areas mainly due to human disturbances. Increasing intensity of shifting of cultivation practices leads to low rainfall due to destruction of habitat which finally reduces biological diversity and causes extinction of previously undiscovered indigenous species too (Jeeva, 2006).

National Policies for Environment Conservation

1. Forest (Conservation) Act, 1980

The Forest (Conservation) Act 1980 has three major objectives, viz., check deforestation, check/rationalize diversion of forestland for non-forest purpose, and compensatory afforestation in lieu of forestland diverted. It can be said that the Forest (Conservation) Act 1980, therefore provides certain amount of legal protection to forests. In the process, it helps in protecting the existing forest-based livelihood of the forest-dependents. However, the act is totally silent about creating alternate livelihood opportunities for the forest-dependents when forest areas are diverted for non-forestry purpose. Furthermore, under the compensatory afforestation component the act can provide provisions for species which would be useful for livelihood earning.

Wildlife (Protection) Act, 1972 and amendments, 1991

Wildlife (Protection) Act, 1972 was a step towards further strengthening of conservation of fauna and flora. The 1991 Amendments of the Act included the word 'plants' along with protection of wild animalsand birds. Under Section 17, the collection, cultivation, dealing, etc of 'specified plants' without license is banned. In fact, the act completely lacks any livelihood orientation. Rather the act has been a major hurdle for forest-based livelihood earning as it completely prohibits any form of product extraction from the protected areas (National Parks and Wild Life sanctuaries).

Joint Forest Management (JFM) 1990 and Forest Development Agency (FDA)

The Ministry of Environment & Forests, Government of India, in June 1990 issued a circular to all the Forest Departments of States and Union Territories for the revival, restoration and development of degraded forests along with the participation of the people, called the Joint Forest Management (JFM). A number of states followed the suggestions of the JFM circular, and issued enabling notifications or resolutions for the initiation of the JFM in the respective states, though the nature of the JFM modalities and arrangement varies from state to state. One of the major achievements of JFM has been focus on regeneration of Non-Timber Forest Produce (NTFP)s in most degraded forest areas of rural communities, besides extension of JFM to good forest areas with sharper focus on activities concentrated on NTFPs. JFM is now the sole strategy adopted under National Afforestation Programme being implemented through Forest Development Agencies (FDAs). The NAP by far may be considered as the most important programme of Government of India, where the livelihood issues of the forest fringe villagers are taken care of through a series of activities including the Entry Point Activities (EPAs) component.

National Biodiversity Strategy and Action Plan

The Draft National Biodiversity Strategy and Action Plan – India has clearly indicated the initiatives, strategies and actions required on wild biodiversity, domesticated biodiversity and land/waterscape or eco-regional approach to planning and natural resource governance, including the links between wild and domesticated biodiversity. The strategy and action plan has also emphasized the need of development of biodiversitybased sustainable livelihood systems. A few such programmes were also worked out as model projects. Under the NBSAP process, each State Government and Ecoregion also brought out their respective Draft Biodiversity Strategy and Action Plans, where such state/region specific programmes were worked out. The Biodiversity Strategy and Action Plan also covered eleven sub-themes on NRM and biodiversity, viz., (1) Understanding and information, (2) In-situ conservation, (3) Ex-situ conservation, (4) Sustainable use, (5) Equitable access, use and sharing of benefits, (6) Capacity of actors in each sector (education, awareness and training), (7) Inter-sectoral co-ordination and integration, (8) Policy and legal measures, (9) Financial measures, (10) Technology and (11) International fora.

North - East Forest Policy, 2002 (Draft)

In pursuance of the recommendations of Shukla Commission which was set up by the Planning Commission to examine the backlog in basic minimum services and gaps in infrastructure sectors for

Eco. Env. & Cons. 28 (February Suppl. Issue) : 2022

the development in NER, the North East Forest Policy Committee was constituted by the Government of India in the Ministry of Environment & Forests in 1998 to suggest a suitable Forest Policy for the NER within the framework of the National Forest Policy, 1988. Some of the draft modifications recommended, amongst others include encouragement of forest-based livelihood opportunities to benefit the region and the local communities.

Biodiversity Act, 2002 and Rules, 2004

The Biodiversity Act 2002 clearly focuses on management of natural resources / biological wealth with community participation through bottom-up approach. The main intent of the legislation is to protect the country's rich biodiversity and associated knowledge against their use by foreign individuals and organizations without sharing the benefits arising out of such use, and check biopiracy. The act provides scope for building up alliances and mechanisms for inter-agencies cooperation, interdistrict relations, trans-boundary issues and eco-development. The Act provides for setting up of a National Biodiversity Authority (NBA), State Biodiversity Boards (SBBs) and Biodiversity Management Committees (BMCs) in local bodies. NBA and SBBs are required to consult BMCs in decisions relating to use of biological resources and related knowledge within their jurisdiction and BMCs are to promote conservation, sustainable use and documentation of biodiversity. The mandates under this act have implications on the people's livelihood which is based on biodiversity. The BMCs being locally constituted can actually impact the local livelihood within the mandates of the Biodiversity Act.

Medicinal Plants Guidelines

Medicinal plants, a very important component of Non-Timber Forest Produce (NTFP), having vast potential for generating alternate livelihood opportunities in the state have been identified as one the thrust areas by the Government of India in the Ministry of Environment & Forests. The existing programmes include activities for conservation of medicinal plants found in the wild, particularly in the reserved forests and protected areas and also cultivation of medicinal plants in the degraded forests areas. The Department of Indian Systems of Medicine & Homeopathy under the Ministry of Health has set up the National Medicinal Plant Board (NMPB) in order to promote conservation

TAMULI AND BORA

and cultivation medicinal plants and value additions for economic improvement and also promotion of health. The Board encourages cultivation of medicinal plants in community lands and other nonforest areas for the benefit of the communities. The National Medicinal Plant Board has been established to ensure availability of medicinal plants in the country and to coordinate all matters relating to their development and sustainable use. It may be mentioned here that the Board has specially identified 32 species of medicinal plants for overall promotion and development in the country.

State Level Policy

Meghalaya Forest Regulation (Application and Amendment) Act, 1973

The provisions of Assam Forest Regulation, 1891 was extended to the state of Meghalaya with certain modifications and renamed as Meghalaya Forest Regulation (Application and Amendment) Act, 1973. Most of the forests in Meghalaya are owned by the private individuals and controlled by the three District Councils, viz., Garo/Khasi/Jaintia Hills District Councils. The act is silent on livelihood issues of the forest dwellers or forest-fringe dwellers.

Garo Hills Regulation, 1882

The Garo Hills Regulation enacted in 1882, applicable in Garo Hills District prohibits non-natives from collecting or removing wood or jungle products without license. There are two types of permits, viz., trade permit and Gurkati permit. While 'trade permits' are for removal of forest produce where royalties are charged at a prescribed rate, the Gurkati permits are essentially for bonafide use / consumption of the local people for removal of thatching grass, bamboos, canes, poles etc. in such quantity as can be carried by the holder on his person. Thus, this old Regulation did take care of livelihood concerns of the local tribal populations.

District Council Level Policy

Khasi Hills, Jaintia Hills and Garo Hills Autonomous District Council Acts

In the Khasi and Jaintia Hills Districts of Meghalaya, the United Khasi-Jaintia Hills Autonomous District (Management and Control of Forests) Act, 1958 regulates the management and control of forests in different classes of forests, viz., community forests, sacred forests, etc. The act also prohibits removal of any forest produce for the purpose of trade from protected forests, raid forests, green blocks, Unclassed forests, council reserved forests without permission of competent authority. The Rules framed under this act known as the United Khasi & Jaintia Hills Autonomous District (Management and Control of Forests) Rules, 1960 provides elaborate procedure for removal and transit of forest produce from all categories of forests under the control and management of the District Councils, which may be either under trade permit or home consumption permit. The local residents or communities are entitled to collect the non-timber forest products for domestic purposes, particularly from forest areas, which are under the ownership of the communities or clans. The Garo Hills Autonomous District Council Act, 1958 has also similar provisions applicable to Garo Hills. Although there have been some concerns for addressing the livelihood issues in these acts, both these important acts have ample scope to specifically mention and implement sustainable forest management and livelihood linkages (*Barik*).

Conclusion

Now-a-days, jhum cultivation and be seen as a leading elementfor severe environment degradation. The characteristics of jhumming are changing over time. Reducing fallow period (jhum cycle), or in some cases with no fallow, and changing vegetation management practices are the major effects of jhum cultivation. The statistical information on biodiversity value of the jhum cultivation lands and impacts of changing practices on biodiversity are inadequate to establish clear relationships. However, carefully designed and well managed jhumming can serve as a sustainable food production system and provide benefits in the form of fuel, building materials and other income source. The threats of forest degradation and soil erosion due to jhumming can affect the vitality of native vegetation due to loss of necessary nutrients and soil features needed for their natural survival. Reduction in the forest, mainly due to jhumming can severely affect the habitat of several of the endangered animals and birds. Government should apply proper strategy and management procedure immediately in Meghalaya for protecting its natural environment.

References

- Barik, S.K. and Darlong, V.T. "Natural Resource Management Policy Environment in Meghalaya Impacting Livelihood of Forest Poor, Centre for International Forestry Research (CIFOR) BOGOR, Indonesia.
- Bochet, E., Garc1 a-Fayos, P. 2004. Factors Controlling Vegetation Establishment and Water Erosion on Motorway Slopes in Valencia. *Spain Restoration Ecology.* 12 : 166-174.
- Borthakur, D.N. 1976. Improving productivity of jhum cultivation with special references to North Eastern Hill Regions, in, Indian Sci Cong Assoc (3rd Annul Session, Waltair).
- Choudhury, B. U., Fiyaz Abdul, R., Mohapatra, K. P. and Ngachan, S. V. 2015. Impact of land uses, agro physical variables and altitudinal gradient on soil organic carbon concentration of North-Eastern Himalayan Region of India. Land Degrad. Develop., DOI: 10.1002/ldr.2338.
- Christanty, L. 1986. Shifting cultivation and tropical soils: patterns, problems, and possible improvements. In: G.G. Marten, Traditional Agriculture in Southeast Asia: a human ecology perspective. Westview Press, Boulder, CO., 226-240.
- Data of the Indian Council of Forestry Research and Education published in Statistical Year Book-2014 by MoSPI.
- De Bano, L.F., Neary, D.G. and Ffolliott, P.F. 1998. *Fire's Effects on Ecosystems*. Library of Congress Cataloguing-in-Publication Data, John Wiley & Sons, Inc, USA.
- DSWC 1995. A report on the survey of shifting cultivation in Meghalaya. Shillong. -A report by the Directorate of Soil and Water Conservation, Government of Meghalaya.
- El Moursi, A.W.A. 1984. The role of higher agricultural education in the improvement of shifting cultivation farming systems in Africa. In: A.H. Bunting and E. Bunting, The Future of Shifting Cultivation in Africa and the Task of Universities, *Proc Int Workshop Shifting Cultivation: Teaching and Research at the University Level, FAO*, Ibadan, Nigeria. Rome 8-14. 7.

Eco. Env. & Cons. 28 (February Suppl. Issue) : 2022

- Ewel, J., Buresh, C., Brown, B., Price, N. and Raich, J. 1981. Slash and burn impacts on a Costa Rican wet forest site. *Ecology*. 62 : 816-829.
- Fleishman, E., Murphy, D.D. and Blair, R.B. 2001. Selecting effective umbrella species. *Conservation in Practice.* 2: 17-23.
- Jeeva, S.R.D.N., Laloo, R.C. and Mishra, B.P. 2006. Traditional agricultural practices in Meghalaya, North-East India. *IJTK*. 5: 7-18.
- Lele, N., Joshi, P.K. and Agrawal, S.P. 2008. Assessing Forest fragmentation in north-eastern region (NER) of India using landscape matrices. *Ecological Indicators*. 8 : 657-663.
- Lele, N. and Joshi, P.K. 2008. Analyzing deforestation rates, spatial forest cover changes and identifying critical areas of forest cover changes in North-East India during 1972–1999. *Environ Monit Assess*. 156: 159-170.
- Mandal, D. and Sharda, V. N. 2013. Appraisal of soil erosion risk in the Eastern Himalayan Region of India for soil conservation planning. *Land Degrad. Dev.* 24: 430–7, doi:10.1002/ldr.1139.
- NIPT, NDF, AIPP, IKAP, IMPECT 2009. Global Warming Scapegoat: A New Punishment Measure Imposed on Indigenous Peoples for Practicing their Sustainable Traditional Livelihood Activities.
- NRSC (National Remote Sensing Centre). 2011. Wasteland Atlas of India, Department of Land Resources.
- Santiapillai, C. and Jackson, P. 1990. The Asian Elephant: An Action Plan for its Conservation. IUCN, Gland, Switzerland, Kelvyn Press, Inc., Broadview, Illinois, USA.
- Tinker, P.B., Ingram, J.S.I. and Struwe, S. 1996. Effects of slash-and-burn agriculture and deforestation on climate change. Agriculture, Ecosystems and Environment. 58 : 13-22.
- Yadav, P.K. 2013. Slash-and-Burn Agriculture in North-East India. *Expert Opin. Environ. Biol.* 2:1. doi:10.4172/2325-9655.1000102.
- Yadav, P.K., Kapoor, M. and Sarma, K. 2012. Impact of Slash-And-Burn Agriculture on Forest Ecosystem in Garo Hills Landscape of Meghalaya, North-East India. *Journal of Biodiversity Management & Forestry*. 1:1.