

The Challenges of Adopting Innovative Agricultural Practices under Shifting Cultivation in Northeast India

AMITKUMAR SINGH AKOIJAM*

MIRINCHONME MAHONGNAO**

Abstract

Shifting cultivation is an organic type of agriculture which is characterized by a rotation of field rather than of crops, by a short period of cropping alternating with long fallow periods and by clearing it by means of slash and burn process. This paper highlights the main challenges of adopting innovative ideas that are embedded in local, culture-specific nature of knowledge, the institutional structure and informal innovations under shifting cultivation in northeast India. The innovation under shifting cultivation is different from the conventional method of agricultural practices. The methodology used in the study relies on both primary and secondary source of information. The study reviews the literature available in various policy documents, reports and previous studies related to shifting cultivation and interviews with certain indigenous people. In this study, we especially focus on Angami, Ao and Sema tribes of Nagaland and Tangkhul, Kuki, Mao, Monsang, Maring and Kabui tribes of Manipur. We found that local farmers developed their own, specific and holistic knowledge for modes of the practice. Besides the local farmer's knowledge

* Amitkumar Singh Akoijam, Ph.D Scholar at the Centre for Studies in Science Policy (CSSP), Jawaharlal Nehru University (JNU), New Delhi.
Email: amit9ses@gmail.com
(ORCID no. 0000-0001-7938-3953)

** Mirinchonme Mahongnao, Ph.D Scholar at the Centre for Studies in Science Policy (CSSP), Jawaharlal Nehru University (JNU), New Delhi.
Email: mirin_life@yahoo.in

and practices, the innovative ideas that are brought by scientists and other public-private collaborations are noteworthy and somehow modify the current practices of shifting cultivation in the region. Understanding the inevitability of the shifting cultivation owing to geographical location, we argue that more cash crops on a larger scale should be cultivated with an introduction of high yielding varieties of seeds.

Keywords: Shifting Cultivation; Northeast Region; Innovation; REDD mechanism; Cash Crops.

Introduction

It is estimated that about two million of the Indian population have cultivated an area of around 11 million hectares of land under shifting cultivation (Singh, J., et al. 2015). Such type of cultivation is a form of organic agriculture which is characterized by a rotation of field rather than of crops, by a short period of cropping alternating with long fallow periods and by clearing it by means of slash and burn process. In our country, it is mostly practiced in the hilly area of the northeast region, Orissa, Jharkhand, Madhya Pradesh, Andhra Pradesh and Chhattisgarh. Generally, people in the states of Arunachal Pradesh, Tripura, Mizoram, Nagaland and Manipur called it as “*Jhum cultivation*” (Nath et al., 2016). Such cultivation is locally known as ‘*Pam Lou*’ in Manipur. It is also known by different names in different regions like “*Slash and Burn Cultivation*” or “*Swidden or rotational cultivation*” (Dressler et al., 2015, Mertz et al., 2009, Mertz, 2009 and Padoch et al., 2007). It is practiced in many parts of the world, particularly in the wet tropical regions like South East Asia, Africa, and Latin America.

In the northeastern region, out of the total area of 25.5 million hectares, about 2.7 million hectares is under the shifting cultivation (Dalong 2004). The region covers about 7.7% of the total geographical area of India, and it also produces only 1.5 % of the country’s total food grain production of the country (Saha et al. 2012; Mishra et al. 2017). The region is also considered as one of the main biodiversity

hotspots of the world due to its geographical position, the favorable climatic factors and richness of biodiversity (Choudhury et al. 2016). In this region, agriculture provides them a livelihood support to around 70 % of the total population of the region.

The main objective of this study is to explore the key challenges of adopting innovative ideas that are embedded in local, culture-specific nature of knowledge, the institutional structure and informal innovations within shifting cultivation in northeast India. The methodology used in the study is based on both primary and secondary data. The study reviews the literature available in various policy documents and previous studies related to shifting cultivation and interviews with certain indigenous people. The term innovation here refers to the finding of new ideas or methods or technique or process for better products that are beneficial for society, environment and economy. From the Schumpeterian theory of innovation, it is understood that innovation is the key to economic change and regional development. Moreover, invention, innovation and successful diffusion of new technologies are main drivers of modern economies (Schumpeter, 1939). Nevertheless, in the context of the agricultural innovation system, it is not only the use of technology, high yield varieties of seed, fertilizers and chemicals but also the informal knowledge of the indigenous people which is significant. In case of shifting cultivation, we are precisely looking at the innovative ideas or methods that are different from the commercial agricultural practices. At the same time, the specific and holistic mode of knowledge transfer (farmer to farmer within or outside the community) is also considered. The nature of knowledge in the shifting cultivation is locally developed not brought from outside. North (1990) defines institution as 'humanly devised constraints that structured human interaction. They are made up of formal and informal institutions. Formal institutions mean rules, laws, and constitutions but in case of informal institutions, they include norms of behavior, conventions, and self-imposed codes of conduct. In our study, we are particularly focusing on Nagaland and Manipur in the northeastern region. We will discuss some challenges

to adopt such practice in different communities particularly *Angami*, *Ao* and *Semat* tribes in Nagaland and *Tangkhul*, *Kuki*, *Mao*, *Monsang*, *Maring* and *Kabui* tribes in Manipur.

Is it socially a great evil or just a myth?

Scholars have been debating on the issue of shifting cultivation, is it a sustainable or unsustainable agricultural practice? Since early nineteenth century, some policy makers have claimed that it is a wasteful practice or any great evil. By saying, it consists of destroying a large and valuable capital to produce miserable and temporal returns. That means it is considered to be a wasteful thing and that should be eliminated like any great evil (Malik, 2008). Deka and Sarmah (2010) state that the evil effects of shifting cultivation is devastating and far-reaching in degradation of environment and ecology of the region. Biswal and Kumar (2013) also describe that such practice does harm not only the environment but also incur negative impacts on the economy. Some of the evil effects are; it helps in drying up springs, results in soil erosion, responsible for causing floods, destroying valuable timber and damage of crops. Saikia and Bhaduri (2006) describes that the policy makers since the colonial period have looked at shifting cultivation as a prodigal child in the field of agriculture. Despite its deep-rooted history associated with local knowledge and customary values, the qualities embedded within are often underestimated in the policy framework of India since the days of the British Raj.

On the contrary, some researchers claim that such practice cannot be eliminated. It is not only the livelihood of the local people but also the cultural identity attached to the socio-economic life of the cultivators. Apart from the different views of the different policy makers from time to time about the good and bad of it, now the nature of knowledge, formal and informal innovations in this practice are interlinked and still go hand in hand. Some scholars have timely opened the humanist approach towards such agricultural practices.

The notion widely held that shifting cultivation is responsible in the main for large-scale soil erosion needs to be effectively dispelled. The correct approach to the problem lies in accepting it not as a necessary evil, but recognizing it as a way of life (Chaturvedi and Uppal, 1953).

It is a mistake to assume that shifting cultivation in itself is unscientific land use...In most of the interior areas where communication is not developed and sufficient land suitable for terracing is not available, shifting cultivation alone can be done for the present and as such, every effort should be made to improve the fertility of such land (Maithani, 2005).

Although some studies bring the ideas of shifting cultivation as a great evil which is considered to be eliminated, the researchers feel the necessity of such practices as it is embedded unfathomable in their culture and livelihood of the indigenous people. The geographical location of the northeast makes inevitable to engage in *jhum* which will be difficult to abandon in the near future. Instead, it is better to find a sustainable and lucrative method of shifting cultivation to enhance the socio-economic status of the indigenous people and for development of the region.

Policy Perspectives at Global Level

In the era of global climate change, resource use and management practices that rely on deforestation and use of fire which emits tons of carbon have come under increased pressure. This is particularly the case of shifting cultivation. This type of cultivation is so different from the conventional practices of lowlands cultivated by the majority of the population as it is one of the most misunderstood land use systems. Thus, in the name of forest conservation and development, colonial and post-governmental governments in Asia have devised policies and rules to eradicate shifting cultivation for more than centuries (Fox et al., 2009).

Countries like Malaysia and Indonesia have recently launched a large-scale conversion of forest land into oil palm cultivations;

rubber plantations have initiated in Southwest China over the last decades and are rapidly expanding in Cambodia and Laos. These programs have come under severe criticism due to their contribution to deforestation, loss of biodiversity, environmental degradation and dispossession of indigenous communities over their land (UNFCCC, 2009; Mukul and Herbohn, 2016).

The United Nations declaration on the rights of indigenous people clearly states that indigenous people have the rights to their land, territories and resources and participate in decision-making directly related to their land resources. Further, Free, Prior and Informed Consent (FPIC) is required before the formulation of policies, programs and projects that had a concern on them. However, the indigenous people are not able to allow effectively in the climate change mitigation schemes like Reduced Emissions from Deforestation and Forest Degradation (REDD) in developing countries and their rights to their land, resources and territories continue to be ignored (UNFCCC, 2009).

The REDD is a new mechanism which is designed to use market or financial incentives to reduce the emissions of greenhouse gases from deforestation and forest degradation. It is the outcome of the Kyoto Protocol agreement. It is not only to reduce greenhouse gases but also it can deliver “co-benefits” such as biodiversity conservation and poverty alleviation. In some developed countries REDD is adopted, but in case of India, it is not yet implemented. It may have the great potential, but the benefits of fallow systems should be recognized in the mechanism. The monitoring system must not only focus on carbon stocks but also look at how livelihood of local farmers developed if they are prevented from producing food locally and live under fragile tenure and governance regime. In many places, the mode of cultivation remains the livelihood of the local people, but it is also undergoing rapid changes and sometimes force transitions to other forms of land use. The main challenges and opportunities of the cultivators are to ensure that the poor farmers have access to products, to clarify land tenure of

fallow land and to provides a guarantee that the compensations will be paid and not be lost in systems of poor governance (Hett, C. et al, 2012; Fox, J. et al., 2009 and Mertz, 2009).

At the regional level, we need to analyze pros and cons of this new mechanism before it is implemented in our country. Further, will the shifting cultivators really benefit from the REDD mechanism and how is it likely to be implemented in the developing countries like India where ecologically fragile environments are undergoing rapid changes?

Policy at National and State Level

Even since the British period, Indian policy makers consider shifting cultivation as primitive, destructive and the cost of forest loss far outweighs its production benefits. Malik (2008) states that this type of cultivation needs to be changed since it is primitive and inferior to the conventional method of agricultural practices. In 1883, a famous British writer, Baden Powel said, “the system is so wasteful that somehow or the other it must be put a stop just like any other great evil” (Malik, 2008). However, Peel (1983) states that the way to stop such practices is to reserve large forest and prohibit such cultivation; otherwise there will be no forest to cut down and burn.

The propaganda of such claims led to strong advocacy towards the abolition of such cultivation which were later found in the *National Forest policy, 1894* which issued a statement “*The shifting cultivation costs more to the community than it is worth and can only be permitted under due regulation*”. Following the British legacy, the post-independence India tried to maintain the policies that are stereotyped and based on the principle of reductionist science. The policy makers and government often assume shifting cultivation as universally unsustainable and destructive to forest and wildlife. Therefore, the policy formulation towards it has always been to wean the cultivator away to conventional agriculture and

gradually reduce the area of *jhum* cultivation (Saikia and Bhaduri, 2006). The result of such policy is the *National Forest Policy of 1952* that discourages the practice of such cultivation. The *National Tribal Policy, 2006* formulated by Ministry of Tribal Affairs look at the perspective of the land tenure system and alternative to such cultivation (Rao and Ramu, 2014).

The policy at state level especially in Nagaland and Manipur manage to encourage the practice of such cultivation. The *Naga Hills Jhumland Regulation, 1946* gave absolute rights to the original inhabitants over their land and permitted the practice of shifting cultivation, clearing of forests and grazing of cattle. However, some limitations over the utilization of forest resources were drawn after the enactment of the *Nagaland Forest Act, 1968* and the *Nagaland Jhumland Act, 1970* by which the government has absolute rights to acquire any forest land on payment of compensation for protection and development. It provides a detailed chapter on penalties and procedures on the line of forest acts such as prison sentences and fines in case of contravening (Saikia and Bhaduri, 2012). The *Manipur Hill Area District Council Act, 1971* recognized the rights of indigenous people to manage the forest but not being the reserved forest. The people are allowed to practice *jhum* or other form of shifting cultivation with a specified regulation laid down by administrator and district council (*The Manipur Hill Area District Council Act, 1971*).

However, Das (2006) highlights that the policy towards the indigenous people give a cultural surprise as they are not able to fully emancipate themselves from their age-old farming practice. The new form of farming often does not keep up their promise either because of the inherent flaws in the system like corruption, bad science, bad planning or the communication gap between traditional knowledge and formal knowledge. The following table 1 indicates the notable regulations and programmes towards such practices in Nagaland and Manipur

Table 1: Remarkable Regulations or Programmes relating to Shifting Cultivation in Nagaland and Manipur

Sl. no	Regulations or Programmes	Focus Area	Regulatory Body
1	<i>Jhum</i> Intensification and Extension of Cropping	Fallow period management, adoption of improved farming practices, introduction of multipurpose tree species, awareness and training programmes,	Department of Agriculture
2	National Watershed Development Programme for Rain-fed Areas (NWDPA)	Introduction of mix plantation (tree, shrub and grass), to produce sufficient food grain in a sustainable manner, to restore ecological balance in the degraded and fragile rain-fed	Department of Horticulture and Soil Conservation
3	Watershed Development Project for Shifting Cultivation Areas (WDPSA)	Development and protection of <i>jhum</i> lands by soil and water conservation measures	Department of Horticulture and Soil Conservation
4	Contour Bunding	Development of contour bunding, bench terracing and plantations	Department of Horticulture and Soil Conservation
5	Integrated Watershed Development Programme (IWDP)	Awareness and training programmes on degradation of land, sustainable farming	Department of Horticulture and Soil Conservation

6	Integrated Land Development (ILD)	Improving land degradation through integrated land development under NABARD	Department of Horticulture and Soil Conservation
7	Integrated Watershed Management Development Programme (IWMP)	Introduction of mini watershed plans and its significance	Department of Land Resource Development
8	Joint Forest Management (JFM)	Participation of locals in creation, management and protection of forest with a focus on sustainable agro-forestry	Department Of Forest, Ecology, Environment and Wildlife
9	<i>The Naga Hills Jhumland Regulation, 1946</i>	Rights of indigenous people over their land and practice of shifting cultivation including clearing of forests and grazing of cattle	Government of Nagaland
10	<i>The Nagaland Forest Act, 1968</i>	Protection and development of forest area	Government of Nagaland
11	<i>The Nagaland Jhumland Act, 1970</i>	Rights of indigenous people over the forest land with particular protection and development	Government of Nagaland
12	<i>The Manipur Hill Area District Council Act, 1971.</i>	Rights of indigenous people to manage the forest but not being the reserved forest.	Government of Manipur
13	<i>National Tribal Policy, 2006</i>	Towards land tenure system and alternative to shifting cultivation	Ministry of Tribal Affairs, Government of India

Source: Authors' Compilation from different sources

After interaction with forest rangers, village council and government officials, it is found that the encroachment of any persons for cultivation, cutting of trees and cattle grazing is restricted in reserved and protected forests in Nagaland. In contrast, the shifting cultivation, felling of trees and cattle grazing is observed in Manipur even in reserved and protected forests. Manipur will observe a faster rate of forest and environment degradation as compared to Nagaland.

Some Initiatives by Government

There are some successful and failed initiatives which were taken up by the government to promote shifting cultivation in the region. Firstly, we discuss few of the failures. A three-tier system model of land use was introduced by some scientists of Indian Council of Agricultural Research to serve the modification of shifting cultivation in Nagaland. In this model, the upper part of the slope left forested the middle portion of plantation crop and the lower portion being terrace cultivation. The model has only limited application because it is very rigid as it intervenes and causes conflict among different communities in the region. Another failure model of shifting cultivation is "Bund Cultivation" which is widely practiced in the Garo hills, Meghalaya where the slope gradient is not too steep (Kumar and Ramakrishnan, 1990 and Das, 2006).

Regarding some success stories initiated by the government, Tripura and Assam were the first states to introduce shifting cultivation control programmes by encouraging the plantation of cash crops like rubber, coffee, black pepper, cashew nuts in the early 1960's. During the 5th Five year plan (1974-1979), Watershed Development Project for Shifting Cultivation Areas (WDPSCA) was introduced in the northeast region. Under the Department of Horticulture and Soil Conservation, the WDPSCA scheme was introduced. In 1995, the scheme was initiated in Manipur. The same scheme was also introduced in Nagaland through Department of Soil and Water Conservation. The primary goals of this scheme

are to protect and develop the hill slopes of *jhum* areas through the various soil and water conservation measures; to reduce land degradation process; to improve the socio-economic status of the cultivator families; to develop the land leading into settled cultivation (WDPSCA website). Other schemes or programmes are shown in the above table 1.

In 2008, some scientists from Indian Council for Agricultural Research (ICAR), Northeast Barapani have introduced some high yield production of ginger, turmeric and new rice varieties like SARS, Kimin, Bamtara and others in some parts of Meghalaya and Nagaland. The programmes were successful.

Innovation through Public-private Partnership

In Nagaland, there are some challenging initiatives undertaken to promote public-private partnership in engaging shifting cultivation. For instance, there is a project Nagaland Environment Protection and Economic Development (NEPED) funded by Canadian International Development Agency (CIDA) in collaboration with India-Canada Environment Facility. It was introduced in 1994 and worked at the village level to promote agroforestry by planting trees in 1995. The state has been actively engaging with the indigenous people to improve the method of shifting cultivation by providing innovative ideas and scientific knowledge.

The project was implemented in three phases. The cultivators were asked to plant another perennial crop in addition to the several annual crops in their plots. The method was to establish two test plots in each of the thousand villages. NEPED also introduced certain crops such as passion fruit, ginger, turmeric, orange, wild sunflower and tapioca plantation (Saikia and Bhaduri, 2012; Deka and Sarmah, 2010).

The main challenge of the above mentioned project activities was on the test plot where the farmers themselves would select, test and demonstrate agro-forestry with technical support from

the NEPED. For its implementation, a separate organization was formed drawing officers from different departments in Nagaland. In this project, steering committee members look after the task of training village councils, rural development boards and farmers. In addition, steering committee members are also responsible for monitoring the test plots and nurseries. They are the primary mediators between the local farmers and the technical expertise of agricultural researchers. In each village, the Government of Nagaland establishes village development boards and village councils with the specific purpose of rural development. The village development boards were established by taking into consideration the traditional village organization of a given cultural group. So the project of enhancing the traditional agriculture was implemented through this institutional mechanism. The NEPED capacitates these institutions for village level interventions, instead of merely using them as entry points into local communities (NEPED and IIPR, 1999). The overall main strategies of the project were:

- i) Addressing people's need and providing employment opportunities and income generation.
- ii) Identification of the trees by local people and demonstration of method towards sustainable resource management.
- iii) Extend the shifting cultivation cycle and promoting marketing initiatives.
- iv) Harness the biodiversity wealth and traditional knowledge system.
- v) Protection and development of the degraded forest.

Another project, National Agricultural Innovation Project (NAIP) of Indian Council of Agricultural Research (ICAR) through the Agriculture Department of Nagaland University also intended to accelerate the agricultural practices. The main objective is to alleviate poverty, income generation by collaborative departments and application of agricultural innovation by the public research

organizations in partnership with the local farmers, civil society and private organizations (Saikia and Bhadhuri, 2012). Through this project, local farmers were given training and exposure to grow crops like ginger and turmeric.

Innovations from local farmers

Local farmers have developed their own, specific, holistic and harmonious knowledge and practices. The type of land use is temporary which is mixed cropping system at the same time. Members of the family and relatives are the main labourer involved in this mode of cultivation. Generally, in Nagaland and Manipur women play a vital role in the selection of seed, planting, watching and weeding. Other activities like cutting of the trees, clearing, burning of the cut trees are done by men. Table 2 gives the idea of farmer's preferred crops with their season and the reasons for the preference.

Table 2. Preferred Crops by Local Farmers in the Study Area, Nagaland and Manipur

Preferred crops	Reason for preference (Cropping season)	Preferred crops	Reason for preference (Cropping season)
Rice	Staple food (June-November)	Pineapples*	Cash crop (October-January)
Maize, Millet	Staple food and making local alcohol (May-November)	Turmeric	Consumption and cash crop (June-November)
Mustard	Home consumption and cash crops (October-March)	Orange*	Cash crops (Throughout the season)
Potatoes	Vegetable and cash crop (August-October)	Sweet Potatoes	Home consumption and cash crop (May-August)

Ginger	Consumption and cash crop (Throughout the season)	Beans	Home consumption (November-February)
--------	--	-------	---

Source: Authors' compilation based on field survey, 2017. Here * meanstypes of plantations which have been recently favored by local farmers particularly in Tamenglong and Ukhrul area in Manipur.

After interviewing 18 local farmers (10 cases in Manipur and 8 in Nagaland), it is found that most of the farmers prefer crops like rich, maize, millet, potatoes, beans and sweet potatoes. Such cropsare mainly cultivated for their self-consumption (household consumption and prefer alcohol preparation for drinking and merrymaking during the festival). Few farmers prefer mustard, pineapple, ginger and orange plantation in their cropping pattern. Such cultivation is more into market orientation. They earn money from such crops that support family, education for their children. Most of them do not avail any financial support or loans from the government.

There isnumber of innovations that are based on farmer's knowledge and practices such as generating variety in seed crops, fencing, harvesting techniques, and theintroduction of socially value tree. They are discussed as follows.

The generation of new variety is a part of innovation system in any agricultural practice. Introduction of new seed varieties in different cropsis through various ways in this practice. The womenfolk collect the mature seeds for further storage during the time of harvesting. Such type of seed collection has been practiced among *Angami, Ao, Sema, Tangkhul, Kuki, Mao, Monsang and Kabui* tribes in Nagaland and Manipur. In case of storage of maize, the farmers stored maize before they are mature. The immature cobs are boiled and hung in the kitchen to dry. Boiling is required to avoid the cobs drying out. This is a local innovation recently

developed to avoid possible loss of maize to rodents and insects. The varieties of rice seed are exchanged between or among the communities. Government institutions and other programmes also play a vital role in bringing new crops into the field.

Farmers' harvesting techniques are one of the important innovative ideas in the context of shifting cultivation. The local farmers (*Tangkhul, Kuki, Mao, Monsang and Kabui* tribes in Manipur) use scarecrows in the crop fields to avoid crop damage by animals. Mostly the scarecrow is made of maize or millet straw and a head made from an earthen pot or similar rounded structure. It is generally placed on a bamboo pole in the middle of the field. The process is an age-old practice and a relatively effective strategy to frighten the birds, monkeys and other animals in the field (Saikia and Bhaduri, 2006). The local farmers use a beating stick to separate grain such as millet seed from the plant. The technology is simple and uses only sticks and some rope. When the stick hits the floor, the small sticks thresh the grain three five times faster than a single stick used in other areas. Traditionally the cultivators used the tools like *cheirong*, henhoe, *dao*, rack, *thangol* (sickle), baskets. *Cheirong* is used for separation of grain from cut plants, henhoe is used digging the soil before plantation, *dao and thangol* is used for cutting crops, rack is used to mix the flying ash after the field is burnt and also used in separation of full grain and empty grain and baskets are usually used to carry seeds, vegetables and firewoods. Recently, new tool like spades, modified in henhoe are started to use in *Angami and Ao* community. The changes and modifications of the tools are brought by interactions with neighbouring areas along with efforts by the local blacksmiths (ibid).

The introduction of the socially valued tree is also an interesting innovation adopted by some communities in the region. *Angami, Ao and Sema* tribes believe that there are some socially valued trees in the community. Nepalese Alder (*Alnus Nepalensis*) is one of them. Such species grows at high altitudes. It is a pioneer species of

degraded lands and does not require fertile soil (Rathoreet al, 2010 and Ramakrishnan, 2007). The tree improves soil fertility by fixing atmospheric nitrogen into the soil. The tree sheds its leaves to retain moisture and mulches and gives humus to the soil. The wood is also used for various domestic needs such as fuel, charcoal burning, construction and specially used for making luxury furniture. The community always has the idea of its ecologically important species for soil fertility management. They have perfected the technology of accommodating the tree in their field so much so that it becomes a socially valued tree (Rathoreet al, 2010; Ramakrishnan, 2008 and 2007).

The local innovation has brought transition to conventional practice which essentially upholds the key components of shifting cultivation that is slash and burn with changes in the geometry of land use. The change in preparation of field from along the slope to across the slope leading to substantial soil retention achieved without heavy inputs of modern technology. It is considering an intermediate from shifting to settled farming but retain of the age old practice. It is a local innovation which the cultivators have adopted feeling the constraints of limited agricultural lands due to their increasing population pressure and the state control the forest resource (NEPED and IIRR, 1999).

Conclusion and Recommendations

Since time immemorial, shifting cultivation is inextricably linked with the socio-economic and cultural life of indigenous people in the northeast region, and it is closely connected with their rituals and festivals. The geographical location and lifestyle of the people make inevitable for such agricultural practices. The people indulging in such practices is gradually decreasing because people have tended to seek the other way of life which are less labour intensive, more productive and lucrative (such as private business, animal husbandry, services and government sector). However, it is still prevalent in many hill areas of the northeast region.

Introduction of new alternatives in the plantation of cash crop like ginger, turmeric, pineapples under shifting cultivation has been a successful innovation and initiatives in the northeast region. With an aid from the government, the local farmers are given planting materials and financial help to wean people from the shifting cultivation. Such agricultural practice continues to be viewed in a deprecatory manner. However, innovations involved in the cultivation brought by the local farmers, the scientists and other public-private collaborations are still underway and continue to modify the way of practicing from time to time.

The success of the NEPED, WDPSCA and ICAR project is a good example of how trial ability has been applied properly while diffusing knowledge in the region. Moreover, the indigenous knowledge on the shifting cultivation, the number of people dependent on it, the rate which is being replaced by other land-use systems or other alternatives given, and the environmental consequences of these changes are imperative to consider before the introduction of any new mechanism. The following recommendations would be essential for sustainable practices and development of shifting cultivation in the northeast regions of the country.

- i) Choosing an area for shifting cultivation should be made in such a manner that reducing of forest degradation and environmental pollution must be given utmost priority (choosing a low lying and less forested area, reducing the burning of forest leaves, branches and trees, promoting the use of organic fertilizers and so on)
- ii) Introduction of horticulture and more cash crops (wheat, tea, sugarcane, spices, mustard seeds, groundnuts, orange, almond, wild sunflower, passion fruit and so on) on a large-scale plantation should be promoted.
- iii) More awareness campaigns and initiatives from the government on the introduction of scientific, sustainable

technology to improve production and sharing of knowledge in the current practices.

- iv) Public-private partnerships should be enhancing so that the production of crops uplift from subsistence farming to market oriented farming.
- v) Finally, the indigenous people rights towards land, territories and resources must be recognised and encouragement to participate in decision making at the time of policy formulation.

References

- Biswal, D.K., and Kumar, S. 2013. 'Shifting cultivation and policies of sustainable development: A meaningless obsession', 9(1) 132-138.
- Chaturvedi, M. D. and Uppal, B. N. 1953. 'A study in shifting cultivation in Assam', Indian Council of Agricultural Research, New Delhi.
- Choudhury, B. U., Fiyaz, A.R., Mohapatra, K.P. and Ngachan, S. 2016. 'Impact of land uses, agrophysical variables and altitudinal gradient on soil organic carbon concentration of North Eastern Himalayan Region of India'. *Land Degradation and Development*.27, 1163-1174.
- Dalong, V. T. 2004. 'To jhum or not to jhum policy perspectives on shifting cultivation'. Missing Link - Society for Environment and Communication, Guwahati, Assam.
- Das, D. 2006. 'Demystifying the myth of shifting cultivation; Agronomy in the northeast'. *Economic and Political Weekly*, 41 (47). 4912-4917.
- Deka, P.K., and Sarmah, D. 2013. 'Shifting cultivation and its effects in regarding of perspective in Northern India', *International Journal of Commerce and Business Management*. 3(2) 157-165.
- Dressler, W., Wilson, D., Clendenning, J., Cramb, R., Mahanty, S., Lasco, R., Keenan, R., To, P., Gevana, D., 2015. 'Examining how long Hallow Swidden Systems Impact upon Livelihood and Ecosystem Services Outcomes compared with Alternative Land-uses in the Uplands of Southeast Asia'. *Journal of Development Effectiveness*, 7. 210-229.
- Fox, J., Fujita, Y., Ngidang, D., Peluso, N., Potter, L., Sakuntaladewi, N., Sturgeon, J., and Thomas, D. 2009. 'Policies, political economy, and swidden in Southeast Asia'. *Human Ecology*, 37. 305-322

- Government of India. *The National Tribal Policy, 2006 (Draft)*. [See, <http://tribal.nic.in/finalContent.pdf>. Accessed on 15.07.2017]
- Government of Manipur. *The Manipur Hill Area District Council Act, 1971*. [See, <http://lawmin.nic.in/ld/P-ACT/1971/A1971-76.pdf>. accessed on 10.06.2017].
- Government of Nagaland. *The Nagaland Forest Act, 1968*. [See, <https://www.nagaland.gov.in/Nagaland/UsefulLinks/The%20Nagaland%20Forests%20Act,%201968.pdf>. accessed on 10.06.2017]
- Government of Nagaland. *The Nagaland Jhumland Act, 1970*. [See, <https://www.nagaland.gov.in/Nagaland/UsefulLinks/The%20Nagaland%20Jhuml and%20Act,%201970.pdf>. accessed on 20.06.2017]
- Hett, C., Castella, J.C., Heinimann, A., Messerli, P., Pfund, J., 2012. 'A landscape mosaics approach for characterizing swidden systems from a REDD+ perspective'. *Appl. Geogr.* 32, 608-618.
- Kumar, A and Ramakrishnan, P.S. 1990. 'Energy flow through an Apatani village ecosystem of Arunachal Pradesh in northeast India'. *Human Ecology*. 18 (3). 315-336.
- Maithani, B. P. 2005. 'Shifting cultivation in northeast India: Policy issues and options', Mittal Publications, New Delhi.
- Malik, B. 2008. 'The problems of shifting cultivation in the Garo Hills northeast India' (1860-1970) in Prasad, A. (ed.). *Environment, development and society in contemporary India*. Macmillan India. Ltd. New Delhi.
- Mertz, O. 2009. 'Trend in shifting cultivation and the REDD mechanism', *Current opinion in Environmental Sustainability*. 1.156-60.
- Mertz, O., Padoch, C., Fox, J., Cramb, R. A., Leisz, S. J., Nguyen, T. L. and Tran, D. V. 2009. 'Swidden Change in Southeast Asia: Understanding Causes and Consequences'. *Human Ecology*. 37(3). 259-264.
- Mishra, G., Marzaioli, R., Giri, K., Borah, R., Dutta, A., and Jayaraj, R.S.C. (2017). 'Soil quality assessment under shifting cultivation and forests in North Eastern Himalaya of India'. *Archives of Agronomy and Soil Science*. 63 (10). 1355-1368.
- Mukul, S.A. and Herbohn, J. 2016. 'The impacts of shifting cultivation on secondary forest dynamics in tropics: A synthesis of key finding and spatio-temporal distribution of research'. *Environmental Science and Policy*, 55. 167-177.
- Nath, A.J., Brahma, B., Lal, R., and Das, A.K. 2016. 'Soil and Jhum Cultivation'. *Encyclopedia of Soil Science*. 1-9. [DOI: 10.1081/E-ESS3-1200537481]

- NEPED and IIRR. 1999. 'Building upon traditional agriculture in Nagaland, India'. Nagaland Environment Protection and Economic Development Project (NEPED) and International Institute of Rural Reconstruction (IIRR), Cavite, Philippines.
- North, D. C. 1990. '*Institutions, Institutional Change and Economic Performance*'. Cambridge University Press.
- Padoch, C., Coffey, K., Mertz, O., Leisz, S., Fox, J. and Wadley, R.L. 2007. 'The demise of swidden in Southeast Asia? Local realities and regional ambiguities'. *Danish Journal of Geography*. 107 (1). 29-41.
- Peel, S. E. 1983. 'The necessity of jhuming' *IF*. vol.9. p.224.
- Ramakrishnan, P.S. 2008. 'Reveloping Mountain Landscapes as cultural cradles of biodiversity'. International Human Dimensions Programmes (IHDP) on Global Environmental Changes Report. United Nations University. ISSN: 1727-155X.
- Ramakrishna, P. S. 1988. 'An inventory of forest resource of the North Eastern Region in forest development in North-East India'. Regency publication house.
- Ramakrishnan, P.S. 2007. 'Traditional forest knowledge and sustainable forestry: A northeast India perspective'. *Forest Ecology and Management*. 249 (1-2), 91-99.
- Rao, M.S. and Ramu, P. 2014. 'An overview of the Tribal Development Policy of India'. *International Journal of Academic Research*. 1 (1). ISSN: 2348-7666.
- Rathore, S.S., Karunakaran, K. and Prakash, B. 2010. 'Alder based farming system a traditional farming practices in Nagaland for amelioration of jhum land'. *Indian Journal of Traditional Knowledge*. 9(4). 677-680.
- Saha, R., Chaudhary, R.S., and J. Somasundaram, J. 2012. 'Soil health management under hill agro ecosystem of north east India'. *Applied and Environmental Soil Science*. 2012. 1-9. [DOI:10.1155/2012/696174].
- Saikia, A. and Bhaduri, S. 2012. 'An institutional analysis of transition to market: The case of shifting cultivators in Mon, Nagaland'. *International Journal of Rural Management*. 8 (1-2). 19-34.
- Saikia, A. and Bhaduri, S. 2006. 'Institutional design and occupational opportunity: The case of shifting cultivation in Nagaland'. Working Paper. Jawaharlal Nehru University, New Delhi.
- Schumpeter, J. A. 1939. 'Business Cycles: A Theoretical, Historical, Statistical Analysis of the Capitalist Process'. New York: McGraw-Hill.

Singh, J., Borah, I. P., Barua, A., and Barua, K. N., 2015. 'Shifting cultivation in north-east India-An overview'. [See; [http://www.icfre.gov.in/UserFiles/File/rfri/rpap 23.htm](http://www.icfre.gov.in/UserFiles/File/rfri/rpap%2023.htm)].

UNFCCC, 2009. 'Shifting Cultivation and Climate Change'. Intercessional Meeting, Brief Paper, Bangkok.

Watershed Development Project for Shifting Cultivation Areas (WDPSCA) website[See, <https://archive.india.gov.in/citizen/agriculture/viewscheme.php?schemeid=772>. accessed on 02.05.2017]
