

# Shifting cultivation and its effects in regarding of perspective in Northern India

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## ABSTRACT

Shifting cultivation, known as 'jhum' in north eastern region of India is widely distributed upland slash and burn agriculture system. Efforts to address jhum remained challenging tasks, more so due to its shortening cycle and ecological threats but continued livelihoods dependency for a large population of upland communities. Shifting cultivation practices are linked with the ecological, socio-economic and cultural life of the people and are closely connected to their rituals and festivals. But the current practice of shifting cultivation in the region is an extravagant and unscientific form of land use. The evil effects of shifting cultivation are devastating and far reaching in degrading the environment and ecology of this region. The earlier 15-20 years cycle of shifting cultivation on a particular land has reduced to 2-3 years now. This has resulted in large scale deforestation, soil and nutrient loss and invasion by weeds and other species. The indigenous biodiversity has been affected to a large extend. To mitigate the environmental loss and to provide other alternative livelihood of the local population, an attempt has been made in this paper to explore the opportunities and focuses on the existing scenario of present situation of the practice, its effects, constraints before controlling of the practice and suggestions and remedial measures that would require to restore the ecological balance and sustainable development of the region.

**Key words :** Shifting cultivation, Jhum, North-East India, Affects, Ecology, Control, Constraints,

North-Eastern region of India has got its definite identity due to its peculiar physical, economic and socio-cultural characteristics. It is a treasure house of diverse problems. The economy of North-Eastern India is also full of potentialities as different valuable natural resources are within the possession of this region. But due to diverse natural location and lack of proper attention, the region couldn't nourish with its resources. The region comprises of eight states namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura having foreign boundary with Bangladesh in the west, Myanmar in the east and Tibet region of China and Bhutan in the north. The region may be safely divided into two broad division—Plain region which comprise of 27 per cent (*i.e.* 68.96 lakh hectares) of the total geographical area of NER and Hill region which comprise of the states like Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Sikkim, Nagaland and Karbi Anglong and North Cachar hills of Assam. In the region the monsoons usually start in June and last until the end of October. Rainfall in the region is usually heavy due to its peculiar geographical position. The annual rainfall ranges from 70 inches in plains to 250 inches or more in the hills.

The soil of NER is normally acidic in nature. There is much acidity on the soil of the hills whereas new alluvial soils representing the lands on the river banks are less acidic. The phosphoric content of the upper Brahmaputra valley where tea is grown is good but it is low in the lower valley. There is high proportion of nitrogen and organic matters in the soil of hill areas in the region. In the hill states of the region, fruit trees respond quickly as its soil contain heavy clays with a high percentage of organic matter. The development of secondary and tertiary sector in the region is comparatively poor. According to Colin Clarke and Kuznets, the economic development of a region consists in the progressive enlargement of the proportion of tertiary occupation. But due to lack of proper development of secondary and tertiary sector, more than 60 per cent of the total population in the region depends on agriculture for its livelihood. However, in the address before the reconstituted North-Eastern Council (NEC), Dr Manmohan Singh said that income level of rural families in NER can be substantially enhanced practically on a mass scale by harnessing the vast readily available potential in the fields of agriculture, horticulture, medicinal and aromatic herbs and bamboo, water, wind power and minerals, to name just few sectors. Table 1 gives us a crystal clear picture about the features of North-Eastern region:

Agriculture has great importance in the region not only from socio-economic point of view but also from ecological balance in the region. A substantial part of State

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**Table 1: Salient features of north-eastern region**

State	Area	Population		Net State Domestic Product(At current prices/Rs. Crores)					
		1991	2001	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Arunachal Pradesh	83743	864558	1097968	1920	2193	2549	2598	3020	3266
Assam	78438	22414322	26655528	39394	42927	47513	52390	57378	62852
Manipur	22327	1837149	2166788	3142	3564	4058	4477	4726	5044
Meghalaya	22429	1774778	2318822	4310	4723	5138	5617	6162	6707
Mizoram	22081	689756	888573	1933	2083	2181	2398	2629	2887
Nagaland	16579	1209546	1990036	4382	4699	4980	5255	NA	NA
Sikkim	7096	406457	540851	1078	1209	1356	1539	1746	1990
Tripura	10486	2757205	3199203	6223	6990	7648	8712	9533	NA
NER	263179	31953771	38857769	46521	51223	56082	NA	NA	NA
All India	3287263	84.6crore	102.86crs	2010938	2258122	2548660	2902074	3342347	3811441

Source: Economic Survey, 2008-09.

Domestic Product is contributed by this primary sector. But at present, a great ecological threat arises due to traditional shifting cultivation in the region which is unscientific and non-environment friendly. Recent survey report on the ecological condition of the region reveals that the climate in the region has undergone a sea change. Large scale deforestation and burning of bushes due to shifting cultivation in the hills of the region are mainly responsible for this climatic setback. Therefore, any study of cultivation development and its effects in the region must make it point to examine the contribution towards socio-economic development of the states of the region in question with a primary objective of suggesting line of development in future. It is with this back ground, a study on shifting cultivation of north eastern region of India and its effects is highly essential to identify and spell out the actual constraints, which stand in the way of growth of the sector and to make appropriate measures for the overall development in near future.

## METHODOLOGY

The study is based on empirical approach. In order to achieve the objectives, information has been collected mainly from secondary sources. The secondary data have been collected from the various periodicals, gazetteer published by the Agricultural Department, State Governments, NEC and the Central Government. The useful primary information was collected from farmers, experts, economists and common people of the state. Data so collected were analyzed and interpreted theoretically to draw the inferences.

### Existing scenario :

The demography of NER is different in comparison to the other parts of India. Population of NER is composed

of heterogeneous element of different races, castes, tribes, languages and cultures. This diversity led to the growth of diverse social institutions. There are different groups of tribal population settled both in the plain and hill areas of the region. Each tribal group maintains different languages and professes different faiths. Every tribe has its own peculiarity and peculiar social institutions. In recent times, it has been observed that the old type of static society is fast disintegrating in the region and this has an important influence in determining the life of these people and also the shape of the economy of the region. The region is pre-dominantly rural with over 83 per cent of the total population in the countryside. Almost all the hill tribes in the region adopt shifting cultivation for their survival.

Land cultivation in the region is classified into two distinct patterns—settled farming on the permanent and developed land in the plains and valley areas and shifting cultivation or ‘Jhumming’ on the hills slopes. In the hill areas, shifting cultivation requires a large amount of land but it supports only a small number of populations. But population growth in hills area of region necessitated expansion of the jhum land, and also, cultivation on the steep slopes and hilltops, due to the shortage of land. As a consequence, a serious problem of soil erosion, deforestation and loss of flora and fauna is evident in the hilly region. The distribution of land resources of the region are given Table 2.

It is observed that the NER of India has often been visualized as the remote landlocked backward region of dynamic economy. Agriculture is the main occupation of the people in the region which accommodates more than 60 per cent of total workforce. Its contribution to the region's Net Domestic Product is also much higher compared to national average. A large track of the

**Table 2: Comparative distribution of land resource of NER (in per cent)**

States	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura	NER	India
Forest/land	94.0	25.0	28.0	43.0	88.0	54.0	36.0	58.0	52.0	23.0
Net area sown/land	3.0	35.0	6.0	10.0	4.0	19.0	13.0	28.0	18.0	46.0
Area sown more than once/net area sown	60.0	49.0	49.0	20.0	NA	5.0	33.0	53.0	43.0	33.0
Net area sown/total cropped area	62.0	68.0	68.0	83.0	100.0	96.0	85.0	65.0	80.0	85.0
Area sown more than once/total cropped area	38.0	33.0	33.0	18.0	NA	4.0	25.0	35.0	30.0	25.0
Other grazing lands/land	0.1	2.1	NA	NA	1.1	NA	9.8	NA	1.1	3.6
Land under misc. trees and groves/land	0.8	3.0	1.1	8.0	1.5	8.9	0.8	2.6	2.8	1.1
Cultivable waste land/land	0.8	1.0	NA	19.8	6.0	4.1	0.1	0.1	3.2	4.5
Fallow land other than current fallows/land	0.9	0.8	NA	8.3	8.4	5.0	1.3	0.1	2.2	3.3
Current fallows/land	0.5	1.4	NA	2.9	1.8	5.8	0.6	0.1	1.4	4.8

Source: Statistical abstracts of India

agricultural land in NER is under mono cropping. All the hill tribes dependent on jhumming *i.e.* slash and burn agriculture for agricultural product. This so-called semi-primitive agriculture could be sustained for centuries due mainly to traditional wisdom and very low population density. Today about 3.86 lakh hectares involving a staggering 4.23 lakh families are involved in jhum cultivation (NEDFI Data Bank Quarterly, January 2003) in this method minor forests were slashed and burned for cultivation, was manageable till the early part of the 20<sup>th</sup> century, fast population growth among the indigenous people as well as influx from outside, have considerably shortened the fallow period in the past few decades resulting in the decline of crop yield and farm incomes, increased soil erosion, loss of secondary forests and reduced biodiversity.

Shifting cultivation is a primitive method of cultivation which might have originated to the Neolithic period covering the years within 13000 to 3000 B.C. This system of cultivation was practiced over a long period of time as a regular system by the hill inhabitants of Black Africa and America. In the remote part of Sweden, this system of cultivation was followed until 1920. In Assam, shifting cultivation is mostly practiced in two hill districts, *i.e.*, Karbi Anglong and North Cachar hill. The total area under shifting cultivation in Assam is estimated at 498300 hectares. Out of which the average area under shifting

cultivation in a year in Assam is estimated at 70000 hectares. In the tribal states like, Meghalaya, in the Garo Hills shifting cultivation or jhum kheti or 'aba-oa' has historically been the principal mode of agricultural production. The practice is carried out in semi-evergreen forest in the upper reaches and most deciduous forest at lower elevation.

In the process of shifting cultivation, the original fertility of land along with the burnt ashes makes it possible to raise a good yield of crops for a year or two. After that all the nutrients of the soil become exhausted and thus yields fall drastically. This will force the farmers to shift into a new area leaving the previous land as fallow land for gaining fertility. Previously, the fallow period or jhum cycle was of 30 years and present due to high pressure of population and heavy erosion of soil, this period reduced to 4 to 9 years. Among the NE states, Meghalaya and Nagaland are having the largest jhum cycle of 9 years followed by Tripura 8 years, Assam 7 years, Manipur 6 years and the states like Arunachal Pradesh and Mizoram are having the lowest jhum cycle of 3 to 4 years. As per an ICAR review, the total estimated area under shifting cultivation was 5.42 lakh hectares and about 26.44 lakh tribal populations were engaged in it. The report of Dhebar Commission revealed that nearly 5.41 lakh hectares of area are covered per year by the shifting cultivation and about 25.89 lakh tribal populations are depending on it.

Again as per the estimates of Vidyarthi, about 2.6 million tribal people are engaged in shifting cultivation covering nearly 135 million acres of land scattered in different parts of India. According to NEC report, about 2.7 million hectares of area *i.e.* about 14.19 per cent of the area of the entire NE region is at present available for shifting cultivation and out of which only 16.8 per cent (*i.e.* about 4.3 lakh hectares ) of the area is cultivated at one point of time leaving the rest area for natural regeneration of fertility. Further, about 4.25 lakh tribal families of the entire NER are engaged in shifting cultivation and total area cultivated per family in the region is only 1.07 hectares. In shifting cultivation tribal farmers follow a mixed land use-pattern for raising various crops together. Thus, they produce large variety of crops from same field and those include food grain, vegetables and cash crops. The most common crop of 'jhumias' are high land paddy or jhum paddy which they produce along with maize, fox-tail millet, finger millet, beans, tapioca, yam sweet potato, ginger, tobacco, sesamum, chillies and leafy vegetables (Table 3 and 4).

Table 3 : Highest comparative advantage for products of NER: Regional Specialization Index (RSI)	
State	Products
Arunachal Pradesh	Small millets, maize, ginger, pineapple
Assam	Tea, rapeseed and mustard, sugarcane
Manipur	Chillies, rice, ginger, pineapple
Meghalaya	Ginger, potatoes, sesamum, pineapple
Mizoram	Ginger, maize and sesamum
Nagaland	Small millet, maize
Sikkim	Ginger
Tripura	Natural rubber, coconut, bananas, pineapple

Source: Statistical abstract and NSSO.

Table 4 : Highest comparative advantage for horticulture products of NER States	
State	Products
Arunachal Pradesh	Chillies, citrus, apple, passion fruits, ginger,
Assam	Turmeric, potatoes, bananas, pineapple.
Manipur	Chillies, rice, ginger, pineapple.
Meghalaya	Ginger, potatoes, brinjal, mushroom, pineapple.
Mizoram	Ginger, brinjal, mushroom.
Nagaland	Passion fruit, pineapple.
Sikkim	Ginger, large cardamom, flowers, seasonal vegetables.
Tripura	Citrus, bananas, pineapple.

Source: Statistical abstract and NSSO.

By identifying crops in which different states have a comparative advantage, resources can be concentrated and efforts made to promote their cultivation at least in the short run. The involvement of tribal families in shifting cultivation can also reflect adequately about its status in the region. Tribal people of the region have been maintaining a special fascination towards shifting cultivation due to their nomadic nature and also due to their traditional habits and belief on such age old practice. Total number of tribal families involved in shifting cultivation of the entire region is also substantial. As per the Task Force Report on shifting cultivation (old) 1.16lakh tribal families in Nagaland, 70000 tribal families in Manipur, 58000 families in Assam, 54000 families in Arunachal Pradesh, 52290 families in Meghalaya, 50000 in Mizoram and 43000 in Tripura had been found practicing shifting cultivation widely in this region at point of time. Again as per the information available with the NEC as reflected, it is observed that total number of tribal families involved in shifting cultivation in the entire NER is 4.25lakh. The participation of tribal families in shifting cultivation is substantial in the states like Arunachal Pradesh (81000), Nagaland (80000), Meghalaya (68000), Assam (58000), Manipur (50000), Mizoram (45000) and Tripura (43000).

Lack of individual ownership rights may be an important reason for the popularity of jhum cultivation in the hills. The soil in hill areas is highly acidic and to neutralize it, hill tribes often take resource to burning wood and leaves to increase its alkalinity. This requires keeping the land fallow after a single harvest to allow wild grass to grow to prepare it for jhumming. Further, as land is common property, cultivators have no incentive to invest in it to improve its quality. Since the hills are sparsely populated and land is relatively abundant, shifting cultivation to a new location is easy.

The major advantage of the shifting cultivation to the hill people is that it provides a very easy method for the preparation of land for cultivation. Weeds and bushes can be cleared easily by slashing and burning process and within a shortest possible period crops can be produced and harvested. In this system there is no danger from either flood or drought. The mountain streams are providing regular water supply for cultivation at moderate rate. The NE states are producing various types of agricultural products and thereby generating marketable surplus of these products. The region has great potentiality to produce marketable surplus mainly in its rich horticulture and traditional fruits. The contribution of the agriculture to net domestic product is still more than 30 per cent whereas it was only 18.0 per cent in national average.

### Effects of shifting cultivation in NER :

The shifting cultivation has been creating serious impact on geographical and environmental conditions of the region. Frequent shifting from one land to the other, has affected the ecology of these regions. The area under natural forest has declined; 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 agriculture. In the predominantly jhum areas, the loss of top soil has been estimated at 22 per cent of the cover with secondary vegetation replacing the original dense cover. Apart from the loss of soil fertility and productivity as mentioned above jhumming is also responsible for large scale deforestation in the hills, siltation of reservoir, flooding the plains, drying up of the natural stream and waterfalls and irreparable damages to region's unmatched flora and fauna. As mentioned above, wanton destruction of forest caused by shifting cultivation resulted in the annual loss of soil to the tune of 181 million tones in the North-Eastern hill region.

Shifting cultivation causes deforestation on a large scale and is highly destructive and protective values of forests. As per one report by the Dehradun based Forest Survey of India (FSI) based on satellite data and extensive field surveys, shows, Assam to be the main victim of shifting cultivation in recent years. As per an estimate of loss in the forest cover assessment in NER prepared by FSI, it is found that the total loss of forest cover in the NE states was 983sq.km, out of which 702sq.km (71.4%) was due to shifting cultivation. Moreover, after adjusting the gain in forestry arising out of regeneration in abandoned shifting cultivation areas (315 sq.km.) and other gain (33sq.km), the net loss in forest cover in NER was 635 sq.km. The loss of forest cover during the same period in different NE states as a result of shifting cultivation were—165sq.km in Assam, 256sq.km in Mizoram, 110sq.km in Meghalaya, 70sq.km. in Arunachal Pradesh, 63sq.km in Nagaland, 23sq.km. in Manipur and 10sq.km. in Tripura.

However, shifting cultivation upsets the ecological balance of nature. It leads to environmental degradation and also disturbs the fragile eco-system. This occurs as a result of the destruction caused to the surrounding natural vegetation. In this way, thousands of valuable timber and medicinal plants are lost every year. This environmental imbalance has resulted uneven spread of monsoon rainfall leading to the problem of drought and excessive rainfall resulting flood in plain areas of the region. In recent survey report on the ecological condition of the region reveals that the climate in the NER has

undergone a sea change. Cherapunji known for receiving highest rainfall in the world has remained quite dry even in the month of June- July in the year 1992 leading to a serious water scarcity in that area. Climate in Kohima, Ukhrul and Senapati districts of Manipur has become unprecedentedly hot needing even air cooling arrangement in recent years. Same climate change has also been reported even in the NE states like Meghalaya, Mizoram, Arunachal Pradesh, Assam and Tripura.

### How to control shifting cultivation:

The major initiative was started only in 1975 when the Indian Council of Agricultural Research (ICAR) established an Agricultural Research Complex for NE hills region at Shillong with the subsequent set up of its centre in the states of NER as well as its major objectives to study the shifting cultivation system in details and suggest various alternatives to replace the age-old practice. Some of the schemes of jhum control programmes are—

- Soil conservation and land reclamation for permanent agriculture in hills.
- Setting jhumias on wet terraced land or valley (WTRC)
- Allotment of dry/wet terraced land along with some sloppy land for growing horticulture crops.
- Engaging cultivators as wage earners in the cash crop plantations and setting them on forest land on small pockets with some provision of basic amenities like schools, sale depots etc. and watershed management schemes with integrated programmes of agriculture, forestry and animal husbandry.
- Providing variety of post rehabilitation incentives as assistance for purchasing power tiller and so on.

Various attempts have been made by the Government to settle the tribal people involved in shifting cultivation. (I) Arable land is provided to the tribal for carrying out agriculture and also to settle in the area; a few schemes are being implemented under integrated tribal development programme in the districts of Koraput, Keonjhar and Phulbani in Orissa and some parts of Meghalaya. These schemes have however, not yielded the desired results perhaps because of the ignorance of the authorities about the socio-economic and agro-ecological conditions of shifting cultivation and also due to minimal involvement of Forest Department officials, who are more informed about the above factors, in implementation of the scheme. Failure of the scheme led the National Commission of Agriculture to reformulate the schemes only after considering the impact of the forest management. (ii) An Agro-forestry project known as Nagaland Environment

Protection for Economic Development (NEPED) funded by Canadian International Development Agency (CIDA) through India–Canada Environment Facility (ICEF) was initiated in 1995 to make Nagaland self-sufficient in agro-forestry. The objectives of the project were: (a) identification of trees by local tribes and demonstration of method leading to more sustainable resource management; (b) addressing people's need, and evolving better management systems; and (c) promoting marketing initiatives. Under this project, experienced Government officials convince the villagers to set aside 6 ha of land, known as test plot, in jhum areas for over two-and-half years. Owner of this plot is required to plant 1200 seedlings, along with usual crop, under supervision of village council and project team. These test plots become open school-cum-research station, as well as demonstration plots to teach new technology. Thus, NEPED project does not aim at eliminating jhum cultivation, but making it more stable and profitable. This project may give us a more scientific way to tackle tribal–forest conflict.

### **The strategies:**

- Providing employment opportunities and income generation on a regular basis through proper utilization of the land resources, *i.e.* by equitable distribution of wasteland among the tribal people. But, the various schemes of the Government, under the tribal plan, will have to pump in sufficient resources for proper reclamation and development of the wasteland through agro-forestry and silvi-pasture practices.

- By encouraging cooperative efforts for carrying out forest-based activities, *i.e.* basket making, rope making, cane furniture processing of minor forest produce, honey collection, etc. have to be made commercially viable by providing proper marketing facilities. This will not only discourage tribal people from practicing shifting cultivation but will also help them monetarily.

- By forming Village Forest Committees for the protection and development of the degraded forests. These committees by providing suitable incentives to the tribal people, after the time of harvest can divert some of the tribals away from the shifting cultivation. Generating employment opportunities during the lean season of forestry operations will also prevent from shifting to other areas. Employing the tribal people in the various rural employment schemes is also the need of the hour.

- By ensuring implementation of total literacy campaign for educating tribal women and children, services of various non-Governmental organizations and voluntary agencies, besides the regular Government

machinery, are on required sustainable basis rather than with a targeted approach.

The North-Eastern Council (NEC), Shillong, took up programmes in the north-eastern states for control of shifting cultivation. These were mainly aimed at soil and water conservation by building terraces for development of agriculture and the production of horticultural crops including tree crops. They covered an area of 11,360 hectares at a cost of U.S.\$6 million. The schemes were implemented through the Directorate of Agricultural and Forest Department in all the NE states. Under the NEC's programmes, 8 pilot projects of soil conservation and jhum control were undertaken in seven constituent units for the settlements of jhumias by providing financial assistance and 2 hectares of developed land to each family. Nearly 9698 hectares of land was developed under this scheme for setting 5187 families at on total expenditure of Rs. 436.16 lakh. To take up settled agricultural system in the jhum areas, 9 pilot projects on watershed management were taken up during the 7<sup>th</sup> plan. Broadly, these programmes envisaged facilities like additional irrigation facilities, development of land, supply of planting materials for agriculture, horticulture, plantation crops, etc., helping development of water bodies for fisheries, raising nurseries for fruits and plantation crops and supply of breeding stock for poultry and animal husbandry.

In recent development, on 18<sup>th</sup> February 2010 the Nagaland Government has noted random burning of jungles in various parts of the State recently and threatened to withhold all government grants if such cases are found in any village. The government has issued a notice on the jungle burning stating that this act has not only caused ecological and environmental imbalance by destroying rare flora and fauna, but also endangering the lives and properties of the common citizens. The notice has also threatened all government recognized villages to withhold the government grants for the Village Development Board (VDB) if any instance of jungle burning by any individual or by village community of any village is reported. The notice reminded the resolution adopted in the in the State VDB Conference held at Dimapur last year. The Rural Development Department has also directed all project directors to inform the village authorities and governing bodies in this respect and asked them to keep strict vigil on their respective jurisdictions for strict compliance to avoid consequences. During this Jhum cultivation, some of the villagers clear jungles in their respective hills for paddy cultivations with traditional Jhum method which is fatal for the villages.

### **Constraints before controlling of shifting cultivation:**

There is lack of co-ordination among the agencies which are directly involved in the implementation of the jhum control schemes and other allied agencies. These agencies should come forward with technical knowledge and other helps. The Soil Conservation Department is implementing the jhum control scheme in Meghalaya; but it was alleged that the Agricultural Department is not co-operating with the Soil Conservation Department with its available resources. As a result even an enthusiast farmer finds him at a loss as to what to do at certain stage. Finally, he has to give up the idea of going with the Jhum Control Scheme and he retreats to his jhum land.

Infra-structural facilities such as communication, irrigation and easy marketing facilities are of utmost necessity. Transport of perishable surplus agricultural products must be immediately made to marketing centre for the benefit of the farmers. Pineapple produced in large numbers in a particular district in Arunachal Pradesh couldn't be sold for want of market and transportation facilities and in the subsequent year the farmers left gardens for stray cattle. Similarly, banana produced in large numbers in certain pockets near Maibang in the N.C.Hills got rotten in the villages for want of market.

Expansion of terraced land in the hilly areas of the region enhances the importance of irrigation facilities. To increase the farm efficiency in crop production the application of irrigation facilities for timely supply of water is a must which makes even the small holdings economically viable. But most of the terraced lands constructed by the Government and allotted to the jhumias are dry terraced. Even where irrigation is introduced, it cannot water the entire fields in time as in the case of Darengiri (Garo Hill) terrace fields.

The role of middlemen in procuring agricultural products is another problem. The middlemen exploit the farmers and the farmers do not get their due share for their produce. The monopolist traders of Shillong have been exploiting the pineapple and potato growers of Meghalaya. The cotton producers of the N.C.Hills and Karbi Anglong district of Assam are also victims of middlemen.

Processing centres for certain agricultural products are badly needed in the region. Cashew nut plantation was encouraged in Garo Hills of Meghalaya, but no steps taken for development of processing centres. Similarly, establishment of processing unit for pineapple in the pineapple growing areas in Arunachal Pradesh or establishment of a banana processing centre at Maibang or a potato chip industry at Shillong, or an apple processing centre in Kameng district of Arunachal Pradesh where

apple is produced in abundance could have ensured ready market and remunerative income to the growers.

It is learnt that the soil of an area where various measures of jhum control scheme are introduced are not scientifically analyzed as to its suitability for the crops to be introduced there. The result is obvious crop failure in many cases. This has totally discouraged the jhumias. In spite of the evil effects of shifting cultivation, there is a surety of crop for the farmer. Because as mixed cropping is the general pattern of shifting cultivation, the farmer gets the production of certain crops even if some other crops in his farm are damaged.

### **Suggestions and remedial measures :**

Considering the evil and deleterious effects of shifting cultivation, it is quite important to adopt a broad based strategy for changing the status of such cultivation in the mind of the tribal people of NER as well as to motivate this tribal people from their nomadic agricultural practices into a settle and permanent agricultural practice. The following measures are to be helpful to control shifting cultivation in the region: –

- In controlling of shifting cultivation, a successful way is to settle the jhum on an irrigated terrace by channeling water from mountain streams. This type of cultivation is known as terrace cultivation which is very much popular in Khasi, Jaintia hills of Meghalaya. Thus, adequate steps must be taken to introduce irrigated terrace cultivation in the other parts of the region.

- Solution to the problem of shifting cultivation requires the settlement of tribal families on permanently settled agriculture. This will require development of land for regular cultivation which again requires a huge investment and many years. Considering the physiographic characters of land, climatic conditions, social conditions, food habits etc., alternative system of farming like diversified farming should be introduced. This would require a system which includes agriculture, horticulture along with animal husbandry, fishery, poultry farming etc.

- The State as well as Union Governments and promotional agencies should come forward with forefront initiative to take up intensive and extensive cultivation of plantation crops (tea, coffee, rubber, pineapple etc.) and for the development of non-forest wasteland in the region. Recently, in Assam the Government has decided that a large area of the non-forest wasteland would be brought under 'rubber block planting' scheme where more than 65% of the total investment would be contributed by Rubber Board of India and the rest would be financed by the state government. This type of scheme should be implemented for other plantation crops in the all states in

the region so that it increases the employment opportunity in the hill region.

- To reduce the population pressure on cultivable land in hill areas of NER, Government should make adequate legal provisions to keep in check the flood of infiltration from other parts of India and the neighboring countries. So that the benefit of controlling measures of shifting cultivation and employment opportunity will be enjoyed by the local people. Besides, the degraded jhum land should be developed into Special Agricultural Zones (SAZ).

- Under the present context, the concept of 'Sustainable Agricultural Development' can be an effective strategy for ensuring adequate supply of food, fibre, fuel and other amenities to the growing tribal population in the region. This strategy will pave the way for improving the living standard of the tribal people and also create a sense of security in their life as well. This concept of sustainable development of agriculture will also give due recognition to the geophysical and environmental factors of the region for developing a sound agricultural pattern for the people of this hilly region. Scientific studies suggest that mixed land use system is quite suitable for hilly areas from the point of view of production as well as conservation. In this context, the latest and most effective land and water management techniques, popularly known as 'Watershed Management programme' along with land development, soil conservation, agriculture, horticulture, plantation crop, forestry, animal husbandry and fishery can safely be considered as most vital and important strategy. The alternative which may come in the way include:

- Agricultural (settled) land use system through terracing and contour binding;
- Horticulture and cash crop plantation land use system for developing fruit orchard, rubber, coffee and

oil palm cultivation.

- Multi-storey cropping land use pattern for differential harvesting of solar energy utilization of soil fertility at variable depth.

- Agri-Horti-Silvipastoral land use system with the strategy to adopt agriculture at the foothills, horticulture at the mid-portion of the hill slope and silvipastoral land use at the top of the hill.

- Livestock based land use system for developing livestock farming along with fodder production system.

### Conclusion:

Shifting cultivation practices are linked with the ecological, socio-economic, and cultural life of the people and are closely connected to their rituals and festivals. Shifting cultivation in the region is not only the way to earn livelihood of rural tribes but also it contributes to the state domestic product substantially of the respective states. But due its evil effects on environment and ecological balance in the region, the time comes to think about the alternative of this traditional system. Thus, to control jhumming completely, it will require huge investment and many years. Under this situation, short term measures should be undertaken to improve productivity and also to check soil erosion. ICAR has already suggested in this line. Considering the physiographic characters of land, climate conditions, social customs, food habits etc. alternative system of farming like diversified farming should be introduced. This would require a system which includes agriculture, horticulture along with animal husbandry, fishery and poultry farming etc. success of this alternative farming depends upon the gaining of confidence of jhummiyas over this alternative system through persuasion, demonstration and applied fundamental research to be conducted very slowly without any haste.

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