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Jhum Cultivation and Environment in Arunachal Pradesh

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Abstract: Jhum cultivation (Shifting cultivation) has been practising from the very beginning of human civilization. Today, it is also practised traditionally generally in hilly region. It is a curse to the human existence because of creating so many problems such as environmental, soil erosion, soil fertility, loss of flora and fauna, loss of water resources, etc. This paper seeks to examine an in-depth study to solve the problems created by the shifting cultivation in the country in general and in Arunachal Pradesh in particular as to bring sustainable development by solving the problems created by Shifting Cultivation.

INTRODUCTION

Arunachal Pradesh is situated on the North-East extremity of India and has a long international border with Bhutan to the West (160 kms.), China to the North and North-East (1030 kms) and Myanmar to the East (440 kms). The State is bounded on the North, North-East and North-West by China (and Tibet), on the South by Assam and Nagaland, on the South-East by Myanmar and on the West by Bhutan. It lies between $26^0$28'N and $29^0$30'N latitudes and between $91^0$30'E and $97^0$30'E longitudes. Its total geographical area is 83,743 sq. km. It is predominantly a hilly terrain state. Its topography is rugged and typical. The whole topography is occupied and characterized by lofty hill ridges and deep valleys. The hill ridges are situated haphazardly. As soon as one ridge ends, the other takes over and runs either parallel or in opposite directions. The surface land is noticed mutilated and variegated almost everywhere on account of these haphazardly located hill ridges and the valleys. The elevation of the hills ranges from 150 to over 7,300 metres. As on 31st march 2003, the state has an estimated gross cropped area of 2.53 lakh hect. of which net area sown is about 2.01 lakh hect. accounting for about 2.39% of the total geographical area of 83,743 sq. km. There are distinctly two types of agricultural practices: (i) settled cultivation and (ii) jhum i.e., shifting cultivation.

As per the state forest report-1999 (published by the Forest Survey of India), forest cover of Arunachal Pradesh is 68951sq.km accounting for 82.21 per cent of its total geographical area. The recorded forest area of the state is 51540 sq. km. which is about 62 per cent of its total geographical area. Thus, the state is fortunate to have such high percentage of its area under valuable forests cover against the national percentage of 23.28. Again, out of its area, 70 per cent constitutes broad and narrow valleys, 10 per cent foothills and flat areas and 20 per cent constitutes snow clad peak areas. The agricultural operations are confined to only 5 per cent of the total geographical area, out of which 62 per cent to 65 per cent are under jhum cultivation.

Almost all the tribes excepting Apatanis and Khamptis in Arunachal Pradesh are practising shifting cultivation. The Apatanis and Khamptis are engaged in settled cultivation. The jhumias (the man who practices jhum cultivation is called the jhumia) produce all the crops, which they need. These types of cultivation are widespread among the hill dwellers of Assam, Meghalaya, Nagaland, Mizoram and Arunachal Pradesh. It is known in different areas by a variety of local names. In North-East India, it is called Jhum. In these wide-spread areas, there is a remarkable uniformity of the method of cultivation. It is the most primitive form of agriculture which is still in vogue in most parts of North East Hill Region of the country. According to 2001 census about 80% of the State's populations are living in rural areas and all are directly and indirectly involved in jhum cultivation. It is also claimed that slash and burn agriculture leads to deterioration of the vegetative cover on the hills: forest lands degenerate into infertile grassland and barren land space. Therefore, it is contended that this system of agriculture is unsustainable and economically impoverishing of the tribal people depended on it.

This paper is an attempt to examine an in-depth study about shifting cultivation. This paper is divided into three sections. The first section examines the procedure of jhum cultivation. The second section deals with the problems created by the shifting cultivation. The third section concentrates the solutions of the problems in context of sustainable development and finally conclusion follows.

Table-1: Shifting cultivation in the North East Region

State	Annual Area under Shifting cultivation (Sq.Kms)	Fallow Period (in years)	Minimum Area under Shifting cultivation one time or other (Sq.Kms)	No. of families practicing shifting cultivation
Arunachal Pradesh	700	3 -10	2,100	54,000
Assam	696	2 – 10	1,392	58,000
Manipur	900	4 – 7	3,600	70,000
Meghalaya	530	5 – 7	2,650	52,290
Mizoram	630	3 – 4	1,890	50,000
Nagaland	190	5 – 8	1,913	1,16,046
Tripura	223	5 – 9	1,115	43,000
Total	3869		14,660	4,43,336

Sources: *The Task Force Report on Shifting Cultivation, Ministry of Agriculture, 1983.*

SECTION-I

The shifting cultivation is also called as slush and burn method of cultivation. It is labour-intensive process of farming with extensive use of land. It is also claimed that slash and burn agriculture leads to deterioration of the vegetative cover on the hills: forest lands degenerate into infertile grassland and barren land space. Therefore it is contended that this system of agriculture is unsustainable and economically impoverishing of the tribal people depended on it. The technology being primitive, the level of production and income is very low. It occupies a distinct place in the socio-economic fabric of tribal economy of this state. The jhumia selects the field on the slope of the hill on rotation basis. Due to deterioration in fertility of soil the jhumia is compelled to shift his cultivation on another plot. He keeps the land fallow for a number of years for regeneration of forests. Again he uses the same land. That is why, this process is also called shifting cultivation. Its chief characteristics are (i) slash and burn operation of vegetal species. (ii) Use of human labour as chief input. (iii) Non-employment of animal and (iv) use of simple implements such as dibble stick, scrapper, etc. The cycle of agricultural operation in all these areas of North-East Region is marked by the following stages:

1) Selecting the forested hilly track.
2) Cleansing the forest tract by cutting down the jungle during December - January.
3) Drying and burning of fallen shrubs/trees into ashes during February - March.
4) Fencing the cleared plots.
5) Worship and sacrifice.
6) Dibbling and sowing of seeds for mixed cropping.
7) Weeding operation.
8) Watching and protecting the crops against depredation by wild animals, pests, etc.
9) Harvesting.
10) Threshing and storing.

The area under shifting cultivation and number of families are engaged are shown in Table - I

SECTION II

It is well established fact now that Jhum cultivation is not an eco-friendly practice. It is a curse to the existence of mankind. Therefore, it needs to be reduced and jhum practitioners should be won over to adopt alternative way for livelihood. Jhum cultivation is creating so many problems which are discussed below:

1. **Environmental and Socio-Cultural Problems:** The recent debates and developments with regard to the draft National Environment Policy (NEP), 2004 and the Scheduled Tribes (Recognition of Forest Rights) Bill (STB), 2005 are illustrative in different ways of the manner in which social concerns are dealt with in environmental policy and legislation in India. Yet, while the pros and cons of specific policies and legislations have been central to the academic debates on the environment, very little attempt has been made to trace the changes in environmental policy – making and the way social concerns have been problematised.

The ecological balance favouring the complete hydrological cycle has been seriously upset over vast areas due to ignorance or lack of appreciation of methods of conserving and managing natural vegetation (whether a forest, grass land or mixed type) and of clearing the vegetation for cultivation. This misuse and destruction of plants cover combined with great increase in human and livestock population has created intense competition for natural resources, in many cases residual, as between forestry, grazing and crop production. In the continued absence of conservation and correctly integrated land use system, overall habitat deterioration has become very widespread.

Our specific focus with regard to social concerns is a community right to resources – a concern that is central to many of the debates on natural resource management. Three arguments are put forth: (i) that while the environment has at one level assumed a

non-negotiable presence in policy, social concerns are only highlighted to the extent that they are deemed not to be environmentally destructive, (ii) that the discursive terrain through which social concerns are deemed harmful is overly simplistic and in need of re-examination and (iii) that the changing nature of environmental discourse can only be understood within the wider shifts in development policy. Although there are many who would claim that the environment itself receives an inadequate attention in development policy, a contention that is at least partly true, we are concerned here with how emerging policies and legislations tackle social concerns given the socially constructed nature of the environment.

The environment assumed a central role in India, to a large extent, as a result of the first major international conference on the environment, namely, the United Nations conference on the Human Environment (UNICHE) held in Stockholm in 1972. In preparation for this meeting, each member country was asked to prepare a report on the state of the environment. India setup a committee on the human environment under the chairmanship of Pitambar Pant, a Planning Commission member. The outcome was three reports, one on the state of the environment, one on the problems of human settlement and one on the possible strategies to manage resources. Environmental goals were subsequently incorporate in the Fifth Five-Year Plan onwards. Legislations such as Wildlife Protection Act, 1972 and the Water (Prevention and Control of Pollution) Act, 1974 were passed soon after as well.

While the discursive thrust of much of environmental policy-making in the late 1970s and early 1980s was on incorporating environmental principles in sectoral planning, something that was matched with legislative intervention, the latter part of the 1980s saw the focus shift towards sustainable development. The importance of this shift was that the link between social and environmental concerns was more forcefully articulated.

The 1988 National Forest Policy (NFP) was the first "environmental" policy document in India that explicitly recognized the linkages between environmental and social concerns in terms of community rights to natural resources. Unlike the previous forest acts that privileged revenue and commercial interests, the NFP was strikingly different section different. Section 4.6 of the policy highlighted the symbiotic relationship between tribals and forests and the need to involve tribal communities in the management of forests. It also emphasized that domestic requirements of firewood, fodder and minor forest produce should be the first priority of forest management, not commercial or industrial needs.

The 1990 government order on joint forest management (JFM), while giving communities adjacent to reserved forest usufruct rights, was also aimed at improving the protection of forest. As Kolavalli (1995) has argued, citing a number of state-level government orders, JFM was the forest department's way to involve communities in the management of forests as it was incapable of doing it on its own.

But JFM has remained a policy and has not been incorporated into the forest act. Thus, while the NFP recognized the symbiocity of forest dependent (tribal) communities with forest, rights afforded to these communities have been limited and often no more (sometimes less) than existing settlement rights.

It has been undisputedly accepted that shifting cultivation creates environment and socio-cultural problems. The growth in the number of members per jhumia family and in the number of jhumia families cannot be absorbed in settled and jhum cultivation, as a result a consumption gap develops in the hills. The greater food requirements cannot be met out of dwindling yields from smaller plots of land devoted to jhuming with smaller and smaller fallowing periods. The over exploitations of forest for jhuming and commercial purposes lead to a deterioration of the healthy condition of the forest. The misuse and destruction of plants cover combined with great increase in human and livestock population has aggravated the problem of eco-system. Ecological damage in the hills, widespread poverty among hill-dwelling tribal, social discontent and the growth of extension has been the fall-out of the development of the hill economy. P. R. Kyndiah, Minister of Tribal Affairs and Development of NER "underlined the strong association of jhum with community life and traditions as well as with the unique mountain eco-system."

2. Soil Erosion: High rainfall and undulated topography is always associated with problem of severe soil erosion, which affects the environment adversely. The excessive deforestation caused by excessive cutting down of trees for commercial purpose as well as shifting cultivation are resulting in alarming and frightening signals for human survival. Estimates reveal that nearly 181 M.T. of soil is lost annually as a result of shifting cultivation from north eastern hill region (Task Force Report on shifting cultivation, 1983). Developments in the hills and its fall out on the ecology have caused soil erosion, landslides, floods and droughts in the plains.

3. Soil Fertility: Burning of vegetation in the process of shifting cultivation chemically alters the plant nutrient supply from organic form to a mineral form in ash, major portion of which is often lost in course of run off. The effect of burning on some soil properties studied at laboratories is shown in the following Table-2.

Table-2: Effect of burning on soil properties

Soil properties	Before burning	After burning
PH	5.10	5.50
Organic Carbon (%)	1.32	1.05
P20s(Kg.ha-1)	3.30	3.31
K20 (Kg ha-1)	210.00	570.00
Exch.Ca (Meg%)	7.15	9.46

Source: Task force report on shifting cultivation in India, Ministry of Agriculture, 1983.

The shorter the jhum cycle preserves the lower level of soil fertility. Five year jhum *cycle* generates very low level of soil fertility. Thus, jhum cultivation becomes uneconomic progressively. This necessitates switching over to settled cultivation.

4. Loss of flora and fauna: The extent of deforestation of tropical forest has caused world wide alarm as tropical forests provide more than 50% of modern medicine. Tropical forests are living museums and laboratories that have yielded only a tiny fraction of their treasures to scientific study. Arunachal Pradesh is, as if, a natural garden of more than 20,000 identified species of medicinal plants and so many still remain unidentified. In course of shifting cultivation remarkable varieties of flora and fauna are disappearing, which need immediate attention for extensive and intensive studies. The type of vegetations destroyed depends upon the length of jhum cycle. A dense forest of long cycle has more tree species than grasses, whereas a forest of short cycle has more number of grasses. About 300 plant species out of native flora in North-Eastern India are used for edible purpose. Of these, over 25 provide tubers/rhizomes etc., which are eaten raw or boiled. Over 50 are consumed as green with their leaves/tender shoots cooked as vegetable; about 170 ripe fruits, which are pulpy and sweet/sub-sweet are eaten raw and many of these are used for pickles/vegetables, when unripe; about 15 have edible seeds are eaten raw or roasted.

Wildlife in the natural situation constitutes the most important component of the ecosystem, which participates affectively in the energy flow and bio-geo-chemical cycling. Animal-plant, plant--plant and animal-animal interactions are the basic milestone of the success of an ecosystem and its productivity. As such, the richness of the ecosystem means the capacity of hold high species diversity but deforestation has threatened the very fabric of the survival of wildlife and the ecosystem in the region. This area is the habitat of as many as 55 major mammalian species of which 17 are rare or extremely rare. 21 rare species of extremely rare birds are found in this region and there are innumerable species of insects. As such, there are different species of wild lives found in this region. Almost all of them are dared as protected species under the protection Act of 1972. Like flora, other forest resources are also disappearing and become rare.

5. Water Resources: There is ample of water resources in North-Eastern Hill Region. Almost 10% of the total rainfall of the country is received in this region. Soil erosion and deforestation favour in less retention of water under ground and more run off water causing flood in the plains. This causes great loss to human and animal lives as well as crops. Now -a-days, supply of drinking water has become serious problem in every town in the hill region.

SECTION III

Worldwide, there has been growing concern over the environmental consequences of economic development and adjustment processes with increasing recent interest in the implications for sustainable development. This has included a special focus on the persistence of poverty and the effects of economic and environmental change upon low-income populations, particularly during the periods of comprehensive macroeconomic and microeconomic policy adjustment. As a legacy of current policies and processes, the state has now saddled with the interlocking triangular crises of worsening poverty, economic decline and environmental degradation on the one hand and one the other hand very often conflicting response package of adjustment programmes and sustainable development prescriptions are far lagging behind. In order to draw attention in connection of having sustainable development of the state, the following solutions of the problems created by shifting cultivation in form of suggestions may be considered. A clear need is very much urgent for an efficient articulation of the systemic interaction among the identified problems and their proposed solutions, defining alternative processes which would channel society towards a new vision based on the principles of sustainable development.

In the colonial period various restrictions were imposed on the practice of shifting cultivation and the hills people's rights to forests and lands were regulated and curtailed for resorting to commercial exploitation of timber and other forest products that yielded increased revenues. In the post-independence period also the colonial contention of

un-sustainability of shifting agriculture and its deleterious effects on forests and soil, etc. was the basic premise of formulating development plans for tribal and hill villages. The main thrust of this approach was to wean the shifting cultivators from this practice and to rehabilitate them by providing land for practicing settled cultivation in the plains or terraced cultivation in the hills or raising of plantation crops, etc. But despite the several 'jhumia rehabilitation' schemes under operation over the last fifty years, the practice of shifting agriculture still continues over large parts of North East India involving over 4.43 lakh families. Annual area under this system of cultivation is over three thousand sq.kms. and minimum area one time or other nearly 15,000 sq.kms. We need, therefore, to look into the basic characteristics of the jhum system of land use for production purpose that account for its sustainability despite all attempts to end the system. Some anthropologists, scholars and agronomists questioned the premise of un-sustainability of shifting agriculture and they pointed out the possibility of practicing improved form of shifting agriculture for sustainable development.

Possible Solutions

Diversification of the hill Economy: For the development of the hill economy of the state in an effective manner, ecologically harmful method of jhuming should be discouraged on the steep slopes. All round development can diversify the hill economy and offer the tribal new avenues of employment but this cannot create job opportunities for uneducated, untrained and unskilled tribal. At best they can find employment as wage labourers. Till the jhumias are rehabilitated in higher income occupying for their upliftment, the public distribution system in the hills will have to be revamped and reinforced and new employment opportunities and guaranteed employment schemes will have to be created to shift the jhumias from their traditional practices.

Second, the idea of implementing scientific jhumming can equally be entertained. Scientific jhumming has something to do with minimizing the bad effects of jhumming and capitalizing on its benefits.

A. Land Reforms: Any plan for improved farm practices cannot be materialized without settling the question of land reforms and land distribution. In Arunachal Pradesh, the following three broad categories of land ownership system are found:

1. Land owned by the Community.
2. Land owned by the Chiefs who distribute land among the individual households for jhum cultivation.
3. Land owned by individual families.

It is well accepted that the transition from shifting to settled agriculture cannot be successfully achieved without abolishing the system of ownership of lands by the Chiefs. It is impossible to radically solve the problem of transition from nomadism to a settle life without fundamentally changing the pattern of social relationship in this state. This is most vital issue. State government has taken several schemes to reform the land. But it is not so much effective to its function. As there is no systematic land record, land reform policy maker should consider the following suggestions to get factual results in this respect.

1. The customary land laws of all communities should be documented and studied and then a uniform land policy should be formulated.

2. As plain land in Arunachal Pradesh is scare, ceiling on cultivable land should be fixed. Ceiling should be varying depending on the quality of land.

3. Landless poor people should be given some cultivable land.

4. Poor people having small amount of land should be prevented from selling their land.

5. Sharecropping should be discouraged.

6. All land sales should be compulsory registered.

7. Restriction should be placed on the sale of cultivable land to non-cultivators.

8. Progressive land tax should be introduced.

B. Land Management: The soil and land use survey should be conducted to examine the eligibility for what type of forest or what type of horticulture or for what type of crop for settled cultivation can be cultivated. Adequate protection measures including soil conservation should be adopted where settled land management should be supported by effective supply of inputs including seeds, manures, fertilizers, tools and implements, etc. It is necessary to undertake studies to improve the farming practices of the jhumias so as to cause minimum soil erosion and loss of soil fertility. Jhumming, wherever it is a necessity, should be promoted and not eliminated. For the upgradation of jhuming two ways are advocated. First, jhum land may be converted to economically more viable horticultural gardens. Horticultural gardens can

pave the way for a roaring business and income for the people. Question arises if a change is brought looking at the entire terrain conditions of the region, will it be acceptable to the local population and fit into their pattern of life. In this regard it may be suggested that some scientific measures should be taken to put an end to the erosion of top soil and studies should be carried out to explore the possibility of introducing modern innovations on jhum land so as to obtain higher yield per unit area.

a) Soil Survey: The terracing of land for settled cultivation may be suggested as remedy for the evils effect of shifting cultivation. But terracing is costly and cannot be immediately undertaken in many steep hills of this state. The essential pre-requisite for terracing is survey. A soil survey can assess the soil potentiality for agriculture identifying erosion, salinity, acidity and alkalinity, water-logging, etc. Soil survey is, also essential for pasture development, horticulture and forestry. A complete soil survey is not undertaken till now in this state.

b) Conversion of jhum land into settled Cultivation: In Arunachal Pradesh the main plan on which the jhum control scheme rests is the introduction of terrace cultivation. According to a recent report, of about 70,000 hectares of jhum area, 2300 hectares have been reclaimed for wet rice cultivation. The govt. should accelerate the process of conversion as much as possible and try to convince the jhumias about good effect of settled cultivation.

c) Surrender of land: The jhumias should be persuaded to surrender at least 50% of their jhum cultivable land to the government on the basis of sale, pension, lease, and donation. Government should use this land only for forest purpose.

C. Agricultural Knowledge: Agricultural school should be opened in every district head quarter so as to give a practical training to the jhumias for different types of cultivation. Again the school authority will also organize sometimes seminar, symposia in almost all villages to convey the jhumia about the ill effect of jhum cultivation. The new policy frame for the Jhumias should reflect a holistic approach emphasizing the need for spread of literacy and education among them and their skill formation for adoption of improved technology. The tribal households which are still dependent on jhum agriculture deserve to be covered under the government's social safety net programmes for providing employment guarantee, food security, educational guarantee, health care services, safe drinking water supply, etc. In the hills in the summer season water scarcity becomes very acute. This problem may perhaps be eased by formulating and implementing rain-water harvesting programme in the affected areas.

Subsidiaries of Agriculture: Replacement of crop cultivation by other types of alternative livelihood like plantations, economic and conservational forestry, horticulture, development of animal husbandry i.e., livestock rearing like poultry farming, sericulture, bee keeping and so on may also be encouraged. The problems arising out of jhumming in Arunachal Pradesh can be solved keeping in view the many facts of shifting cultivation, the socio-cultural life of the people, the feasibility of change over the expenditure involved, and the maintenance of a changed pattern.

i. Tribal should be encouraged to take **up horticulture, floriculture, agro-forestry, growing of medicinal and aromatic, plants** on hill slope which will not damage the fragile hill ecology. Arunachal Pradesh with its undulating topography and rich diversity of agro climatic condition has scope for growing wide variety of tropical, sub-tropical and temperate fruits.

ii. **Cultivation of Tea, Coffee, Rubber and Black pepper:** Tea, Coffee, Rubber and Black Pepper can occupy an important place in the hill economy of Arunachal Pradesh. Proper development of these industries will not only contribute to generate revenue but also to create employment opportunity for growing population of the state. Tea cultivation in the state was started in 1978-79 by the Arunachal Pradesh Forest Corporation Limited at Kanubari in Tirap District. Being encouraged by success of the forest corporation many big and small private tea garden have come up in recent past. Besides tea, the Arunachal Pradesh Forest Corporation is also growing Coffee, Rubber and Black pepper in Tirap, Lohit and Changlang District.

Fisheries, Piggeries, dairies and duckeries: Whenever possible water bodies should be created for starting fisheries, piggeries, dairies and duckeries. These should be encouraged among the hill people to diversify the hill economy. Water resources have great potentiality in the North-Easter region. The region, primarily because of the high rainfall, has also abundant ground water resources. Arunachal Pradesh has very good scope for exploitation of water resources and for the development of irrigation and mini-hydro projects. By introducing terrace/settle cultivation among the jhum cultivator's, water resources can be exploited for the better agricultural productivity. For utilization of water resources in Terrance preparation and mini-hydro projects, large number of jhumias can be engaged and huge wage employ-ment could be created in rural areas.

Fish production system has very high potential and adopted as subsidiary source of income for the jhumias. However, its applicability is limited in some cases only depending on the location opportunities. Involving the local manpower can create most of the water harvesting structures. Embankment type of ponds can be created in perennial water bodies for fish production. On the basis of location, in the hill areas there are so many scopes to make pond making only one site embankment surrounding three sites hill. At individual and community level, this programme has tremendous potential for boosting the rural economy of the jhumias and it will help immensely as alternative way of living instead of their traditional life style.

D. Forest based industries: Industries based on forest products should be set up on a priority basis throughout the hill region so as to engage the jhumias in the industrial work. The tendency to preserve forests will grow if the forest products will have a ready market. In fact the setting up of such industries will revolutionize the economy in the tribal areas and will have a negative impact upon the jhuming practice. The forest-based industries such as paper pulp, plywood, vineer, matches, saw mills, wooden railway slippers, etc. may be set up. If once Arunachal Pradesh gets herself industrialized at least 25%, it would greatly help to achieve economic rehabilitation of the jhumias. When they will realize the potential value of bamboos, timber species, etc., which they will sell to the industrial authorities, then they will automatically try to conserve these resources which will be a permanent source of income for them.

E. Tourism, Power and Trade: Arunachal Pradesh is gifted with many basic resources necessary for tourism development such as unique natural beauty, different species of wild life, religious places, historical sites, diverse attractive tribal culture and friendly and hospitable people. A proper development of tourism sector can provide alternative employment to the growing population in tourism activities as there is unparallel beauty which would make this state a tourist destination alluring lakhs and lakhs of visitors.

Although, Arunachal Pradesh possesses immense potential of power in the form of hydro, oil, natural gas and coal resources the progress in this sector in the state has not taken place on scale proportionate to resources availability. As a result, there is a big gap between availability and requirement for power in the state. As per 2001 census out of 2, 12, 615 households only 116,275 households (54.7%) are having electricity facility.

The National Hydro Power Corporation (NHPC) has undertaken survey and investigation works of Siang and Subansiri basin mega hydro power project with an estimated installed capacity of 20700 MW. If once power is available, it will bring revolution of infrastructural development with set up of different industries. It will open a new era for employment in the state. The unexploited Hydro-Power potential of the state is estimated to be 49,000 M.W.

Even if a part of the available hydro potential is harnessed, the state will not only be self-sufficient in meeting its own demand for power but at the same time it can earn revenue by supplying power to the other neighboring states. It opens the door of employment with setting up of new and new industries. Again government can give allowance to the Jhumias from this revenue for stopping their jhum practice.

F. Border Trade: Border Trade with neighboring countries is a priority of Central Govt. for which infrastructure would be developed in Arunachal Pradesh, said Secretary of External Affairs Ministry, Shyam Saran while addressing a high level official meeting at Itanagar dated 26.11.2004. The Chief Minister, Shri Gegong Apang said that due to cross-border trade, priority development of border areas through infrastructure development in terms of road, health, education, etc., could boost states economy. Free flow of goods and trade with China and South East Asian countries as part of "Look East Policy" would neutralize the disadvantage of North-East Region, particularly Arunachal Pradesh (The Arunachal Times, 27.11.2004). If border trade is established, it will reduce the jhum cultivation by engaging jhum practitioners in different activities.

1. An appropriate mechanism should be devised to help extension of bank credit to the jhumias even though the property relation prevailing among them prevents it. It is not necessary that the banks should give loans only when land is held as security.

2. Planned development with simultaneous steps for forestation, conservation of germ plasm through establishment of national parks, of arboreta of biosphere reserves should be a satisfactory solution.

Conclusion

An integrated approach as said above could be the basis of solution to ecological imbalance occurring in the state. Besides, this jhunias can divert from their traditional mode of occupation to newly established permanent cultivation, environmental problems cannot be solved. For the successful implementation of these integrated approaches

Govt., other agencies and village chiefs/decision makers are to be involved frequently. In every implementation of programme new problems are likely to arise. It is believed that if the schemes are implemented with unexhausted patience by involving the local tribal leaders, the success will be surely achieved.

It is also a fact that in all hill areas, sufficient amounts of plains land are not even available for settling the jhumias and helping them to take permanent and sustainable practice of farming. In such cases attempts may be made for introducing improved and sustainable system of jhum farming and providing these farm households with subsidized avenues for supplementary occupations in animal husbandry, horticulture, food-processing, cottage industry, etc. While bringing the change from shifting cultivation to settled cultivation, there will necessarily come about some changes in the social and land reforms. Special care should be taken so that there is no undesirable social consequence.

The solution of the problem arisen by the shifting cultivation is greatly depended on integrated and coordinated affords of all concerned - Government, district council, village organization, village leaders and farmers. But assistance of the agricultural scientists, economists, sociologist, political leaders and social workers in formulation and implementation of the action plan to solve these problems is also equally important. An integrated agricultural and adaptive forest management practice based on scientific and sound ecological principles should be sought out. Efforts should be so made as to bring the change from within the society. The cultivators should be imparted proper training and education to adopt new innovations. They must also be educated about the danger of jhumming.

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