Review Article

ENVIRONMENTAL DEGRADATION DUE TO SHIFTING CULTIVATION IN ARUNACHAL PRADESH

Comment [NC1]: ENVIRONMENTAL DEGRADATION DUE TO SHIFTING CULTIVATION IN ARUNACHAL PRADESH- AN OVERVIEW or A REVIEW of ENVIRONMENTAL ISSUES DUE TO SHIFTING CULTIVATION IN ARUNACHAL PRADESH

ABSTRACT

Shifting cultivation (Jhum 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. **Objectives:**The study has tried to explore the adverse impacts of shifting cultivation and different causes of water pollution. **Literature Review:** Some recent studies are reviewed and research gap is identified. **Methods:** This study is descriptive in nature based basically on data of secondary sources. **Results and Discussion:** Someadverse impacts are sought out. **Findings:** Some findings are sought out.**Suggestions:** Some suggestions are given to solve the adverse impacts to bring the all round development of the State. **Conclusion:** It is necessary to make an integrated research on the basic problems raised with the shifting cultivation by scientists of all the disciplines including social scientists.

Comment [NC2]: Abstract should be reframed. Make it continue i.e the objective of this study….The recent studies reviewed for this article focusing on similar issues. Secondary data sources were used….some of the similar adverse impacts such as……. Were observed and it has been founded that……. it has been concluded with few suggestions that…

Keywords: Jhum cultivation, human existence, soil erosion, soil fertility, flora and fauna, water resources.

I. INTRODUCTION

Comment [NC3]: References should be added while writing the Introduction part.

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 latitudes $26^0$28´N and $29^0$30´ N and longitudes 91^0 30´E and $97^0$30´E. 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. 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 shifting cultivation (jhum).

Almost all the tribes of 26 except 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

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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.

The shifting cultivation i.e., jhum 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 (who practices jhum cultivation) 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.

II. OBJECTIVES

This paper seeks to examine an in-depth study the adverse impacts created by the shifting cultivation and the different causes of environmental pollution in Arunachal Pradesh so as to bring sustainable development by solving the problems.

III. LITERATURE REVIEW

Comment [NC4]: No latest reviews are included.

Debajit Datta, R.N. Chattopadhyay and Shovik Deb (2011) studied that to achieve sustainable productivity of natural resources through proper management regimes, comprehensive knowledge on the condition of these mangrove dominated ecosystems and their patterns of utilization are needed. **Sachchidananda did a comparative study of shifting** cultivation (Jhum) in five countries: India, Indonesia, Malaysia, the Philippines and Thiland and saw thatforest plays an importantrole in providing goods and services to the forest dependent communities. The diverse need of the communities could all possible from the forest due to the prevalence of diversity of vegetation in the region (Katewa, 2003). Forest dependent communities have protected their natural forest for securing livelihood and stabilizing their economic condition by retaliating logging of natural forest and further conversion to plantation viz., chipko movement (IIED, 2009). The existence of the forest is depending upon the participation of forest dependent communities in the forest protection and regeneration. The symbiotic relationship of forest and tribal communities has been well recognized in the Indian national forest policy. The wisdom of the forest dependent community has been a tool to conserve the valuable biological diversity that ascertained the socio-economic upliftment of the traditional societies. International and national initiatives have also emerged to safeguard the indigenous knowledge system (IKS) or traditional knowledge system through Convention on Biological Diversity (CBD) and National Biodiversity Act 2002 (Venkataraman, 2009). The existing forest resources of the northeast India is a result of the community involvement in the protecting the forest resources through a protection regime adopted through village council by enforcing customary laws suiting to the local conditions. Various wild plant species have been used by the local communities in Arunachal Pradesh that include green vegetables, roots and fruits as food (Haridasan et al., 1990).

Need of the Study: There is no region based study, where we can get the safeguard of our natural resources and thereby we get the proper supply of water for all purposes.

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IV. METHOD AND MATERIALS

This study is descriptive in nature based basically on data of secondary sources. The data of secondary sources are collected from government offices, books, articles, various census reports, and websites published in different times.

Analysis: The different materials collected from the different sources have been scrutinized, verified and set up systematically under appropriate heading and data are arranged in systematic statistical tables, if necessary, to hold requisite presentation and conclusion.

Comment [NC5]: This part is not found or not required. It's a review article based on secondary data.

V. RESULTS AND DISCUSSION

Adverse Impacts

1. **EnvironmentalProblems:** 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. 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 exploitation of forests of jhuming and for commercial purposes also leads to a deterioration of the condition of the forests. 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. Development in the hills has obviously not led to development of the hills. It has also produced external diseconomies. A climate of uncertainly has been generated among the jobless tribal.

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 mt of soil is lost annually as a result of shifting cultivation from north eastern hill region[1]. Development in the hills and its fall out on the ecology and economy of the hills has caused soil erosion, landslides, floods and droughts in the plains.According to the forestry experts' soil conservationists, "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". Shifting cultivation is regarded as one of the most destructive method of land operation causing ecological imbalance, which raises temperature of the environment.

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.

Table 1. Effect of burning on soil properties

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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

Sources: 1. Borthakur, et al. 1983. [Majumdar, D.N. (1990)(Ed.), "Shifting Cultivation in North East India," Omsons publications, Guwahati, New Delhi, p-147].
2. Task force report on shifting cultivation in India, Ministry of Agriculture, 1983.

Comment [NC6]: It is pH (small p and capital H) & not PH

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.

Comment [NC7]: Convert italic to normal font.

4. Loss of flora and fauna: The extent of deforestation of tropical forest has caused worldwide 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 trees 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 holding 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 and 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 life as well as crops. Now -a-days, supply of drinking water has become serious problem in every town in the hill region.

VI. FINDINGS: From the above discussion, we get the following main findings.

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1. **Environmental problems:** 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.
2. **Soil Erosion and Soil Fertility:** High rainfall, undulated topography, the excessive deforestation caused by excessive cutting down of trees for commercial purpose as well as shifting cultivation is always associated with problem of severe soil erosion, which affects the environment adversely and thereby alarming signals for human survival.
3. **Loss of flora and fauna:** The richness of the ecosystem means the capacity of holding high species diversity but deforestation has threatened the very fabric of the survival of flora and fauna and the ecosystem in the region.
4. **Water Resources:** 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 runoff water causing flood in the plains.

VII. SUGGESTIONS

Jhum cultivation today is regarded as an alternative farming to permanent or settled cultivation on mountain slopes. But the government has to try his level best to abolish it completely. The following issues may be considered for positive approach towards shifting cultivation.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 for the jhumias.

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. S ate government has taken several achemes 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.

- The customary land laws of all communities should be documented and studied and then a uniform land policy should be formulated.
- 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.
- Landless poor people should be given some cultivable land.

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- Poor people having small amount of land should be prevented from selling their land.
- Sharecropping should be discouraged.
- All land sales should be compulsory registered.
- Restriction should be placed on the sale of cultivable land to non-cultivators.
- 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.

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. A detailed survey work should be undertaken keeping in view the nature of slope, soil depth and prevalent practices to reclassify the land for proper use in the form of terraces.

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 cultivation4. The govt. should accelerate the process of conversion as much as possible and try to convince the jhumias about good effect of settled cultivation. Agricultural practice by slash and burn method must be avoided. Their practice has to be improved upon so that productivity per hectare rises without causing soil erosion.

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.

Subsidiaries to Agriculture:

a. Tribal should be encouraged to take up horticulture, floriculture, silviculture, agro-forestry, growing of medicinal and aromatic, plants on hill slop and fodder crops with special emphasis on crops 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. The government has been trying to enhance the scope of horticulture since 1987-88 with set up of Directorate of horticulture at Itanagar. But this is much lagging behind the expectation due to lack of proper marketing, transportation etc. The area under fruits has gone up from 12,175 hectares in 1987-88 to 49,102 hectares in 2002-03 and production rose from 29,025 M.T. in 1987-88 to 96,438 M.T. [Directorate of Economics and statistics, Govt. of Arunachal Pradesh, Itanagar].

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b. **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 generation of revenue but also create employment opportunity for growing population of the state. Tea cultivation is 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. Therefore, horticulture, cultivation of tea, coffee, rubber and black pepper as alternative and subsidiary occupations may be desirable and feasible to bring the jhumias from their attachment with the traditional practice of jhum cultivation.

c. **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 diversity the hill economy.

Livestock rearing is an integral component of the rural economy. It plays an important role in improving the economy of the rural population. For livestock development Govt. has paid his attention on (i) Animal and disease control (ii) cattle development (iii) poultry development (iv) piggery development (v) dairy development and (v) Education and Training.

The total livestock and poultry population as per 1997-98 livestock census was 11.87 lakhs whereas in 1992-93 livestock census it was 9.59 lakhs. But it is very little supply as per demand. There are bright scopes to develop the livestock in the state. Government should pay more attention in this respect.

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. If once Arunachal Pradesh gets herself industrialized at least 50%, 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, they will automatically try to conserve these resources which will be a permanent source of income for them. The industrialization programme is a necessary and unavoidable part of overall planning for development of the region. Without an industrialization programme agricultural improvement programme cannot succeed. Industrialization programme would provide employment to surplus farm hands. This will reduce the excessive pressure of growing population on land. Thus, industrialization programme would indirectly help soil conservation programme.

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.

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Although, Arunachal Pradesh possessing 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.

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 neighbouring states.

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 26.12.2004. The Chief Minister, GegongApang said that due to cross-border trade, priority development of border areas through infrastructure development in terms of road, health, education, etc., could boost state's 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). Arunachal Pradesh has a long international border with Bhutan to the West (160 Km), China to the North and North-East (1,030 Km) and Myanmar to the east (440 Km).

In a meeting with Kolkata-based US Consulate General George N Sibley and Economic Advisor Sourav Sen held at Itanagar, dated 02.12.2004, GegongApang said that Arunachal Pradesh has power potential to meet half of the Country's demand. But power potentials could not be tapped properly due to paucity of fund, he pointed out and regretted that the state was lagging behind due to wrong attitude of successive Central Government Apang also requested the consulate general to take initiative to convince US firms to invest in power and tourism sectors in Arunachal. Sibley pointed out the inner line restriction as a hindrance to tourism development. He also added that Arunachal Pradesh could be the richest state in India if its huge water resources were harnessed properly [The Arunachal Pradesh Times, 03.12.2004].

F. 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.

G. **Transport and Communication:** Under Make in India and Border Area Development, Transport and Communication are being developed beyond of the expectation. The State will be no more lagging behind the other states within a span of next plan period. Transport and communication play a vital role on the overall development of an area in general and industrial development in particular. Arunachal Pradesh being hilly State no any other suitable and viable mode of communication like railways and waterways. Road is the principal mode of communication for movement of goods as well as movements of passengers. At present, the entire Districts' Head Quarters are being interlinked with each other by road. The Government has to take attention on priority basis to develop transport and

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communication so as to bring the jhumias in the main stream of the people.
In addition to the above suggestions, the following has to be minded:

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.

3. Jhumming, wherever it is a necessity, should be promoted and not eliminated. For the up gradation 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. 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.

4. 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. Besides, 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.

VIII. CONCLUSION

As an economic proposition, till the shifting cultivation is replaced by an improved form of land management, it is essential to make the above alternative techniques more productive so that it can sustain the growing pressure of population and improve the quality of life of the people concerned without creating imbalance in the fragile eco-system of the region.We think, question may arise if such a change is brought looking at the entire terrain conditions of the region, will it be acceptable to the local people and to fit in their pattern of life? The population arising out of jhuming can be solved keeping in view the many facets of shifting cultivation such as the socio cultural life of the people, the feasibility of change over the expenditure involved and the maintenance of a changed pattern. 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.

Last of all, I feel that it is necessary to make an integrated research on the basic problems raised with the shifting cultivation by scientists of all the disciplines including social scientists.

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