SHIFTING CULTIVATION AND ENVIRONMENTAL DEGRADATION: A CASE STUDY IN TWO HILL DISTRICTS OF ASSAM

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Declaration

I here by declare that the thesis entitled "**Shifting Cultivation and Environmental Degradation: A case study in two hill districts of Assam'** submitted by me to the Department of the **Business Administration**, **Tezpur University**, is my own and it has not been submitted to any other university for the award of any research degree or published previously.

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Hiranya Kumar Baruah

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All helps received by him from various sources have been duly acknowledged.

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ACKNOWLEDGEMENT

The researcher acknowledges the help received from various quarters. It may not be possible to mention all the names. However, special mention may be made to Dr. D. N. Borthakur, ex. Director, Indian Council of Agricultural Research, North Eastern Hill Region, Barapani, Meghalaya, Prof. S. C. Patra, Director, North Eastern Regional Institute of Water and Land Management, Tezpur and Prof. B. C. Bhowmick, Assam Agricultural University, Jorhat, who provided valuable inputs to the research in this study.

I express my gratitude to Dr. G. Singaiah, my research guide, who had encouraged me to pursue research in this particular area and who constantly inspired me to update my knowledge and look into new insights of the study. Much of the credit goes to him for making me undertake an in-depth study and analysis of this research work.

I wish to acknowledge the help and support of Prof. S. S. Khanka, the Head of the Department of Business Administration of Tezpur University, and all the faculty members of the Department and extend my gratefulness to them for providing me with intellectual inputs from time to time. I extend my profound gratitude to late Prof. M. C. Bora, former Head of the Department of Business Administration of Tezpur University, who had ignited my mind to look at the research topic from different perspectives.

I am also grateful to all concerned governmental officials and members of the N. G. O.s, the supporting organizations, eminent persons from the society and the target segment who extended their cooperation during the study and with whose help this study could possible.

My family had been my pillar of strength; I would like to acknowledge the support and encouragement received from each one of them in this endeavor.

H. K. Baruah

Tezpur, Assam
Dated: 12/09/2008

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ABBREVATION

APCDC	Assam Plantation Crops Development Corporation
AAU	Assam Agricultural University
FAO	Food and Agricultural Organization
FSI	Forest Survey of India
HADP	Hill Area Development Programme
Ha	Hectares
IFAD	International Fund for Agricultural Development
IJDP	Integrated Jhumia Development Programme
ICAR	Indian Council of Agricultural Research
ICRAF	International Council for Research in Agro-forestry
LEISA	Low External Input and Sustainable Agriculture
MBC	Microbial Biomass Carbon
MBN	Microbial Biomass Nitrogen
NABARD	National Bank for Agriculture and Rural Development
NEHU	North Eastern Hill University
NGO	Non-Government Organizations
NEC	North Eastern Council
NEH	North East Hill Region
NER	North Eastern Region
NERIWALM	North Eastern Regional Institute of Water and Land Management
NECSSR	North Eastern Council for Social Science Research
SC	Scheduled Caste
ST	Scheduled Tribe
TDA	Tribal Development Agency
UNESCO	United Nations Education Science and Cultural Organization
UNEP	United Nations Environment Programme,
WSM	Watershed Management Programme

CHAPTER – I

INTRODUCTION
AND
CONCEPTUAL FRAME WORK

Introduction:

There is a growing concern for better quality of life among the poorest of the poor across the globe. In this regard people either on their own or on the advice of various development agencies have been attempting to pursue either traditional economic activities or non-traditional one or both very aggressively. For example, earlier Jhumias used to select the land for shifting cultivation with community consensus for safeguarding societal interest. But, now-a-days land is selected by few individuals with their ulterior motive. Similarly necessary plants used to be cleared by retention of major ones for the cultivation, where as, at present all the major trees are also cleared for making more money by ignoring the environmental requirement. Besides, previously people used to reselect the one's left land after 20-30 years, where as at present within 4-5 years, they are coming back to the left land. The way of thinking of the people has become very self-centered while ignoring the long term benefits of the society. As a result of it, modern approaches of pursuing major means of livelihood affecting the environment at various levels of the ecosystem.

Maintaining sustainable environment has become a great challenge across corporate and non-corporate sectors. Some of the environmental degradations caused by corporate sector are depletion of biological, geological, chemical and gaseous resources. Air, water and soil pollution have cause environmental degradation. Unwise utilization of space and industry wastage. Blocking and contaminating food chains and causing of interruption in flow of material and energy in ecosystem. On the other hand environmental degradation caused by non-corporate sectors are decrease in potentiality, productivity and bio-diversity of eco-system and loss of genetic resources, replacement of virgin/primeval invaluable vegetation with wanton deforestation, endangering plant and animal species to the stage of extinction. Impact of shifting cultivation on environment include a general decline in annual rainfall, meagre increase in average annual temperature, and spread of weeds and harmful micro-organisms in new areas, drying up of water sources, loss of fertile land due to bank erosion by the floods and unusual frequent floods in which valuable land and forests are destroyed. The indiscriminate destruction of forest resources has led to heavy soil erosion and consequent siltation of major rivers in the region. This has in turn been responsible for

heavy floods in the lower reaches of the main river systems – the Brahmaputra and the Barak – causing enourmous damage to large tracts of land every year.

It is understood that there is conflicting interest between approaches use for modernization process for improving quality of life and major constituents of environment. At present there is a greater need to bridge such gaps for facilitating the process of sustainable development in creating healthy eco-system. Therefore, this study is an attempt in this direction.

Shifting Cultivation:

Shifting cultivation, developed over centuries of experience is known as "Swidden", "Slash-and–burn agriculture", "Rotational bush-fallow agriculture.' or by a variety of local names; in India, it is commonly referred to as Jhum cultivation. This farming system is believed to have originated in the Neolithic period around 7000 B.C[1] . This is the most primitive form of agriculture and is still common amongst the tribal people in various pockets. Shifting cultivation is mainly confined to medium to high rainfall zones between 100 meters and 2,000 meters above sea level. It is practised in three types of vegetation, such as forests, bush and grasslands[2].

Hill people who lived in tropical regions practised shifting cultivation. In this system, a piece of land is selected for cultivation, trees or bushes are cut down partially or fully, left to dry and burnt them in situ. In the cleared land, seeds of crops are dibbled into holes or broadcast without using ploughs or animal powers. When the crop yield begins to decrease after some years, the cultivators return back to the same land for cultivation. The length of the period under cultivation and the following fallow period vary considerably from place to place which is according to the type of community involved and depends on population density and local environmental factors. When population increased people cultivated in the same area for a longer period and encroached upon unusable land, which ultimately affected the environment[3].

Throughout the cropping period, weeds pose a problem. The most common weeds are root sprouts, rhizome sprout, stump sprouts, tree seedlings, grasses and herbs. Under long shifting cycles, the problem is less severe than under short shifting cycles, where many weeds, particularly *Imperata cylindrica* keep sprouting from underground

rhizomes and are difficult to eradicate. Soil erosion results in gradual depletion of the outer surface of the soil due to lack of any protective measures. Shifting agriculture generally tends to be casually managed. The number of crop species in the mixture may vary from six to over 40, depending upon the agricultural cycle. Linked to traditional animal husbandry such as poultry and swine, and also with the forest sector, this land use is highly complex, with differences in agricultural procedures, cropping and yield patterns. As a consequence, the ecological and economic efficiencies of these systems may differ considerably. The crop diversity alone does not express the total bio-diversity in the system. The species diversity in a plot may go up to about 60 or more[4].

Hillside cultivation is practised in many countries around the world. More than 525 million people live in tropical hillsides depending on shifting cultivation. This system is practised in Amazon basin, South America, high land areas of Manchuria, Korea and southwest China. In Asia, Africa and Latin America, the tropical hill sides cover 12.9 million square km, which form nine per cent of the earth's landmass, out of which Africa has fourty per cent[5].

This type of farming system is practised in some parts of Andhra Pradesh, Bihar, Madhya Pradesh, Orissa and N.E States. In India, the "Problem of Jhum" affected 4.9 million hectares in eleven states and about 4.44 million farm families were engaged in this system in the year 1980. As per task force on Shifting cultivation, Ministry of Agriculture, 1983, in N.E India comprising seven states namely Assam, Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh and Mizoram about 4,43,336 tribal families were involved in shifting cultivation and area affected by this practised was about 14,660 sq km. The N.E states which had sixty seven per cent forests covered, had lost 316 sq km forest cover in the 1997 assessment as per North East Council report 2000, as per the report lost in the North East India was mainly attributed to the felling of trees and shifting cultivation[6].

Definition:

Shifting cultivation in developing countries closely relates to both deforestation and land degradation as their cause as well as the affected object. The estimated shifting cultivators are about 250 to 300 million people, which constitute only 5 percent of the world's population, but extend to 30 percent of the world's exploitable land. (Phom To Mai,1999)[7]

According to Food and Agricultural Organization shifting cultivation is a traditional agricultural system, where a patch of forest is cleared, burnt and cultivated for a few seasons, then abandoned for a several years following soil fertility decline and weed proliferation, and allowed for natural vegetation regeneration before being cleared and used again.

However, as stated in FAO (1984), the shifting cultivation is differently defined by different people in differing ways and noted by different terms. Shifting cultivation sometimes is called swidden farming or agriculture. The FAO/University of Ibadan Workshop on shifting cultivation in 1982 recommended the use of the term "Long Fallow Agriculture" as equivalent to shifting cultivation. This term arises following the adoption of the most acceptable definition of shifting cultivation as a system in which relatively short periods of continuous cultivation are followed by relatively long periods of fallow. Since most prevalent method of land clearing in shining is slash-and-burn, it is referred to as slash-and-burn cultivation as well[8].

According to Harold C. Conklin[9] "Any continuing agricultural system in which impermanent clearances are cropped for shorter period in years than they are followed" constitutes shifting cultivation. According to him shifting cultivation is "Any agricultural system in which fields are cleared by firing and are cropped discontinuously (implying periods of fallowing which is always in average longer than periods of cropping)".

According to S.D Jha[10], "It is clear enough that a wide gap remains between the food grains production under Shifting cultivation and the population dependent on it. The future gap will be wider still."

According to U.C. Sharma and R. N. Prasad[11], all cultures are intimately linked with the mode of subsistence. It may, however, be emphasized that shifting cultivation has been an integral part of the life and culture of the various tribal communities. As a matter of

fact, most of the socio-culture and religious aspects are intimately connected with this system of cultivation, "Certain social cultural and even religious functions are associated with certain aspects of agricultural operations in shifting cultivation."

Main Characteristics:

First characteristic of shifting cultivation is the rotation between short cultivation and long fallow periods. After some crops, when soil fertility is depleted by repeated crop removals, leaching and erosion, and production is no longer labour-effective, the cultivation is shifted to new site with original site led to fallow growth. The length of fallow period is the most critical factor for the long term sustainability of shifting systems. The recovered vegetation help nutrient cycling and serve as major buffer against leaching losses, hence, enhance restoration of soil fertility. This characteristic defines the viability of shifting cultivation over permanent agriculture in marginal areas of poor soil but with abundant tropical vegetation.

Second characteristic of shifting cultivation is in slash-and-burn methods for vegetation clearance. The use of fire helps to save labours and enrich soil with ashes and the increase in leaching effect. Fire also plays in removing foci of fungal diseases and noxious insects. With the purpose of saving labour, cultivators often prefer clearing secondary than high forests. The precaution measures are open applied to prevent forest fires and protect useful species from damaging effects of fire.

According to B. K. Roy Barman[12] the chief characteristics of shifting cultivation are -

(i) Rotation of fields

(ii) Slash and Burn operation of vegetal species

(iii) Keeping the land fallow for a number of years for regeneration of forest.

(iv) Use of human labour as chief input

(v) Non-employment of draught animal and

(vi) Use of simple implements such as dibble stick, scrapper etc.

According to him shifting cultivation is the custom of cultivation clearance scattered in the reservoiur of natural vegetable (forest or grass or wood land) and of abandoning them as soon as the soil is exhausted and this includes in certain areas the customs of shifting homesteads in order to follow the cultivators, searching for new lands.

According to Promod Goswami[13] the most important features of shifting cultivation in North-east India are:

a) Land is owned by the community but each family cultivates its own field after selecting the same jointly with the help of headman

b) Fire is employed to clear the cut and dried up debris. Shifting cultivation is not done without burning – if no fire is employed as in many other parts of India and abroad – then it is believed that the process causes relatively less damage to ecology

c) Soil is not cultivated

d) Community approach in certain broad operations – jungle clearances, burning crop, protection from animals.

e) Yield goes down rapidly – hence field is abandoned after 2-3 years

f) The field remains with the shifting cultivators as long as he continues to use it.

According to R. K. Kar[14], the most important characteristics feature is, therefore, the community action and participation in the entire economic activity in the relevant area. The social organization of the people is built around the concepts of community worship, community participation and community responsibility. According to him shifting cultivation is not just an alternate form of land use or a set of agricultural practices, but it implies the whole nexus of people's religious belief, attitude, self-image and the tribal identity. Since several festivities are associated with shifting cultivation, abandoning of the practice would mean leaving these functions and festivals. Agriculture is that sector of human activity in which there is greatest interaction between the environment and the culture, which has grown in and from it.

L. P. Vidyarthi[15] mentioned the following thirteen stages adopted by the shifting cultivators:

1. Selecting a piece of forest patch or land
2. Worshiping
3. Cutting the forest growth and spreading it for drying
4. Collecting big logs and firewood
5. Setting fire to the shrubs
6. Planning or final preparation of the field for sowing
7. Sowing seeds with digging sticks or with the help of hoes
8. Weeding

9. Watching and protecting the crop
10. Harvesting and storing
11. Worshipping
12. Merry-making and
13. Fallowing

Other features:

Shifting cultivation is known as subsistence based system with low inputs and low productivity that requires a large amount of land per family and relatively low densities of population for acquiring long enough fallow rotation. If these basic requirements for sustainability are met, shifting cultivation can be ecological sound. The provision of human needs, in this case, is integrated with the natural environment, and species composition and diversities in the natural forest are preserved by unmanipulated natural regrowth during fallow. This cultivation system occupies a distinct place in the indigenous economy and constitutes a vital part of livelihood and socio-economic set up of the majority of the highland population. Despite its low income nature, shifting cultivation may not be replaced by other production system since few alternatives are proved both ecologically and economically feasible for many marginal lands. However, as long as the fallow periods is forced to be shortened under population and poverty pressure, productivity declines following the decrease in soil fertility and land degradation. The accelerated shifting cultivation, thus, may cause a lot of social problems such as hunger and malnutrition, concentration on food crops at the expense of cash crops to ensure survival, displacement of indigenous community, outward migration to urban areas, primary forest encroachment and so on.

The system aims at self-sufficiency and does not lead to any capital formation or growth. Human labour and land in its widest sense are the chief factors of production. It is both a labour intensive and land extensive system based on low technology. According to shifting cultivators, this practice has trickled down generations and they think it does not harm the environment. But scientist and policy makers did not agree. They believed that Jhum destroyed the environment and it must be banned.

The significance of this system of farming in the present day is more because of the maladies associated with it. Resource degradation, low productivity, tendency to

encourage large family size and little or practically no scope for application of improved agricultural production technology are some of the drawbacks in this system.

Due to the short period of the shifting cycle and rapid population growth in the last two decades, the hill slopes are severely disturbed by the growth of villages and their cultivating practices, which is also leading to the problem of soil erosion. Thus the environmental imbalance has resulted uneven spread of monsoon rainfall leading to the problem of drought and excessive rainfall resulting flood in this region.

Due to the Shifting cultivation, 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 and of clearing the vegetation for cultivation.

The Shifting Cultivation Process:

(December-January): The undergrowth is slashed and small trees and bamboos are felled. Short tree stumps and large tree boles are left intact. The underground organs of different species are not disturbed. This laborious process is often completed by the men from two or three families such a joint effort is one of the essential ingredients of a well-knit social organization. This effort, along with the process of allotment of sites for shifting cultivation by the village headman who is in overall control of the village community, helps to promote kinship among the members of the village, and among many communities such as the Garos and the Mikirs.

Towards the end of March or the beginning of April, (before onset of the monsoon,): The debris is burnt in situ. Before burning a fire line is cleared around the field. Burning is often repeated to destroy any unburnt material that has first been collected in heaps. A bamboo hut is built for temporary lodging. The family's presence protects the field from wild animals. Sowing is done after the first few monsoon showers. The seed mixtures used for different shifting cultivation cycles may vary considerably. Whereas cereals are emphasized under long shifting cultivation cycles, perennials and tuber crops are emphasized under short shifting cultivation cycles, as by the Garos in Meghalaya or by the Nishis in Arunachal Pradesh. Some 8-35 crop species are grown together at Burnihat, but the number may be up to 35 species elsewhere in Arunachal Pradesh or in the Garos and the Naga Hills, seeds of pulses, cucurbits, vegetables and cereals are

mixed with dry soil from the site to ensure their uniform distribution, and broadcast soon after the burn. Maize seeds are dibbled at regular intervals amongst other crops. Similarly, rice is sown into the crop mixture by dibbling with a long stick, after the first rainfall in mid-April. Semi-perennial and perennial crops such as ginger, colocasia, tapioca, banana and castor are sown intermittently throughout the growing season.

Environment and Environmental Degradation:

In modern industrial civilization, environment degradation is one of the major critical problems, which if getting more serious consideration as special issue as social progress of any nation depend on healthy environmental ecosystem of that country. The rate of environmental degradation depends on many factors such as whether the country is developed or developing, densely or scarcely populated; economically solvent or not and also on the overall environmental consciousness of the people from top to bottom level in every segment of a society. The environmental degradation is more acute in case of developing countries like Bangladesh where population is too high in comparison to its land resources and other facilities. Not only is that, due to low literacy rate, there is also a lack of self-consciousness about the environmental pollution and its effects on our life and society. Environmental condition deteriorates mainly because of air, water and land pollution, and these types of pollution are due to the unplanned and unwise activities of human being.

Meaning:

The word "Environment'' means aggregate of all the external conditions and influences affecting life and development of human beings, animals and plants, including various external factors, such as air, climate, culture, water, noise, temperature, soil etc., which affect the health and development of life. These external conditions and factors by interacting with each other, keeps ecological balance. This balance is necessary for healthy human life.

The highest rate at which, renewable resources can be used without decreasing its potential for renewable, throughout the world or in a particular area is called its natural replacement rate or sustainable yield. If this yield is exceeded, the base supply of a renewable resource begins to shrink- a process known as environmental degradation.

Bio-diversity:

Biodiversity is the variety of the world's living species, including their genetic diversity and the communities and ecosystems that they form. It is the result of two opposite actions: the processes that produce new genotypes, new varieties, and new species and the processes that eliminate mutations, variants, and species from the system. Natural selection is primarily responsible for the reduction of biodiversity; it acts through differential reproduction and differential mortality. The complex threats to biological diversity call for a wide range of responses from many private and public sectors, and the mix of these responses must be adjusted to suit local conditions. Because government polices often are responsible for depleting biological resources, policy changes usually are a necessary first step toward conservation. National policies that deal directly with wild lands management or forestry or that influence resource use indirectly by affecting, for example, land tenure, rural development, family planning, food prices, pesticide use, or fuel consumption can have significant impacts on the conservation of biodiversity. Today, the diversity of life is facing serious threats. Scientists concur that, at current rates of tropical forest loss and disturbance, roughly 5 to 10 per cent of all tropical forest species will be lost per decade during the next quarter century.

Meaning: Biological diversity includes two related concepts: Genetic diversity and ecological diversity. Genetic diversity is the amount of genetic variability among individuals of a species as also between species. Ecological diversity (species richness) is the number of species in a community of organisms. Maintenance of both kinds of diversity is fundamental to the functioning of ecological systems and hence to human welfare.

Biological resources - the portion of biodiversity that is of actual or potential use to people - provide the basis for most human enterprises. The species being lost today possess unknown food, medical and industrial uses. The ecosystems being degraded through mismanagement of biological resources are losing their capacity to support the human population dependent upon them, and this degradation is exacting further costs through soil erosion solution reservoirs, local climate changes, desertification, and loss of productivity.

Production Economics:

Production is a process where by certain goods and services are used to create goods and or services of a different nature. Production is the name given to the process of conversion of certain inputs (resources) into a consumable form. Farm production likewise refers to the producing of food, fiber and livestock by using several different kinds of inputs. Land is used by the farmers as a factory which helps them produce the desired crop. To this manufacturing plant (land) labour and capital are added to cultivate plant and harvest the crop. When considered necessary, fertilizer is also added by the farmers. Water may either be provided by rainfall or by artificial irrigation methods. Application of all these inputs results in the desired crop (output). The crops so produced are, in turn, consumed by the population, feed to animals which produce meat, milk, eggs and many other livestock and poultry products through complex biological processes.

Meaning:

According to S. S. Johl and T.R. Kapur[16] farm production economics is broad division or field of specialization within the subject of agricultural economics. It is concerned with the choice of production pattern and resource use in order to maximize the objective function of the farm operator, their families, the society or the nation, within the framework of limited resources. It is concerned with choosing of available alternatives or their combinations with a view to maximizing the returns and or minimizing the costs.

Production economics is concerned with two broad categories of decisions in the production process:

(i) How to organize resources in order to maximize the production of a single commodity i.e to make choices from among various alternative ways of using resources.

(ii) What combination of different commodities to produce.

The goals of agricultural production economics are two fold:

(i) to provide guidelines in using the farm resources most efficiently and

(ii) to facilitate the most efficient use of resources from the stand point of the economy.

Culture:

Every human being belongs to a group, which has its culture. The material artifacts, which he employs to make a living or to protect him from the elements, form the material part of his culture. His beliefs concerning his relationship with nature, rules and regulations governing his relationship with other individuals; his attitudes, his values all form the non-material aspects of his culture. In short, the way of life he shares with other members of his group is his culture. A particular culture consists of a mode of life characteristics of a particular society is relevant in this respect.

Any culture is liable to change from one point of time to another. No culture can remain static. The conditions which make a culture to change, and along with these the culture is also bound to change. Change is one of the natures of culture, change as immanent; there are forces within the culture itself which provide dynamism. Sociologist also thinks that change is inherent in culture, so also its capability to accept and absorb change. Culture satisfies the basic needs of most of the individuals who are bearers of that culture. But these basic needs do not remain static. Under normal conditions every culture insures the survival of the society which bears it and also the contentment of most of the society's members. However, the adoptions which it provides are so perfect that they cannot be improved upon nor are they ever completely satisfactory to all the society's members. Imperfection of cultural adaptations result in individual discomforts and these, in turn, provide the motives for culture change."

The cause of culture change may lie within the culture (some inconsistencies due to changed circumstances) or may be external to it, when the geographical environment changes, the culture is bound to change to adjust itself to the changed environment; or else, the culture may change by imitation to an external culture. Sometimes these two factors may combine; when the geographical environment changes, the culture strives to adjust itself, and if it finds an existing model of adjustment it imitates the model, because, it saves the effort to invent a means for adjustment. The Garos adoption of plough cultivation is a change of this nature.

Government schemes for controlling Shifting Cultivation:

After independence, the problem of shifting cultivation received adequate attention and in the fifties, first attempt on tackling the problem was made by the then Assam Government by way of introducing plantation crops, such as, rubber, coffee, black pepper and cashew nut to encourage shifting cultivators to take these crops. This effort was strengthened in the fifth Five Year Plan. Mathur[17] (1979) reviewed progress of states own programmes of soil conservation which included contour bunding, land reclamation measures, afforestation including plantations and the development of pastures. He has found that absence of irrigation with declining fertility in dry terraces was considered the main reason for their dependence on Jhum for food crops.

Taking into consideration the adverse effects of shifting cultivation, the Government of India and the concerned state governments have embarked upon a good number of schemes under the different Five Year Plans to regulate and control the practice in the highly affected areas of the country. The Integrated Jhumias Development Programme (IJDP) is such an attempt to wean the shifting cultivators away from the practice of shifting cultivation in the two autonomous districts of Karbi Anglong and North Cachar Hills of Assam by providing them with alternative permanent means of livelihood.

Definition of Sustainable Development:

Sustainable development is the Key to preserving the planet by using the Earth's resources without permanently damaging the ecosphere. By using the Earth's resources intelligently, we can continue to harvest the Earth's renewable and non-renewable resources indefinitely leading towards development of today and for the generations to follow.

While many definitions of the term "Sustainable development" have been introduced over the years, the most commonly cited definition comes from the report our common forum, known as the "Brundtland Report", which states that Sustainable development is development that "meets the needs of the present without compromising the ability of future generations to meet there own needs."

According to A. C. Thakur[18] ,Sustainable agriculture is that form of farming which produces sufficient food to meet the needs of the present generation without eroding the ecological assets and the productivity of the life supporting system of future generation. According to World Conservation Strategy[19] , Sustainable development must take into account of the social and ecological factors as well as the economic ones of living and non-living resource base, and of the long term and short term advantages of the alternative actions.

Sustainable development is "Meeting the needs of the present without compromising ability of future to meet their own needs". Sustainable agriculture production not only involves identification and application of improved technologies but also ecological and socio-economic concerns, such sustainable production is environmentally non-degradation, technologically appropriate, economically sound and socially acceptable.

As a tool for development, sustainable development is a collection of methods to create and sustain development which seeks to relieve poverty, create equitable standards of living, satisfy the basic needs of all people, and establish sustainable political practices all while taking the steps necessary to avoid irreversible damages to natural capital in the long term, in turn for short term benefits by reconciling development projects with the regenerative capacity of the natural environment. Sustainable development has three components environment, society and economy.

Human survival depends upon availability of clean air to breathe, fresh water to drink and food in the form of cereals, fruits and vegetables etc. All these needs are met through consumption of one or more of the natural resources, which are finite. The scientific and engineering community has made a major contribution to the health and well being of mankind by developing potential of an earth that is rich in natural resources. But the technological growth essential to social, economic and cultural advance should ensure sustainability of development by conserving and enhancing environment. Within the concept of sustainable development there is an inherent conflict between conservation of the environment and our present path of development. This conflict is the task that confronts us all.

No doubt, the developmental activities are essential for economic progress but these should not disturb the fragile ecological balance on earth. Obviously, the need of the

hour is sustainable development through utilization of natural resources. We have to realize that if we continue our development the way we have been doing now, we may have to fact the wrath of the nature. It is very important for us to understand our role very carefully as being part of the we continue to degrade the environment; but equally we cannot renounce development in favour of environmental protection. It has become imperative that resource conservation and environmental protection must now become a part of an overall management system to be adopted as a strategy by all concerned for meeting the expectations of the society as well as sustainable growth. While doing this we must realize that natural resources are not infinite but finite.

Rationale of the study:

Shifting cultivation in developing countries closely relates to both deforestation and land degradation. The estimated shifting cultivators are about 250 to 300 million people, which constitute only 5 percent of the world's population, but extend to 30 percent of the world's exploitable land.

Shifting cultivation is affecting the environment in terms of soil erosion, soil fertility. Short shifting cycle has resulted in immense environmental problems like depletion of bio-diversity and loss of soil fertility in the two hill districts of Assam. It is also observed that heavy floods in low lying areas of Assam during rainy season are primarily due to the soil erosion in the hills. Conservation and management of natural resources are very much important in this region.

If the shifting cultivation in its present form is allowed to continue, land degradation and the impoverished living conditions of resource-poor upland farmers are bound to worsen with time. However, as yet we have no viable alternative to shifting cultivation practice successfully tested and widely accepted by the people.

Our study will focus mainly on understanding the dynamic relation between economics, development of people, rationalization of shifting cultivation. In the process of shifting cultivation how environment is affected, whether system could be recovered back to its original state.

We have to observe and analyze the standard of life of poor people dependent on shifting cultivation. People efforts for improving life of people, how government is encouraging other activities. Therefore, it is urgent to seek new options for farming

sloping lands that can enhance crop yield, stabilize the slopes, conserve the soil to an acceptable level and modify the existing practice of shifting cultivation suitably so that they can be accepted widely by the people in the mountain areas.

Studies so far conducted by the researchers are mostly from sociological, economical and anthropological point of view. They have not addressed environmental degradation issues like loss of soil fertility; bio-diversity lost, soil erosion etc., resulted due to shifting cultivation system.

Besides research needs to be carried out based on people's perception perspectives and field level scientific data analysis. Therefore this study is attempt in this direction. This study will help academicians, planners and researchers for gaining knowledge on shifting cultivation and environmental degradation.

Research Objectives: Based on the intensity of the problem, the following objectives were formulated for study.

1. To find out the very critical and sensitive socio-cultural aspects of the people associated with the system, which has been continuing for a long time.
2. To study the economics of shifting cultivation system in the study area.
3. To understand the intensity and the severity of various environmental degradation problems resulted out of shifting cultivation methods and practices.
4. To study the effectiveness of various schemes implemented by various agencies to rationalize the shifting cultivation system as eco-friendly and economically viable one.
5. To suggest constructive methods and models to reduce and make free the shifting cultivation from its evil affects of environmental degradation resulted out of shifting cultivation.

Scope of the study:

The study on shifting cultivation is focused on household level analysis of Karbi and Dimasa ethnic group, which is the majority of inhabitants in the area of Karbi Anglong and North Cachar Province of Assam. Their farming system is subsistence with permanent food shortage and prevalence of shifting cultivation practice. An attempt was made to collect data from households, N. G .Os and Govt. offices to get a better insight of the problem. An extensive review of literature both national and international level were collected, analyzed to understand the problem from many aspects economic, environment and social point of view. It is expected that the present study will be useful to policy makers, development departments and field functionaries in general and the farmers in particulars in the hill zone of Assam.

Limitations of the study:

1) Out of more than thousands of Jhumias households in the two hill districts, only 300 households have taken into consideration for the study due to the lack of manpower, time and money of researcher and topography constraints of the two hill districts.
2) The households have not kept accurate record on production, consumption. So, transparency of data and originality, accuracy of data may be occurs.
3) The researcher had to depend upon the respondent's memory regarding farm level data. Absence of written farm records affects considerably in assessing the actual condition.
4) It is not safe to generalise from the results obtained and conclusion arrived at, on the basis of only one year enquiry through the shifting cycle may be 10-20 years.

Plan of the study:

The Ph.D. thesis will be presented in nine chapters. First chapter introduces the Introduction and Conceptual Framework. Second chapter presents review of literature. Third chapter deals with need for the study, objectives, research design, methodology, scope of the study. Fourth chapter presents the profile of the two districts, Fifth chapter deals with shifting cultivation practices from socio-cultural perspectives. Sixth chapter focuses on economics of shifting cultivation and Seventh chapter deals with impact of shifting cultivation on environmental degradation. Eight chapter discusses the effectiveness of various programmes meant for rationalization of shifting cultivation system, last chapter gives findings and suggestions to streamline the system.

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CHAPTER – II

REVIEW OF LITERATURE

Studies on shifting cultivation had been carried out by the various authorities including social scientists, agronomists, forestry experts, soil scientists and ecologists from time to time. A good number of articles on this subject had also come out in the national and international journals, research bulletins, weeklies and daily newspapers etc. So far as the North Eastern Region of India is concerned, In Assam, the Agro-Economic Research Center for N.E. India, Jorhat, in Meghalaya North Eastern Hill University, North East India Council for Social Science Research, North East Council and Indian Council of Agricultural Research Complex for N.E. Hill Region had taken keen interest on the study of various aspects of the shifting cultivation.

In this chapter, an attempt is made to review some of the relevant literatures on the relevant issues available within and outside the country on shifting cultivation.

Economics of Shifting Cultivation

Sharma[1] (1994) reported that the socio-economic and agro-ecological parameter responsible for the sustenance of shifting cultivation needs to be analyzed objectively in order to prescribe the models for development of tribal and forests. Due to manifold increased in total population in general and tribal population in particular, the human pressure on forests have increased of late, much beyond their carrying capacity. The problem is compounded by the pressure brought about by substantial increase in cattle population. As a result, land resources are no more surplus. Due to the impact of market forces and fact that village economy is no more isolated from national economy and global economy, the barter and subsistence tribal economy is giving way to a monetized one, thereby disrupting the traditional structure. The author also reported that socio-economic constraints such as lack of knowledge, risk aversion, inadequate market and credit facilities, non-availability of inputs, poor soil and inefficient cultural practices have hindered the development of modern agricultural practices in the region. Tribal, in general, believe in instantaneous consumption and live for today only. Therefore, saving habits to tide over any contingencies arising in future are not found among them.

Mukherjee[2] (1980) had conducted a socio-economic surveys of shifting cultivation areas. The survey showed a tendency towards settled agriculture in some regions. For instance, the percentage of land under shifting cultivation, horticulture and homestead of wet paddy cultivation are about 30, 31 and 39 respectively in Banishindua, a Garo village, where a decade back shifting cultivation was the main occupation of the people. The

survey further showed that villagers having small farm sizes, namely 0.5-2 hectares tend to stick to the traditional shifting cultivation, but those having larger farm sizes (3-6 hectares) divert a greater proportion of their land to wet paddy cultivation. Study on Mizo village also showed that shifting cultivation is a part and parcel of the agricultural methods being integrated with settled cultivation, animal husbandry, horticulture etc. The percentages of lands under shifting cultivation, horticulture, livestock and poultry are about 60, 5 and 11 respectively. Several cropping patterns exist depending on the land formation and availability of resources; out of these the pattern involving paddy and maize cultivation is the most general because of its high economic return. Some families started sugarcane farming which showed promise.

Saha[3] (1980) discussed about subsidiary occupation and shifting cultivation. He reported that the shifting cultivation was once a complete economic system with several subsidiary occupations as its adjuncts. Each village was, more or less, self-sufficient in respect of food, clothes, implements and housing materials. But such isolation was possible only during the period when such villages were ruled by independent Chiefs; even now the economic life in the shifting cultivation villages revolves round the system of shifting cultivation. Traditionally, hunting, fishing and gathering from nature's stock are important subsidiary sources of food. Moreover, collection of timber, canes and bamboos for house-building and making house-hold tools and implements remain an important source of income. Each shifting cultivator's household possesses a few domesticated animals like cows or mithuns, pig and poultry birds. Cattle breeding and dairy farming does not have much place in their economy. Weaving is an important female occupation supplying almost all the consumption requirements of dress, but it has now lost much of its grounds to mill-made cloths.

Singh et. al.[4] (1998) conducted a study on shifting cultivation in Manipur. The study indicated that shifting cultivation occupied more than three-fifth of the net cultivated area on which more than two-third of the households were directly or indirectly dependent on their livelihood. A shifting cycle of 10 years was found to be economically viable and ecologically sustainable. Nearly 54% of the shifting cultivators practiced mono cropping while the remaining 46% adopted mixed cropping. Paddy occupied the highest proportion of the total cropped area followed by soybean and maize. The output-input ratio was the highest for ginger (2.54) and the least being 1.13 for paddy plus maize cropping. The

ratio for soyabean + maize was 1.67 followed by soyabean mono, paddy mixed, paddy mono and maize mono cropping respectively. It revealed that ginger and soybean were more remunerative as compared to other crops. Mixed cropping was found to have increased the income as well as maintained the soil fertility.

Sarma and Sarma[5] (1998) reported that the remarkable features of the shifting cultivation are well defined calendar of operations no use for farm tools, observance of rituals and sacrifices after each operation and different taboos. The Lakher's agricultural calendar, begins in December when the chief and elders of the village decide what place/slope shall be used for the shifting cultivation for the ensuing year. Having decided the slopes, the forest is cut in January or February followed by a sacrifice. Sowing of maize, millet, cucumber, pumpkin and other vegetables is done during this period. Towards the end of April, Paddy is sown by scratching the ground with a hoe and about ten seeds being dropped into each scratch. The seeds are left uncovered and the heavy rain soon washes the earth over them. The crops have to be weeded two or three times depending on weather the plant materials have been burnt well or not. At the end of July or beginning of August, maize and millets are harvested. In October, tapioca and spices are gathered and laid out in the sun to dry. From the end of October paddy harvesting begins. The paddy is pulled out by roots, not cut with a sickle. Pulling up of Paddy completes in mid-November. The harvest is not finally gathered in till between the end of December. The lakhers, therefore, are more or less busy the whole year round with agriculture. However, the Lakher method of harvesting is clumsy and labourious. The main crop is rice of which there many varieties like *Livanmong, Batanong, Bupinar, Chairo, Zaibenong, Saibainong, Savenong, Buhpui, Knogloing etc.*

Kalita[6] (2002) found that the extent of diversification was comparatively more under settled cultivation as compared to shifting cultivation. The results of the economic analysis of the settled and shifting cultivation revealed that higher output-input ratio (2.18) in shifting cultivation while net return was found to be higher under settled cultivation regarding the standard of living of people, it was observed that the Sen's P measure of poverty was more in the case of shifting cultivation than that of settled cultivation. The percentage of people who lived below the poverty line was more in the case of shifting cultivation compared to settled cultivation.

Chakravarti[7](1986) reported that, in Tripura about 20,000 tribal shifting cultivators' families still now practice shifting cultivation in the forests for their sustenance, as forestry and tribal economy are complementary, great importance is now given in Tripura to the development of forestry for the rehabilitation of the Jhumias. The promising prospects of rubber plantations in Tripura which practically started only in the sixties of the present century and of the Jhumia resettlement programme undertaken at present have been noted. Coffee plantation was also undertaken a few years back and it was found to be very suitable for Tripura.

Banerjee, et al [8] (1986) have conducted a study on importance of forests in the economic life of the Jhumias of Tripura. The study was sponsored by the Government of Tripura and undertaken jointly by the Department of Analytical and Applied Economics of the Agartala and the Department of Economics of Calcutta University. They have found the average annual income of a humid household in the sample from shifting cultivation was Rs.184.50 and the average annual incomes derived by a Jhumias family from the collection of bamboo, firewood and sungrass were Rs.185.00, Rs.200.00 and Rs.154.50 respectively. In contrast, non-traditional activities connected with forests yield a higher level of income of the sample Jhumias families. The average annual income of sample Jhumias families from wage employment was being Rs.1790.50. The main sources of wage employment of the Jhumias were the Forest Department, horticulture and plantations crops which provide them employment respectively. In terms of income generation, forests have ceased to play their important traditional role in the economic life of the Jhumias of Tripura. This was not the case in the past when land suitable for Jhumming was easily available and forest products which could be collected by the Jhumias were not in short supply in the state. Jhum lands have sustained a less of fertility, which has led to the reduction of yield from Jhum and a reduction in the income of the Jhumias from Jhumming. In order to compensate for the loss of income from Jhumming, the Jhumias have been forced to fall back on the collection of forest products and felling trees in forest.

Goswami[9] (1986) reported that utilization of land for shifting cultivation differs from area to area. Moreover, land utilization in such areas has undergone tremendous changes along with the progressive decreasing fertility of the land under shifting cultivation. The green vegetables, if not allowed growing more than a decade, the resultant fertility added by the

decomposed green foliage and retention of the top soil cannot be helpful for rising of cotton. Now-a-days, even the traditional items of crops like chilies, ginger, tuberous roots, maize, and various kitchen garden vegetables do not grow luxuriantly because of the shortening of the Jhum cycle. In some villages near Churachandpur, in Manipur, Jhum is practiced every year in the same plot of land, but there they raise beans which replenish the fertility of the soil, however poor it might be. In Tripura the soil of the shifting-cultivated area is so soft and loose that it becomes easily prone to erosion of the top soil, hence some villagers of Chakma Ghat area did not even get the double of the seeds which they sowed/broadcast. In Tirap in Arunachal Pradesh farmers having the Jhumed area, for plantation of seeds, roots, tubers etc. This is mainly due to loss of fertility. New crops like tapioca, mustard, hill gourd etc. are grown in many shifting cultivation fields.

In those areas where the shifting cycle is around 3 years, the shifting plots are usually used for two years consecutively, after which it is left fallow for regeneration of the green foliage. In Garo hills the first year is known as *alal* and in the second year the same cultivated plot is called *abreng*, whereas the fallow period is known as *airl*. In Meghalaya a new technique of turning the shifting cultivation area into orchards of oranges or banana or pineapple has paid them good dividends as market for such fruits are readily available in the adjoining townships or cities. Attempts at raising cashew nuts have checked progress whereas coffee and tea plantations have held out bright prospects.

Mishra and Ramakrishnan[10](1981) studied the economic yield and energy efficiency of hill agro systems, namely, slash and burn agriculture (Jhum), terrace cultivation (both of which involve mixed cropping) and valley cultivation of a monoculture of *Oryza Sativa*, as practiced in the higher elevations of Meghalaya, and compared their economic yield, and energetic efficiency patterns. A comparatively longer Jhum cycle of 15 year was contrasted with two others of 10 and 5 years. From an economic point of view, a 15 years, cycle was most efficient followed by a 10 year cycle; a 5 year cycle was extremely inefficient, this being further aggravated in the second year of cropping, while the yield from valley cultivation was reasonable, terrace cultivation gave poor returns due to labour cost for terracing and maintenance and also due to heavy cost of fertilizers. Comparing the three shifting cycles, which are very rare now due to increased population pressure and reduced acreage was found to be the most efficient with an output/input

ratio of 25.6 for a 5 year cycle. While the energy efficiency of valley cultivation was high (16.2) as it needs fewer inputs, that of terrace cultivation was very low (1.7) due to heavy labour and fertilizer inputs required to sustain this. They suggested that only a long shifting cycle of 10 years could be sustained along with valley cultivation, both from an economic and energy point of view.

Saikia [11] (1971) made a study on pattern of agricultural production, land and labour utilization of six hills tribal villages in North East India and observed the most of the surveyed farmers were shifting cultivators. Some of them also practised settled faming in the low-lying areas and in areas where facilities for settled cultivation were available. The authors reported that the per hectare production of crops under shifting and settled cultivation was nearly the same except one village, while per hectare labour utilization was higher in shifting cultivation than settled cultivation.

Saikia and Bora [12](1971) examined the pattern of crop production under shifting and terrace (settled) cultivation in Garo hills, Meghalaya and reported that the farmers raised paddy, arum, maize, millets, sesamum, ginger, cotton, tapioca etc. simultaneously in the shifting cultivation fields. The similar systems of mixed cropping followed in terrace fields also. The average yield of paddy per acre under terrace and shifting systems was 2.77 and 2.07 quintal respectively. The return per unit of land from mixed crops was much higher in shifting cultivation than that of terrace cultivation.

Sharma[13] (1994) reported that Orissa is the worst affected among all the Indian States due to the shifting cultivation. The estimated annual area under active shifting cultivation in Orissa is 5298 Km^2, which constitutes about 8.8% of the total forest area. Nearly 150,000 households depend on shifting cultivation and problem is acute in seven districts of Orissa. Shifting cultivation is legally prohibited inside the reserved and protected forest of Orissa, but it may be allowed in other categories of forests such as unclassed forests with the permission form Revenue Department. However, the practice is quite prevalent even inside the reserved and protected forests, despite punitive actions against the offenders taken by the Forest Department.

Roy and Verma[14] (1980) in their research paper animal husbandry as a subsidiary source of economy for Jhumias reported two basic approaches to the socio-economic problem of Jhumming. First is the Jhumias must be induced to settled framing and second is land classification should be done based on the fact the all lands are not suitable for each and

every purpose and is required to be used profitably. Short Jhum cycle and consistent low agriculture yield, no limited command area of the clans have also created a severe socio-economic problem. When the available land in the vicinity is getting exhausted, the tribes migrate to another location for Jhumming. The migration of farmers and shifting cultivation are thus two problems interlinked. The particular area of a hill for Jhumming is selected by group of experienced clan leaders usually away from the village and all subsequent agricultural activities are in fact very much of a cooperative enterprise. The various agricultural operations such as clearing the forest, burning the Jhum, sowing or dibbling the seed, weeding, fencing and reaping are performed in a religious spirit by the group. The shifting cultivation does not necessarily mean shifting homesteads.

Ganguly[15](1980) reported that Government has taken various Jhum control measures like Jhumias rehabilitation colonies in Tripura where the Jhumias were given individual plots for settled wet rice cultivation and were provided with various extension services. In Assam's Jhum control scheme has been a part of the soil conservation programme undertaken by the forest department and in the Angami and Chakasang areas of Nagaland hill slops have been terraced where the people practice continuous cultivation. Terrace cultivation obtains in Meghalaya also; it is also being tried in Manipur, particularly in the Tonghul area in Ukhrul Sub-division. In Arunachal Pradesh the main plan on which the Jhum control scheme rests was the introduction of terrace cultivation. Despite the various Jhum control and improvement measures adopted in different parts of the region, it can not be said that the problem of shifting cultivation have been substantially solved in any of the state or Union Territories. On the contrary, the problem is still very much there.

From the above studies, it may be understood that agricultural production system in hilly areas differs greatly form the plough farming else where. The hill areas are generally characterized by undulating terrain, dense forests, difficult communication and low population density. Each tribal people have own customs and dialects usually lived in a compact area. Most tribal people in the hill practised a shifting type of cultivation, which is popularly known as Jhumming. This system is regarded as the first step in transition from food gathering and hunting to food production. Yet this most primitive system of farming is still in vague amongst the tribal and backward people in the North East India. Besides this production system, settled agriculture is also practised in the plains and valley lands and to some extent on foothills and terraced lands in the gentle slopes in the

hilly areas. The productivity in these two production systems differs greatly and thereby causes a serious problem of food availability. The productivity in Jhum land has strong bearing on Jhum cycle. Jhum cycle is the time period between one cultivation periods to another cultivation period in the same plot. Longer the Jhum cycle higher is the productivity. But the population pressure over the years and heavy deforestation has resulted in shrinking of Jhum areas over years. It has been estimated that production from shifting cultivation on an average, could meet about the half of the annual food requirement of cultivators' family. On the other hands, the productivity under settled agriculture is substantially more. Moreover the yield loss in settled cultivation is comparatively lower than the shifting cultivation.

Environmental Imbalance due to Shifting Cultivation:

Das[16] (1980) reported that hazard of soil degradation and consequent sediment and flood havocs caused by the practice of Jhumming on the hill slopes. The flood in the plains of the North East India is a serious and almost annual. The problem of flood is not so grave due to excessive run off, but more so due to the associated heavy silt load. The flood havocs in the river system of North East India have always been associated with the heavy sediment loads. These sediments come from the hills where shifting cultivation is practised. It is not the erosion and sediment hazard alone. The problem is far more serious. The Jhum cycle, which used to be 30-40 years a few decades back, now ranges from 1-17 years only. The shortened cycle degrades the land at a faster rate and return falls further making the subsistence agriculture even more precarious.

Jain et. al.[17] (1980) discussed about the vegetation and flora of shifting cultivation area. The author reported that the shifting cultivation affects the soil mainly in following manner (i) due to removal of tree canopy there is no obstruction to mechanical force rain and falling water dislocated soil, (ii) rainfall causes leaching and acidity of soil increases (iii) increased acidity renders soil unsuitable for plant growth and makes it further unusable and vulnerable to washing away. The humus which would have been created by falling leaves and other vegetable material is not available any more, further adding to acidity. Such disturbances effect micro-flora and macro-fauna of the soil, which in turn affects the flora. The authors have made some observations in changes in flora of Jhum lands in Meghalaya and Arunachal Pradesh.

Jain et al [18](1980) reported that in some spots certain trees and shrubs are scare, and may become further rare or even eliminated from the flora of the region, e.g., *Tetracentron sinense, Michad excelsa, Betcula alnoides, Taxus baccata Cephatotaxus griffithii, Cinnamoumum tamala, Illicium griffithii, Magnolia camphellii, Accrcamphellii, Acer hookra* are becoming scare in most of the areas of Arunachal Pradesh where shifting cultivation is being practised. In process of cutting trees and burning the site many parasites and epiphytes get depleted or eliminated from the flora e.g., C*aleola falconeri*, a saprophytic orchid, (which happens to be one of the larges ground orchids) was collected from the Kameng district of Arunachal Pradesh in the year 1970, but in subsequent visits it could not be located from the same area, as the area under shifting cultivation. After the tree cover is removed many components of ground find the habitat no more suitable for example, *Paphiopedilum fairieamum* in Rupa in Kameng and some parasitic plants like *Balanophora dioica, Aeginetia indica* etc. and ferns like *Osmunda, cyathea* at other spots. Epiphytic plants like orchids and ferns are particularly becoming rare in the areas where forests are being destroyed, e.g. species, of *Dendrobiuml cymbidium* and Vanda.

Singh et. al.[19] (2000) reported that the shifting cultivation system at present has become not only unproductive but also hazardous to environment. The deleterious effect of the system which involves forest cutting, burning, clearing and dibbling of seeds can be discernible from the fact that it accounts for nearly 3.7 tones/ha of soil material to slide/roll down to foothills annually. Estimates reveal that nearly 181 million tones of soil are lost annually as a result of shifting cultivation in North Eastern Hill Region of India. Soil erosion from hill slopes (60-70%) under first year, second year and third year (abandoned Jhum/shifting) was reported to be 146.6, 170.2 and 30.2 tones/ha/year, respectively. Exposure of rocks due to soil erosion, heavy silt load of riverbeds and drying of perennial water resources from the areas of shifting cultivation. During shifting cultivation cycle, a large number of edible vegetations were cut and burnt which cause great hardship to semi domestic and wild animals. The author reported that in the process of operations in shifting cultivation, soil materials removed from the slope might be as much as 3.85 tones/ha depending on the steepness of the slope. The magnitude of soil erosion depends on gradient of slopes, soil texture, permeability etc. Nutrient loss in North East Hill India Region seems to be quite alarming due to shifting cultivation,

which is to the tune of 6.0 million tones of organic carbon, 9.7 tones of available phosphorus and 5690 tones of Potash respectively.

Singh[20] (2000) reported that the shifting cultivation, which is a part of the very ethos of the communities dwelling in hilly terrains, leads to degradation of natural resources like forest, soil, water and thus destabilizing the ecology. It has led to extinction of some unique flora and fauna of the region, which in the long run may prove clear to the mankind. Forest denudation which causes (a) extinction of genetic resources of plants and animals along with forest canopies like loss of genes from wild species and primitive cultivars useful intercrop breeding, (b) high run off, hence, poor recharge of ground water, floods, silting of tanks and reservoirs, and (c) removal of vegetation reduces evapo-transportation resulting in change in hydro-geological balance in the area and rise in perched water table causing salinity and cultivation in the hilly areas causes loss of suitable sandy area which leads to increase the sand load manifold and accelerates the mobility of sand towards desertification.

Patiram and Verma,[21] (2001) in their research paper reported that each year one per cent geographical area of this region is being depleted of forest cover due to large-scale cutting. In between 1995 and 1997 assessments, 1875 sq. km of forest area was lost due to the shifting Cultivation, out of 2030 sq. km total lost. However, 1700 sq. km of abundant cultivation area came under forest cover during the same period as a result of regeneration. Thus tribal for Jhum cultivation causes single largest factor for destruction of forest. The good forests are seen only in reserved forest away from such habitations. Tropical evergreen and deciduous forest are the home of several species of plant and animals; the system of Jhum had resulted loss of biological diversity and the serious depletion of gene pool. With the thinning of forest cover and destructive practices of Jhumming have destroyed the natural forest cover with the result that the volume of silt washed down from the adjoining to Brahmaputra and Barak River had gone up. Huge shifting islands of sands are formed, restricting vegetation. In Manipur, 140 sq. km. Loktak lake is silting up with debris from the treeless hill around it. In addition, water hyacinth and floating plants are choking the surface of lake. Sedimentation production rate of rivers originating from these hills is mostly very high. The problem of foot hills is severe, gully erosion, which tends to inundate and swamp cultivated lands with coarse materials rushing down from the barren hilltops.

Arunachalam[22](1998) conducted an experiment on shifting cultivation and soil degradation at lower altitudes of Arunachal Pradesh and found that the pH of the topsoil 0-10 cum increased after the burn and gradually decreased during cropping. The soil moisture content declined sharply after burning. Carbon and nitrogen concentration decreased slightly during cropping. There was an up shock in microbial biomass carbon (MBC) and nitrogen (MBN) in the soil as a result of burning. A shifting cycle of 3-5 years, now prevalent in the region, is definitely too short. For example, the soil degradation was more in systems under 3 year Jhum cycle as the C and N concentrations were lower than those of a natural forest. The highly labile fraction of soil organic matter, the microbial biomass, reportedly a soil degradation indicator also indicated that the 3-5 year shifting cycle is harmful.

Effects of burning

Borthakur[23] (1974) reported than burning chemically alters a portion of the plant nutrients supply from an organic form to a mineral form in ash which is often readily soluble. When water runs over or passes through this ash, the soluble components are flushed out and lost from the site in the run off.

Borthakur[24] (1988) in their study on the effect of burning reported that the organic carbon which was initially 10.6 percent before burning, decreased to 9.8 percent after burning. Total nitrogen content at 0.68 percent before burning increased slightly to 0.69 percent afterwards. Available phosphorus increased immensely with burning from 3 to 20 kg per hectares, while available potassium almost doubled from 480 to 870 kg per hectare and pH changed from 7.7 to 8.0.

Awasthi[25] (1975) reported that in forest areas burn resulted temporary increases in the microbial population of soil, as well as, in the rate of mineralization of nitrogen after burning in the forest zones.

Griffiths[26] (1974) reported destruction of nitrifying bacteria and negligible nitrogen supply for some time after burning Improvement in physical condition of soils. It had also been reported by several workers from Philippines and Parts of India. The increase in nutrients' supply is only for short period, as these are lost with subsequent showers.

Ramakrishnan and Toky[27] (1981) made a comparison of soil nutrient status between three shifting cycles of 30, 10 and 5 years. Depletion in soil carbon and nitrogen during cropping period extended up to five year fallow. Phosphorus build up after Jhumming

and fallow started after five years and increased in 10, 15 and 50 years fallows, Cationic concentration in the soil also declined rapidly in early phase of regrowth of vegetation. This decline was most pronounced for potassium. *Dendrocalamus hamiltoni*, a common bamboo species dominated the fallow up to 20 years. This species is heavy accumulator of potassium and plays important role in its conservation. In a 50 year fallow land, calcium and magnesium levels were declining with depth, which is in contrast to that of potassium and phosphorus. Five year shifting cycle generate very low level of soil fertility.

Borthakur[28] had studied the effect of burning on some soil properties at Burnihat (Meghalaya) which are given below:

Effect of burning on soil properties.

Soil Properties	**Before**	**After**
pH	5.10	5.50
Organic Carbon (%)	1.32	1.05
Available P_2O_5 (kg / ha)	3.30	3.31
Available K_2O (kg / ha)	210.0	570
Exch. Ca (meq %)	7.15	9.46

The above data suggest substantial increase in the contents of exchangeable calcium and potassium in the soil and a corresponding rise in the pH. The litter layer is destroyed by burning with possibly no loss of humidified organic matter from the soil itself. The level of organic carbon decreased due to burning. There are many secondary effects of burning. These arise from the effects of heat on the soil, influence of pH change and nutrient additions on the soil population. The rate of mineralization generally increases on account of burning of the soil.

Thangam[29] reported that according to estimates made by the United Nations Environment Programme, up to 5,000 km^2 of land are lost of productive use every month in the world, because of erosion, flood damage, salinization and alkalization, advancing deserts and other causes, In developing countries, potential arable land is not adequate to meet the growing needs of the increasing population. In India, nearly half of the land area is subjected to water and wind erosion. Since irrigation facilities are limited, the choice for the future is limited with relatively small opportunities to bring new arable land under the

plough. This call for a new approach and in this respect agro-forestry could help to produce food and wood while conserving the ecosystem.

Das[30] reported that shifting cultivation has been held responsible for disturbing ecological balance by causing disproportionate deforestation. This in turn has been causing huge soil erosion in the areas where this system is in practice.

From the above studies it can be conclude that at present shifting cultivation system has become not only unproductive but also hazardous to environment. The deleterious effects of the system are forest cutting, burning, clearing and dibbling of seeds. Shifting cultivation leads to soil erosion from hill slopes. During shifting cultivation cycle, a large number of edible vegetations are cut and burnt which cause great hardship to semi domestic and wild animals.

Evaluation of Shifting Cultivation programme:

Although various attempts have already been made by the state Governments and various other agencies in weaning the North-East tribal into modern scientific cultivation, but most of these attempts have failed to achieve desirable results.

Borthakur, et. al.[31](1997) reported that a few surveys has been made on the success of the schemes under operation although no detailed and through survey has yet been taken up. It is, however, a fact that the schemes have not meet with complete success as was expected in many instances, the Jhumias have either abandoned the new settlements or have carried on Jhuming even after the settlement.

The primary causes for this failure to attract the Jhumias to permanent settlement are:

(i) The new settlement cuts into their socio-cultural life abruptly.

(ii) They are not used to cultivation in terraces using bullocks / implements,

(iii) They find the production to be low in the terraces in the first year due to removal of top soil while developing terraces.

(iv) The production technology for terraces, water management, water conservation practices, etc., is also not properly developed for the region.

A field study by the Department of Sociology and Anthropology of the North Eastern Hill University, Shillong, showed that the tribal hardly used the subsidy given to them for starting a settled way of cultivation. In some cases, they sold the land allotted to them,

and went back to their old life. The study pointed out that Jhumming is an ancient socio-economic tradition that the tribes like to cling to.

Dhar[32] (1999) reported that tribal resistance to change alone is not the only reason for the failure to halt Jhum cultivation in North East India rather the lack of whole-hearted effort on the part of Government agencies and Non-Government Organizations (NGOs) is also responsible for such failure. Field surveys in the Garo Hills of Meghalaya showed that some areas selected for terrace cultivation, as part of the anti-Jhum efforts, were unsuitable for food crops. Seeds were often not supplied on time, leading to delayed sowing and poor harvests. The proper infrastructure facilities required in this connection were also not provided in the resettlement of colonies. Such half-hearted official endeavors will hardly stop jumming's silent march in the North East. Thus under the present scenario, more planning and patience will be required in helping its tribal make the painful switch to settled agricultural existence.

Mathur[33] (1979) reviewed progress of states own programmes of soil conservation which included contour bunding, land reclamation measures, afforestation including plantations and the development of pastures. Terracing and provision of irrigation facilities have also been included to give the programmes a Jhum prevention bias. These programmes have been tried through extension method and initiative comes from the farmer who is given a subsidy. The Departments supply subsidized inputs such as seeds, fertilizers and provide technical know how. The cost as estimated per hectare of area brought under cultivation was found to be varying from Rs.1000.00 to Rs.7000.00. The farmers take up this programme in their free time from Jhum cultivation, therefore, the Jhum was not given up at the time when the programme under taken. It was considered that the farmers would give up Jhum cultivation after the terraces stabilized. Under this programme, out of some 10,000 families in Mizoram who had joined the programmes, only 300 families gave up Jhumming. The others used the terraces for cash crop cultivation and practised Jhum for food crops. Most of the farmers who gave up Jhumming had more than four hectares of land and were located in close proximity of large towns. These farmers have now become new affluent elite in the society and employed hired labour to cultivate their terrace fields, while they themselves have taken other vocations, such as, dairying, pig rearing, etc. The position in Meghalaya and Tripura is similar and out of the 3000 families in Meghalaya only 150 have given up Jhum practice, while the corresponding figures for

Tripura are 7500 and 250. Absence of irrigation with declining fertility in dry terraces was considered the main reason for their dependence on Jhum for food crops.

Sharma[34] (1994) reported that the pioneer attempt to settle shifting cultivators was first made by the Orissa Forest Department in 1951 when Khonds were settled in the Girishchandrapur colony in Sambalpur District. This experiment was successful as the tribal who were allotted irrigated lands are still living settled life by practising modern agriculture. Subsequently, special tribal development schemes were implemented during the 5th Five Year Plan in the districts of Koraput, Keonjhar and Phublani with full financial assistance of the Government of India. But these schemes did not yield desired results possibly due to ignorance of the socio-economic and agro-ecological environment of shifting cultivation. Tribal depends on forestry for their sustenance, was completely ignored while implementing the tribal welfare schemes.

It is understood from above studies that, it will not be possible to wean away the traditional age old practice of cultivation completely, but the magnitude of their practice of this type of cultivation is being considerably reduced by diverting and motivating the hill people for accepting a permanent and settled method to cultivation. Thus both the whole-hearted efforts on the part of Government agencies and NGOs as well as the motivational process are equally important to transform this age old tribal agricultural practices into a settled and developed farming practices and at the time of formulation of the plans and programmes for Jhum control, the views of the social scientists should be taken into consideration. The schemes should be implemented in such a manner that the people do not feel apprehensive of losing their tribal identity in the name of development. Monitoring and follow up action should be undertaken constantly by the scheme implementing agencies. Furthermore, evaluation studies should be conducted by an independent organization immediately after the completion of the period of the programme.

Socio cultural aspects :

According to Indian Council of Agricultural Research, Barapani, Shillong[35], shifting cultivation is being a part and parcel of Socio-cultural life of the tribal people in North-East India, all its operations are inseparably linked with their religious rites and festivals, viz, Agalmaka, Miamua, Rongchugala and Ahia om of Garo Hills. In spite of its adverse

effects on the eco-system and low productivity, it is still continuing with them as a necessary evil for the following inherent characteristics –

(a) Bulk of the labour force management and capital comes from the households;

(b) Production is either consumed on the farm or traded in local markets;

(c) The decision making process is hampered by limited access to marketing and political institutions; and

(d) Most of the farmers do not live much above the culturally determined subsistence level.

The rationale behind the persistency of this system lies in its compatibility with the physico-social environment of sparse population, community land tenure system, undulating and steep topography, short crop cycle, rainy season and thereafter, acute moisture stress during post-monsoon period, as well as, meager resources with the farmers and also the only available means of providing moderate calories and protein for the sustenance of families with minimum risk and the least income variability. This sort of socio-cultural equilibrium environment centering round shifting cultivation is, of course, gradually getting slackened under the impact of higher population, low yield, shortening of Jhum cycles, new economic and social goals, as well as, incursion of modern science and technology with the dying out of tribal isolation from the main stream.

Samanta[36] (1978) conducted two pilot field investigations on socio-agro-economic characteristics and attitudes of tribal farmers towards modern agricultural practice and village leadership pattern for agricultural development. The studies were conducted in the year 1977-78, at ICAR Research complex, Barapani, The study revealed that;

(i) the lower rate of adoption of agricultural innovations and the least favourable attitude towards them by the tribal farmers were found to be due to their lower educational levels, lower socio-economic status, small size of holdings and lower annual income;

(ii) as the village headman plays an important role in all round agro-economic development of the tribal farmers, training to the village headman regarding modern agricultural practices may help in adoption and diffusion of technological innovations.

Ganguly[37] (1980) found that the hill men are very sensitive about two things one is ownership of forests lands and another is growing of rice which is their staple food. Any schemes which affects either or both of these aspects is resisted by them. In parts of Meghalaya and Manipur there are still the vestiges of feudalistic land ownership. Any attempt to end it may encounter stiff opposition. In Manipur, the act passed to abolish the chief ship some years back was strongly opposed out of fear that this would affect the ownership of land by the tribal people. It is also for the same reason that every attempt at extending the reserved forest areas, or strictly improvements the forest regulations in the existing reserved forest area is opposed by the people who are affected by it. Jhumias are emotionally much attached to producing rice (which is their staple food) on their own farms. They will feel extremely helpless if they do not produce their staple food themselves. Such a vital change in their economic organization cannot be smooth or even readily acceptable to them.

Majumdar[38] (1980) reported that culture satisfies the basic needs of most of the individuals who are bearers of that culture. All cultures necessarily have intimate links with the mode of subsistence. As in other preliterate cultures traditional Garo religion was nothing but a way to obtain bumper crops and to keep away disease and disasters. All operations of shifting cultivation were performed with religious awe and the series of annual rites and festivals were linked with different stages of shifting cultivation. After allocation of plots each house hold performed a religious rite in the plot. The *agalmaka* rites make burning and planting. The *miamua* rites are performed by the *nokma* (representative of the land owing clam) at the time of fruiting of the rice plants. The rongchugala and ahia rites mark the lifting of taboo on certain plants and vegetables of the shifting cultivation. The agricultural activities of the year culminated in the gand wangala rites and festivities to mark the end of harvest and also to mark the close of the agricultural season. Wangala rites are performed in honors of *Saljong*, the Sun-god, who is the ultimate bestowed of crops. All these rites involve festivities, in which rich man can demonstrate their wealth which adds to their prestige. The author also reported that the importance of traditional rites and festivals in decreasing along with the decline of shifting cultivation.

Sharma,[39] (1980) reported that shifting cultivation is way of life, training of youths, the whole social and political system, the ceremonies and festivals, their philosophy of life is a product of shifting cultivation system of economy.

From the above studies, it may be concluded that culture and society are susceptible to changes but the ecology offered by the geographical environment could hardly be changed. This speaks well as to why many of the new methods of cultivation recently introduced in the tribal areas are yet to generate the process of culture acceptability. The above author also reported that the cause of continuity of this prehistoric system is linked up with cultural factors.

Suggestions for streamline the Shifting Cultivation system:

Mukherjee[40] (1980) reported that the problems of evolving a suitable alternative to shifting cultivation are many. Resettlement of shifting cultivators in the face of paucity of land, high cost of terracing, and the lack of marketing facilities for commercial produce, becomes an impracticable proposition. The shifting cultivators may be induced to sow seeds of a leguminous crop before abandoning a shifting cultivation area. This would not only act as some kind of a cover crop but also add nitrogen and organic matter to the soil. Sociologist have another viewing angle, according to which shifting cultivation must not be hastily abolished as this step might react sharply with the way of their like. The author also suggested that Tribal Development Agency and the Hill Area Development Programme is to raise the economic level of those who are engaged in shifting cultivation through agricultural and allied occupations, such as cattle development, dairying, piggery, sheep, goat rearing poultry,duck keeping, fisheries, bee keeping and sericulture etc. In order to successfully implement these programmes the strengthening of cooperative and marketing infrastructure is essential.

Gangully[41] (1980) suggested that industrialization programme is a necessary and unavoidable part of overall planning for development of this region. Without an industrialization programme agricultural improvement programme cannot be succeed. Apart from providing inputs to agriculture and demand for agricultural and forest products industrialization programme would provide employment to surplus farmlands. This will cause a fall in the pressure of land. Thus industrialization programme would indirectly help soil conservation programme. The author also suggested the 3-

dimonsional forestry, i.e. combining silvi-culture and horticulture, with animal husbandry. Various quick-growing tree species have also been suggested for introduction in the region by the author.

Bordoloi[42] (1980) reported that soil fertility is greatly enhanced by the algal growth in the soil and soil composition is thus changed to a considerable extent, bringing it to the fertile side. One of the most significant changes brought about by algae is the increase in total phosphorous in the soil. Other organic substances like carbon, calcium, etc., were also found to increase considerably due to the algal growth. Algal ability to fix free atmospheric nitrogen in the soil, which makes soil rich in nitrogen, it is so vitally important for any plant growth. There is a great potentiality lies in the mass use of algae not only in rice cultivation but also in the cultivation of other crops. Algal species, therefore, are to be cultural enmass in the nearby scientific laboratories of soil conservation or forest laboratories and Jhum fields should be inoculated with these cultures for a quick growth of algae which will then take care of the problem of soil conservation by reclaiming such soil. While selecting algae species, for culturing, algae with the nitrogen fixing ability should be chosen carefully. Some of the strong nitrogen fixtures are *Aulosira fertilissima, A. implexa, Anabaena circularis, A. variabilies, Tolypothrix tenuis, Oalothrix brevissilna*, species of Nostoc, all belonging to the Blue-green algae.

Das[43] (1980) suggested that the problem of controlling shifting cultivation should viewed not only as a soil and water conservation problem, but also a necessity of altered way of living suitable to the changing circumstances. Therefore, the elements of the plan should be such that it progressively provides better return from the limited areas with lesser working force involved in the management. The plan should also endeavor to maintain the mixed way of living comprising agro-horticultural activities, livestock keeping and utilization of resources from forest in selective manner, the plan should also ensure adequate work for each member of the family who opts for the land use management in the integrated plan towards the replacement of shifting cultivation. The speed of implementation of any such plan has to be appropriate so as not to create any disruption in the socio-economic living of the people and further development in that respect. The development of permanent agriculture will call for necessary soil conservation and water management practices as well as introduction of suitable agricultural tools, implements,

machineries and storage facilities. The expanded livestock programme will also bring changes in their feeds and housing and also modification in the homesteads of the families in the region.

Bhowmick[44] (1980) reported that most of the times tribal suffer because of lack of proper marketing facilities and communication facilities. They have to travel a long way for collecting some bare necessities of their life, and a portion of whatever little they earn is wasted on the way. The Government can make arrangement for making the necessities of the life available to them through micro-growth centers like Andhra Pradesh Tribal Development Corporation. Tribal groups should be given training in raising tree protecting plan and trees. Cottage and Small Industries and indigenous handicrafts should be developed in tribal areas. One should see to the fact that the tribal people get jobs there and they are not exploited. They should be given an education, which is in tune with the eco-techno system they belong to. Their love for nature and forest should be reinforced through the education. It should be ensured that they could utilize the education and training they received for enriching their life.

Singh et. al.[45] (2000) reported that North-East India promise for potential development of agriculture including horticulture, fishery, forestry, animal husbandry etc. The present agricultural activities in this region are not exposed by adequate scientific base in circumvention the land degradation process and scientific exploitation of water resources. There is therefore, an urgent need to develop sustainable agricultural strategy for hill areas of North-Eastern Hill Region to conserve soil, water and ecology while carrying out various agricultural practices. The author suggested that shifting cultivation system should be so designed as to meet the various needs of the farmers. The latest and most effective land and water management techniques i.e. Watershed Management Programme integrating soil conservation measures, land development, agriculture, plantation crops, horticulture, animal husbandry, fishery and forestry should be considered as vital and most important. The alternatives are horticultural and plantation crops land use system, Agri-horti-silvipastoral land uses system, multi-storied cropping land use system, livestock-based land use system and water harvesting for irrigation and fish production unit.

Singh, et. al [46](2000) reported that as the shifting cultivation is no more a profitable and self-sustaining proposition, agro-based industries can help bringing about prosperity to

people in the rural areas. Establishment of rural based agro industries may lead to improvement the infrastructure facilities in backward areas and may create potential for development of subsidiary industries. The different agro-based industries viz; agar wood oil, turpentine oil, cinnamon leaf oil, citronella oil, lemon grass and ginger oil etc. and fruit based industries, spices and plantation based industry, agro-based and sericulture based industries can be effectively developed for curbing the traditional shifting cultivation practices in the North Eastern Hill Region. The authors also reported that the establishment of agro-industries in the rural areas might reduce the migration of people from rural areas to urban areas.

Patiram and Verma,[47] (2001) discussed about the cultivation system, importance of shifting cultivation, degradation of natural resources, reformed shifting cultivation for sustained productivity and finally they have suggested that agro-forestry, contour hedgerows, improved fallow, plantation crops, livestock farming are as alternative to shifting cultivation. The authors suggested that the introducing of plantation and horticultural trees like rubber, coffee, tea, black pepper, cashew, banana, citrus species, pine apple etc. on the shifting fields on sloppy hills are the promising alternatives. In this regard, first step should therefore be of determining with degrees of firmness to the kind of plantation that would be taken up in any areas. During the establishment of plantation crops, immediate plan for resettlement of shifting cultivators on permanent settled terrace cultivation and sufficient employment of families to be assured in the programme, so that they are able to provide food and other essential for themselves. For achieving this goal, it would be necessary to give free food for some time to gain confidence. Action should be simultaneously taken to discourage whatever possible to prohibit the practice of shifting cultivation in the project area. The success of the strategy would depend on whether the plantation can ultimately provide sufficient income to the families to buy their own food and sufficient surplus for better economic conditions. The local people without breaking their tradition can achieve this through a reasonable share of profit after processing and marketing. Tree and bush crops would represent a relatively replacement of original forest land put under Shifting Cultivation and can sustain large number of people through the generation of cash income with which food may be purchased without loss of land resources.

Banerjee, et. al [48] (1986) observed that not only are the shifting cultivators facing serious economic problems because the forests in their traditional economic role are unable to sustain them, but society as a whole is also having to pay a price for the extensive deforestation in the state in the form of soil erosion, floods and droughts, Therefore, any well-designed forest policy will have to wean the shifting cultivators away from shifting cultivation by providing them with alternative occupations in the long run while in the short run, it will have to ensure that the shifting cultivators can derive a higher income from their forest based occupations. Both long and short term measures have a two-hold aim-to protect the forests and to improve the economic condition of the shifting cultivators. The two aims are complementary because forests cannot be saved without improving the standard of living of the forest dwellers and vice-versa.

Banerjee, et. al.[49] reported that any policy to be successfully implemented has to be acceptable by the people for whom it is designed. A survey was carried out in the course of their study on shifting cultivation in Tripura to find out the shifting cultivators themselves regarding their preferred occupations. They have found that although the shifting cultivators are aware of the problems of shifting cultivation and the low economic returns derived from shifting cultivation, the majority of them are not willing to give it up at least in the short run. Although only 234 out of 1999 respondent families indicated that they want to carry on shifting cultivation as their main source of livelihood, roughly three quarters of the respondent households indicated that they wish to continue shifting cultivation as one of the sources for earning a living. The reason for this seemingly inconsistent preference pattern was also investigated. It was found that 1217 households wish to carry on shifting cultivation because shifting cultivation provides them with a supplementary source of income while 1016 households in the sample feel that shifting cultivation is a way of life and should not be given up. However, only 162 out of the total 1999 respondent families expressed a desire to earn their living from the collection of forest products. This is indicative of the extent of deforestation that has taken place in the state and points to the need for under taking a massive programme of afforestation to renew this depleted natural wealth of the state. Only 290 Jhumias households appeared to be interested in opting for wage labour as a source of earning has an uncertain prospect and also because the shifting cultivation are averse to becoming wage labourers and losing their 'independence'. However, the other forest based

occupations like plantations of coffee and rubber proved to be very attractive as a source of earning a living for the shifting cultivation. More than 50 per cent of the respondent households showed an inclination to take up these occupations for earning a living. Block authorities were asked to give their opinion, regarding suitable occupations, for the shifting cultivators living in their jurisdiction for increasing their level of income. It was found that 14 out of the 15 block authority voted for wage labour, three for shifting cultivation and none at all for the collection of forest products.

Lalthanzama[50] (1986) mentioned that the North East Council has initiated watershed management project in all the constituent units as measure against the evil of the practice of shifting cultivation during the sixth plan and this is intended to be continued in seventh plan also.

Ramkrishnan[51] (1986) suggested that we must design packages of development suited to each unit areas. Horticulture, agro-forestry systems, development of medicinal and aromatic plant cultivation suited to the region, could be considered. Social forestry systems would have to receive much emphasis. All these would help in strengthening the shifting cultivation cycle to at least 10 years or more, which could make the shifting cultivation system ecologically and economically viable. The forestry system should be bases on indigenous tree species-the region had indeed a rich variety of tree species available. Indigenous trees could also be used for regeneration for desertified areas, if planned in the basis of an understanding of germination and establishment of native trees and their subsequent tree architecture. Only a multi-prolonged approach could ensure economic well being for the tribal people, while providing maximum ecological security.

Dutta[52] (1986) suggested that the shifting cultivators should be rehabilitated in the protected forest area and allowed them to participate in the regeneration scheme and be encouraged to develop horticulture as means of livelihood and thereby weaning them away from the age old practices of shifting cultivation. Forest planning and policy should be so framed as to provide maximum employment and income to the tribal people. The cultivation of rubber holds out a big promise. The case of rubber plantation is made stronger in view of the sufficient availability of hillock lands, its short gestation period in Tripura and also its foreign exchange saving role.

Sharma[53] (1994) suggested that a holistic and participatory approach of integrated development, encompassing Government interventions at almost all the levels of vicious

circle, needs to be adopted, such interventions may include labour-intensive agro forestry practices (with indigenous species), soil conservation measures including mulching, credit and subsidy, development of marketing facilities, nutritional improvement, population control measures, and ownership of land and trees.

Roy and Verma[54] (1980) reported that among the people of N.E. India Region who practise shifting cultivation, do not generally keep animals to improve their economy, Moreover the agricultural technique of shifting cultivation is not high enough to produce surplus food. To get extra income and to patch up the shattering economy of shifting cultivation, particularly in N.E. India Region, livestock and poultry rearing are perhaps most promising and untouched field. Animal husbandry may be best insurance against economic and social risk. The livestock can protect shifting cultivators against uncertainty of rainfall and destruction of their harvest by pests. Sale of animal products like milk, butter, ghee, eggs, mutton, pork, beef and birds etc can give additional income to shifting cultivators. There is a bright scope of expansion of shifting cultivation areas for cultivation through maintenance of livestock. The extent of cultivable shifting cultivation area is also directly connected the number and unit of livestock kept by shifting cultivators for direct and indirect source of income. The author also suggested that to be viable animal units, a strong co-operative amongst shifting cultivators is needed to supply necessary inputs of housing animals with indigenous materials, supply of feed, land and fodder developments, storage of extra fodder in the form of silage, hay or straw for lean periods. The state Government Veterinary and Animal Husbandry Department may also assist in providing health guards for animals and other technical guidance. Once the animal unit is economically viable, it will be a standing source of income for the shifting cultivators besides meeting the domestic requirements of milk, meat, egg etc.

National Environment Report on Shifting Cultivation:

In the environment report submitted by the Union Environment Ministry to the United Nations in 1992, has mentioned about the practice of shifting cultivation among the tribal people of the Northeast. The report reasoned out why the old practice became unviable and damaging. The report also stated that the increasing population and decreasing availability of land and the fall in the crop fallow period in shifting cultivation have

affected the cultivation process, reducing the cycle to more five years from more than 20 to 40 years in the past.

However, the study paper suggested that the new technologies need to be explored and interim mechanism be applied before replacing the old system, because the report added, "Changing practices is a slow process." The national paper also stressed on alternative farming in the hilly region, the report noted that the Department of Agriculture in Nagaland had identified experts who were said to have guided farmers in different parts of the state.

Terrace method is adopted by the Nagaland farmers to suit the hilly terrains by constructing terraces. The report explained: "During the monsoons, the fields are flooded. Rainwater is used for irrigation, canalized through indigenous bamboo conduits. Young rice plants are transplanted to the terraces, locally known as *'panikheti'* from the nurseries.

Bio-diversity of North Eastern Region of India:

According to famous Botanist Kunjilal (1940) the climatic factors of North East Region (NER) are high humidity (80-90%), frequent and heavy rainfall and moderate to mild temperature without extremes of heat or cold. The average rainfall is heavy but varies from 2,000 to 12,700 mm. The Brahmaputra flows through to the whole length of Assam valley with alluvial deposits on either sides. The NER is an area of rivers, hills and plains, extraordinary rich in vegetation: a part of the Khasi hills above the pine zone (2,000 m) is considered to be the richest, not only in India, but perhaps in the whole world. North Eastern Region is a genetic paradise, which is also recognized globally as an area of mega biodiversity. It is considered to be home for some crops and secondary center of origins for others. Unfortunately, this region is also classified as 'hot spot' area with regard to threat to biodiversity. Fire and agriculture practices in the form of shifting cultivation have influenced the forest and bio-diversity of the region for past 9000 years. (Sharma, 1976).The region is a store house of bio-diversity with its species richness of flora and fauna. The NER represents a wide range of physiography and eco climatic conditions and is endowed with vast and luxuriant vegetation ranging from tropical to alpine with rich gene pool of both wild and cultivated plant species (Chauhan and Wadhwa,1988).This calls for urgent steps for collection and conservation of the diverse

flora to halt genetic erosion. Among the cereals, pulses and oilseeds many of which have originated in this region; rice, rice bean and soyabean are the most important. Among others, considerable variability has been recorded in the germplasm of maize, millets, beans, cotton, pigeon pea and perilla.

Extent of Destruction of Forest in North East India Region:

A recent report released 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 the recent years. In the early 1990s, the state lost about 243 sq. km of forest to Shifting cultivation. In the same period, Shifting cultivation further deforested 100 sq. km in Meghalaya, 28 sq. km in Arunachal Pradesh and Manipur and 10 sq. km in Tripura.

In the past, the gap between successive shifting cultivation cycles used to be around 25 years, giving enough time for the forests and soil to regenerate. Today the lag is down to a few years and thus the regeneration become impossible.

Renewed cultivation has permanently rendered the land waste. Studies show that the topsoil loss in the shifting mode of cultivation is 40 tones per hectare, compared to a more three tones per hectare in conventional farming. Further, severe soil erosion on the hilltops and catchments areas causing silting of reservoirs and streams below.

As for example, in Meghalaya, unabated Shifting cultivation has turned the once thick evergreen forest belt of Cherrapunji a place, which used to record the highest rainfall in the world, into a dry, brown scar. The Shifting cultivation practice has caused extensive in to climatic changes in the state and destroyed rare flora and fauna.

Shifting Cultivation and Environmental degradation:

The swidden agriculture is blamed for most of the forest fires since uncontrolled flames during the field burning often burn 10 to 20 times the intended area. The fires do not only destroy protective vegetative cover, but also cause the loss of soil organic matter and associated soil structure decline.

Shifting cultivation also causes serious land degradation problems and prevents natural forest regeneration. The depletion of soil nutrients was due to over-cultivation of the shifting cultivation practice. Sedentary shifting cultivation with the rotating lands that

annually cover up to one million ha is the most expensive cause of the evolution of barren lands and land degradation in many parts of the world.

The traditional Shifting cultivation, in the condition of low population density and the absence of the market economy, presented itself a sustainable cultivation method and did not cause the inverse consequences to the environment and the society. However with in population density this status no longer exists. The actual consequences of shifting cultivation with reference to environment are described below;

Deforestation:

The most severe deforestation by shifting cultivation can be happened by two ways. Firstly, the new appeared pioneer shifting cultivators who transfer the land under fallow to people for money and then continue clearing forests for further cultivation. Secondly the forest fires are caused by uncontrolled flames during land clearance for shifting cultivation. Together with the social changes, the prevention measures against forest fire have been fallen into oblivion. The lands for shifting cultivation now are scattered, the forestland is no longer the ancestral property of the village, and therefore no punishment is applied for deliberate forest fires by the community. As a result, forest fires occur more frequently.

***Hydrological regime disruption*:**

The forests in the up streams of watershed contribute to the regulation of the hydrological regime in the region as the trees can help to increase the water retention of the soil in rainy season and reduce the evaporation in dry season. It has been well established that the forest loss increase the flood peaks and decreases discharges of the stream flow during dry period.

Downstream effects:

The soil erosion and hydrological regime disruption in the upper watershed are going to result in a range of downstream effects for its lowland and coastal region. More frequent and more serious flooding, more rapid siltation of irrigation channels and deposits of gravel as well as silt in delta areas have the effects in agricultural productivity and outputs of the lowland farmers and thus on their standard of living as well.

Weed Potential:

Weeds in agro ecosystems are generally considered to be plant that are out of place, that adversely affect crop growth, and that for a variety of reasons are difficult to control. Since weeds are often considers being competitive with crops for limited resources that are available in the system, much of the research effort have been directed towards looking at the decline in crop yield due to weed-crop competition Extensive studies on crop yield decline, in any case seem to suggest a world average loss of about 10 per cent due to weed growth.

The presence of weeds may cause rapid depletion of resources often resulting in reduced crop yield. The shading of crops by weeds is also an important factor. The reduction in monetary yield of 1.9 times under a 5 year shifting cultivation cycle compared to a 10 year cycle (yield per 5 year cycle versus yield per 10 year cycle) may partly be related to the weed problem along with poorer soil fertility recovery under shorter cycles.

As cultivation has to be done on young forest soil after short periods of fallow, the soil impoverishes the weed pressure increases, which require more labour input for weeding, and the rice yields are lower.

Desertification and land use:

Although shifting cultivation is the traditional land use of the Khasis of Meghalaya and their staple diet is rice and fish, the people living in Tytiang close to Cherrapunji have abandoned this land use system because of large scale desertification that has occurred. In many areas in the Khasi hills of Meghalaya, where forest have almost disappeared and the land is being desertified because of the reduction in Shifting cultivation cycle length to less than 5 years, the Khasis have adopted a fallow system of agriculture in which the burning operation of shifting cultivation is eliminated. The new system may cause even more rapid desertification of the landscape due to rapid depletion of soil fertility such that the fallow/sedentary agricultural systems often become uneconomic. This is because, the fallow regrowth is only herbaceous weeds that are ploughed back into the system and this alone is inadequate to sustain soil fertility.

Culture:

Majumdar (1978) who paved the way for study of culture change in the North East by taking two Garo Villages of Meghalaya for study. The study grew out of his field work in the Garo Hills of Meghalaya since 1953. He selected two villages namely Metchakolgiri and Wajadagiri. He found that to a certain extent, the phenomenon of change observed was ecologically determined. The main reason for culture change was found to be impoverishment of shifting land and adoption of wet paddy cultivation. Several forces were found to have jointly acted to impel a change in the method of cultivation in Wajadagiri and in the change over to other methods of earning a livelihood in Matchakolgoro. He found that in Wajadagiri in spite of a vital change in the system of agriculture, the people did not face a major crisis. Their society could be described as in a state of "eunomia". On the other hand, there was no such major change in any of its vital aspects of culture in Matchakolgiri; it was in a state which would be termed as "dysnomia". Majumdar gave a fine and solidly grounded account of all aspects of culture change, giving precise data on such topics as crops, land tenure and harvest and suggesting implications of changing subsistence patterns of the household, for extended kinship groups and for the village as a whole. He depicts how the whole situation he observed totally changed after a lapse of about a decade due to urbanization and modernization.

Socio-cultural aspects of shifting cultivation:

Shifting cultivation is being a part and parcel of socio-cultural life of the tribal people in North-East India; all its operations are inseparably linked with their religious rites and festivals. The festivals of tribes of N.E. India related to Shifting cultivation are given in the table. In spite of its adverse effects on the eco-system and low productivity (Borthakur et al, 1979), it still continues with them as a necessary evil for the following inherent characteristics as revealed in its analysis elsewhere (Abalu and D'silva, 1979):

1. Bulk of the labour force management and capital comes from the households;
2. Production is either consumed on the farm and /or traded in local markets;
3. The decision making process is hampered by limited accesses to marketing and political institutions; and

4. Most of the farmers do not live much above the culturally determined subsistence level.

The rationale behind the persistency of this system lies in its compatibility with the physico-social environment of sparse population, community land tenure system, undulating and steep topography, short crop cycle, rainy season and thereafter, acute moisture stress during post-monsoon period, as well as, meagre resources with the farmers and also the only available means of providing moderate calories and protein for the sustenance of families with minimum risk and the least income variability. This sort of socio-cultural equilibrium environment centering round shifting cultivation is, of course, gradually getting slackened under the impact of higher population, low yield, shortening of shifting cycle, new economic and social goals, as well as, incursion of modern science and technology with the dying out of tribal isolation from the main stream. In this context, the results of two pilot field investigations on "Socio-Agri-Economic" characteristics and attitudes of tribal farmers towards modern agricultural practices and village leadership pattern for Agricultural development" carried out by ICAR Research Complex, (Samanta, et. al.; 1978) in Meghalaya state in the year 1977-78 are worth mentioning:

1. The lower rate of adoption of agricultural innovations and the least favourable attitude towards them by the tribal farmers were found to be due to their lower educational levels, lower socio-economic status, small size of holdings and lower annual income;

2. As the village headman plays an important role in all round agro-economic development of the tribal farmers, training to the village headman regarding modern agricultural practices may help in adoption and diffusion of technological innovations.

The momentum of this change ushers in settled cultivation to prevail in some tribal communities, which is visible with three tribes of Angami in Nagaland, Apatani in Arunachal Pradesh and the Garos in Meghalaya.

Regarding rites and rituals and their connection with shifting cultivation clearly reflects that adoption of any new farming system may not provide facilities to worship the appropriate Goddess. The shifting cultivation is a traditional way of life itself. Hence the

introduction of settled cultivation among the tradition bound shifting cultivation will be a long process because it will contain itself the seed of a vital change of in their lives. Shift from shifting cultivation to settled cultivation may not only get cent per cent adoption when new cropping system is blended with the traditional festivals that are linked with shifting cultivation.

Thus, we should search cropping systems that conform to the traditional system, with ability to control over biophysical problems as well as increase in productivity on sustained basis.

Alternative Systems/techniques for shifting cultivation:

Various alternatives farming systems, techniques have been developed by farmers themselves, scientists in different parts of the world to control shifting cultivation. Some of the techniques are given below:

1. Fallow management strategies used by shifting cultivators in South East Asia as recommended by Dennis P. Garrity and Chun K Lai
2. Agro-forestry system developed by ICAR
3. Alternative farming system to Shifting cultivation developed by I.C.A.R Barapani, Meghalaya
4. Suggestion made by Ramakrishnan et.al.

Fallow Management:

Since shifting cultivators usually create one or more new fields every year, a household usually possesses a number of fallow fields of different ages and at different stages in the natural succession of the forest community. Thus the diversity of available useful resources is very high, probably even higher than in an undisturbed forest. This has a lot to be done with the fact that the fallow vegetation is being "managed". A fallow field is anything but "abandoned". In addition, most shifting cultivators in Southeast Asia have relatively poor upland soils and cannot draw on the type of nutrient stocks available to farmers working on relatively rich alluvial lowland soils. They are therefore strongly dependent on the ecological processes involved in the species succession of fallow vegetation. Good fallow management, therefore, is vital to them.

Fallow has the following important effects:

* Eradicates weeds;
* Restores soil fertility and brings back soil life;

* Provides forage land for livestock;
* Is a source of domesticated, semi-domesticated or wild food plants, and of protein from large or small wild animals;
* Is a source of herbal medicine, raw material for all kinds of domestic tools, crafts and other products of potential commercial value.

Spectrum of fallow management strategies have been used by the shifting cultivators in Southeast Asia.

* **Burning** of vegetation for easy clearing and nutrient activation also used to rejuvenate rangeland vegetation.
* **Slash and mulch** of fallow vegetation as an alternative to slash and burn to start a new production cycle.
* **Green manure / cover crops** for inter-and-relay cropping and seasonal fallows in annual systems to improve soil productivity: viney and non-viney legumes, composite and others.
* **Improved fallows:**
  – **Accelerated fallows**: Natural fallow vegetation improved with (N-fixing and non-N-fixing) trees, shrubs, legumes, and others to improve soil productivity.
  – **Enriched fallows**: Natural fallow vegetation improved with trees and shrubs of economic value.
* **Inter planted fallow**: N-fixing and non-N-fixing trees or shrubs for soil productivity improvement inter-planted in annual or perennial crops, for example, dispersed trees, alley's bushes, field borders in 'cut and mulch' or 'cut and carry' regime (with Alder trees)
* **Intercropping economic trees**: (timber and non-timber) with annual crops or shrubs for cash, shade or increased soil productivity, for example, taungya and other systems.
* **Analog (agro) forestry**: Consciously making use of the ecological processes involved in natural forest regeneration such as natural species succession and natural rejuvenation: annual crops, economic shrubs and trees, introduced pioneer (fallow) vegetation (N-fixing and non-N-fixing) and natural fallow and forest vegetation.

* **Managed and enriched fodder fallow** to intensify livestock production: trees, shrubs, legumes and grasses.

Agro-forestry Systems:

Agro-forestry has the potential to contribute directly to sustainable improvements in rural income and welfare, to reclamation of degraded agricultural lands, and to the conservation of tropical forests, through a role in expanding sustainable agro-forestry alternatives to slash and burn farming. Its primary aims are the production of food and wood and conservation and rehabilitation of soil resources needed for future production, at the same time maintaining and improving the quality of the producing environment. In the coming years growing population combined with increasing pressures on finite areas of agricultural land will make the food supply situation even more precarious. Sometimes it is said that agro-forestry is suitable only for marginal and brittle ecosystems. In reality it can be practiced on all types of agricultural lands, as it enables better utilization of the nutrients and water available in the soil as well as of solar energy.

Definition:

There are variations of the definition of agro-forestry system, but the most widely accepted definition is of the International Council for Research in Agro-forestry (ICRAF). According to it, Agro-forestry is a collective name for land-use systems and technologies where woody perennials are deliberately used on the same land management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agro-forestry systems there are both ecological and economical interactions between the different components. There are two main components in this definition. The first is the deliberate integration of trees with agricultural crops and/or animals on the same piece of land, and the second is the ecological and economical interactions between woody and non-woody components. The systems that lack of one from these two components cannot be classified as agro-forestry. Based on the ICRAF's definition, shifting cultivation itself, thus, is the oldest and most widespread form of agro-forestry.

Agro-forestry has been defined by Indian Council of Agricultural Research (ICAR) as "Sustainable land management system which increases the overall yield of the land, combines the production of crops (including tree crops) and forest plants and/or animals simultaneously or sequentially, on the same unit of land, and applies management

practices that are compatible with the cultural practices of the local population". Though agro-forestry is not new, during recent years its importance has increased dramatically especially as regards its potential for optimizing land use in the tropics

Agro-forestry systems can be classified into three basic categories based on their structure and functions

Agrisilvicultural systems are combination of crops and trees. They include Shifting cultivation, alley cropping, taungya, multilayer tree gardens, multipurpose trees and shrubs on farmlands, home gardens, windbreaks and shelterbelts, live-hedges fuel wood production and integrated multistoried mixtures of plantation crops.

Silvopastoral systems are combinations of pastures and/or animals and trees. They include protein bank (multipurpose fodder trees on or around farmlands), live fences of fodder hedges and shrubs, trees and shrubs on pastures as well as integrated production of animals and wood products.

Agrosilvopastoral systems are combinations of crops, pastures and/or animals and trees. They include home garden with animals, multipurpose woody hedgerows and integrated production of crops, animals and wood.

Impact of Agro-forestry on shifting cultivation:

Agro-forestry can be effectively practiced on lands subjected to shifting cultivation, on mountain ecosystems denuded of vegetation from biotic causes and in arid and semi-arid tracts. In agro-forestry two essential and related aims are:

a) The conservation and improvement of the site, and
b) The simultaneous optimization of the combined production of a forest crop and an agricultural crop.

Through proper selection of tree species, it should be possible to minimize soil erosion, to tap nutrients from deeper levels than those reached by the roots of agricultural crops, and to replace through leaf fall and fixation of atmospheric nitrogen the nutrients removed in the crop. However, success of this system depends on the incentives given, social amenities and services provided and marketing facilities arranged. So, like any other rural development scheme, an agro-forestry programme has to be considered with relevance to the social and economic development of the people. For successful implementation of agro-forestry, the institutional requirements are also important. The curricula and syllabus in training and educational institutions need to be properly oriented by making changes.

What is essential is that scientists and institutions should be "people oriented" and they should develop systems that are appropriate to the physical, biological and socio-economic conditions that prevail in the country.

Alternative farming system to Shifting Cultivation developed by ICAR, Barapani, Meghalaya:

Five years studies on Alternative farming system to shifting cultivation by ICAR, Barapani indicate that agriculture with bench terrace and contour bunds as conservation base can provide stable alternative to switch over from shifting to permanent agriculture system provided maintenance of conservation measures is properly done. Agro-horti system of land use with subsidiary source of income through live stock rearing provides most favourable indication in favour of adopting mixed land use system as an alternative to shifting cultivation on steep hill side. Such a system will certainly be technologically feasible, sociologically acceptable, ecologically sound and economically viable. Based on above facts and production behaviours, the land use pattern considered for hill slope is given below:

Table 2.1 : Land use pattern for hill slopes as an alternative to Shifting cultivation.

Slop	**Portion of total area**	**Land use**	**Conservation measures.**
Lower portion	1/3 rd	Agriculture	bench terracing
Mid portion	1/3 rd	Horti-pastor	half-moon terracing for horticultural plants and contour bunds.
Top portion	1/3 rd	Agro forestry	Contour bunds.

Source: Report on Shifting Cultivation, ICAR, Barapani

While considering the design of land use pattern of the kind mentioned above, the following advantages were the main points in its favour.

- Soil and fertility loss can be checked.
- Productivity can be adequately increased in the 1/3 rd terraced area by way of introducing improved crop production technology.
- Nearly same production can be obtained from 1/3 rd terraced area, what is obtained from entire area if under Shifting cultivation
- Subsidiary source of income can be generated form livestock rearing, meeting 100% feed requirement from by products and silvi-pastoral land use.

- The 1/3 rd area can be terraced by the family labours of the Shifting cultivation farmer.
- Development efforts of the Government will be greatly helped as more area can be covered within available resources.
- Since horticultural crops will be grown, the farmers will have long term interest in the land and when round the year cropping with good yield can be obtained from the lower terraces, a gradual attitude for permanent settlement will be induced. Even the farmers may eventually like to terrace the other areas themselves.
- The system will least interfere with their socio-cultural system. Even, the system can be adopted from the year when shifting cultivation farmer abandoned the shifting land. This will reduce the efforts required on land clearing.
- The system will help in preserving the ecology of the region.
- The system can be implemented in micro watersheds for proper management of resources.

The Shifting Agriculture (Jhum) and Sustainable Development for North-eastern India:

For improving the system of land use and resource management in North-eastern India, the following strategies suggested by Ramakrishnan, P.S and his co-workers are based on a multidisciplinary analysis. Many of these proposals have already been put into practice.

1) With wide variations in cropping and yield patterns under shifting agriculture practised by over a hundred tribes under diverse ecological situations, transfer of technology from one tribe/area to another alone could improve the Shifting cultivation, valley, land and home garden ecosystems. Thus, for example emphasis on potato at higher elevations compared to rice at lower elevations has led to a manifold increase in economic yield despite low fertility of the acid soils at higher elevations.

2) Maintaining a shifting cycle of maximum 10 years (this cycle length was found critical for sustainability, when shifting was evaluated using money, energy, soil fertility, biomass productivity, bio-diversity, and water quality as currencies) by greater emphasis on other land-use systems such as traditional valley cultivation or home gardens.

3) Where shifting cycle length cannot be increased beyond the five years period that is prevalent in the region. Therefore, redesign and strengthen this agro-forestry system incorporating ecological insights on tree architecture (e.g. the canopy form of tree should be compatible with crop species at ground level so as to permit sufficient light penetration and provide fast recycling of nutrients through fast leaf turnover rates). Local perceptions are extremely important in tree selection, for introduction into the cropping and fallow phases of shifting, as is being done in Nagaland.

4) Improve the nitrogen economy of shifting cultivation at the cropping and fallow phases by introduction of nitrogen-fixing legumes and non-legumes, like the Nepalese alder (*Aldus nepalensis*). Another such example is the lesser-known food crop legume *Flemingia vestita*, traditionally used by tribal as an important species when shifting cycles decline below five years

5) Some bamboo species highly valued by the tribal, can concentrate and conserve important nutrient elements such as nitrogen, phosphorus and potassium. They could also be used as windbreaks.

6) Speed up fallow regeneration after shifting cultivation by introducing fast growing native shrubs and trees.

7) Condense the time-span of forest succession and accelerate restoration of degraded lands, based on an understanding of tree growth strategies and architecture, by adjusting the species mix in time and space.

8) Redevelop village eco-systems through the use of appropriate technology to relive drudgery and improve energy efficiency (cooking stoves, agricultural implements, biogas generation, small hydroelectric projects, etc.). Promote products based on leather, bamboo and other woods.

9) Strengthen conservation measures based upon the traditional knowledge and value system with which the tribal communities could identify, e.g. the revival of the sacred grove concept based on cultural tradition which enabled each village to have protected forest.

10) In the ultimate analysis, have an integrated approach for land use development in a given ecological and cultural landscape; base on short-term sustainable livelihood strategy on traditional ecological knowledge and technology and long term sustainable development on ecological and economic combinations to avoid social options.

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CHAPTER – III

RESEARCH DESIGN

RESEARCH METHODOLOGY

The study was carried out in the two hill districts of Assam, namely Karbi Anglong and North Cachar hills district. The study was taken in these two hill districts because shifting cultivation is pre-dominated in this two hill districts of Assam only. The study is based upon on both secondary and primary data.

Variables: The major economic variables studied are costs and returns from crop enterprises, costs and return from livestock enterprises, environmental variables like bio-diversity, soil nutrients, soil erosion and run-off, social variables like age, sex, education and family size and *puja,* religious rites and festivals etc. are cultural variables.

Secondary data: Secondary data are on demography, economy, soil fertility, bio-diversity, Shifting Cultivation practice and Governmental schemes for controlling shifting cultivation. The secondary data have been collected from different sources viz; statistical year books, journals, magazines, newspaper etc. The following are the institutional sources of secondary data:

	Organization	**Location**
1.	North Eastern Council	Shillong
2.	IFAD, Natural Resource Management Project	Shillong
3.	ICAR Research station for Hill Region, Barapani	Shillong
4.	NEHU, Department of Anthropology, Economics and Geography	Shillong
5.	Hill Research Station, Assam Agricultural University	Diphu
6.	North East Regional Institute of Land and Water Management	Tezpur
7.	North Eastern Regional Institute of Science and Technology	Itanagar
8.	Omeio Kr Das Institute of Social Science	Guwahati
9.	Tribal Research Institute of Assam	Guwahati
10.	Divisional Forest Office, Karbi Anglong	Diphu
11.	Divisional Forest Office, N. C. Hills District	Haflong
12.	Soil conservation office, Karbi Anglong	Diphu
13.	Soil Conservation office, N. C. Hills District	Haflong

Primary data:

A sample survey of 300 shifting cultivators selected through convenient sampling technique.

The composition of the sample is given below:

Geographical division	Number of respondents
Karbi Anglong districts	150
N.C.Hills districts	150
Total	**300**

Ethnical division	Number of respondents
Karbi	103
Dimasa	118
Minor-tribe	43
Non-tribe	36
Total	**300**

Though the populations in two districts differ but the minimum sample from each district (justification given below) with equal numbers were selected having tolerance level of significance by adopting crude method.

Tolerance level: How much sample can be taken irrespective of population size

Sample size = $1/(\text{Error})^2$

$= 1/(0.0812)^2$

$= 153$

Justification of minimum sample size:

Following are reasons for justification of sample size;

Difficult terrain: In the Karbi Anglong and N.C. Hills district most of the villages are remotely located and in some parts the ethnic conflict between the tribal and non-tribal population is predominant. Both the districts are hilly with undulating topography leading to difficulty in transportation. Topographical reason and ethnic conflict acted as impediment in further data collection.

Lack of communication facilities: In the hill areas of Assam roads are not properly developed and roads are damaged by the erosion and floods in the rainy seasons. Only few buses are running in irregular interval with heavy loads and of passengers and goods.

Households scattered and sparsely populated: In hill areas population density is less. In shifting cultivation areas, villagers are temporary and they frequently shift their locations due to epidemic, drought and presence of wild animals. Villages have few households and these households are scattered across the place.

Language problem: In hilly areas many ethnic communities are found and they speak their own language. Most of the villagers do not know regional or national language. Therefore, it is very difficult to communicate with each and every one.

Observations and case studies and personnel interview methods were used to collect primary data from households through interview schedule.

The primary data collected includes:

- **Information and data on shifting cultivation and agricultural production**: land size, household's land use patterns, cultivation time on the same plot and fallow period for shifting cultivation, varieties used and time for first use, total production and output prices, fertilizer and agrochemical application.
- **Information on environment**: reasons for yield decrease or increase, knowledge on soil conservation methods, natural and planted forests allocated and methods for preservation, local market condition for products.
- **Household data**: family size, age structure of the household, working force of the household, education level of the family members, family income and assets, time of food shortage and survival sources during this time, reasons for livelihood improvement or impoverishment, credit availability.

The personal communication and interviews with the traditional and modern village headmen, technical officials and local authorities were also implemented in order to obtain the additional information and data on traditional social life and shifting cultivation practice of people and on the operation of governmental organizations at research site.

Statistical tools like cross tabulation used to analyze the data. The mass of data thus collected has been systematically arranged and various diagrammatical tools like line, pie and bar diagrams are used to present the data.

CHAPTER – IV

STUDY AREA PROFILE

The state of Assam endowed with fertile river valleys and green mountains has been the abode of various tribes with rich cultural heritage since remote past. Assam has always been known for her forest wealth[1]. The tribal communities have entered into the Assam state from their original habitats through different routes at different intervals of time and have permanently settled here. The tribes of Assam may conveniently be classified into two main categories- the plains tribes and the hill tribes[2]. The plains tribes are exclusively found in the Brahmaputra and Barak Valleys of the state. On the other hand, the hill tribals are mainly concentrated in the two autonomous hill districts of Karbi Anglong and North Cachar Hills, which are commonly referred to as the Hill areas of Assam[3].

The Karbi Anglong district located between latitudes $25^0 30'$ and $26^0 41'$ N and longitudes $92^0 7'$ and $93^0 52'$ E. It is bounded on the north by Nagaon and Golaghat districts, on the South by the North Cachar Hills district, on the east by Golaghat district and Nagaland and on the west by Meghalaya[4]

The district happens to be the largest district in the state of Assam, covering a total geographical area of 10,434 Sq. Km. As per 1991 census the total population of the district is 6,62,723[5]. On the whole the district covers 13.3% and 2.95% of the state's total area and total population respectively. The important rivers of the district are Kopili and Dhansiri. The tributaries of Kopili are Barapani, Umium, Amreng, Kolonga and Jamuna etc. while those of Dhonsiri are Kaliani, Nambar, Deopani and Doigrung etc. The highestpeak in the district is the Singhason (1357 meters) located at East Karbi Anglong. Physio-graphically, the district consists of two hilly lobes which genetically belong to the Shillong plateou. The two lobes are separated by the Kopili Valley. The eastern lobe is dome shaped and approximately doubles the size of the western lobe[6].

The district of North Cachar Hills lies between latitudes 25^0 and $25^0 45'$ N and longitudes $92^0 30'$ and $93^0 30'$ E. It is bounded by Karbi Anglong and Nagaon districts on the north, Cachar district on the south, Nagaland and Manipur on the east and Meghalaya on the west. The district with a total geographical area of 4,888 Sq. Km. Covers a total population of 1,50,801 thus having 6.2% and 0.67% of the states total

area and total population respectively. The northern flanks of the Barail range and the eastern flanks of the Jayantia hills constitute the North Cachar Hills. The highest peak Hempeupet (1571 meters) is located at the Barali range. Diyung is the longest river (170km) of the district. Originating from the Barail range it flows to join Kopili at Diyungmukh. The tributaries of this river are Langting, Lumding and Mohur etc. Again, Jatinga, Jiri and Chiri rising from the North Cachar Hills become the tributaries of Barak, the principal river of the Cachar district of Assam[7].

The two hill districts were, in fact, two subdivisions of the United Mikir and North Cachar Hills district which was inaugurated on November17, 1951 and created (03.11.50) by carving out certain portions of Nagaon, erstwhile Sibsagar and United Khasi and Jayantia Hills districts and the whole of the North Cachar subdivision of Cachar district. On February 2, 1970 North Cachar was declared as a September civil district while the remaining portion, i.e. Mikir Hills subdivision was constituted into Mikir Hills district which was again rechristened as Karbi Anglong in 1976[8].

In accordance with the provisions of the Sixth Schedule to the constitution of India, the North Cachar Hills district Council and the Karbi Anglong (Mikir Hills) district council came into existence. On April 20 and June 23, 1952 respectively. The powers and functions of the District Councils may be broadly divided into four heads- Legislative, Executive, Financial and Judicial. Each council has tenure of five years. The District Council budget consists of two sections-Council Sector and State Sector. The Council Sector budget is entirely dependent upon the revenue collected through the Taxation Department of the Council while the State Sector is financed jointly by the Centre and the Government of Assam[9].

The Karbi Anglong district has three civil subdivisions viz., Diphu, Hamren and Bokajan while the North Cachar Hills district has two civil subdivisions viz, Haflong and Maibang. It may be noted here that Bokajan and Maibong subdivisions have came into existence on August 15, 1989 and November 17, 1987 respectively. Again, there are 4 Revenue Circles, namely, Phulani, Diphu, Silanijan and Donka in Karbi Anglong and 3 Revenue Circles, Namely, Haflong, Maibang and Harangajao in North Cachar

Hills. Moreover, the number of Development Block is 10 and 4 in Karbi Anglong and North Cachar Hills respectively[10].

According to 1991 census the autonomous hill districts of Assam i.e. Karbi Anglong and North Cachar Hills together cover a total geographical area of 15, 322 Sq. Km. Out of the State's total area of 78,438 Sq. Km. The total population of the two districts is found to be 8,13,524 against the State's total population of 2,24,14,322. In other words, the two hill districts cover 19.5% of the total geographical area and 3.6% of the total population of the state[11].

People:

The Scheduled Castes and Scheduled Tribes orders (Amendment) Act, 1976 specifies the following fourteen tribes in the two hill districts of Assam (1) Chakma, (2) Dimasa Kachari, (3) Garo , (4) Hajong, (5) Hmar, (6) Khasi, Jayantiya, Synteng, Pnar, War Bhoi, Lyngnam (7) any Kuki tribe (8) Lakher (9) Man (Tai speaking) (10)Any Mizo (Lushai) tribe (11) Mikir (Karbi) (12) Any Naga tribe (13) Pawi and (14) Syntheng. Again, according to the same Act, the following nine tribes have been scheduled in the state of Assam, excluding the autonomous district (1) Barmans in Cachar (2) Boro, Boro-Kachari (3) Deori (4) Hojai (5) Kachari , Sonowal(6) Lalung(Tiwa)(7) Mech (8) Miri (Mishing) and (9) Rabha.

The Karbi Anglong district is inhabited by the Karbis, Bodos, Tiwas, Dimasa Kacharis, Rengma, Nagas, Garos, Kukis and Shyams etc. while the North Cachar Hills district is inhabited by the Dimasa Kacharis, Jeme nagas, Hmar, Kukis, Mizos, Karbis and Khasis etc. As a matter of fact, the major concentration of the Karbis is found in the Karbi Anglong district. On the other hand, the North Cachar Hills district is predominantly inhabited by the Dimasa Kacharis[12].

The Karbis:

The Karbis, mentioned as the Mikirs in the constitution order, Govt. of India, constitute an important ethnic group in the hill areas of present Assam. However, they never call themselves Mikir but call themselves Karbi and sometimes Arleng, which literally means a man. The name Mikir is that given to the race by the Assamese; its origin is

unknown. Although at present they are found to inhabit the Karbi Anglong District, nevertheless, some Karbi inhabited pockets are found in the North Cachar Hills, Kamrup, Nagaon, Morigaon, Golaghat, Lakhimpur and Sonitpur districts also. Moreover, their settlements are known in Nagaland, Meghalaya, Manipur and Arunachal Pradesh. It is often heard that the Karbis are living in Sylhet of Bangladesh and Myanmer also. Racially the Karbis belong to the Mongoloid group and linguistically they belong to the Tibeto- Burman group. The Karbis, along with others entered Assam from Central Asia in one of the waves of migration. It is very difficult to trace the history of the early settlement of the Karbis bereft of any written documents and other evidence like archaeological remains, etc. According the Stock and Lyall the original abode of the Karbis was the eastern portion of the Khasi and Jaintia Hills bordering on the Kopili River. The folklores of the Karbi, however, indicate that during the long past once they used to live on the banks of the rivers the Kalang and the Kopili and the entire Kaziranga area, the famous National Game Sanctuary of Assam, was within their habitation. During the reigns of the Kachari Kings they were driven to the hills and some of them entered into Jaintiapur, the erstwhile Jaintia Kingdom and lived under the Jaintia Sovereignty. Those who continued to live under the sovereignty of the Jaintia King had to face constant harassment at the hands of the Jaintias and this had compelled them to migrate new world. A good number of them had entered into the Ahom territory and prayed for protection from the Barphukan at Raha. Thus migration took place at the beginning of the 17th Century. The Karbis who migrated to the Ahom Kingdom had to face the Burmese invasion. The Burmese who invaded Assam perpetrated inhumane oppression on the people. The Karbis took refuge in the deep jungles and high hills leaving their hearth and home in the sub mountainous regions. The British found them to be quite a peaceful people and there had not been any hostility between the British and the Karbis.

Clans.

The Karbis have five clans called "Kur". These are Terang, Teron, Ingti and Timung. Each of the five clans has a number of sub-clans. While Ingti and Timung have 30 (thirty) sub clans each, Terong and Teron have 6(six) sub clans each and the remaining

clan Ingti has only 4 (four) sub-clans. These clans are completely exogamous and marriage between a boy and a girls belonging to the same clan can never take place since the children of the same clan are considered as brothers and sisters. Cremation found called Tipit or Thiri, area is kept demarcated for each clan. Although all the five clans are socially on an equality. Ingti, being a priestly clan was supposed to have a higher status in former times.

Demographic characteristics:

As per 1961 census the total population of the Karbis was 1,16,887 and this had gone up to 8,12,320 (52% males and 48% females) in 2001 census. The Karbis constituted 3.05 percent of the total population in the state of Assam in 2001 and 11.89% of the total tribal population of the state. Their percentage of literacy as per 2001 census was 48.33 and level of literacy between the males and the females was 60.56 percent and 39.44 percent respectively against the state percentage of 53.79 % (58.10% males and 412.90 females) As per 2001 census 88.58 percent people living in rural areas and 11.42 percent people living in urban areas, 1000 males there were 992 females (sex ratio). Population density (per Sq. Km) was 78 against 340 of state as per 2001 census.

Religion:

From the point of view of religion the Karbis can be regarded as animists Hinduism in its crude form finds manifestation in their worships of Gods, Goddesses and deities. They believe in the immortality of the soul, life here after and reincarnation. "Arnam Sansar Recho" or God Almighty is considered to be the creator of this universe. Among the innumerable deities, Some are considered to be benevolent and some malevolent. Each disease is associated with as presiding deity. Hemphu and Mukrang are two benevolent household gods. For the appeasement of the deities the Karbis observe many religious rituals throughout the year where the sacrifice of pigs and birds and use of rice beer are indispensable. They also believe in witchcraft and black magic. Karbis do not have any idol, temple or shrine. They do not worship trees and animals. A smaller section of the Karbis has embraced Christianity.

Family Structure, Birth, Death and Marriage:

The Karbi follow the patriarchal system of family structure and as such the father is the head of the family and his authority, as such, is undisputed. The line of descent is traced through the male members only. The head of the family, his wife, their children, the unmarried brothers and sisters constitute the family. The brothers start living separately as soon as they get married. A Karbi family, therefore, is a unitary one. Joint family system is also still prevalent to a very limited extent.

The birth of a child whether male or female is an occasion for joy in the family in the sense that a person died earlier in the family is supposed to be reborn in the same family. Death in the family, on the other hand, is considered to be the most tragic incident in the family. For the cremation of the deceased the Karbis observe some specific rules and regulations and they believe that non-observance of them might lead the family to great troubles in near future. They perform the death ceremony called chomongkan at a later date for the eternal pace of the deceased, it is the most elaborate and expensive socio religious ceremony of the Karbis which continuous for four days and four nights non- stop. In respect of marriage clan exogamy is strictly followed. Since the violation of this customary law leads to ex-communication, which is rather a severe punishment, this marriage taboo is rarely violated. Although monogamy is the prevailing practice, there is no bar to polygamy and the cases of polygamy are very rare. Marriage by negotiation and marriage by selection of life partners are prevalent among the Karbis.

Houses:

A typical Karbi hut is neither too small nor too big. It is built on a bamboo platform using timber posts for super structure. The platform is several feet high above the ground. For roofing purpose, thatch is used. The walls made of split bamboos are mud-plastered. The house is divided into two parts lengthwise. The front part or room with a hearth at the center is called Kam or guestroom while the inner chamber called Kut is

used as the living room for the family members. A wooden or bamboo ladder is used as an approach to the front varanda. Cattle are generally kept under the bamboo platform.

Socio-culture:

Shifting Cultivation being a part and parcel of Socio-cultural life of the Karbi people of North-East India, all its operations are inseparably linked with their religious rites and festivals, viz, Agalmaka, Miamua, Rongchugala and Ahia om Mikir Hills. In spite of its adverse effects on the eco-system and low productivity, it still continues with them as a necessary evil for the following inherent characteristics –

(a) Bulk of the labour force management and capital comes from the households;
(b) Production is either consumed on the farm or traded in local markets;
(c) The decision making process is hampered by limited access to marketing and political institutions; and
(d) Most of the farmers do not live much above the culturally determined subsistence level.

The rationale behind the persistency of this system lies in its compatibility with the physico-social environment of sparse population, community land tenure system, undulating and steep topography, short crop cycle, rainy season and thereafter, acute moisture stress during post-monsoon period, as well as, meager resources with the farmers and also the only available means of providing moderate calories and protein for the sustenance of families with minimum risk and the least income variability. This sort of socio-cultural equilibrium environment centering round Shifting Cultivation is, of course, gradually getting slackened under the impact of higher population, low yield, shortening of Jhum cycles, new economic and social goals, as well as, incursion of modern science and technology with the dying out of tribal isolation from the main stream.

The Dimasa Kacharis of Assam:

The Dimasa Kacharis are a Scheduled tribe in the autonomous Hill Districts of Assam. Their present abode is confined mainly into the North Cachar Hills District. They are, however, found in small-scattered groups in Dhansiri, Mahangdihua (Manga), Hawaipur and some interior areas of the Karbi Anglong district also. The Dimasa

Kacharis belong to the Bodo group of people. Linguistically the Dimasas belong to the Tibeto-Burman family. The origin home of Tibeto-Burman family was in Western China near the Yong-te-Kiang and the Howangho rivers from where they went down the courses of the Chindwin and the Irawadi and then the Brahmaputra and started settling down in the valleys of these rivers and also remote hills adjacent to the valleys.

The term "Dimasa" literally means the children or descendants of a big river, meaning children of Brahmaputra "di" means water, "Ma" means big and "Sa" means Children.

Clan: The Dimasa Kacharis have 40 (fourty) male clans called SENGPHANG and 42 (fourty two) female clans called JULU or JADDI. The existence of female clans along with the male clans is the most outstanding feature of the social life of the Dimasas and such a division of clans on the basis of sex is very rare among the tribal societies. Moreover the female clans are numerically more than those of the males.

A list of SENGPHANGS and JULUS or JADDIS is given below:

SENGPHANGS (male clans)

1. Adaosa	2. Dader Bhagia	3. Bodosa/Batarisa
4. Daudungangthasa	5. Daulagupusa	6.Daolagajaosa
7. Diphusa	8. Dibragadesa	9 Disausa
10. Gorlosa	11. Girisa (Lonf Mailai)	12. Haflongparsa
13. Hagjersa	14. Hakmaosa	15. Haphilasa
16. Hasnusa	17. hohaisa	18 Jongthongsa
19. Jongthongsa	20. jareambusa	21. Kersa
22. Kampraisa	23. Kharigabsa	24. laftaisa
25. Langthasa	26. Laobangdisa	27. Maibangsa

28. Mramsa	29. Mitherfangsa	30. Nabensa
31. baidingsa/ Gainisa	32. Nunisa/ Londisa	33. Perbarsa
34. Phonglosa	35. Rajyongsa	36. Riaosa
37. Singyungsa	38. Gurungfangsa/Phurusa Warisa	39. Thaosensa
40. Zigdungsa		

JULU/JADDU(female clans)

1. Bairengma	2. Bairengsama	3. Banglaima Daoga
4. banglaima Gedeba	5. Banglaima Khaseba	6. Barranima
7. Buguma	8. Desriknima	9.Draingsongma Daoga
10. Draingsongma Gedeb	11. Draingsongma Khaseba	12. Diyungma
13. Hamlaigumundima	14. Kumbasingma	15. Madaima
16. Mairangma	17. mairangma Daoga	18. Mairangma Gedeba
19. Mairangma Khasaba	20. Mairangma Phasaidi	21.Mairang Praisong
22. Mayungma	23. Miyungma Doaga	24. Miyungma Gedeba
25. Miyungma Khaseba	26. Pakhajima	27. Panthaobarjilu
28. Rajama	29. Ransaidima	30. Ranima
31. Phasaidima Daoga	32. Phasaidima Gedeba	33. Phasiadima Khaseba.
34. Sasdima Daoga	35. Saidima Gedeba	36. Saidma Khaseba
37. Sagaodima	38. Sagaoson Parain	39. Saikhudima
40.Sander Sagaedi	41. Tharnjikma	42. Ymathondiraoma

Demographic characteristics:

As per 2001census the total population of the Dimasa was 1,86,189 (53.12% male and 46.88% female). The district has 0.70 percent of total state population. As per 2001 census 68.81 percent people live in rural areas and 31.19 percent people living in urban areas which are higher than state rural urban ratio. The sex ratio was 883, density of population only 38 against 340 of state population density. Regarding literacy percent, the district 57.56 percent literate peoples in which 59.71% male and 40.29% female. The district occupies 6.23 percent of state total area 99,000, scheduled tribe population which 3.45 percent of state scheduled tribe population[13].

Religious life:

The Dimasa consider themselves to be Hindus although they have their traditional gods and goddesses. Among the six ancestral gods, Sibrai/Shivraj being the eldest is the most important and in every worship his name is to be uttered first. Sibrai or Shivaraj is equated with Hindu Siva, and Ranchandi with Parbati or Kali. The Hindu goddesses Lakshmi and Saraswati have already made a place for them in the Dimasa religion.

But the most noteworthy feature of Dimasa religion is the abode of gods and goddesses. They believe that gods and goddesses residing in a particular Daikho protect the people and control their destiny[14].

Family:

A Dimasa family generally consists of the head of the family, his wife their unmarried sons and daughters and the unmarried brothers and sisters of the head of the family. Marriageable daughters and sisters when given in marriage have to live in the houses of their husbands after spending one year in their own houses along with their husbands.

Marriage:

The Dimasa society has also its own system of marriage. The male clans and the female clans are exogamous and no marriage can take place between the boys and the girls of the same clan whether be it patrician or matricial, and however distantly related they might be. Many Dimasa families do not like to send their daughters to the bridegrooms' houses and the boys are required to stay in their father-in-laws' houses for a period of one year. This custom is called ***minihawaba***. This custom, however, is losing its ground

as many of the boys do not like to follow it when the period of ***minihawaba*** is over, the couple lives in a newly constructed house erected either near the brides house or the bridegroom's own house in the village. Monogamy is the prevailing practice among the Dimasa although there is no bar to polygamy. Divorce is allowed in the Dimasa society but the incidence is not of greater significance[15].

Dimasa concept of life and death:

The Dimasa concept of life and death does not fundamentally differ from the Hindu concept of life and death. They believe that while the body is subject to death and decay its soul or spirit never dies. They also believe life hereafter and in the rebirth. The deceased is supposed to be reborn sooner or later either in the same family or in the family of a relative. If the death ceremony is not properly performed and ceremonial offering of food and drink does not take place during the celebration of annual harvesting festival of Bishu, the spirit of the deceased will not fine a place in the other world and it will roam with great misery in the vicinity of the village[16].

In Dimasa society all operations of shifting cultivation were performed with religious awe and the series of annual rites and festivals were linked with different stages of shifting cultivation. After allocation of plots each house hold performed a religious rite in the plot. The *agalmaka* rites make burning and planting. The *miamua* rites are performed by the *nokma* (representative of the land owing clam) at the time of fruiting of the rice plants. The rongchugala and ahia rites mark the lifting of taboo on certain plants and vegetables of the shifting cultivation. The agricultural activities of the year culminated in the grand wangala rites and festivities to mark the end of harvest and also to mark the close of the agricultural season. Wangala rites are performed in honors of *Saljong*, the Sun-god, who is the ultimate bestowed of crops. All these rites involve festivities, in which rich man can demonstrate their wealth which adds to their prestige. The traditional rites and festivals importance is decreasing along with the decline of shifting cultivation.

TABLE 4.1: General Profile of the two hill districts of Assam

Sl. No.	Particulars	K. A	N.C.	Assam
1	Population (As per 2001 census)	8,12,320	1,86,189	2,66.38,407
2	Percent of population to state population	3.05	0.7	100
3	Percent of male population	52.02	53.12	51.76
4	Percent of female population	47.98	46.88	48.24
5	Percent of rural population	88.58	68.81	87.28
6	Percent of urban population	11.42	31.19	12.72
7	Sex- ratio (female per 1000 male)	992	883	932
8	Density (per sq. km)	78	38	340
9	Percent of literate population	48.33	57.56	53.79
10	Male literacy percent	60.56	59.71	58.1
11	Female literacy percent	39.44	40.29	41.9
12	Area (in sq. km)	10434	4888	78,438
13	Percent of Area to state area	13.3	6.23	100
14	Scheduled Tribe Population ('000)	342	99	2874
15	Scheduled Caste Population ('000)	28	4	1659
16	Sub-division	3	2	49
17	Block	11	5	219
18	Revenue Circles	6	4	155
19	Mahkuma Parishades	-	-	42
20	Gaon Panchayat	-	-	2490
21	Number of Villages	2843	640	26247
22	Number of towns	6	4	125
23	Gross District Domestic Product (1997-98)			
	a) Primary Sector (Agril, Forestry, Fishery)	29040	12138	1037751
	b) Secondary Sector(Manufacturing ,Gas, Electricity, Water supply, Construction)	10274	4807	378459
	c) Tertiary Sector (Transport, Storage & Communication, Trade, Hotel & Restaurant banking)	20019	7425	864392
	d)Total	59333	24371	2280602
	e)Per capita Gross District Domestic product	7911	14169	8989
24	Percent of Population by Religion			
	a) Hindu	84.82	72.92	67.13
	b) Muslim	1.57	2.21	28.43
	c) Christians	12.48	24.48	3.32
	d) Other religious & Persuasions	0.01	-	0.62
	e) Sikhs, Buddhists & Jains	1.52	0.36	-
	f) Religion not stated	-	0.03	0.05
25	Languages speaking			
	a) Assamese	64911	4920	12958088
	b) Bengali	73325	23698	4356532
	c) Hindi	63188	8330	1035474
	d) Tribal Languages	415965	99679	2808417

Source: Statistical Handbook of Assam, 2000

Table 4.1 presents General profile of the two hill districts of Assam. The table shows data on demography, administrative and economy of two hill districts of Assam. From the table it is clear that Karbi Anglong and N. C. Hills district plays an important role in state economy

This chapters presented profile of two hill districts of Assam. It includes natural resources, ethnic group composition, culture, food habits, and demography of the two hill districts. The information on profile of two hill districts is necessary for proper planning and sustainable management of resources.

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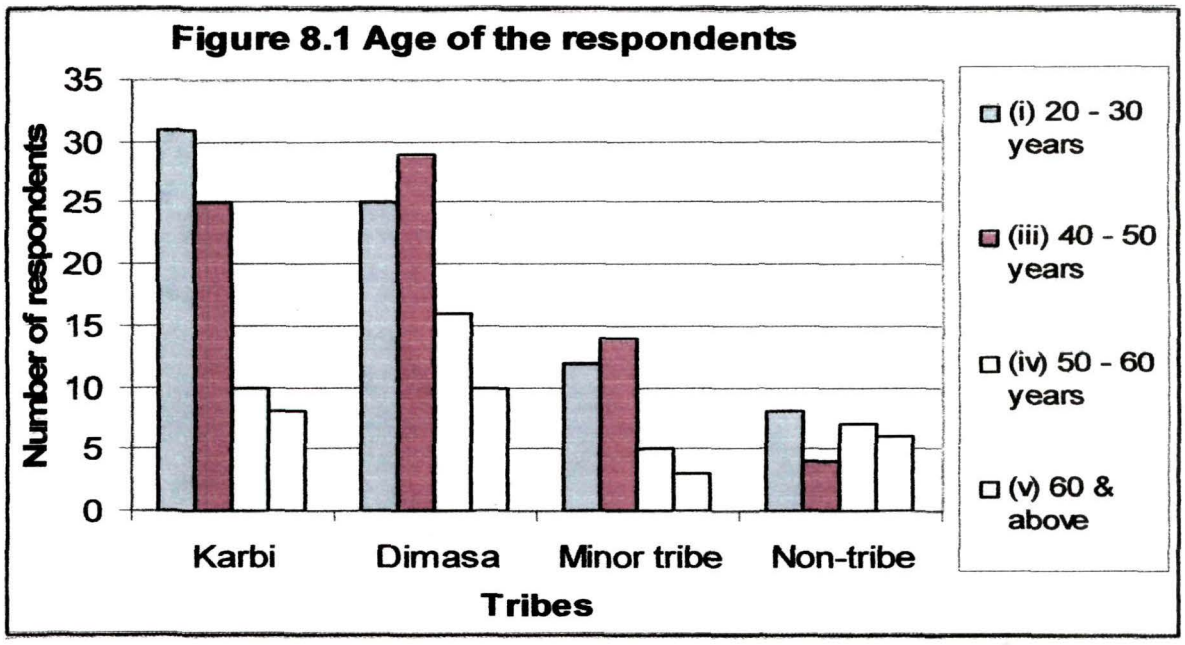
CHAPTER – V

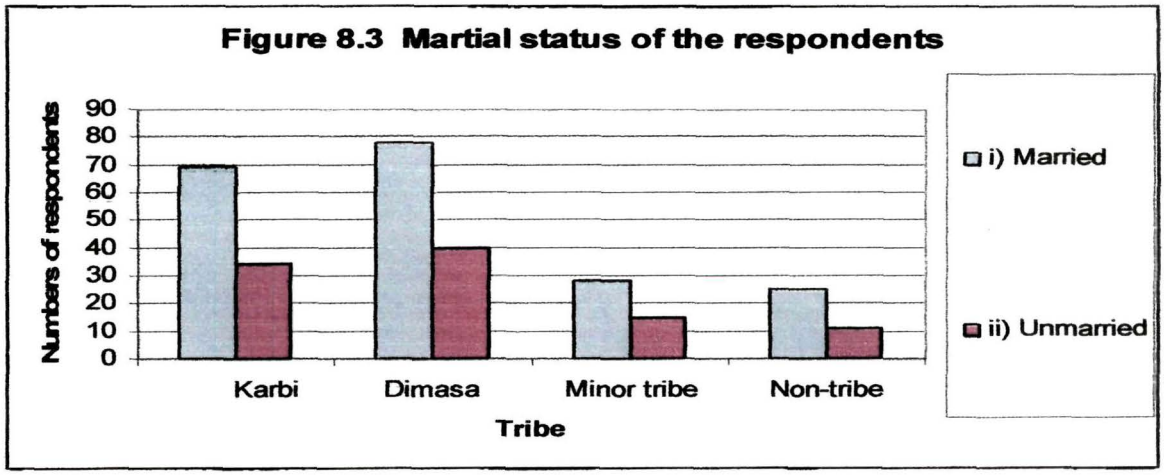
SHIFTING CULTIVATION PRACTICES FROM SOCIO-CULTURAL PERSPECTIVES

Socio-Economic Profile:

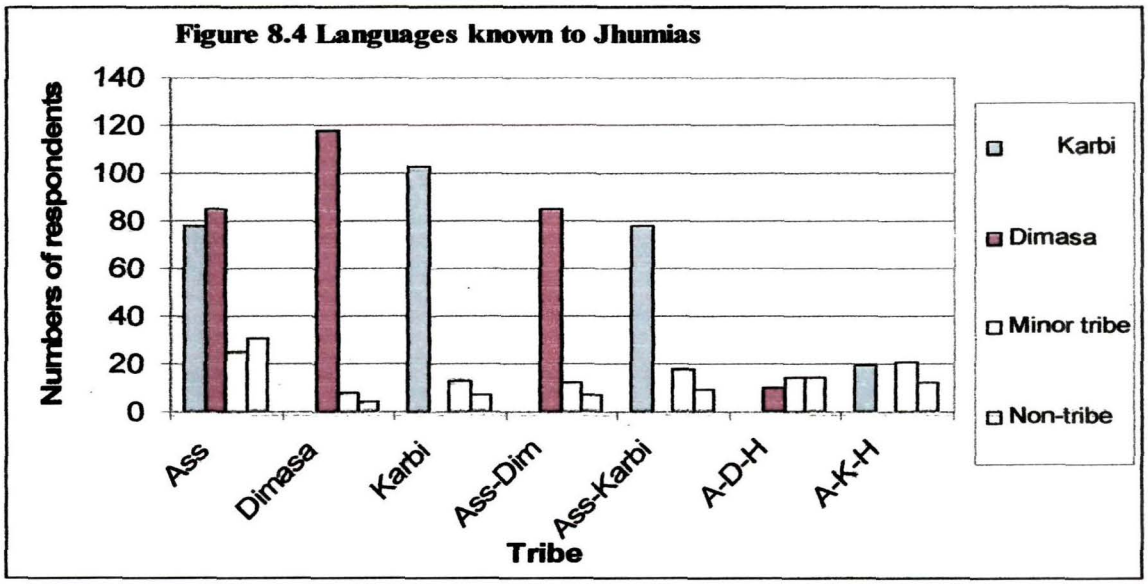
In this chapter an attempt is made to present a brief account of the socio-economic profile of the respondents, such as age, religion, martial status, languages known, sex, family system, education system, family members and occupation pattern were presented. The details of the analysis are presented below. (Tables are in Appendix). Such a study has relevance in determining not only the size and quality of labour force and resources available in different categories of households but also the type of crops and other economic activities that can be taken up so as to improve their socio-economic well being.



As regards age of the respondents, it is observed from the table that 29.00 per cent of the respondents belonged to the age group of 30-40 years, 25.33 per cent respondents were 20-30 years, 24.00 per cent respondents were 40–50 years, 12.67 per cent respondents were 50-60 years and the remaining 9.00 per cent were 60 & above age group. As a whole it is understood that majority of the respondents belonged to the young and middle age groups. Ethnicity wise shows that 32.56 per cent respondents were 40-50 years, 32.20 per cent Dimasa respondents were 30-40 years, 30.10 per cent Karbi respondents were 20-30 years and 16.67 per cent Non-tribe respondents were 60 & above age groups.

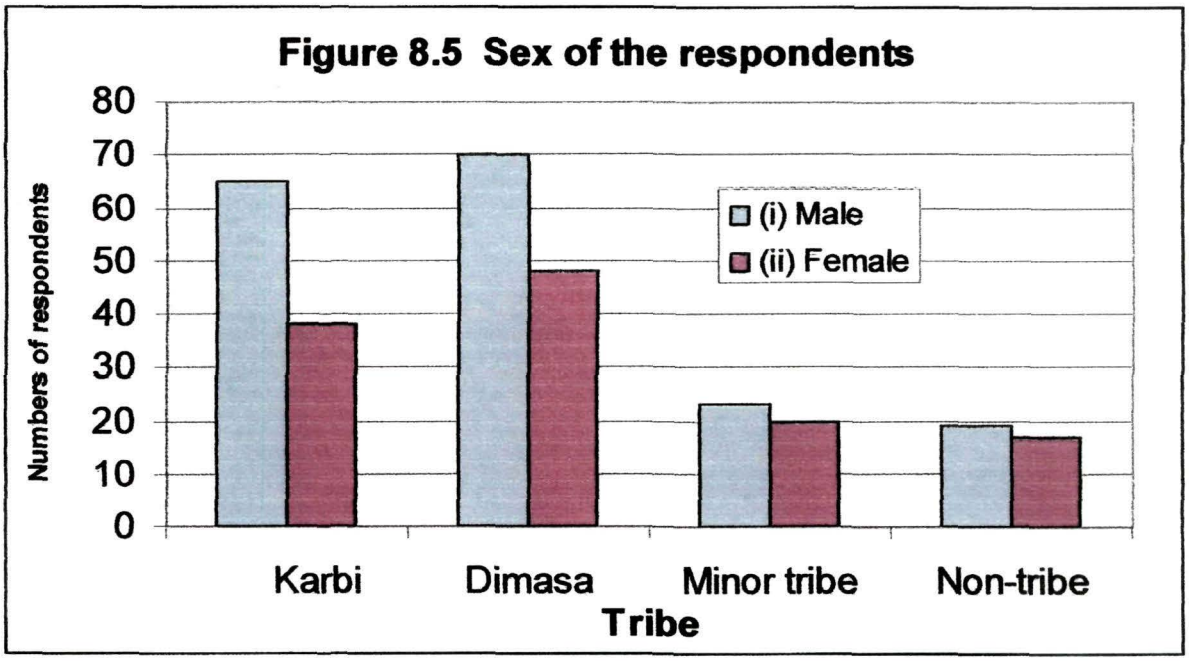


Pertaining to martial status of the respondents, from the table it is seen that a great majority (66.67 per cent) of the respondents were married. Ethnicity wise shows that 69.44 per cent minor tribe were married on the other hand 34.89 per cent Dimasa were unmarried.



Language is a medium of communication, although many tribal and non-tribal languages spoken by different communities of two hill districts of Assam. Each tribal community has its own language, but most of the respondents also can speak Assamese language

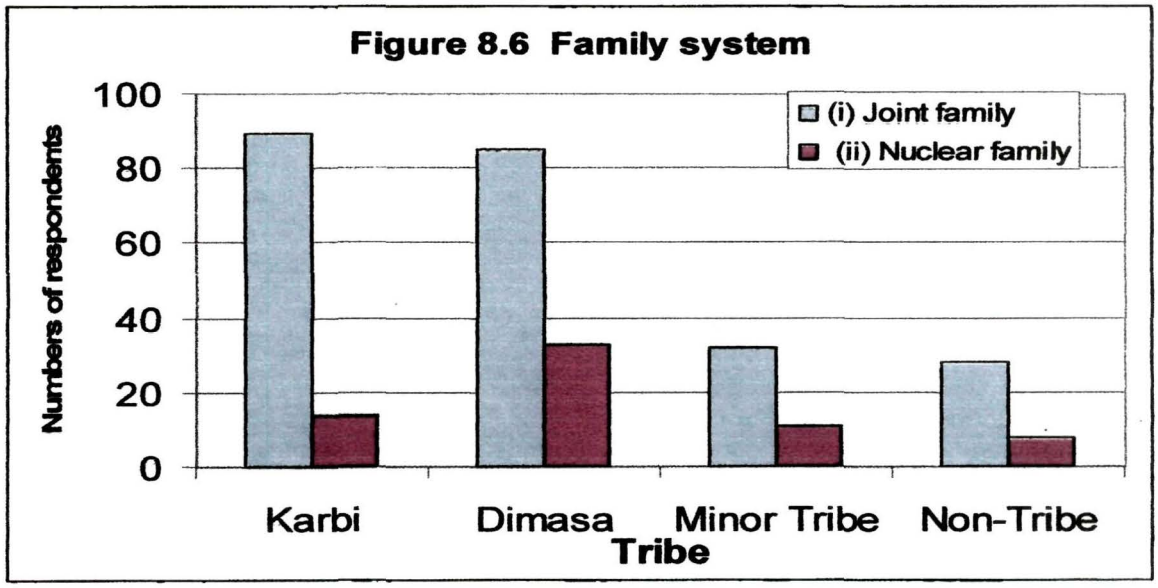
which is a lingua of Franca of Assam State. From the table it is seen that 24.39 per cent respondents know Assamese-Karbi language, 22.30 per cent respondent know Assamese and Dimasa language. Ethnicity wise shows that 11.71 per cent Minor tribe known Karbi languages, 8.33 per cent Non-tribe Known Karbi language.



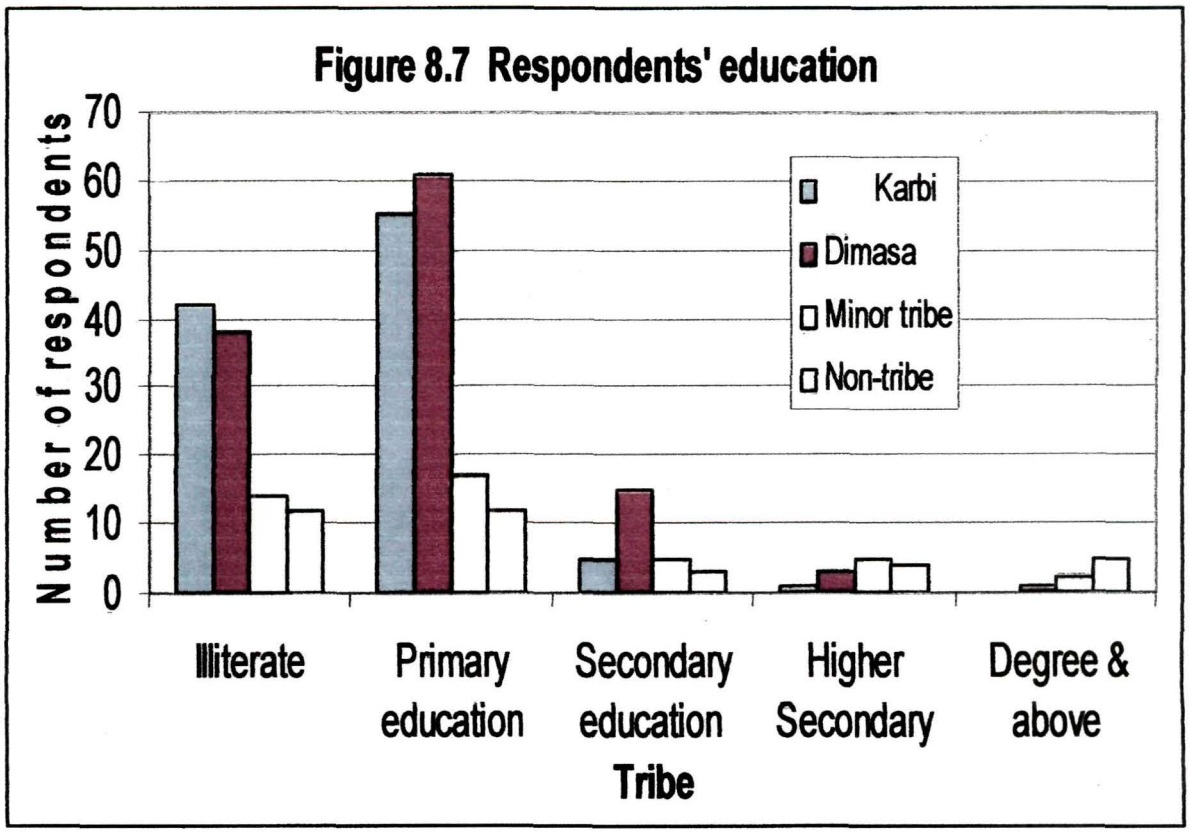
The distribution of population according to sex revealed that the concentration of male population was slightly higher than the female population. 59.00 per cent respondent were male, on the other hand 41.00 per cent respondent were female. Regarding sex of the respondents in their respective category wise a large segment of Karbi respondents (63.10 per cent) were male, on the other hand only 36.80 per cent respondents were female. More female respondents (47.22 per cent) were found in non-tribal community.

As regards the family structure of the respondents, both joint family and nuclear family structure was found in the two-hill district. In joint family system more numbers of family members but on the nuclear family less number of family members seen. It can be seen from the table that a great majority (78.00 per cent) of the respondents belonged to joint family and only 22.00 per cent respondents belonged to nuclear family. Ethnicity wise shows that 86.41 per cent Karbi respondents have joint family system and on the other hand 27.97 per cent Dimasa respondents have nuclear family system. The table 8(g) shows numbers of family members in the family system, from the table it can be seen that

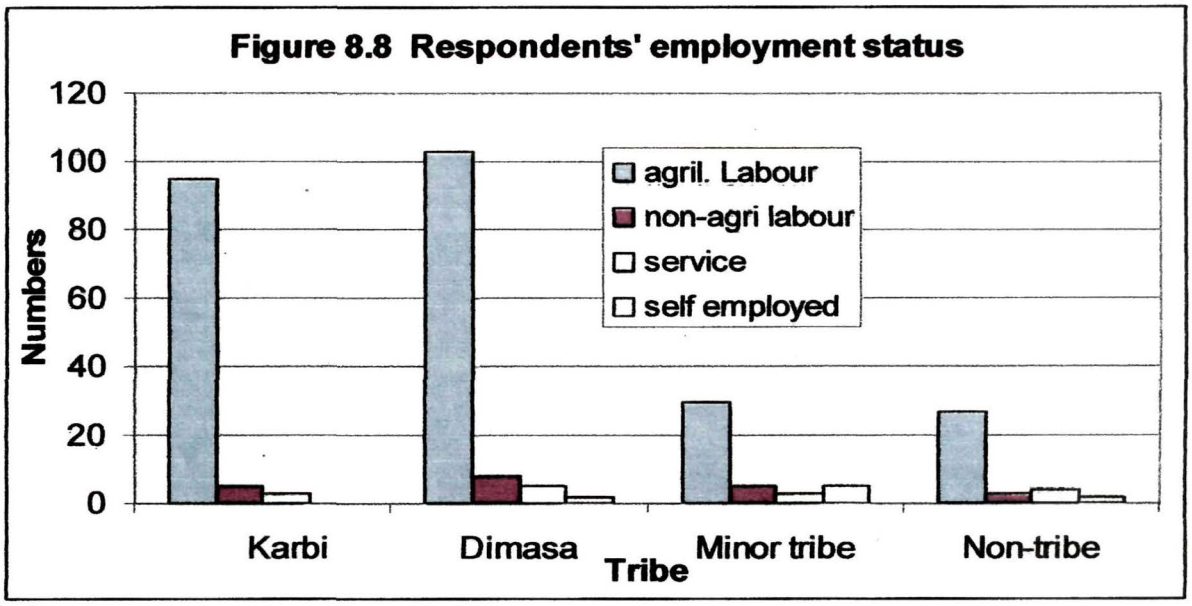
44.00 per cent of the respondents have two male members followed by 33.00 percent respondents



have 3 & above male members. Ethnicity wise shows that 47.57 per cent Karbi respondents have 2 male members, 36.11 per cent non-tribe respondents have 3 and above male member in their family. Regarding female member in the family, it can be seen from the table that 36.67 per cent of the respondents have 2 female member followed by 35.67 per cent respondent have one female members, 24.67 per cent respondents have 3 and above female members. Ethnicity wise showed that 43.69 per cent Karbi respondents have less male members, 39.45 per cent minor tribe respondents have 3 and above member, 38.89 per cent non-tribe respondents have only one female member in their family. As regards minor children in the family, it can be seen from the table that 38.67 per cent of the respondents have only one children followed by 27.00 percent respondents have two minor children, 22.00 per cent respondents have 3 and above minor children. Ethnicity wise shows that 44.19 per cent Karbi respondents have one children, 30.56 per cent Non- tribe respondents have 1-2 minor children, 25.00 per cent non-tribe respondents have 3 and above minor children. Numbers of family members is a very important variable in tribal economy, because most of the labours come from family members.



Academic attainment of an individual is an important factor which affects the standard of living, acquiring new ideas and in taking firm decision particularly in the context of the rural agricultural economy. Table 8(h) shows the distribution of population of the sample households according to their education status. Generally, the head of the household plays a major role in taking firm decision-making and therefore the academic attainment of the head of the household was analyzed. It was found that 35.33 per cent head of household illiterate, 48.33 per cent head of household studied up to primary level, 9.33 per cent household respondents were studied up to secondary level, 4.33 per cent household respondents were studied up to class XII standard, It is interesting to note that 2.67 per cent of household respondents were studied up to degree and above. Ethnicity wise shows that more illiteracy (40.78 per cent) found in the Karbi respondents, non-tribe has more degree passed respondents than other communities.



Relating to the employment status of the respondents shown in the table, majority (85.00 per cent) worked as agricultural labour, followed by 7.00 per cent worked as non-agricultural labour, 5.00 per cent worked in Government, public and private organization. It means major per cent of population concentrated in agricultural sector. Ethnicity wise showed that 92.23 per cent Karbi respondents were worked as agricultural labour, 11.63 per cent minor tribe worked in non-farm sector, 11.13 per cent worked in Government/Public/Private organization. It is interesting to note that 11.63 per cent have their own business that means they are self employed.

Socio-cultural aspects of shifting cultivation:

Shifting cultivation being part and parcel of Socio-cultural life of the tribal people in North-East India, all its operations are inseparably linked with their religious rites and festivals viz., Agalmaka, Miamua, Rongchuglu and Ahiaom Garo Hills. In spite of its adverse effects on the eco-system and low productivity, it is still continues with then as a necessary evil for the following inherent characteristics as revealed in its analysis elsewhere; (a) bulk of the labour force management and capital comes from the house holds; (b) production is either consumed on the farm and/or traded in local markets; (c) the decision making process is hampered by limited access to marketing and political institutions; and (d) most of the farmers do not live much above the culturally determined subsistence level. The rationale behind the persistency of this system lies in its compatibility with the physico-social environment of sparse community land tenure system, undulating and steep topography, short crop cycle, rainy season and thereafter, acute moisture stress during post monsoon period, as well as, meagre resources with the farmers and also the only available means of providing moderate calories and protein for the sustenance of families with minimum risk and the least income variability. This short of socio-cultural equilibrium environment centering round shifting cultivation is, of course, gradually getting slacked under the impact of higher population, low yield, shortening of Jhum cycle, new economic and social goals, as well as, incursion of modern science and technology with the dying out of tribal isolation from the main stream. In this context, the results of two pilot field investigation on "Socio-Agro-Economic characteristics and attitudes of Tribal farmers towards modern agricultural practices" and Village leadership pattern for Agricultural development" carried out by ICAR Research Complex, in Meghalaya state in the year 1977-78 are worth mentioning: (i) The lower rate of adoption of agricultural innovations and the least favourable attitude towards them by the tribal farmers were found to be due to their lower educational levels, lower socio-economic status, small size of holdings and lower annual income; (ii) as the village headman plays an important role in all round agro-economic development of the tribal farmers, training to the village headman regarding modern agricultural practices may help in adoption and diffusion of technological innovations. The life of a community is sustained through nature

Table 5.1: List of festivals related to shifting cultivation in North Eastern India

Meghalaya	Achiroka/ Agalmika	It is observed to propitiate God / Goddess for rains.
	Jamegapovaha –u –a	It is observed at the time of sowing of Seeds. They offer boiled grains of paddy to the God of Harvest to protect the crops and for bumper yield.
	Mangela	It is celebrated after harvest of Jhum produce. Jhum products are offered to the God/ Goddess.
Manipur	Nungchungha	The worship of Nungchungha is performed at the beginning of the agricultural operation.
	Sabuhog	The ceremony is observed in the month of October- November. The worship of Saubuhog is carried out when the paddy stalks appear.
	Senamahi	In this festival the first fruits of the year are offered to God Senamahi by the priest.
Arunachal Predesh	Mopun / Papet	The ceremony is observed in the months of February and April. After 10 days of this festival sowing are performed.
	Etter Festival	The festival is observed in the months of April and June. Etter (Fencing) are completed and winter and autumn paddy and millets etc are sown. The ceremony is observed during mid June to mid August. It is performed for prosperity of cattles and general welfare.
	Solung Aran	The ceremony is observed during mid December to mid February and is popularly known as harvest festival. Arun is celebrated by sacrificing pigs, chickens to propitiate. Goddess "KENEDENE (the Goddess of Agriculture and wealth)
	Kopkhut/ challiwn	It is celebrated just before sowing operation .
Mizoram	Chapchar Kut	This the most important spring festival held in between the cutting of jungles and burning of Jhums usually in the last part of February and first part of March every year. The meaning of the chapchar kut is chapbamboo, trees are cut down and awaiting for burning of Jhum. Mizo believes that the festival would ensure a good harvest in their Jhum field.
	Powl Kut	It is celebrated when rice harvest is almost reaped. This festival is mainly for the children who are dressed in their best attire and are fed with rice, meat and boiled eggs.
	Min Kut	It is observed during August and September when maize harvest is reaped. This festival is celebrated with feasting, singing and dancing.
Assam	Rongkher	Festival of Karbi
	Bishu	Festival of Dimasa

Sources: Complied with (1) Shifting Cultivation in North East India, Majumdar, D.N.,ed;Omsons Publication, New Delhi (2) Tribes of Assam, B.N.Bordoloi, G.C. Sharma Thakur, M.C. Saikia published by Tribal Research Institute, Guwahati (3) The Dimasa Kacharis of Assam, B.N.Bordoloi, Tribal Research Institute, Guwahati, Assam

and cultural modifications, which are done by human beings on the basis of mutual dependency. Nature sustains human beings and human beings sustain nature. The mutuality is so intense that it is impossible for one to live/exist without the other. The balanced based on the mutuality between nature and culture has been continuing since pre-historic period, particularly among the tribal of the North East India. The list of festivals related to shifting cultivation in N.E India is presented in the table 8.2. A few examples cited above regarding rites and rituals and their connection with shifting cultivation clearly reflects that adoption of any new farming system may not provide facilities to worship the appropriate God/Goddess. The shift from traditional farming system means partial shift from the traditional way of life itself. Hence the introduction of settled cultivation among the tradition-bound shifting cultivation will be a long process because it will contain itself the seed of a vital change of in their lives. It is understood that shift from shifting cultivation to settle cultivation may only get cent percent adoption when new cropping system is blended with the traditional festivals that are linked with shifting cultivation. Thus, we should search a cropping system that conforms to the traditional system, with an ability to control over bio-physical problems as well as increase in productivity on sustained basis.

CHAPTER – VI

ECONOMICS OF SHIFTING CULTIVATION

In the hill areas particularly in Karbi Anglong and North Cachar the cultivators practise jhumming or shifting cultivation. Cultivators in these areas are unwilling to adopt new costly technology and methods of permanent cultivation. Because traditionally they are food gatherers, a small percentage rear cattle, hence bullock for ploughing is not available. Further they are not accustomed to the technology of permanent cultivation, simple ploughing, leveling, planting and harvesting methods are unknown to them. There is also institutional gap in hill areas to impart proper educational and training facilities. Most of the semi urban and rural areas are unbanked. Hence cultivators are victims of money lenders[1].

The agricultural practices that are prevalent among the hill tribe communities are dependent on a variety of factors. Some of the important factors are topography, climatic conditions including rainfall, natural resources, growth of population and its pressure on land, land ownership, tribal life style and the socio-cultural practices connected with the agricultural practices, besides the extension services offered by the Department of Agriculture[2]. A sizable section of the hill tribes of Assam are still solely dependent on shifting cultivation. There are also communities, which are partly dependent on shifting cultivation and partly on settled or permanent cultivation. An attempt is made in this chapter to discuss about area under shifting cultivation, population, households dependents on shifting cultivation, input used in shifting cultivation, output obtained, income generation from agriculture and allied activities and consumption pattern of households' respondents.

These two hill districts plays an important role in economy of Assam, since a considerable amount of land under forest and natural vegetation flora, timber, bamboo and other forest products are available in two hill districts. The conservation and sustainable management of these resources are very much essential not only from economic point of view but also ecological point of view. N.C hills district has reservoiur of bamboo forest which supply bamboo to Hindustan Paper Mill located at Jagiroad, Morigaon district of Assam. The sustainable management of bamboo forest is very much essential.

Area covered under shifting cultivation:

International Perspective:

Jhum or shifting cultivation is practised in many parts of the world. The indigenous tribal community of the world living in the hilly tract mainly depends upon on agriculture for subsistence. Shifting cultivation is largely practised in hilly areas of the world and tribal population and their families were mostly involved in it.

Table-6.1: Estimated area covered under shifting cultivation (in '000 ha) in some South East Asian Countries

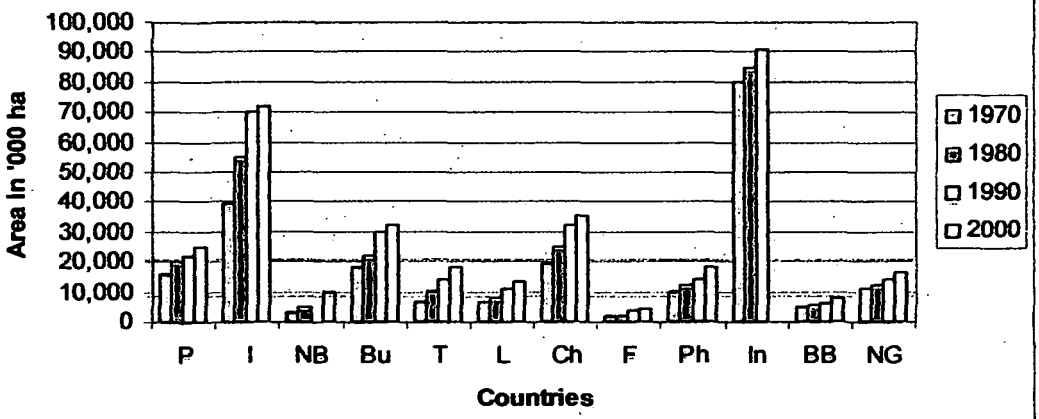
Countries\Period	1970	1980	1990	2000
Pakistan	16,020 (7.33)*	20,000 (7.57)*	22,075 (6.92)*	25,100 (6.98)*
		(24.84)**	(37.80)**	(56.68)**
India	39,700 (18.17)*	55,000 (20.83)*	70,020 (22.01)*	71,900 (20.00)*
		(38.54)**	(76.37)**	(81.11)**
Nepal-Bhutan	3,250 (1.49)*	5,000 (1.89)*	84,00 (2.63)*	10,000 (2.78)*
		(53.83)**	(158.46)**	(207.69) **
Sri Lanka	412 (0.19)*	600 (0.23)*	815 (0.26) *	1025 (0.29)*
		(45.63)**	(97.82)**	(148.79)**
Burma	18,040 (8.26)*	22,050 (8.35)*	29,700 (9.31) *	32,600 (9.07)*
		(22.23)**	(64.63) **	(80.71)**
Thailand	6,514 (2.98)*	10,000 (3.79)*	14,200 (4.45) *	18,400 (5.12)*
		(53.52)**	(117.99) **	(182.47)**
Laos	6,491 (2.97)*	8,000 (3.03)*	10,750 (3.37) *	13,200 (3.67)*
		(23.25)**	(65.61) **	(103,36)**
Cambodia	42 (0.02)*	50 (0.02)*	80 (0.03) *	120 (0.03)*
		(19.05)**	(90.48)**	(185.71)**
South Vietnam	485.2 (0.23)*	650 (0.25)*	800 (0.25)*	1050 (0.29)*
		(33.97)**	(64.88)**	(116.40)**
North Vietnam	651 (0.30)*	800 (0.30)*	1150 (0.36)*	1400 (0.39)*
		(22.89)**	(76.65)**	(115.05)**
China	19,750 (9.04)*	25,000 (9.47)*	32,050 (10.05)*	35,200 (9.79)*
		(26.58)**	(62.28)**	(78.23)**
Formosa	1,600 (0.73)*	2,000 (0.76)*	3,500 (1.10)*	4,160 (1.16)*
		(25.00)**	(118.75)**	(260.00)**
Philippines	10,050 (4.60)*	12,000 (4.54)*	14,050 (4.41)*	18,070 (5.03)*
		(19.40)**	(39.80)**	(79.80)**
Indonesia	79,950 (36.59) *	85,000 (32.18)*	91,050 (28.55)*	1,00,020 (27.82)*
		(6.32)**	(13.88)**	(25.10)**
British Borneo	4,870 (2.23)*	5,500 (2.08)*	6,050 (1.90)*	8,000 (2.23)*
		(12.94)**	(24.23)**	(64.27)**
New Guinea	10,750 (4.92)*	12,500 (4.73)*	14,050 (4.41)*	16,500 (4.59)*
		(16.28)**	(30.70)**	(53.49)**
Total	2,18,515 (100)*	2,64,100 (100)*	3,18,920 (100)*	3,59,545 (100)*

N.B: * indicates vertical percentage to total.

** indicates horizontal percentage with base year 1970.

Sources: Complied with (1) Shifting cultivation in South Eastern Asia, B. Singh and M.P. Singh, J.E Spencer Publications, New Delhi, (2) Shifting cultivation and deforestation, questing the dominant narrative in tropical Africa by Amy Ickowitz (2004) www.peri.vmass.edu/fileadmin/edu.

Fig: 6.1 Area under jhum in S.E.Asian Countries



P = Philippines, I=India, NB= Nepal-Bhutan, T=Thiland, Ch=China, In=Indonesia, BB=British Borneo, NG= New Guinea

An attempt has been made to present an international scenario of shifting cultivation. Table 6.1 shows estimated area covered under shifting cultivation in South East Asian countries for four decades viz. 1970,1980, 1990 and 2000. Among the countries practicing shifting cultivation in South East Asia, Indonesia was leader followed by India and China. It is interesting to note that in case of Indonesia area was declining over the years (1970-36.59 per cent, 1980-32.18 percent, 1990-28.55 percent and 2000-27.82 percent). On the other hand, area was increasing trend in case of India and China over the years.

The countries, which play moderate role in shifting cultivation, were Burma, Pakistan, Philippines and New Guinea. The countries, which cleared less area, were Nepal-Bhutan, Ceylon, Thailand, Laos, Cambodia, South Vietnam, Formosa and British Borneo.

From the table 6.1, it is understood that in some countries area is increased in 1980, 1990 and 2000 and in some countries area is decreased in 1980, 1990 and 2000. The moderate countries, which maintained increased rate, were Burma and Pakistan. New Guinea maintained decreased rate. Philippines maintained fluctuating rate. The countries, which maintain moderate growth, rate were Nepal-Bhutan, Ceylon, Thailand.

On the other hand Cambodia maintained a stable growth rate. Formosa maintained an increasing growth rate. In the table an attempt was made to find out horizontal growth rate with base year 1970. It is observed from the table that some countries maintaining significant variation during last four decades, on the other hand, some countries made consistency, stable, moderate growth rate. The countries showing steady growth rate were Pakistan, India, Burma, Laos, Philippines and Indonesia. These countries maintained a steady moderate growth rate. On the other hand Nepal-Bhutan, Ceylon, Thailand, Cambodia maintained an increasing growth rates over the base year. The countries which showed highest growth rates were Formosa (260 per cent in 2000), Nepal-Bhutan (207.69 per cent in 2000) and Thailand (82.47 per cent in 2000). The countries which showed lowest growth rate were Pakistan (56.68 per cent in 2000), Indonesia (25.10 per cent in 2000) and New Guinea (53.49 per cent in 2000). It is interesting to note that every countries of South East Asia where shifting cultivation was practised have maintained an increased growth rate over the last 30 years, i.e. from 1970 to 2000.It can be said that the increased in area may be due to population explosion, non-availability of suitable alternatives farming system for livelihood, which can provide shifting cultivators' employment. Hence from the table, we can conclude that shifting cultivation is a popular primitive practice and way of life of hill people of south East Asian countries.

National Perspective:

The Shifting cultivation process has been increased unprecedently in the hilly areas of North East India and Orissa. The cultivation has laid large forest tracts bare. Although this is an old age practice and dates back to Neolithic period and existence of which is noticed in sixteen states and there is a quest for low energy budget and low investment system of subsistence agriculture that uses rapid mineralization and recycling of nutrients.

An attempt has been made to present national scenario of shifting cultivation. Table 6.2 presents estimated area covered under shifting cultivation in Indian states for four decades viz; 1970, 1980, 1990 and 2000. Among the Indian states Madhya Pradesh has got 13.49 per cent of geographical area of India, which is highest among the Indian States followed by Andhra Pradesh (8.37 per cent) and Bihar (5.29 per cent) and on the other hand, Tripura (0.32 per cent) and Nagaland (0.50 per cent) are tiny states of India. From the table it is seen that in shifting cultivation area concerned among the Indian States Orissa and Manipur were leader followed by Meghalaya and Arunachal Pradesh. It is

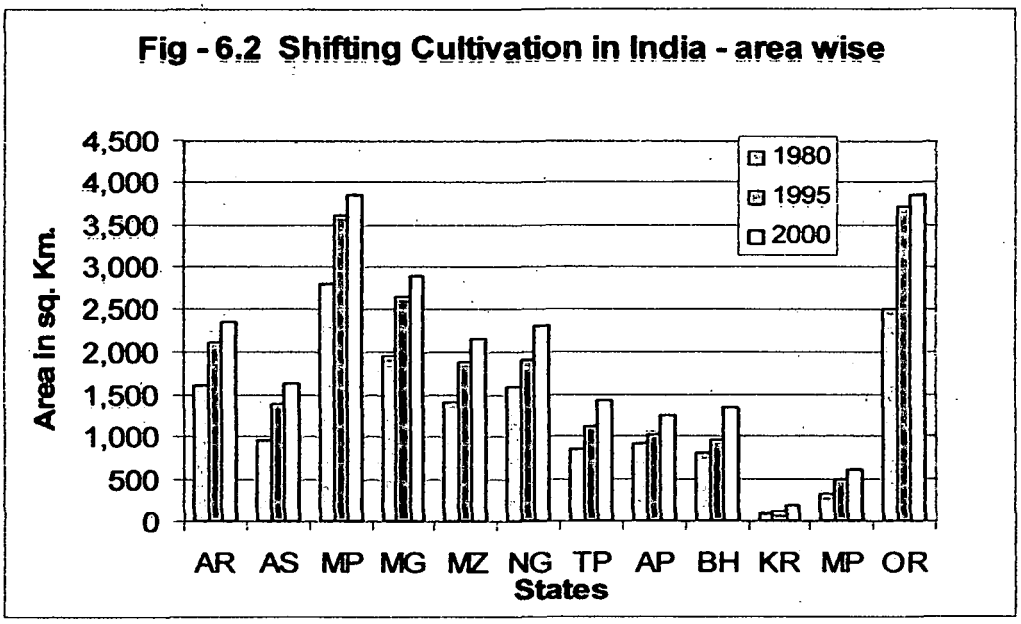
interesting to note that in case of Manipur, area is decreasing over the years. On the other hand, Meghalaya maintained a stable growth rate over the years. In case of Arunachal Pradesh area was decreasing at minute level. Orissa showed increasing rate at first then decreasing rate.

Table-6.2 Area under shifting cultivation in India, (Area in Sq. Km)

States	Geographical Area (sq. km)	1980	1995	2000
Arunachal Pradesh	83,743 (2.55)	1,623 (10.24)*	2,100 (10.02)* (29.39)**	2,350 (9.87)* (44.79)**
Assam	78,438 (2.39)	972 (6.13)*	1,392 (6.64)* (43.21)**	1,645 (6.91)* (69.24)**
Manipur	22,327 (0.68)	2,800 (17.67)*	3,600 (17.17)* (28.57)**	3,846 (16.15)* (37.36)**
Meghalaya	22,429 (0.68)	1,950 (12.30)*	2,650 (12.64)* (35.89)**	2,895 (12.15)* (48.46)**
Mizoram	21,081 (0.64)	1,420 (8.96)*	1,890 (9.01)* (33.10)**	2,150 (9.03)* (51.41)**
Nagaland	16,579 (0.50)	1,600 (10.09)*	1,913 (9.12)* (19.56)**	2,300 (9.66)* (43.75)**
Tripura	10,486 (0.32)	850 (5.36)*	1,115 (5.32)* (31.18)**	1,430 (6.00)* (68.24)**
Andhra Pradesh	2,75,045 (8.37)	913 (5.76)*	1,020 (4.86)* (11.72)**	1,248 (5.24)* (36.69)**
Bihar	1,73,877 (5.20)	814 (5.14)*	972 (4.64)* (19.41)**	1345 (5.65)* (65.23)**
Kerala	38,863 (1.18)	85 (0.54)*	114 (0.54)* (34.12)**	173 (0.73)* (103.53)**
Madhya Pradesh	4,43,446 (13.49)	314 (1.98)*	486 (2.32)* (54.78)**	595 (2.50)* (89.49)**
Orissa	1,55,707 (4.74)	2506 (15.81)*	3708 (17.68)* (47.96)**	3843 (16.13)* (53.35)**
Total all India	32,87,263 (100)	15,848 (100)*	20,968 (100)* (32.31)**	23820 (100)* (50.30)**

N.B : * indicates vertical percentage to total.
** indicates horizontal percentage with base year 1980.

Sources: Complied with (1) Swidden Cultivation and Development Programmes in North East India by Girindra Nath Das published by Akansha Publications, New Delhi (2001), (2) Wastelands Atlas of India, published by Ministry of Rural Development, Department of Land Resources and National Remote Sensing Agency, Department of Space, Government of India,2000, p-81, (3) Shifting cultivation in India, ICAR, New Delhi (4) Shifting Cultivation – Magnitude of the Problem & lesson learnt by Kaul, G.L, Journal of North East Council (1998), Shillong, Vol:4, pp-19-20 (5)



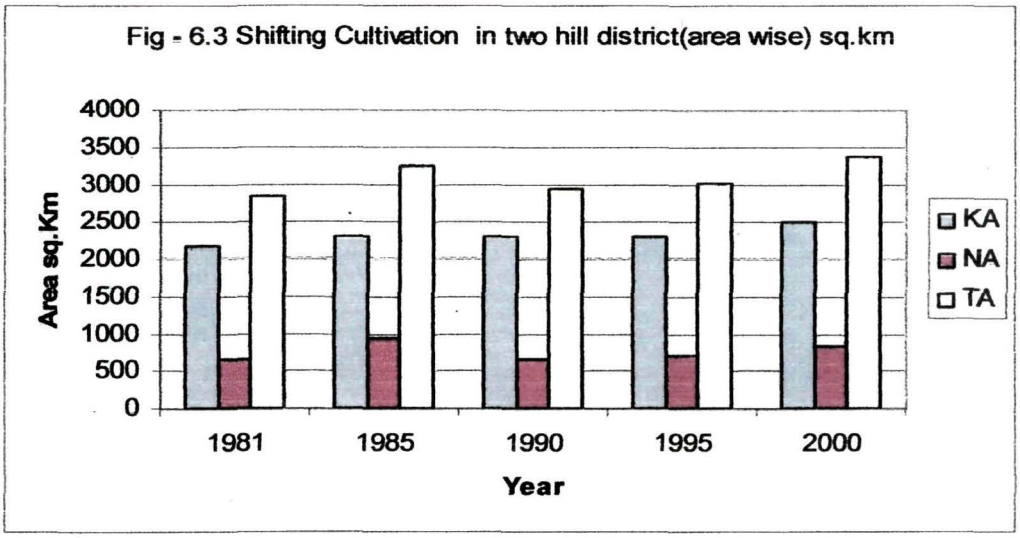
(Abbreviation used in graph AR= Arunachal Pradesh, AS=Assam, MP=Manipur, MG=Meghalaya, MZ=Mizoram, NG=Nagaland, TP= Tripura, AP= Andhra Pradesh, BH=Bihar, KR=Kerala, MP=Madhya Pradesh, OR=Orissa)

In the table an attempt was made to find out horizontal growth rate with the base year 1970. It is observed that all the states of India maintained an increasing rate over the years. But some states showed increased growth rate, where as some states showed a stable growth rate. The states, which showed an increased growth rate, were Nagaland, Bihar and Kerala. On the other hand, the states shows stable increased rates were Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Tripura and Andhra Pradesh. From the table, it is understood that shifting cultivation is practised in many states of India. The Indigenous tribal communities living in the hilly tract of India where climate and soil is favours for shifting cultivation, in that area people depends on shifting cultivation for subsistence.

Table 6.3 Shifting Cultivation in Two Hill Districts of Assam (Sq. km.) year wise

District	Geographical area	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Karbi Anglong	10434	2305.00	2267.50	2240.30	2280.00	2300.00	2498.00	2500.00	2488.00	2489.00	2514
		(77.55)*	(76.45)*	(76.52)*	(76.55)*	(76.28)*	(77.25)*	(75.88)*	(75.36)*	(75.10)*	(74.83)*
		(5.50)**	(3.76)**	(2.52)**	(4.33)**	(5.25)**	(14.31)**	(14.40)**	(13.85)**	(13.90)**	(15.04)**
N C. Hills	4888	667.40	698.30	687.40	698.40	715.40	735.60	794.50	813.40	825.30	845.40
		(22.45)*	(23.48)*	(23.45)*	(23.72)*	(23.75)*	(22.75)*	(24.12)*	(24.64)*	(24.90)*	(25.17)*
		(3.07)**	(7.85)**	(6.16)**	(7.86)**	(10.89)**	(13.61)**	(22.70)**	(25.62)**	(27.46)**	(30.50)**
Total	15,322	2972.90	2965.80	2927.70	2978.40	3015.40	3233.60	3294.00	3301.40	3314.30	3359.40
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
		(4.95) **	(4.70) **	(3.35) **	(5.14) **	(6.45) **	(14.15)**	(16.30)**	(16.30)**	(17.00)**	(18.59) **

N.B: * Indicates vertical percentage to total.
** Indicates horizontal percentage to the base year 1981.
Source: Directorate of Economics and Statistics, Govt. of Assam, Guwahati, Assam.



(KA = Karbi Anglong, NA = North Cachar, TA= Total Area)

Study area perspective:

In Assam, the practice of shifting cultivation is observed in the two hill districts, Karbi Anglong and North Cachar Hills. Shifting cultivation is a popular practice and way of life of hill people of Assam. There is a quest for low energy budget and low investment system of subsistence agriculture that uses rapid mineralization and recycling of nutrients.

In the table 6.3 an attempt has been made to present area under shifting cultivation in the two hill districts of area. The table presents shifting cultivation area in two hill districts of Assam for twenty years. It has been observed from the table that the area is increased in some years and decreased in some years. In Karbi Anglong in the year 1978 shows highest growth, but in NC Hills in the year 1985 shows highest growth. An attempt has been made to find out horizontal growth rate with the base year 1981. It is interesting to note that in the year 2000 Karbi Anglong district shows highest growth rate and in the year 1985, N.C. Hills shows highest growth rate. The year, which shows increased in area, were 2000, 1997, 1996 for Karbi Anglong and 1985, 2000, and 1999 for N.C. Hills.

Respondents' perception:

Land is a limiting factor and one of the important components of agricultural production system. Table 6.4 shows area under cultivation of households' respondents. From the table, it is understood that respondents households practising both permanent and shifting cultivation.

In case of permanent cultivation one third of the respondents practising permanent cultivation in below two bigha of land followed by 23.00 per cent cultivated in 2-4 bigha, 13.67 per cent cultivated in 4-6 bigha, 10.33 per cent cultivated in 6 and above and only 14.33 per cent respondents were not practising permanent cultivation.

Table-6.4 Respondents' area under cultivation Ethnicity wise

Ethnicity of respondents	Area under cultivation				Total (A + B)	
	Permanent (A)		Jhum (B)			
	Bigha	% of column Total	Bigha	% of column Total	Bigha	% of Total
Karbi	430.00	45.70	660.00	45.25	1090.00	47.19
Dimasa	269.82	28.58	432.00	31.58	701.82	30.38
Minor tribe	144.00	15.31	160.00	11.70	304.00	13.17
Non-tribe	98.00	10.41	116.00	8.47	214.00	9.26
Total	941.82	100.00	1368.00	100.00	2309.82	100.00

Source: Primary data

Ethnicity wise analysis also revealed that more or similar trend with over all trend but in case of minor tribe relatively more number (41.86) practising permanent cultivation in 2-4 bigha of land, similarly in case of non-tribe 50 per cent households practising permanent cultivation below two bigha of land. In case of Karbi tribe category 18.45 per cent households respondents were not practising permanent cultivation. As a whole, it is understood from the table that majority of the households practising permanent cultivation. In case of shifting cultivation nearly half of the respondents (49.67) households were practising below 2 bigha of land followed by 28.00 per cent (2-4 bigha),12.00 per cent (4-6 bigha) and 10.33 per cent (6 and above).

Ethnicity wise analysis also revealed more or less same trend, majority of Karbi, Dimasa, practising shifting cultivation in below 2 bigha of land, but in case of minor tribe relatively more number of households (53.49 per cent) practising shifting cultivation in 2-4 bigha of land, only 9.30 per cent practising in 4-6 bigha of land. It is interesting to note that only small per cent (2.78) of non-tribe practising shifting cultivation in 6 and above bigha of land. It is understood from the table that all the respondents households practising shifting cultivation. As compared between permanent cultivation practice with shifting cultivation it reveals that more number

of respondents practising both shifting cultivation and permanent cultivation in below 2 bigha of land. Ethnicity wise more Karbi engaged in shifting cultivation in below 2 bigha of land followed by 20.39 per cent engaged in 2-4 bigha. On the whole, more Dimasa engaged in shifting cultivation in below 2 bigha, more minor tribe engaged in shifting cultivation in 2-4 bigha of land, on the other hand majority of non-tribe practising permanent cultivation in below 2 bigha of land.

Area under production of crops:

Table 6.5 shows area under production of crops. Shifting cultivator cultivated cereals, oilseeds, pulse crops, vegetable crops, tuber crops and fruit crops.

The cereal crops includes paddy, wheat, maize etc. Cereals are sources of Carbohydrate. It should be compulsory in our diets. Moreover tribal people cultivated rice because it is required for preparation of wine, paddy is most subsistence oriented and every house preserves a good amount of it. Paddy is properly dehusked and made into rice. Rice has several uses in the Karbi and Dimasa society.

Major oilseed crops cultivated by the respondents in the study area are rapeseed and mustard. Oilseed crop is an important crop, which has got good market in out side of Karbi Anglong and N.C. Hills. The table shows area under production of oilseed crops.

Pulse crop is an important crop. It is a source of protein and it should be taken up regularly specially by women and young age people, the deficiency of which causes many diseases.

Tuber crop is one of the popular crop in the hilly areas of Assam. Tuber crop includes ginger, turmeric and colocasia etc.

Fruit crop plays an important role in human health and economy. Being a cash crop fruit crop helps tribal to earn cash income. In the hill district farmers mostly cultivated pineapple in shifting cultivation plots, other fruit crops include banana, pineapple, lemon etc.

TABLE 6.5 Respondents Area Under Production of Crops Ethnicity Wise

Ethnicity of Respondents	Cereal crops (A)		Oilseed Crops (B)		Pulse Crops (C)		Vegetables Crops (D)		Tuber Crops (E)		Fruits Crops (F)		Total (A+B+C+D+E+F)	
	Bigha	% of column Total	Bigha	% of column Total	Bigha	% of column Total	Bigha	% of column Total	Bigha	% of column Total	Bigha	% of column Total	Bigha	% of column Total
Karbi	295	48.52	178	48.24	139	44.43	190	48.84	152	41.53	136	51.32	1090	47.19
Dimasa	207	34.04	121	32.79	89.82	28.71	93	23.91	131	35.79	60	22.64	701.82	30.38
Minor Tribe	62	10.20	40	10.84	46	14.70	62	15.94	50	13.66	44	16.60	304	13.16
Non Tribe	44	7.24	30	8.13	38	12.16	44	11.31	33	9.02	25	9.44	214	9.27
Total	608	100.00	369	100.00	312.82	100.00	389	100.00	366	100.00	265	100.00	2309.82	100.00

Source: Primary data

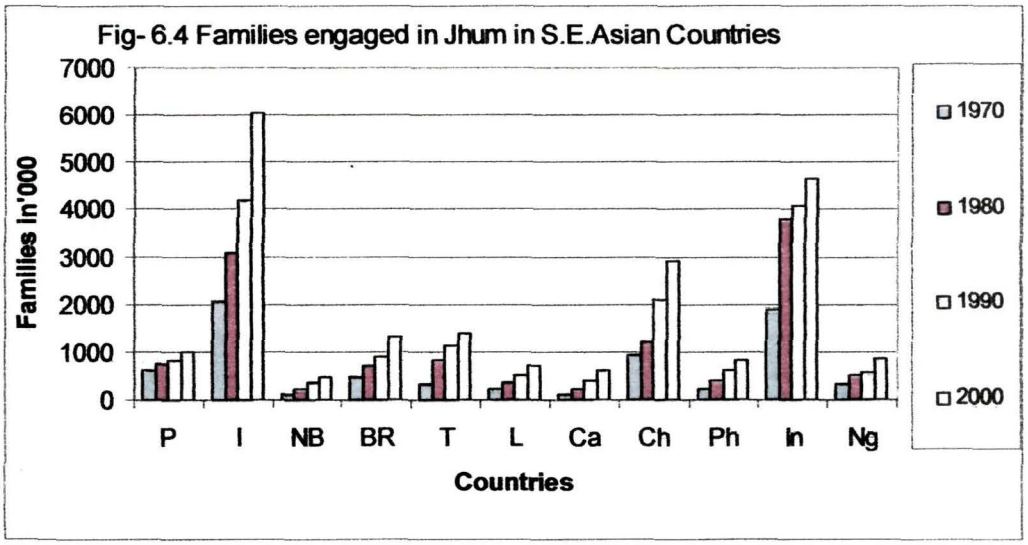
Table - 6.6 Number of families engaged in shifting cultivation (in '000 nos) in South East Asian Countrie

Countries/Period	1970	1980	1990	2000
Pakistan	590 (7.81)	750 (6.25)*	825 (5.07)*	980 (4.59)*
		(27.11)**	(39.83)**	(66.10)**
India	2,050 (27.14)	3,100 (25.83)*	4,200 (25.81)*	6,050 (28.35)*
		(51.22)**	(104.88)**	(195.12)**
Nepal-Bhutan	120 (1.59)	200 (1.67)*	370 (2.27)*	450 (2.11)*
		(66.67)**	(208.33)**	(275.00) **
Ceylon	20 (0.26)	40 (0.33)*	80 (0.49)*	150 (0.70)*
		(100)**	(300)**	(650.00)**
Burma	475 (6.29)	700 (5.83)*	900 (5.53)*	1300 (6.09)*
		(47.37)**	(89.47)**	(173.68)**
Thailand	325 (4.30)	800 (6.67)*	1150 (7.07)*	1400 (6.56)*
		(146.15)**	(253.85)**	(330.77)**
Laos	215 (2.85)	350 (2.92)*	505 (3.10)*	725 (3.40)*
		(62.79)**	(134.88)**	(237.21)**
Cambodia	120 (1.59)	215 (1.79)*	405 (2.49)*	610 (2.86)*
		(79.17)**	(237.50)**	(408.33)**
South Vietnam	20 (0.26)	35 (0.29)*	55 (0.33)*	105 (0.49)*
		(75)**	(175)**	(425.00)**
North Vietnam	29 (0.38)	50 (0.42)*	75 (0.46)*	96 (0.45)*
		(72.41)**	(158.62)**	(231.03)**
China	915 (12.11)	1200 (10.00)*	2100 (12.90)*	2900 (13.59)*
		(31.15)**	(129.51)**	(216.94)**
Formosa	50 (0.66)	85 (0.71)*	120 (0.74)*	175 (0.82) *
		(70.00)**	(140.00)**	(250.00) **
Philippines	215 (2.85)	400 (3.33)*	615 (3.78)*	825 (3.87) *
		(86.05)**	(186.05)**	(283.72) **
Indonesia	1900 (25.15)	3800 (31.67)*	4100 (25.20)*	4650 (21.79) *
		(100.00)**	(115.79) **	(144.74) **
British Borneo	200 (2.65)	175 (1.46)*	55 (0.34) *	85 (0.40) *
		(-12.50)**	(-72.50) **	(-57.50) **
New Guinea	310 (4.10)	500 (4.17)*	55 (4.39) *	840 (3.94) *
		(61.29)**	(130.65) **	(170.97) **
Total	7,554 (100)	12,000 (100)*	16,270 (100)*	21,341 (100) *
		(58.86)**	(115.38)**	(182.51) **

N.B: * indicates vertical percentage to total.

** indicates horizontal percentage with base year 1970.

Sources: Complied Shifting cultivation in South Eastern Asia, B. Singh and M.P. Singh, J.E. Spencer Publications, New Delhi & Shifting cultivation and deforestation, questing the dominant narrative in tropical Africa by Amy Ickowitz (2004) www.peri.vmass.edu/fileadmin/edu.



P=Philippines, I= Indonesia, NB= Nepal-Bhutan, BR=British Borneo, L=Laos, C=Cambodia, Ng=Nigeria

Families, Population, Households dependent on shifting cultivation

International Perspective:

The table 6.6 presents number of families engaged in shifting cultivation in South East Asian countries. The indigenous tribal families of the world living in hilly tracts mainly engaged in agriculture and allied activities for their livelihood. Shifting cultivation plays an important role in hill economy of South East Asian countries. From the table, it is cleared that among the countries of South East Asia practising Shifting cultivation, highest percent of Indonesia families followed by Indian and Chinese families involved in age-old cultivation practice.

It is very interesting to note that in case of Indonesia the number of families were declining over the years (1970-25.15 per cent, 1980-31.67 per cent, 1990-25.20 per cent and 2000-21.79 per cent). In case of China and India the rate was fluctuating i.e. increasing and decreasing trend. The countries, which played moderate role in shifting cultivation, were Pakistan, Burma, Thailand and New Guinea. The countries, which played minor role and fewer families, involved were Laos, Nepal-Bhutan, Cambodia, British Borneo, Philippines and North South Vietnam. The moderate countries Pakistan maintained a decreasing rate over the years. Burma,

Thailand and Philippines showed fluctuating rate over the years. Among the small countries which show an increasing growth rate were Nepal-Bhutan, Ceylon, Laos and Cambodia. On the other hand British Borneo shows decreasing trend over the years.

In the table an attempt is made to find out growth rate with the base year 1970. It is observed from the table that in some countries maintained a significant variation during last four decades. On the other hand, some countries made consistency, stable, moderate growth rate. The countries, which showed steady growth, rate were Pakistan, Burma, North Vietnam and New Guinea. The countries which showed increasing growth rate were India, Nepal-Bhutan, Ceylon, Thailand, Laos, Cambodia, South Vietnam, China and Formosa. Indonesia showed deceased growth rate. The highest growth rate were shown by Ceylon (650 per cent) followed by Cambodia (408 per cent) and South Vietnam (425 per cent). From the table, we can conclude that shifting cultivation is a popular primitive practice and way of life of hill people of south East Asian countries. More Indonesian families were involved in shifting cultivation followed by Indian and Chinese families.

National Perspective:

Population dependent on shifting cultivation in India:

An attempt has been made in the table 6.7 to give a general view of population dependent on shifting cultivation practices in India for four decades viz.1970, 1980, 1990 and 2000. The indigenous tribal families of North East Indian states, Orissa and Bihar living in hilly tracts mainly engaged in agriculture and allied activities for their livelihood, shifting cultivation plays an important role in hill economy of Indian hilly states. From the table, it is cleared that among the states of India practicing shifting cultivation, highest percent of Orissa population involved in age old cultivation practice followed by Nagaland, Arunachal Pradesh and Meghalaya families. It is very interesting to note that in case of Orissa and Arunachal Pradesh the numbers of families were declining over the years. In case of Nagaland the rate is fluctuating first decreasing than increasing again decreasing. Arunachal Pradesh shows a decreasing trend. Meghalaya shows an upward increasing trend. The states in which families plays moderate role in shifting cultivation in India were Manipur, Assam, Mizoram, Tripura and Andhra Pradesh. It is very interesting to note that Manipur maintains an upward increasing trend.

Table 6.7 Population dependent on shifting cultivation in India

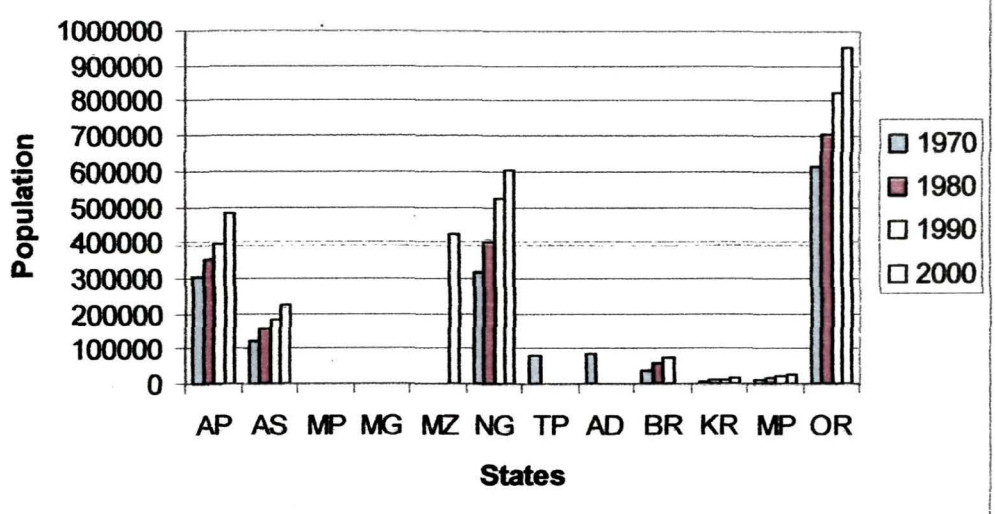
States	1970	1980	1990	2000
Arunachal Pradesh	3,05,000 (13.77)	3,50,165 (12.42)* (14.80)**	3,95,614 (11.02)* (29.71)**	4,80,275 (10.92)* (57.46)**
Assam	1,25,000 (5.64)	1,53,000 (5.43)* (22.40)**	1,81,000 (5.04)* (44.80)**	22,5000 (5.12)* (80.00)**
Manipur	1,95,000 (8.80)	3,00,000 (10.64)* (53.85)**	4,05,000 (11.29)* (107.69)**	5,10,000 (11.60)* (161.54)**
Meghalaya	2,58,000 (11.65)	3,50,000 (12.42)* (35.66)**	5,90,000 (16.44)* (128.68)**	7,05,000 (16.03)* (173.26)**
Mizoram	1,90,000 (8.58)	2,60,000 (9.22)* (26.98)**	3,09,000 (8.61)* (62.63)**	420,000 (9.55)* (121.05)**
Nagaland	3,15,000 (14.22)	4,00,000 (14.19)* (26.98)**	5,25,000 (14.63)* (66.67)**	6,05,000 (13.76)* (92.06)**
Tripura	81,000 (3.66)	1,00,000 (3.55)* (23.46)**	1,30,000 (3.62)* (60.49)**	1,45,000 (3.30)* (79.01)**
Andhra Pradesh	83,000 (3.75)	1,16,000 (4.11)* (39.76)**	1,20,000 (3.34)* (44.53)**	2,10,000 (4.78)* (153.01)**
Bihar	38,000 (1.75)	61,000 (2.16)* (60.53)**	75,000 (2.09)* (97.37)**	1,05,000 (2.39)* (176.32)**
Kerala	5,000 (0.22)	8,900 (0.32)* (78.00)**	13,300 (0.37)* (166.00)**	18,230 (0.41)* (264.60)**
Madhya Pradesh	9,000 (0.40)	14,000 (0.47)* (55.56)**	19,900 (0.82)* (121.11)**	24,300 (0.55)* (170)**
Orissa	6,15,000 (27.77)	7,06,000 (25.04)* (14.80)**	8,25,000(22.99)* (34.15)**	9,50,000(21.60)* (54.47)**
Total All India	2,215,000 (100)	2,81,9065 (100)* (27.27)**	3588814 (100)* (62.02)**	4397805 (100)* (98.55)**

N.B: * indicates vertical percentage to total.

** indicates horizontal percentage with base year 1970.

Sources: Complied with (1) Swidden Cultivation and Development Programmes in North East India by Girindra Nath Das published by Akansha Publications, New Delhi (2001), (2) Shifting cultivation in India, ICAR, New Delhi (4) Shifting Cultivation – Magnitude of the Problem & lesson learnt by Kaul, G.L, Journal of North East Council (1998), Shillong, Vol:4, pp-19-20

Fig- 6.5 Population dependent on Jhum cultivation in India



(AP=Arunachal Pradesh, AS=Assam, MP=Manipur, MG=Meghalaya, MZ=Mizoram, NG=Nagaland, TP=Tripura, AD=Andhra Pradesh, BR=Bihar, KR=Kerala, OR=Orissa)

On the other hand Assam shows decreasing trend. Mizoram, Tripura and Andhra Pradesh maintained a fluctuating trend. Among the states whose less family involved were Bihar, Kerala and Madhya Pradesh. These states showed an upward increasing trend while Madhya Pradesh shows fluctuating trend. In the table an attempt was made to find out growth rate with the base year 1970. It is understood from the table that all the states shows an increasing trend but in some states shows consistency, stable, moderate growth rate. The states shows moderate growth rates were Arunachal Pradesh, Assam, Nagaland, Tripura and Orissa.

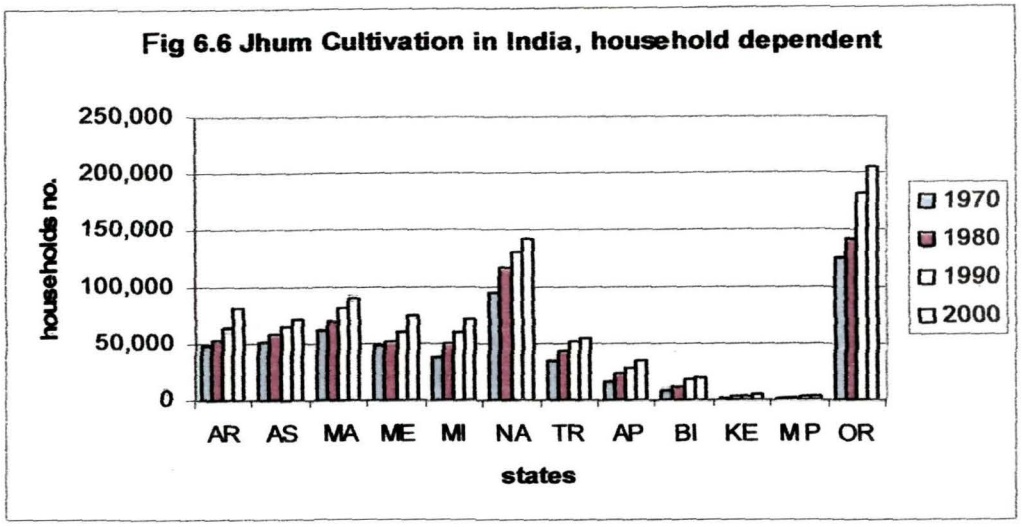
On the other hand the states, which shows increasing growth rate, were Manipur, Mizoram, Andhra Pradesh, Bihar and Kerala. Kerala showed the highest growth rates (264.60 per cent) followed by Bihar (176.32 per cent), Meghalaya (173.26 per cent) and Manipur (161.54 per cent). From the table we can conclude that shifting cultivation is a popular, primitive practices and way of life of hill people of many Indian states.

Table 6.8: Households dependent on shifting cultivation in India

States	1970	1980	1990	2000
Arunachal Pradesh	49,000 (9.21)	54,000 (8.63)* (10.20)**	63,000 (8.42)* (28.57)**	81,000 (9.49)* (65.31)**
Assam	51,000 (9.59)	(9.27)* (12.07)**	64,500 (8.62)* (26.47)**	72,200 (8.46)* (41.57)**
Manipur	61,050 (11.48)	70,000 (11.19)* (14.66)**	81,000 (10.83)* (32.68)**	90,050 (10.55)* (47.50)**
Meghalaya	48,500 (9.12)	52,290 (8.36)* (7.81)**	60,050 (8.03)* (23.81)**	75,050 (8.79)* (54.74)**
Mizoram	38,650 (7.27)	50,000 (7.99)* (29.37)**	60,400 (8.07)* (56.27)**	71,200(8.35)* (84.22)**
Nagaland	95,000(17.86)	1,16,046(18.55)* (22.15)**	1,30,250 (17.41)* (37.11)**	1,41,050(16.53)* (48.47)**
Tripura	34,800 (6.54)	43,000 (6.88)* (23.56)**	51,000 (6.82)* (46.55)**	54,250 (6.36)* (55.89)**
Andhra Pradesh	16,070 (3.02)	23,200 (3.71)* (44.37)**	29,100 (3.89)* (81.08)**	34,200 (4.01)* (112.82)**
Bihar	8,500 (1.59)	12,200 (1.95)* (43.53)**	18,400 (2.46)* (116.47)**	20,500 (2.40)* (141.18)**
Kerala	2,500 (0.34)	3,200 (0.51)* (28.00)**	4,000 (0.54)* (60.00)**	4,800 (0.56)* (92.00)**
Madhya Pradesh	1,800 (0.34)	2,500(0.40)* (38.89)**	3,200 (0.42)* (77.78)**	3,800 (0.45)* (111.11)**
Orissa	125,000(23.50)	1,41,000 (22.54)* (12.80)**	1,81,000 (24.19)* (44.80)**	2,05,000 (24.03)* (64.00)**
Total All India	5,31,810(100)	6,25,436 (100)* (17.61)**	7,45,900 (100)* (40.26)**	8,53,100 (100)* (60.04)**

N.B: * indicates vertical percentage to total.
** indicates horizontal percentage with base year 1970.

Sources: Complied with (1) Swidden Cultivation and Development Programmes in North East India by Girindra Nath Das published by Akansha Publications, New Delhi (2001), (2) Shifting cultivation in India, ICAR, New Delhi (3) Shifting Cultivation – Magnitude of the Problem & lesson learnt by Kaul, G.L, Journal of North East Council (1998), Shillong, Vol:4, pp-19-20



Household dependent on shifting cultivation in India

An attempt has been made in the table 6.8 to give a general view of households' farmers dependent on shifting cultivation practices in India for four decades viz. 1970, 1980, 1990 and 2000. The indigenous tribal families households of North East India states, Orissa and Bihar living in the hilly tracts mainly depended upon on agriculture and allied activities for their livelihood, shifting or Jhum cultivation plays an important role in hill economy of Indian hilly states. From the table, it is cleared that among the states of India practising shifting cultivation, highest percent of Orissa households' population involved in age-old cultivation practice followed by Nagaland and Manipur households. It is very interesting to note that in case of Manipur the numbers of households were declining over the years. In case of Orissa, the rate is fluctuating first decreasing then increasing again decreasing, but Nagaland shows first increasing then decreasing. The states in which households played moderate role in shifting cultivation in India were Assam, Arunachal Pradesh, Meghalaya, Mizoram and Tripura. It is very interesting the note that Mizoram maintained an upward increasing trend. On the other hand Assam, shows decreasing trend. Arunachal Pradesh, Meghalaya and Tripura maintained a fluctuating trend. Among the states whose less households families involved were Andhra Pradesh, Bihar, Kerala and Madhya Pradesh. These states showed an upward increasing trend.

In the table an attempt was made to find out growth rate with the base year 1970. It is observed from the table that all the states showed an increasing trend, but some states shows consistency stable, moderate growth rate. The states shows moderate

growth rates were Assam, Manipur, Mizoram, Nagaland and Tripura. On the other hand, the states, which show an increasing growth rate, were Andhra Pradesh, Bihar and Madhya Pradesh. Bihar showed the highest growth rate (141.18 per cent) followed by Andhra Pradesh (112.82 per cent) and Madhya Pradesh (111.11 per cent).From the table; we can conclude that shifting cultivation is a popular, primate practice and way of life of hill people of many Indian states.

Study area perspective:

Population dependent on shifting cultivation in two hill districts of Assam

The state of Assam endowed with fertile river valleys and green mountains have been the abode of various tribes with rich cultural heritage since remote past. The tribal communities have entered into the state from their original habitats through different routes at different intervals of time and have permanently settled here. The tribes of Assam may conveniently be classified into two main categories, the plain tribes and the hill tribes. The plain tribes are exclusively found in the Brahmaputra and Barak Valleys of the state. On the other hand the hill tribal are mainly concentrated in the two autonomous hill districts of Karbi Anglong and North Cachar Hills which are commonly referred to as the Hill areas.

The table 6.9 gives a general view of total population, scheduled tribe population and Jhumias population, of two-hill district of Assam for 5 decades. From the table it is cleared that those Jhumias and Scheduled Tribe populations were increasing in every year. In N.C Hills Jhumias percent more than the Karbi Anglong district. In N.C. Hills Jhumias population increasing at increased level, but in Karbi Anglong district Jhumias population increasing at decreasing level. It is interesting to note that the rate of growth of scheduled tribe population is more than Jhumias population. An attempt has been made to find out horizontal percentage with base year 1960. The table shows Jhumias population increased at stable level, but scheduled Tribe population increased at increasing level.

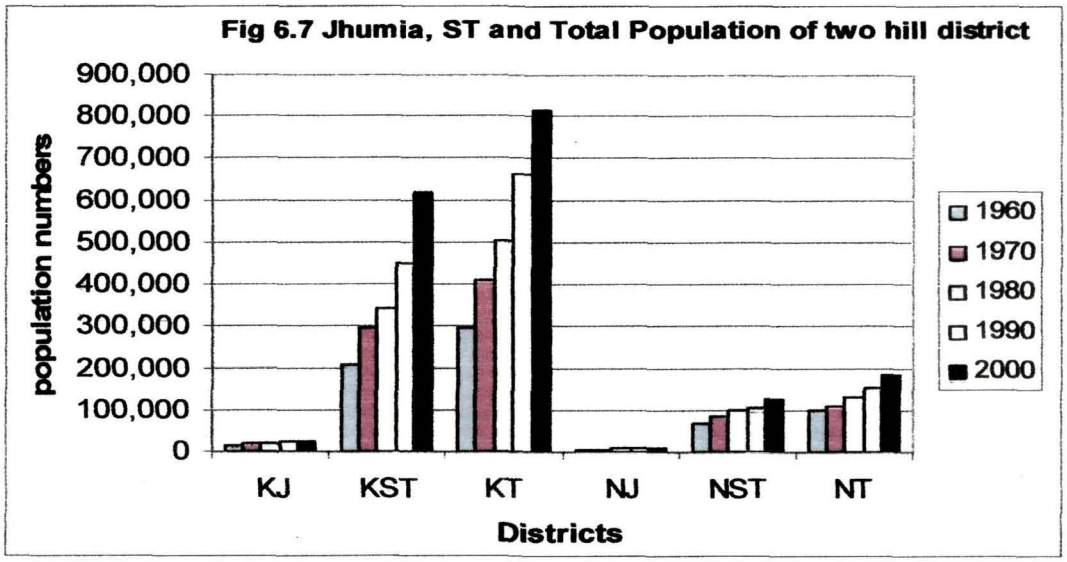
Table: 6.9 Total Population and Jhumias Population of two hill district of Assam

District	1960	1970	1980	1990	2000
Karbi Anglong					
Jhumias	14,300(4.78)	18,625(4.54)*	20,050(3.96)*	22,123(3.34)*	23,248(2.86)*
		(30.24)**	(40.21)**	(54.71)**	(62.57)**
ST	2,05,075	2,98,800	3,42,000	4,50,000	6,15,000
	(68.61)	(72.87)*	(67.68)*	(67.90)*	(75.71)*
		(45.70)**	(66.77)**	(119.43)**	(199.89)**
Total	2,98,920	4,10,025	5,05,320	6,62,723	8,12,300
	(100)	(100)*	(100)*	(100)*	(100)*
		(37.17)**	(69.05)**	(121.70)**	(171.74)**
N.C. Hills					
Jhumias	4,810	5,952	7,800	8,340	9,200
	(4.85)	(5.41)*	(6.04)*	(5.53)*	(4.94)
		(23.74)**	(62.16)**	(73.39)**	(91.27)**
ST	69,245	85,146	99,000	1,05,140	1,25,652
	(69.83)	(77.37)*	(76.65)*	(69.72)*	(67.49)*
		(22.96)**	(42.97)**	(51.84)**	(81.46)**
Total	99,164	1,10,045	1,29,154	1,50,801	1,86,189
		(100)*	(100)*	(100)*	(100)*
	(100)	(10.97)**	(30.24)**	(52.07)**	(87.76)**

* indicates percentage to total population

** indicates horizontal percentage to the base year 1960

Source: Statistical hand book of Assam, Department of Economics and Statistics, Guwahati, Assam



KJ= Jhumias of Karbi Anglong, KST= ST of Karbi Anglong, KT= Total Population of Karbi Anglong, NJ=Jhumias of North Cachar, NST= ST of North Cachar NT= Total population of North Cachar

Input supplied by IJDP Schemes:

In the table 5.10 an attempt has been made by the author to give a general view of supply of input i.e. seed and number of beneficiaries for twenty year periods from 1982-83 to 2001-02 in the Karbi Anglong and N.C. Hills district. An attempt has been made to find out per unit. The inputs have been provided under Integrated Jhumias Development Programme (IJDP) by the Government. It is observed from the table that assistance was given to four centers in Karbi Anglong district and four centers in the N.C. Hills district. The names of the IJDP centers in the Karbi Anglong district are Kheroni IJDP, Bora Tisso IJDP, Sinandi IJDP and Amardisa IJDP and the name of the IJDP in N. C. Hills are Indrimbunglow IJDP, Boromoulkoi IJDP, Natun Leikul IJDP and Digendu IJDP.

It is observed from the table that the assistance was not uniform in all the year, some year assistance was more as compared to the previous year again in some year assistance was less as compared to the previous year. It was observed from the table that in the Karbi Anglong district more assistance was given to Bora Tisso centre followed by Kheroni IJDP. It is also understood from the table in the Bora Tisso Centre the assistance as highest in the year 1989-90 (34 qtt.) followed by 32 qtt. in 1988-89, 26qtt. in 1985-86. It is also cleared from the table that the number of beneficiaries also more in Bora Tisso followed by Kheroni and Sinandi IJDP. Regarding the distribution of seed in the N.C. Hill district, it was observed that more assistance was given to Indrimbunglow IJDP Center followed by Natun Leikul and Boromoulkoi IJDP centre.

Table 6.10: Supply of Input (seed) to Jhumias (Beneficiary) under Integrated Jhumias Development Project (IJDP) Karbi Anglong District

Name of IJDP	1982 -83	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	1993 -94	1994 95	1995 -96	1996 -97	1997 -98	1998 -99	1999 2000	2000 2001
1) Kheroni																			
Qtty.of seed(qtl.)	4.5	9.5	12.5	10.5	13.5	13	17	17	21	12.5	8.5	11.2	10.85	9.5	10.5	12.5	9.3	8.5	10.41
Number of beneficiary	12	19	22	15	18	15	18	18	22	25	17	23	22	19	21	25	19	17	21
Unit (qtt)	0.38	0.50	0.56	0.70	0.75	0.87	0.94	0.94	0.95	0.50	0.50	0.49	0.49	0.50	0.50	0.50	0.49	0.50	0.50
2) Bura tissu																			
Qtty of seed(qtl.)	20	4.18	26	28	16	29	32	34	24	24.5	22.3	21.4	20.5	23.5	22	24	26	20.5	24.5
Number of beneficiary	55	11	49	48	23	40	36	38	25	53	45	43	41	47	44	49	53	43	49
Unit (qtt)	0.36	0.38	0.53	0.58	0.69	0.72	0.88	0.89	0.96	0.46	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.48	0.50
3) Sinandi																			
Qtty of seed(qtl.)	4.5	8.5	11	9	7	6	7.5	10	12.5	11.5	12	13.5	9.5	8.9	10.5	11.40	12.5	13.30	13
Number of beneficiary	10	18	20	14	17	16	20	23	25	23	24	27	20	20	23	24	25	27	26
Unit (qtt)	0.45	0.47	0.55	0.64	0.41	0.38	0.38	0.43	0.50	0.50	0.50	0.50	0.48	0.45	0.46	0.48	0.50	0.49	0.50
4) Amardisa																			
Qtty of seed(qtl.)	4.5	9.5	11.5	8.5	13	16	18	20	23	13.50	13	12.5	12	14.5	14	13.5	12.5	12	11.5
Number of beneficiary	11	18	20	14	20	18	20	21	24	27	26	24	21	29	27	26.5	25	25	26
Unit (qtt)	0.41	0.53	0.58	0.61	0.65	0.89	0.90	0.95	0.95	0.50	0.50	0.52	0.57	0.50	0.52	0.51	0.50	0.48	0.44

Source: Office of the Development Commissioner for the Hill Areas, Assam

Table 6.10: Supply of Input (seed) to Jhumias (Beneficiary) under Integrated Jhumias Development Project (IJDP) North Cachar Hills

Name of IJDP	1982 -83	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	1993 -94	1994 -95	1995 -96	1996 -97	1997 -98	1998 -99	1999 2000	2000 2001
1)Indrim-bunglow																			
Qtty of seed(qtl.)	9.2	18	20	17	11	14	22	23	13	13	22.5	20.5	21	22.5	23	24.5	20	21.5	22
Number of beneficiary	25	35	25	32	20	24	41	40	26	48	45	42	43	47	46	48	41	43	43
Unit (qtt)	0.37	0.51	0.80	0.53	0.55	0.58	0.54	0.58	0.50	0.48	0.50	0.49	0.49	0.48	0.50	0.51	0.48	0.50	0.51
2) Bormoulkoi																			
Qtty of seed(qtl.)	4.5	9.5	11	8	12	11	14	16	17	13.5	14	12	12.5	13	13.50	14	14.5	14	15
Number of beneficiary	12	19	22	15	18	15	18	20	20	28	29	25	26	27	28	31	33	31	33
Unit (qtt)	0.38	0.50	0.50	0.53	0.67	0.73	0.77	0.80	0.85	0.48	0.48	0.48	0.48	0.48	0.48	0.45	0.43	0.45	0.45
3) Natun lekil																			
Qtty of seed(qtl.)	4.0	8.0	10.5	9	12	13	14	13	19	10.5	11	11.5	12	13	13.5	11.5	11	10	12.5
Number of beneficiary	10	17	18	12	16	15	15	14	20	22	23	25	27	28	31	23	22	23	25
Unit (qtt)	0.40	0.47	0.58	0.75	0.75	0.86	0.93	0.95	0.95	0.47	0.48	0.46	0.44	0.46	0.44	0.50	0.50	0.43	0.50
4) Digendu																			
Qtty of seed(qtl.)	6.5	11.5	12.5	9	11	11	14	15	19	8.5	19.5	10.5	12.5	10.5	11.5	12.5	13.5	9.5	11.5
Number of beneficiary	12	19	22	15	18	17	18	19	24	17	29	22	26	23	21	24	27	20	21
Unit (qtt)	0.54	0.61	0.57	0.60	0.61	0.65	0.77	0.78	0.79	0.50	0.67	0.47	0.48	0.45	0.55	0.52	0.50	0.47	0.55

Source: Office of the Development Commissioner for the Hill Areas, Assam

Table 6.11 Supply of input (Fertilizer) and (Beneficiary)
Karbi Anglong

Name of IJDP	1982 -83	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	1993 -94	1994 -95	1995 -96	1996 -97	1997 -98	1998 -99	1999 2000	2000 2001
1) Kheroni																			
Qtty of seed (qtl.)	50	105	110	90	80.5	60	70	120	130	85	120	125	100	110	130	100	85.50	120	115
Number of beneficiary	12	19	22	15	18	15	18	22	25	17	23	22	19	21	25	19	17	22	24
Unit (qtt)	4.17	5.53	5.00	6.00	4.47	4.00	3.89	5.45	5.2	5.0	5.22	5.68	5.26	5.24	5.20	5.26	5.03	5.45	4.79
2) Bura tissu																			
Qtty of seed (qtl.)	265	45	260	250	120	210	190	130	250	230	220	210	240	230	240	260	210	225	230
Number of beneficiary	55	11	49	48	23	40	36	25	53	45	43	41	47	44	49	53	43	45	47
Unit (qtt)	4.82	4.09	5.31	5.21	5.22	5.25	5.28	5.20	4.72	5.11	5.12	5.12	5.11	5.23	4.90	4.91	4.88	5.00	4.89
3) Sinandi																			
Qtty of seed (qtl.)	50	90	110	90	70	60	80	130	120	125	140	100	90	110	120	130	135	140	145
Number of beneficiary	10	18	20	14	17	16	20	25	23	24	27	20	20	23	24	25	27	26	27
Unit (qtt)	5.00	5.00	5.50	6.43	4.12	3.75	4.00	5.20	5.22	5.21	5.19	5.00	4.50	4.78	5.00	5.20	5.00	5.38	5.37
4) Amardisa																			
Qtty of seed (qtl.)	45	100	120	90	70	65	80	135	135	130	125	120	145	143	135	125	127	130	135
Number of beneficiary	11	18	20	14	20	18	20	24	27	26	24	21	29	27	26.5	25	25	27	28
Unit (qtt)	4.09	5.56	6.00	6.43	3.50	3.61	4.00	5.63	5.00	5.21	5.71	5.00	5.30	5.09	5.00	5.08	4.81	4.82	4.83

Source: Office of the Development Commissioner for the Hill Areas, Assam

North Cachar Hills

Name of IJDP	1982 -83	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	1993 -94	1994 -95	1995 -96	1996 -97	1997 -98	1998 -99	1999 2000	2000 2001
1) Indrim -bunglow																			
Qtty of seed(qtl.)	95	180	205	175	135	115	130	220	230	225	205	210	225	230	245	200	215	225	230
Number of beneficiary	25	35	25	32	26	20	24	41	48	45	42	43	47	46	48	41	43	44	45
Unit (qtt)	3.8	5.14	8.20	5.47	5.19	5.75	5.42	5.37	4.79	5.00	4.88	4.88	4.79	5.00	5.10	4.88	5.00	5.11	5.11
2) Bormoulkoi																			
Qtty of seed (qtl.)	45	105	110	80	70	60.5	70.5	125	135	140	120	125	130	135	145	140	160	155	150
Number of beneficiary	12	19	22	15	18	15	18	20	28	29	25	26	27	28	35	31	41	40	38
Unit (qtt)	3.75	5.53	5.00	5.33	3.89	4.03	3.92	6.25	4.82	4.83	4.80	4.81	4.81	4.82	4.14	4.52	3.90	3.88	3.95
3) Natun lekil																			
Qtty of seed (qtl.)	40	85	110	90	70	60	80	130	110	110	115	120	130	135	115	110	100	125	130
Number of beneficiary	10	17	18	12	16	15	15	20	22	23	25	27	28	31	23	22	23	24	26
Unit (qtt)	4.00	5.00	6.11	7.50	4.38	4.00	5.33	6.50	5.00	4.78	4.60	4.44	4.64	4.35	5.00	5.00	4.35	5.20	5.00
4) Digendu																			
Qtty of seed (qtl.)	65	12	13	90	70	60	80	130	85	90	105	115	125	105	115	120	135	125	120
Number of beneficiary	12	19	22	15	18	17	18	24	17	19	22	26	28	23	21	24	27	22	23
Unit (qtt)	5.42	0.63	0.59	6.00	3.89	3.53	4.44	5.42	5.00	4.74	4.77	4.42	4.46	4.57	5.48	5.00	5.00	5.68	5.22

source: Annual Report, Deptt of Hill Area Development, Dispur, Guwahati.

Table 6.12 Supply of Livestock and Beneficiary
Karbi Anglong

Name of IJDP	1982 - 83	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	1993 -94	1994 -95	1995 -96	1996 -97	1997 -98	1998 -99	1999 2000	2000 2001
1)Rongbong Adong																			
Numbers	210	242	276	286	242	276	392	435	435	720	496	408	408	378	418	437	486	594	580
Number of beneficiary	21	22	23	22	22	23	28	29	29	45	31	24	24	18	22	23	27	33	29
Unit (qtt)	10	11	12	13	12	12	14	15	15	16	16	17	17	18	19	19	18	18	20
2) Rongnagan																			
Numbers	198	200	216	216	225	243	270	286	243	264	363	372	637	663	672	660	720	752	816
Number of beneficiary	22	25	27	27	25	27	27	26	27	24	33	31	49	51	48	44	45	47	48
Unit (qtt)	9	8	8	8	9	9	10	11	9	11	11	12	13	13	14	15	16	16	17
3) Kekang Adong																			
Numbers	112	144	162	198	250	297	348	403	348	273	299	308	270	240	288	357	374	450	468
Number of beneficiary	14	16	18	22	25	27	29	31	29	21	23	22	18	16	18	21	22	25	26
Unit (qtt)	8	9	9	9	10	11	12	13	12	13	13	14	15	15	16	17	17	18	18
4) Amardisa																			
Qtty of seed (qtl.)	144	168	208	252	300	330	322	350	330	294	322	375	448	595	738	684	513	684	740
Number of beneficiary	12	14	16	18	20	22	23	25	22	21	23	25	28	35	41	38	27	36	37
Unit (qtt)	12	12	13	14	15	15	14	14	15	14	14	15	16	17	18	18	19	19	20

Source: Office of the Development Commissioner for the Hill Areas, Assam

North Cachar Hills

Name of IJDP	1982 -83	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	1988 -89	1989 -90	1990 -91	1991 -92	1992 -93	199 3 -94	1994 -95	1995 -96	1996 -97	1997 -98	1998 -99	1999 2000	2000 2001
1) Indrim-bunglow																			
Numbers	154	176	240	216	286	325	378	351	378	286	350	405	405	405	432	448	493	527	576
Number of beneficiary	14	16	20	18	22	25	27	27	27	22	25	27	27	27	27	28	29	31	32
Unit (qtt)	11	11	12	12	13	13	14	13	14	13	14	15	15	15	16	16	17	17	18
2) Bormoulkoi																			
Numbers	154	154	160	198	216	240	299	260	299	273	322	330	352	352	391	476	522	589	672
Number of beneficiary	14	14	16	18	18	20	23	20	23	21	23	22	22	22	23	28	29	31	32
Unit (qtt)	11	11	10	11	12	12	13	13	13	13	14	14	16	16	17	17	18	19	21
3) Natun lekil																			
Numbers	132	168	192	198	286	312	364	390	364	315	368	352	374	306	360	414	475	494	540
Number of beneficiary	12	14	16	18	22	24	26	26	26	21	23	22	22	18	20	23	25	26	27
Unit (qtt)	11	12	12	11	13	13	14	15	14	15	16	16	17	17	18	18	19	19	20
4) Digendu																			
Numbers	168	192	234	234	300	330	300	312	330	286	299	434	495	525	608	608	680	756	779
Number of beneficiary	14	16	18	18	20	22	25	26	22	22	23	31	33	35	38	38	40	42	41
Unit	12	12	13	13	15	15	12	12	15	13	13	14	15	15	16	16	17	18	19

Source: Office of the Development Commissioner for the Hill Areas, Assam

Input supplied by IJDP Schemes:

In the table 6.11 an attempt has been made by the author to give a general view of supply of input i.e. fertilizer and number of beneficiaries for twenty years periods from 1982-83 to 2001-02 in the Karbi Anglong and NC Hills district. An attempt has been made to find out per unit. The input have been provided under Integrated Jhumia Development Programme by the govt. It is observed from the table that the assistance was given to four centers in Karbi Anglong district and four Centers in the N.C. Hills district. The names of the IJDP in the Karbi Anglong district are Kheroni IJDP, Boratisso IJDP, Sinandi IJDP and Amardisa IJDP and the name of the IJDP in N.C. Hills district are Indrimbunglow, Boromoulkoi, Natun Leikul and Digendu IJDP.

It is understood from the table that the distribution of fertilizers and beneficiaries were not uniform in all the year, some year assistance was more as compared to the previous year again in some year assistance was less as compared to the previous year. It was observed from the table that in the Karbi Anglong district more fertilizers were given to Bora Tisso center. It is also observed from the table that in the Bora Tisso centre the assistance was highest in the year 1982-83 (265qt). It is also cleared from the table that the numbers of beneficiaries were also more in BoraTisso followed by Kheroni IJDP. Regarding distribution of fertilizer in the N.C. Hills district, it was observed that the more assistance was given to Indrimbunglow IJDP centre followed by Boromoulkoi IJDP centre.

In the table 6.12 an attempt has been made by the author to give a general view of supply of livestock and number of beneficiaries for twenty-year periods from 1982-83 to 2001-02 in the Karbi Anglong and N.C. Hills district. An attempt has been made to find out per unit. The Government has provided the inputs under Integrated Jhumias Development Programme. It is observed from the table that the assistance was given to four centres in Karbi Anglong district and four centres in the N.C. Hills district. The names of the IJDP in the Karbi Anglong district are Kheroni IJDP, Bora Tisso IJDP, Sinandi IJDP and Amardisa IJDP, and the name of the IJDP in the N.C. Hills are Indrimbunglow IJDP, Boromoulkoi IJDP, Natun Leikul IJDP and Digendu IJDP. It is observed from the table that the distribution of livestock to beneficiaries were not uniform in all the year, some year assistance was more as compared to the previous year again in some year assistance was less as compared to the previous year. It was observed from the table that in the Karbi Anglong district more

livestock were given to Bora Tisso Center followed by Kheroni I.J.D.P. It is also observed from the table Bora Tisso center the assistance was highest in the year 1989 followed by 1985. It is also cleared from the table that the number of beneficiaries were also more in Bora Tisso followed by Kheroni and Sinandi I.J.D.P.

Regarding the distribution of livestock in the NC hill district, it was observed that more assistance was given to Indrimbunglow IJDP center followed by Natun Leikul and Boromoulkoi IJDP center.

Respondents Perspective:

Input used per year in the production programme:

In a production process input is converted to output. In agricultural production system, the yield or output depends upon on many inputs viz; seed, organic and inorganic fertilizer, pesticides, labour and capital. In modern farming system farmer uses many inputs, but in tribal economy due to the non-availability of modern input and lack of exposure to new methods they used primitive cultivation methods and few inputs. An attempt was made to know about input used per year in the production programme by the shifting cultivators. There is a relationship between input used and output obtained. In shifting cultivation due to less input, production decreases, as a result, people shifted from one place to another place, which causes environmental degradation.

Table 6.13 Inputs used per year in the production programme.

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
Pesticides used					
(a)Yes	15	21	7	5	48
	(14.56)	(17.80)	(16.28)	(13.89)	(16)
(b)No	88	97	36	31	252
	(85.44)	(82.20)	(83.72)	(86.11)	(84.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(ii)If used sources					
(a)Own source	5	6	2	4	17
	(4.85)	(5.08)	(4.65)	(11.11)	(5.67)
(b)Government	10	15	5	1	31
	(9.71)	(12.71)	(11.63)	(2.78)	(10.33)
(c)No response	88	97	36	31	252
	(85.44)	(82.20)	(83.72)	(86.11)	(84.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Inorganic fertilizer used:					
(i) 5 - 40 Kg	9	18	5	4	36
	(8.74)	(15.25)	(11.63)	(11.11)	(12.00)
(ii) 40 - 80 Kg	6	3	2	1	12
	(5.83)	(2.54)	(4.65)	(2.78)	(4.00)
No response	88	97	36	31	252
	(85.44)	(82.20)	(83.72)	(86.11)	(84.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
HYV and local seeds used					
i) HYV seeds user	15	21	7	5	48
	(14.56)	(17.80)	(16.28)	(13.89)	(16.00)
ii) Local seeds user	88	97	36	31	252
	(85.44)	(82.20)	(83.72)	(86.11)	(84.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Organic fertilizer					
i) 10-50 kg	24	38	25	7	94
	(23.30)	(32.20)	(58.14)	(19.45)	(31.34)
ii) 60-100 kg	15	29	8	21	73
	(14.56)	(24.58)	(18.60)	(58.33)	(24.33)
iii) More than 100 kg	3	3	3	4	13
	(2.91)	(2.54)	(6.98)	(11.11)	(4.33)
iv) No response	61	48	7	4	120
	(59.22)	(40.68)	(16.28)	(11.11)	(40.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Labour used (Own Labour)					
a) 1-3 labour	80	90	30	26	226
	(77.67)	(76.27)	(69.77)	(72.22)	(75.33)
b) 4-6 labour	10	20	8	8	46
	(9.71)	(16.95)	(18.60)	(22.22)	(15.33)
c) 6 & above	13	8	5	2	28
	(12.62)	(6.78)	(11.63)	(5.56)	(9.33)
Total	113	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Labour used (Hired labour)					
a) 1-3 labour	6	9	4	5	24
	(5.83)	(7.63)	(9.30)	(13.89)	(8.00)
b) 4-6 labour	4	5	3	3	15
	(3.88)	(4.24)	(6.98)	(8.33)	(5.00)
c) 6 & above	15	25	9	7	56
	(14.56)	(21.19)	(20.93)	(19.44)	(18.67)
No response	78	79	27	21	205
	(75.73)	(66.95)	(62.79)	(58.34)	(68.33)
Total	113	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

The details of the inputs used by the households' respondents under the survey are presented in the table 5.13. From the table it appears that majority (84.00) of the respondent Jhumias were not familiar with pesticides, it is interesting to note that only 16.00 per cent Jhumias respondent familiar with pesticides. Ethnicity wise also reveals the similar trends, among all the tribes, more Dimasa households were (17.80 per cent) familiar with pesticides.

As regards their sources of pesticides, 10.33 per cent respondents reported that they have received pesticides from Government sources, only 5.67 per cent respondents used own sources. Ethnicity wise input sources reveals that 4.85 per cent Karbi respondents used own sources while 9.71 per cent respondents were received input from Government. It is interesting to note that Non-tribal Jhumias shows dissimilar trends with Karbi, Dimasa and Minor tribe.

Regarding sources of input, 11.11 per cent non-tribal households' uses own source which is the highest percent among all the groups. Non-tribal groups were getting less assistance from Government (2.78 per cent). Fertilizer is an important component of production. Organic fertilizer is derived from villages itself, but inorganic fertilizers like Urea, Potash have to be procured from other parts of the country.

Regarding use of organic and inorganic fertilizer by the Jhumias, It is dishearten to note that majority of respondents (84.00 per cent) were not familiar with inorganic fertilizer, only 4 percent uses 40-80 Kg fertilizer, 12 percent uses 5-40 Kg of fertilizers. Ethnicity wise also reveals the same trend for minor tribe and non-tribe group while difference is found in case of Dimasa and Karbi tribe.

Regarding high yielding varieties seed and local seeds used, the trend is same for all the groups with respects to overall. Seed is an important input for production, from the table it appears that majority of (84.00 per cent) farmers used their own seed, only 16.00 per cent used high yielding varieties seeds. The table also shows organic fertilizer used by the respondents, majority (40.00 per cent) respondents not aware about organic fertilizer, 31.34 per cent used 10-15 Kg organic fertilizer, 24.33 per cent used 60-100 Kg, only 4.33 per cent used more than 100 Kg of organic fertilizer.

Labour is an important component in production programme. There are two types of labour, one is own labour i.e. farmers and his family member and another is hired labour. Regarding labour used the table shows own labour used by the respondents, majority (75.33 per cent) of the farmers used 1-3 own labour, 15.33 per cent

engaged 4-6 labour, 9.33 per cent used 6 and above labour. Ethnicity wise shows dissimilar trend with overall trend, but the trend is same for 1-3 labour category.

The table also shows hired labour engaged by the respondents, majority of the farmers (68.33 per cent) not engaged any hired labour, only 18.67 per cent used 6 and above labour, 8 per cent used 1-3 labour, 5 per cent used 4-6 labour in their production programme. Ethnicity wise shows non-tribe used more hired labour followed by minor-tribe, Dimasa and Karbi. From the above discussion we may come to understood that the majority of the respondents used very less input viz; pesticides, inorganic fertilizers, high yielding varieties seeds and hired labour in their production programmes which affects their output and that's why they shifted the land to get more yield in other plots.

Area, Production and Average Yield of Major Crops of Study Area:

Agriculture occupies a very important place in the economy of the two hill districts of Assam and forms the major occupation of the people of the two hill districts. Keeping in view the importance of this sector various agricultural programmes have always been assigned high priority in each successive five year plans. But compared with districts of the states the pace of development of this sector has not been up to the expectations. However, due to the strategies adopted by the state government for attaining self-sufficiency in food grains, a positive indication can be seen in the form of a growing awareness on the part of the two districts cultivators for use of improved seeds, manure etc. The soil, topography, rainfall and climate of the two-hill district are suitable for cultivation of many field crops as well as horticultural crops.

Table 6.14: Area, Production and Average Yield of Major Crops in Two Hills Districts of Assam

Crops		KARBI ANGLONG					NORTH CACHAR HILLS				
		1995-96	1996-97	1997-98	1998-99	1999-2000	1995-96	1996-97	1997-98	1998-99	1999-2000
Winter Rice	A	89,040	93,050	96,045	99,094	1,01,450	5,840	5,950	5,940	5,938	6,040
			(4.50)	(7.87)	(11.29)	(13.94)		(1.88)	(1.71)	(1.68)	(3.42)
	P	1,30,070	1,35,070	1,36,070	1,39,145	1,40,020	10,436	10,846	11,250	11,546	11,925
			(3.84)	(4.61)	(6.98)	(7.64)		(3.93)	(7.80)	(10.64)	(14.27)
	AY	1,460	1,452	1,417	1,404	1,380	1787	1823	1,894	1,944	1,974
			(-0.54)	(-2.95)	(-3.84)	(-5.48)		(2.01)	(5.99)	(8.79)	(10.46)
Autumn Rice	A	10,050	10,275	11,250	11,471	12,050	5,020	5,245	5,640	5,886	6,140
			(2.24)	(11.94)	(14.14)	(19.90)		(4.48)	(12.35)	(17.25)	(22.31)
	P	12,850	13,000	13,050	13,492	13,200	7,745	7,958	8,050	8,091	8,250
			(1.17)	(1.56)	(500)	(2.72)		(2.75)	(3.94)	(4.47)	(6.52)
	AY	1,279	1,265	1,160	1,176	1095	1,543	1,517	1,427	1,375	1,344
			(-1.09)	(-9.30)	(-8.05)	(-14.39)		(-1.69)	(-7.52)	(-10.89)	(-12.90)
Summer Rice	A	1,205	1,289	1300	1319	1325	20	28	32	36	42
			(6.97)	(7.88)	(9.46)	(9.96)		(40.00)	(60.00)	(80.00)	(110.00)
	P	1,305	1,406	1,625	1,514	1,548	63	95	107	118	123
			(7.74)	(24.52)	(16.02)	(18.62)		(50.73)	(69.84)	(87.30)	(95.24)
	AY	1,083	1091	1,250	1,148	1,168	3,150	3,393	3,344	3,278	2929
			(0.74)	(15.42)	(6.00)	(7.85)		(7.71)	(6.160	(4.06)	(7.02)
Maize	A	9,315	9840	10,158	10,561	11,245	1,256	1,310	1,390	1,428	1502
			(5.64)	(9.05)	(13.38)	(20.72)		(4.30)	(10.67)	(13.69)	(19.59)
	P	7,045	8,410	7,840	8,038	8,750	1005	1,028	1,045	1,071	1,085
			(19.38)	(11.28)	(14.10)	(24.20)		(2.29)	(3.98)	(6.57)	(7.96)
	A Y	756	855	772	761	778	800	785	752	750	722
			(1310)	(2.12)	(0.66)	(2.91)		(1.88)	(6.00)	(6.25)	(9.75)
Wheat	A	1,435	1,510	1,645	1,845	1,905	40	45	48	51	54
			(5.23)	(14.63)	(28.57)	(32.75)		(12.50)	(20.00)	(27.50)	(35.00)
	P	2,240	2,415	2,506	2,670	2,945	920	943	980	110	1040
			(7.81)	(11.88)	(19.20)	(31.47)		(2.5)	(6.52)	(9.78)	(13.04)
	AY	1,561	1,599	1523	1447	1546	23,000	20,956	20,417	19,803	19,259
			(2.43)	(-2.43)	(7.30)	(0.96)		(-8.89)	(-11.23)	(-13.9)	(-16.27)
Pulse	A	3,250	3,840	3,345	3,365	3,540	495	525	545	572	595
			(18.15)	(2.92)	(3.54)	(8.92)		(6.06)	(10.10)	(15.56)	(20.20)
	P	1,645	2,050	1,845	1,897	2,100	287	290	294	309	315
			(24.62)	(12.16)	(15.32)	(27.66)		(1.05)	(2.44)	(7.67)	(9.76)
	AY	506	534	552	564	593	580	552	539	540	529
			(5.53)	(9.09)	(11.46)	(17.19)		(-4.83)	(-7.07)	(-6.90)	(-8.79)

(A=Area='ha, P=Production='qt , AY= Average yield= kg) Source : Annual Report (1995-2000) Department of Agriculture, Govt. of Assam, Guwahati.

N.B : Figures in the brackets includes horizontal percentage

In the table 6.14 an attempt has been made by the author to give a general view on area, production and average yield data of winter rice, autumn rice and summer rice, maize, wheat and pulse crop for a period of five years, data from 1995-96 to 1999-2000. In the table an attempt has been made to present horizontal percentage with the base year 1995-96 for both the districts. It is very interesting to note that the areas of the all crops were increasing with compared to the base year 1995-96. It is seen from the table that autumn rice area of Karbi Anglong district shows an increasing trend from 2.24 per cent in the year 1996-97 to 11.94 per cent in the year 1997-98. It is also observed from the table that area under summer rice crop of N.C. Hills shows an increasing trend from 40 per cent in the year 1996 to 100 per cent in the year 1999. It is very interesting to note that the pulse crop area in the Karbi Anglong districts shows insignificant increase from 1997-98 to 1999-2000. Other crops maintained a stable growth rate in the Karbi Anglong district over the years. It is seen from the table that the N. C. Hills district shows a better performance in area under different crops than the Karbi Anglong district. Regarding production of crops in the two hill district, it is observed from the table that the production of winter, autumn and summer rice, maize, wheat and pulse crops shows an increasing trend with the base year 1995-96. Summer rice in Karbi Anglong district shows a significant increasing trend 24.52 per cent in the year 1997-98. In N.C. Hills production of summer rice also shows significant increasing trend (95.24 per cent) in the year 1999. It is observed from the table that pulse crop which is important for human diet, deficiency of which causes Kwarsikor and Maramus disease of children shows a fluctuating trend for the period. It is understood that the N.C. Hills district shows good performance in production of crops than Karbi Anglong district. The increase in production may due to fertile soil, use of improved seed, good monsoon and farmers' hard work. Regarding average yield of winter rice, autumn rice, wheat crops in the Karbi Anglong district shows negative trend. Autumn rice, wheat and pulse crop in the North Cachar also shows negative trend. The people inhabiting the hill areas of Assam usually supplement their economy through livestock rearing, ideal agro-climatic factors and the necessity for offering scarifies to various deities have played a vital role in rearing animals and birds in a traditional manner since remote past. However, the Department for Animal Husbandry & Veterinary Science has embarked upon a good number of schemes after taking into consideration the vast potentiality of livestock development in the hill Areas of Assam.

Table 6.15 Yield of crops

Details	Karbi	Dimasa	Minor Tribe	Non Tribe	Total
A) Cereals					
(i) 40 - 100 Kg/bigha	61	58	18	20	157
	(59.22	(49.15)	(41.86)	(55.55)	(52.34)
(ii) 100 - 200 Kg/bigha	18	26	12	4	60
	(17.48	(22.03)	(27.91)	(11.11)	(20.00)
(iii) 200 - 300 Kg/bigha	5	9	3	3	20
	(4.85)	(7.63)	(6.98)	(8.34)	(6.67)
(iv) more than 300kg/bigha	1	10	1	0	12
	(0.97)	(8.47)	(2.33)	0	(4.00)
No Response	18	15	9	9	51
	(17.48)	(12.71)	(20.93)	(25.00)	(17.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(b) Oil Seed					
(i) 40 - 100 Kg/bigha	29	30	9	12	80
	(28.16)	(25.42)	(20.93)	(33.33)	(26.67)
(ii) 100 - 200 Kg/bigha	24	34	8	6	72
	(23.30)	(28.81)	(18.60)	(16.67)	(24.00)
(iii) 200 - 300 Kg/bigha	13	17	2	2	34
	(12.62)	(14.41)	(4.65)	(5.56)	(11.34)
No Response	37	37	24	16	114
	(35.92)	(31.36)	(55.81)	(44.44)	(38.00)
Total	103(100)	118 (100)	43(100)	36 (100)	300 (100)
(c) Pulses					
(i) 40 - 100 Kg/bigha	33	34	18	20	105
	(32.04)	(28.81)	(41.86)	(55.56)	(35.00)
(ii) 100 - 200 Kg/bigha	13	32	6	4	55
	(12.62)	(27.12)	(13.95)	(11.11)	(18.33)
(iii) 200 - 300 Kg/bigha	10	16	3	2	31
	(9.71)	(13.56)	(6.98)	(5.56)	(10.33)
(iv) more than 300 kg/bigha	0	10	0	0	0
		(8.47)			
No response	47	26	16	10	99
	(45.63)	(22.03)	(37.21)	(27.78)	(33.00)
Total	103(100)	118 (100)	43(100)	36 (100)	300 (100)
(d) Vegetables (Kg/bigha)					
(i) 40 - 100 Kg/bigha	37	35	14	12	98
	(35.92)	(29.66)	(32.56)	(33.33)	(32.67)
(ii) 100 - 200 Kg/bigha	18	18	10	15	61
	(17.48)	(15.25)	(23.26)	(41.67)	(20.34)
(iii) 200 - 300 Kg/bigha	7	19	3	2	31
	(6.80)	(16.10)	(6.98)	(5.56)	(10.33)
(iv) more than 300 kg/bigha	3	7	0	0	10
	(2.91)	(5.93)	0	0	(3.33)
No response	38	39	16	7	100
	(36.89)	(33.05)	(37.20)	(19.44)	(33.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

(e) Tuber Crops					
(i) 40 - 100 Kg/bigha	43	18	12	7	80
	(41.75)	(15.25)	(27.91)	(19.44)	(26.67)
(ii) 100 - 200 Kg/bigha	18	27	15	10	70
	(17.48)	(22.88)	(34.88)	(27.78)	(23.33)
(iii) 200 - 300 Kg/bigha	4	12	2	1	19
	(3.88)	(10.17)	(4.65)	(2.78)	(6.33)
(iv) more than 300 kg/bigha	3	14	1	0	18
	(2.91)	(11.86)	(2.33)		(6.00)
No response	35	47	13	18	113
	(33.98)	(39.83)	(30.23)	(50.00)	(37.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(f) Fruit Crops (Kg/bigha)					
(i) 40 - 100 Kg/bigha	32	26	7	6	71
	(31.07)	(22.03)	(16.28)	(16.67)	(23.67)
(ii) 100 - 200 Kg/bigha	23	32	6	7	68
	(22.33)	(27.12)	(13.95)	(19.44)	(22.67)
(iii) 200 - 300 Kg/bigha	6	10	4	2	22
	(5.83)	(8.47)	(9.30)	(5.55)	(7.33)
no response	42	50	26	21	139
	(40.78)	(42.38)	(60.47)	(58.33)	(46.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Respondents' perspective:

Yield of Crops

Respondents were interviewed to learn about yield of crops. The responses are discussed below. Table 6.15 presents yield of crops, regarding yield of cereals, majority of farmers (52.34 per cent) getting yield 40-100 Kg/bigha, 20.00 per cent received a yield of 100-200 Kg/bigha, 6.67 per cent getting 200-300 Kg/bigha, only 4.00 per cent farmers received more than 300 Kg/bigha, 17 per cent farmers not cultivated cereals crops, hence no output. Ethnicity wise shows that 8.47 per cent Dimasa received yield more than 300 Kg/bigha on the other hand 8.34 per cent non-tribe farmers received yield 200-300 Kg/bigha, 27.91 per cent minor tribe got yield 100-200 Kg/bigha. It is interesting to note that 59.22 per cent Karbi farmers received cereals yield 40-100 Kg/bigha.

Regarding yield of oilseed crops, the performance is not very good. 26.67 per cent farmers received 40-100 Kg oilseeds per bigha, 24.00 per cent farmers received 100-200 Kg yield per bigha and 1.34 per cent farmers not cultivated oilseed crops, hence no output. Ethnicity wise shows that 14.41 per cent Dimasa received yield more than

200-300 Kg/bigha on the other hand 28.81 per cent Dimasa received yield 100-200 Kg/bigha, 28.16 per cent farmers received yield 40-100 Kg/bigha. Regarding the yield of pulse crops, 35.00 per cent of farmers received 40-100 Kg/bigha, 18.33 per cent received 100-200 Kg/bigha and 10.33 per cent received 200-300 Kg/bigha, 33 per cent farmers not cultivated pulse crops hence they received no output. Ethnicity wise shows that 8.47 per cent Dimasa gets more than 300 Kg per bigha, 13.56 per cent Dimasa gets yield 200-300 Kg/bigha, and 27.12 per cent Dimasa gets yield 100-200 Kg/bigha. It is interesting to note that 55.56 per cent non-tribe got yield 40-100 Kg/bigha. Regarding the yield of vegetable crops, from the table it appears that 32.67 per cent farmers received yield between 40-100 Kg per bigha. 20.34 per cent farmers received yield 100-200 Kg/bigha, 10.33 per cent farmers received yield 200-300 Kg/bigha, only 3.33 per cent received more than 300 Kg/ bigha, about one third of the respondents not cultivated vegetable crop at all. Regarding the yield of tuber crop, it appears that 26.67 per cent farmers received yield 40-100 Kg/bigha, 23.33 per cent farmers received 100-200 Kg/bigha, 6.33 per cent received 200-300 Kg per bigha, only 6.00 per cent received more than 300 Kg per bigha, 37.67 per cent farmers not cultivated tuber crop at all. As regards, the yield of fruit crops 23.67 per cent farmers getting yield 40-100 Kg/bigha, 22.67 per cent getting yield 100-200 Kg/bigha, 7.33 per cent getting yield 200-300 Kg/bigha, 46.33 per cent not cultivated fruit crops.

Table 6.16 Output of Subsidiary Occupation (Milk, Egg & Meat)

Karbi Anglong

Occupations	1995-96	1996-97	1997-98	1998-99	1999-2000
Eggs (million numbers)	139	143 (2.88)	147 (5.76)	151 (8.63)	154 (10.79)
Meat (Million tones)	0.25	0.28 (12.00)	0.32 (28.00)	0.36 (44.00)	0.41 (64.00)
Milks (Million liters)	40	43.50 (8.75)	45.00 (12.50)	46.35 (15.88)	48.00 (20.00)

N. C. Hills

Occupations	1995-96	1996-97	1997-98	1998-99	1999-2000
Eggs (million numbers)	74	82 (10.81)	86 (16.22)	90 (21.62)	94 (27.03)
Meat (Million tones)	0.12	0.14 (16.67)	0.16 (33.33)	0.19 (58.33)	0.21 (75.00)
Milks (Million liters)	23	27 (17.39)	30 (23.33)	32.50 (41.30)	34.50 (50.00)

N.B: Figures in the bracket indicates horizontal percentage with base year 1995-96 for both the districts.

Source: Directorate of Economics and Statistics, Guwahati, Assam

Output of Subsidiary Activities:

In the table 6.16 an attempt has been made by the author to present a general view on output of subsidiary occupation i.e. milk, meat and egg from 1995-96 to 2000. In the table an attempt has been also made to present horizontal percentage with the base year 1995-96.It is observed from the table that production of milk, egg and meat increased with compared to base year 1995-96. It is very interesting to note that N.C. Hills district showed a better performance in the production of milk, egg and meat than the Karbi Anglong district.

Respondents' perspective:

Livestock Population:

Livestock plays an important role in rural economy. The Karbi like the Mongoloides dislike milk and cows are rarely reared, children therefore do not drink milk. In the interior places, milk business is in the hands of the Nepalese. They penetrated deep into the interior of the district and established their farm. In the Western wing of Karbi Anglong it is a profitable business. The Karbi restrict their preferences to pigs, goats and fowls, because of their aversion to cows the bullock carts operated by the Karbi are not seen on the road. The fowl is a well-loved bird and the Karbi use fowl as the bird of Sacrifice.

Development of the livestock resources is one of the important farming activities. It has got special importance in the context of generating supplementary income and employment opportunities in addition to meeting the family needs.

The different types of livestock/birds etc reared in the study area were goats, pigs, poultry and bee keeping. The populations of livestock/birds possessed by household are presented in table 6.17. Regarding the number of animals reared by the respondents, 40.00 percent respondents have no cow, 31.33 per cent respondents have 1-2 number of cows 24.33 per cent respondents have 2-4 numbers of cows. It is interesting to note that only 4.33 per cent have 5 and above numbers of cows. Ethnicity wise also showed that minor tribe reared more cow than the other tribe, 11.11 per cent non tribe have 5 and above numbers of cow. On the other hand 58.33 per cent non-tribe have 2-4 number of cow, 58.14 per cent minor-tribe have below 2 number cows. Goat is a poor man friend. It seems that goat are reared by most of the respondents except 21.33 per cent, 37.33 per cent respondents reared below 3 numbers, 28.67 per cent respondents reared 4-6 numbers, 12.67 per cent reared 7

Table 6.17 : Livestock Population of the respondents:

Details	Karbi	Dimasa	Minor Tribe	Non Tribe	Total
(i) Number of Dairy cow					
(a) Below -2	24	38	25	7	94
	(23.30)	(32.20)	(58.14)	(19.45)	(31.33)
(b) 2 - 4	15	29	8	21	73
	(14.56)	(24.58)	(18.60)	(58.33)	(24.33)
(c) 5 & above	3	3	3	4	13
	(2.91)	(2.54)	(6.98)	(11.11)	(4.33)
No response	61	48	7	4	120
	(59.22)	(40.68)	(16.28)	(11.11)	(40.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(ii) Goat (Numbers)					
(a) Below - 3	38	42	18	14	112
	(36.89	(35.59)	(41.86)	(38.89)	(37.33)
(b) 4 - 6	29	35	13	9	86
	(28.16	(29.66)	(30.23)	(25.00)	(28.67)
(c) 7 & above	14	14	3	7	38
	(13.59	(11.86)	(6.98)	(19.44)	(12.67)
No response	22	27	9	6	64
	(21.36	(22.89)	(20.93)	(16.67)	(21.33)
Total	103	118	43	36	300
	(100.00	(100.00)	(100.00)	(100.00)	(100.00)
(iii) Poultry Birds (Nos.)					
(a) Below - 4	63	74	14	14	165
	(61.17	(62.71)	(32.56)	(38.89)	(55.00)
(b) 5 - 8	18	10	17	17	62
	(17.48	(8.47)	(39.53)	(47.22)	(20.67)
(c) 9 & above	3	3	3	4	13
	(2.91	(2.54)	(6.98)	(11.11)	(4.33)
No response	19	31	9	1	60
	(18.45	(26.28)	(20.93)	(2.77)	(20.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(a) Below -2	29	32	19	9	89
	(28.16)	(27.12)	(44.19)	(25.00)	(29.67)
(b) 2 - 4	34	42	10	6	92
	(33.01)	(35.59)	(23.26)	(16.67)	(30.67)
(c) 5 & above	14	16	4	2	36
	(13.59)	(13.56)	(9.30)	(5.56)	(12.00)
No response	26	28	10	19	83
	(25.24)	(23.73)	(23.26)	(52.78)	(27.66)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

and above number goats. Ethnicity wise shows non-tribe reared more goats than other tribe followed by minor-tribe Karbi and Dimasa. 19.44 per cent non-tribe

reared 7 and above number goat, on the other hand 30.23 per cent minor tribe reared 4-6 number goats. It is interesting to note that 41.86 per cent minor tribe reared below 3 number of goats.

Poultry is a popular livestock; it is well-loved bird of tribal community, which is used for sacrifice. Majorities (55.00 per cent) of the respondents have below 4 number of poultry birds. 20.67 per cent have 5-8 numbers, only 4.33 per cent have 9 and above bird. 20 per cent farmers have no poultry bird at all. Ethnicity wise shows that 62.71 per cent Dimasa have below 4 bird, 47.22 per cent non-tribe have 5-8 bird, on the other hand 11.11 per cent non-tribe have 9 and above poultry birds.

Pig rearing is also common in tribal society, since pig can adopt any situation and need no extra care, hence it is a very popular animal in tribal society. The table also shows number of pigs available in respondent family. 30.67 per cent of the respondents have 2-4 numbers of pigs, 29.67 per cent respondents have below 2 numbers of pigs, only 12 per cent respondents have 5 and above pigs and 27.66 per cent respondents have no pigs.

Ethnicity wise shows that 44.19 per cent minority tribe respondents have below 2 number pig, 35.59 per cent Dimasa respondents have below 2-4 number pig and on the other hand 13.59 per cent Karbi respondents have 5 and above number of pig. From the above table, we have seen that tribal maintained a good number of livestock that are integral part of economy. Emphasis should be given on scientific management of livestock for augmenting income and employment of the respondents.

Respondents' Perspective:

Income generation from Agriculture: Agriculture is a primary activity of rural economy, but the income generated from this sector is low in hill shifting economy than permanent cultivation of valley area.

Table 6.18: Income generation from Agriculture:

Details	Karbi	Dimasa	Minor Tribe	Non Tribe	Total
Agriculture:					
(i) Income belowRs.5,000.00	7	5	4	4	20
	(6.80)	(4.24)	(9.30)	(11.11)	(6.67)
(ii) Rs.5,000 to Rs.10,000.00	48	57	22	21	148
	(46.60)	(48.31)	(51.16)	(58.33)	(49.33)
(iii) Rs.10,000 to Rs.20,000.00	39	38	12	9	98
	(37.86)	(32.20)	(27.91)	(25.00)	(32.67)
(iv) Rs.20,000 & above	9	18	5	2	34
	(8.74)	(15.25)	(11.63)	(5.56)	(11.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table 6.18 shows income generated by respondents from agriculture, majority of the respondent (49.33 per cent) of the farmers generated Rs.5,000.00 to Rs. 10,000.00 per year followed by 32.67 per cent generated Rs.10,000.00 to Rs.20,000.00.

Table 6.19: Income generation from subsidiary activities:

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
Dairy farming					
(a) Below Rs.500.00	27	23	8	8	66
	(26.21)	(19.49)	(18.60)	(22.22)	(22.00)
(b) Rs.500 - Rs.1,000.00	14	35	9	3	61
	(13.59)	(29.66)	(20.93)	(8.33)	(20.33)
(c) Rs.1,000 - Rs.2,000.00	30	39	12	20	101
	(29.13)	(33.05)	(27.91)	(55.56)	(33.66)
(d) above Rs.2,000.00	32	21	14	5	72
	(31.07)	(17.80)	(32.56)	(13.89)	(24.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Goat farming					
(a) Below Rs.500.00	41	45	21	17	124
	(39.81)	(38.14)	(48.84)	(47.22)	(41.33)
(b) Rs.500 - Rs.1,000.00	22	37	9	10	78
	(21.36)	(31.36)	(20.93)	(27.78)	(26.00)
(c) Rs.1,000 - Rs.2,000.00	14	7	3	2	26
	(13.59)	(5.93)	(6.98)	(5.56)	(8.67)
(d) above Rs.2000.00	4	2	1	1	8
	(3.88)	(1.69)	(2.33)	(2.78)	(2.67)
No response	22	27	9	6	64
	(21.36)	(22.88)	(20.93)	(16.67)	(21.33)
Total	103(100)	118 (100)	43(100)	36 (100)	300 (100)

Pig farming					
(a) Below Rs.500.00	35	37	20	8	100
	(33.98)	(31.36)	(46.51)	(2.22)	(33.33)
(b) Rs.500 - Rs.1,000.00	37	45	13	9	104
	(35.92)	(38.14)	(30.23)	(25.00)	(34.67)
(c) Rs.1,000 - Rs.2,000.00	3	5	0	0	8
	(2.91)	(4.24)			(2.67)
(d) above Rs.2000.00	2	3	0	0	5
	(1.94)	(2.54)			(1.67)
No response	26	28	10	19	83
	(25.25)	(23.73	(23.26)	(52.78)	(27.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(v) Poultry farming					
(a) Below Rs.500.00	50	69	11	11	141
	(48.54)	(58.48)	(25.58)	(30.56)	(47.00)
(b) Rs.500 - Rs.1,000.00	31	15	19	9	74
	(30.10)	(12.72)	(44.19)	(25.00)	(24.67)
(c) Rs.1,000 - Rs.2,000.00	3	3	4	5	15
	(2.91)	(2.54)	(9.30)	13.89)	5.00)
No response	19	31	9	11	70
	(18.45)	(26.27)	(20.93)	(30.56)	(23.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: primary data

On the other hand 11.33 per cent respondents generated Rs.20,000.00 and 6.67 percent generated income below Rs.5,000.00. Ethnicity wise show that 11.11 per cent Non-tribe received income below Rs.5,000.00. On the other hand 58.33 per cent Non-tribe respondent received income Rs.5,000.00 to Rs.10,000.00 from Agriculture. While 37.86 per cent Karbi respondents received income Rs.10,000.00 to Rs.20,000.00. 15.25 per cent Dimasa respondents received income Rs.20,000.00 and above.

Income from subsidiary activities:

Regarding income generation from Dairy farming, it is seen from the table 5.19 that 33.66 per cent earned Rs.1,000.00 to Rs.2,000.00, 24.00 per cent earned above Rs.2,000.00, 22.00 per cent earned below Rs.500.00, 20.33 per cent respondent Rs.500.00 to Rs.1,000.00.Ethnicity wise shows that 26.21 per cent Karbi respondents earned below Rs.500.00, 29.66 per cent Dimasa respondents earned Rs.500.00 to Rs1,000.00, on the other hand 55.56 per cent Non-tribe respondents have earned Rs.1,000.00 to Rs.2,000.00. It is interesting to note that 32.56 per cent Minor tribe have earned above Rs.2,000.00.Regarding income from goat farming

farming, 41.33 per cent farmers received income below Rs.5,000.00, 26.00 per cent received income between Rs.500.00 to Rs.1,000.00, and 8.67 per cent received Rs.1,000.00 to Rs.2,000.00. It is interesting to note that only 2.67 per cent received income above Rs.2,000.00, 21.33 per cent respondents have no income from goat farming farming, since they have no goats. Ethnicity wise shows that 48.84 per cent Minor tribe earned below Rs.500.00, 31.36 per cent Dimasa tribe has income Rs.500.00 to Rs.1,000.00 and on the other hand 13.59 per cent Karbi tribe has income Rs.1,000.00 to Rs.2,000.00. It is interesting to note that 3.88 percent Karbi respondent have income above Rs.2,000.00. 34.67 per cent respondents received income between Rs.500.00 to Rs.1,000.00 from Pig framing, 33.33 per cent respondents received below Rs.500.00. 2.67 per cent received Rs.1,000.00 to Rs.2,000.00, only 1.67 per cent received above Rs.2,000.00. It is interesting to note that 21.67 per cent respondents have no income from Pig farming farming. Ethnicity wise shows that 46.51 per cent minor-tribe have income from Pig farming farming below Rs.500.00, 38.14 per cent have income Rs.500.00 to Rs.1,000.00 on the other hand 4.24 per cent Dimasa tribe have earned Rs.1,000.00 to Rs.2,000.00. It is interesting to note that 2.54 per cent Dimasa earned above Rs.2,000.00. The table also depicts income generated from poultry farming. Majority of respondent (47.00 per cent) have income below Rs.500.00 to Rs.1,000.00. Only 5 percent earned an income between Rs.1,000.00 to Rs.2,000.00, 23.33 per cent farmers have no income from poultry farming. Ethnicity wise shows that 58.48 per cent Dimasa have income below

Table 6.20 Utilization of Production

Details	Karbi	Dimasa	Minor Tribe	Non Tribe	Total
a) Home Consumption					
(i) 50% to 60%	12	14	12	9	47
	(11.65)	(11.86)	(27.91)	(25.00)	(15.67)
(ii) 60% to 70%	47	43	11	14	115
	(45.63)	(36.44)	(25.58)	(38.89)	(38.33)
(iii) 70% to 80%	24	19	15	7	65
	(23.30)	(16.10)	(34.88)	(19.44)	(21.67)
(iv) more than 80%	20	42	5	6	73
	(19.42)	(35.60)	(11.63)	(16.67)	(24.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(b) Keeping as seed					
(i) 1% to 5%	49	59	17	18	143
	(47.57)	(50.00)	(39.53)	(50.00)	(47.66)
(ii) 5% to 10%	27	32	20	9	88
	(26.21)	(27.12)	(46.51)	(25.00)	(29.33)
(iii) 10% to 20%	14	19	2	6	41
	(13.59)	(16.10)	(4.65)	(16.67)	(13.67)
(iv) more than 20%	13	8	4	3	28
	(12.63)	(6.78)	(9.31)	(8.33)	(9.34)
Total	103	118	43	136	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(c) Given for wages					
(i) 1% to 5%	45	47	29	14	135
	(43.69)	(39.83)	(67.44)	(38.89)	(45.00)
(ii) 5% to 10%	14	20	8	12	54
	(13.59)	(16.95)	(18.60)	(33.33)	(18.00)
(iii) 10% to 20%	19	11	5	8	43
	(18.45)	(9.32)	(11.63)	(22.22)	(14.33)
(iv) more than 20%	25	40	1	2	68
	(24.27)	(33.90)	(2.33)	(5.56)	(22.37)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(36.00)	(100.00)
(d) Sold to market					
(i) 1% to 5%	48	49	11	8	116
	(46.60)	(41.53)	(25.58)	(22.22)	(38.67)
(ii) 5% to 10%	11	38	12	15	76
	(10.68)	(32.20)	(27.91)	(41.67)	(25.33)
(iii) 10% to 20%	24	19	9	7	59
	(23.30)	(16.10)	(20.93)	(19.44)	(19.67)
(iv) more than 20%	20	12	11	6	49
	(19.42)	(10.17)	(25.58)	(16.67)	(16.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source : Primary data

Rs.500.00, 44.19 per cent minor-tribe have income Rs.500.00 to Rs.1000.00, on the other hand 13.89 per cent non-tribe have income Rs.1000.00 to Rs.2000.00. From the above discussion, we have seen that tribal earned a good amount of money from livestock that contributed to economy. Therefore, emphasis should be given on scientific management of livestock for augmenting income of the respondents.

Respondents Utilization Pattern of Production:

Utilization of production may be home consumption, keeping as seed, given for wages, sold to market. Table 5.20 shows details about it. Regarding utilization of production for home consumption by the respondents, it reveals that one third of the respondents (38.33 per cent) consumed 60 per cent to 70 per cent, 24.33 per cent of the respondents consumed more than 80 per cent, 21.67 per cent of the respondents consumed 70 to 80 per cent, only 15.67 per cent of the respondents consumed 50 per cent to 60 per cent. Ethnicity wise shows that 27.91 per cent minor tribe consumed 50 per cent to 60 per cent, 45.63 per cent Karbi tribe consumed 60 per cent to 70 per cent, and on the other hand 34.88 per cent Minor tribe consumed 70 per cent to 80 per cent. It is interesting to note that 35.60 per cent Dimasa consumed more than 80 per cent. Regarding utilization of production for keeping as seed, 47.66 per cent of the respondents kept 1 to 5 per cent, 29.33 per cent of respondents kept 5 to 10 per cent, 13.67 per cent of respondents kept 10 per cent to 20 per cent, only 9.34 per cent kept more than 20 per cent of production for seed.

Ethnicity wise utilization of production as seed shows that 50 per cent of Dimasa and Non-tribe kept 1 per cent to 5 per cent of production for seed. 46.51 per cent Minor tribe kept 5 per cent to 10 per cent of production for seed. 16.67 per cent non-tribe kept 10 per cent to 20 per cent productions for seed. It is interesting to note that 12.63 per cent Karbi respondents kept more than 20 per cent of production for seed.

Regarding utilization of production given for wages, 45.00 per cent of farmers have given 1 per cent to 5 per cent as wages, 22.37 per cent gave more than 20 per cent, 18.00 per cent gave 10 per cent to 20 per cent as wages. Ethnicity wise shows that 67.44 per cent Minor tribe gave 1 per cent to 5 per cent of production for wages, 33.33 per cent Non- tribe gave 5 per cent to 10 per cent of production for wages, on the other hand 90 per cent Dimasa respondents given more than 20 per cent of their production for wages.

One of the important aspects of utilization of production is marketing of their produce. In a tribal economy barter system also plays an important role. Therefore, training on marketing of produce is also important.

Regarding marketing of production, 38.67 per cent of respondents sold 1 per cent to 5 per cent of production, 25.33 per cent sold 5 per cent to 10 per cent, 19.67 per cent sold 10 per cent to 20 per cent, 16.33 per cent sold more than 20 per cent of their produce in the respective local markets. Ethnicity wise shows that 46.60 per cent Karbi respondents sold 1 per cent to 5 per cent of their product to market, 41.67 per cent non-tribe respondents sold 5 per cent to 10 per cent of their product to market. On the other hand 23.30 per cent Karbi respondents sold 10 per cent to 20 per cent of their product to market. It is interesting to note that 25.58 per cent minor tribe sold more than 20 per cent of their product to market. Proper utilization of produce is one of the important aspects. Consumption plays an important role in tribal economy, because they produce mostly for consumption not for marketing. Consumption expenditure is an important indicator of the socio-economic status of a household.

Table:6.21 (a) Estimation of Costs and Return from Pig Farming

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of feed (in Rs.)	1716.00	2658.00	1654.00	1009.00	1759.00
2. Cost of human labour (in Rs.)	903.00	1532.00	948.00	1128.00	1128.00
3. Other cost (in Rs.)	17.00	22.00	11.00	17.00	17.00
4. Interest on working capital (in Rs.)	342.00	548.00	340.00	410.00	410.00
5. Total cost (in Rs.)	2979.00	4760.00	2953.00	3564.00	3564.00
6. Sale of animal (in Rs.)	3642.00	5597.00	3924.00	4388.00	4388.00
7. Gross return (in Rs.)	3642.00	5597.00	3924.00	4388.00	4388.00
8. Net return (in Rs.)	663.00	837.00	971.00	824.00	824.00
9. B.C. ratio	1.22	1.18	1.39	1.23	1.26

Table:6.21 (b) Estimation of Costs and Return from Poultry Farming

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of feed (in Rs.)	103.00	66.00	38.00	69.00	69.00
2. Cost of human labour (in Rs.)	79.00	43.00	17.00	46.00	46.00
3. Other cost (in Rs.)	60.00	21.00	13.00	31.00	31.00
4. Interest on working capital (in Rs.)	31.00	17.00	9.00	19.00	19.00
5. Total cost (in Rs.)	273.00	147.00	77.00	165.00	166.00
6. Sale of eggs (in Rs.)	125.00	47.00	5.00	59.00	59.00
7. Sale of birds (in Rs.)	295.00	217.00	111.00	208.00	208.00
8. Gross return (in Rs.)	420.00	364.00	116.00	267.00	292.00
9. Net return (in Rs.)	147	117.00	39.00	102.00	101.00
10. B.C. ratio	1.54	2.48	1.51	1.62	1.76

Table:6.21 (c) Estimation of Costs and Return from Goat Farming

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of human labour (in Rs.)	507.00	364.00	342.00	404.00	404.00
2. Other cost (in Rs.)	313.00	245.00	238.00	2.95.00	273.00
3. Interest on working capital (in Rs.)	107.00	79.00	75.00	87.00	87.00
4. Total cost (in Rs.)	627.00	688.00	655.00	786.00	689.00
5. Production of Milk (in Rs.)	714.00	506.00	500.00	590.00	578.00
6. Sale of animal (in Rs.)	686.00	411.00	519.00	538.00	539.00
7. Gross return (in Rs.)	1410.00	917.00	1019.00	1128.00	1119.00
8. Net return (in Rs.)	483.00	229.00	364.00	342.00	355.00
9. B.C. ratio	2.25	1.33	1.56	1.44	1.62

Table:6.21 (d) Estimation of Costs and Return from Pine Apple Cultivation

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of material input (in Rs.)	198.00	205.00	194.00	199	199
2. Cost of human labour (in Rs.)	87.00	93.00	85.00	88	88
3. cost of bullock labour (in Rs.)					
4. Manuure and fertilizers (in Rs.)					
5. Plant protection measures (in Rs.)		11.00	11.00	7.00	9.00
6. Interest on working capital (in Rs.)	37.00	40.00	38.00	38.00	38.00
7.Total cost (in Rs.)	322.00	349.00	328.00	333.00	333.00
8. Gross Return (in Rs.)	507.00	453.00	489.00	483.00	483.00
9. Net return (in Rs.)	185.00	104.00	161.00	150.00	150.00
10. B:C. ratio	1.57	1.30	1.49	1.45	1.45

Table:6.21 (e) Estimation of Costs and Return from Mandarin Cultivation

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of material input (in Rs.)	4.00	3.00	4	4	4
2. Cost of human labour (in Rs.)	18.00	16.00	14	16	16
3. cost of bullock labour (in Rs.)					
4. Manuure and fertilizers (in Rs.)					
5. Plant protection measures (in Rs.)					
6. Interest on working capital (in Rs.)	3.00	2	2	2	3
7.Total cost (in Rs.)	25.00	21	20	22	22
8. Gross Return (in Rs.)	45.00	32	33	37	37
9. Net return (in Rs.)	20.00	11	13	15	15
10. B.C. ratio	1.80	1.52	1.65	1.68	1.68

Table:6.21 (f) Estimation of Costs and Return from Banana Cultivation

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of material input (in Rs.)	73	36	25	45	45
2. Cost of human labour (in Rs.)	42	23	14	26	26
3. cost of bullock labour (in Rs.)					
4. Manuure and fertilizers (in Rs.)					
5. Plant protection measures (in Rs.)					
6. Interest on working capital (in Rs.)	15	8	5	9	9
7.Total cost (in Rs.)	130	67	44	80	80
8. Gross Return (in Rs.)	199	104	68	124	124
9. Net return (in Rs.)	69	37	24	43	44
10. B.C. ratio	1.53	1.55	1.55	1.55	1.55

Table 6.21 (g) Estimation of Costs and Return from Jhum Cultivation

Particulars	Karbi	Dimasa	Minor tribe	Non-tribe	All Group
1. Cost of material input (in Rs.)	79	85	72	72	77
2. Cost of human labour (in Rs.)	55	53	51	53	53
3. cost of bullock labour (in Rs.)					
4. Manuure and fertilizers (in Rs.)					
5. Plant protection measures (in Rs.)					
6. Interest on working capital (in Rs.)	15	9	8	12	11
7.Total cost (in Rs.)	149	147	131	137	136
8. Gross Return (in Rs.)	159	163	142	153	148
9. Net return (in Rs.)	36	23	38	36	33
10. B.C. ratio	1.07	1.11	1.08	1.12	1.09

Table 6.21 (h) Comparative Table of Benefit-Cost Ratio of Different Activities

Farming/Tribe	Karbi	Dimasa	Minor tribe	Non-tribe
1. Pig Farming (in Rs.)	1.22	1.18	1.39	1.23
2 Poultry Farming (in Rs.)	1.54	2.48	1.51	1.62
3. Goat Farming (in Rs.)	2.25	1.33	1.56	1.44
4. Banana Cultivation (in Rs.)	1.53	1.55	1.55	1.55
5. Mandarin Cultivation (in Rs.)	1.80	1.52	1.65	1.68
6. Pineapple Cultivation (in Rs.)	1.57	1.30	1.49	1.45
7. Jhum Cultivation (in Rs.)	1.07	1.11	1.08	1.12

Comparison of Cost and Returns:

The indicator for the success or failure from the farmer's point of view is the return, which he is earning from his farm. An in-depth examination of different cost and corresponding income for different farming systems has been done and is presented in table 6.21

The Benefit-Cost (B-C) ratios of different farming shows that poultry farming by Dimasa has highest benefit cost ratio followed by goat farming than mandarin cultivation by Karbi.

The Benefit Cost ratios analysis of different tribe shows that Karbi tribe have higher B-C ratio in goat farming followed by mandarin than pine apple cultivation. Dimasa tribe have higher B-C ratio in poultry farming followed by banana than mandarin cultivation. Minor tribe have higher B-C ratio in mandarin farming followed by goat farming than Banana cultivation. Non-tribe have higher B-C ratio in mandarin farming followed by poultry farming than banana cultivation.

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2. Sarma, B (1999): Land use management and agricultural practices in North East India, O.K.D Institute of social change and development, Guwahati, p-3

CHAPTER – VII

SHIFTING CULTIVATION AND ENVIRONMENTAL DEGRADATION

In this chapter an attempt is made to discuss the impact of shifting cultivation on environment. Secondary data are collected from different research organizations working on shifting cultivation besides primary data from two hill districts of Assam. Various authorities including agronomists, forestry experts, soil scientist and ecologists from time to time have carried out studies on soil erosion due to the shifting cultivation. Shifting cultivation causes deforestation. Deforestation is associated with increased runoff. In the deforested area rainfall intensified soil erosion due to the land surface exposure to rainfall and wind, and loss of root systems of forest trees, which may help in soil moisture absorption and soil retention. The erosion of fertile top soil will affect agriculture production by reducing productivity. Soil erosion in watershed significantly contributes to the watershed degradation.

N.E India perspective:

The Indian Council of Agricultural Research has conducted experiment on extent of soil and nutrient loss in different states of N.E states of India in 1995 due to the shifting cultivation, the result of the experiment is presented in Table 7.1. It may be kept in mind here that the extent of erosion greatly depends on the slope of the land and distribution of rainfall over time and space.

Table 7.1 Soil and Nutrient loss due to shifting cultivation in different states of Northeast India

States	Area under Jhum ha('000)	Soil loss tons('000)	Nutrient loss tons ('000) Organic carbon	valuable P_2O_5	K_2O_5
Assam	69.60	2846.64	91.94	0.015	0.87
Arunachal Pradesh	92.00	3762.80	121.53	0.015	1.15
Manipur	60.00	2454.00	79.26	0.013	0.75
Meghalaya	76.00	3108.40	100.00	0.016	0.95
Mizoram	61.61	2519.85	81.39	0.013	0.77
Nagaland	73.54	3007.79	97.15	0.016	0.092
Tripura	22.30	912.07	29.46	0.005	0.28

Source: Darlong, V.T and Prasad, N.L.N.S (1996) Soil erosion in the Northeast: Past, Present and Future, Zahid Hussain (ed): Environmental degradation and conservation in N.E. India, Omson Publicatios, New Delhi

Arunachal Pradesh has highest area under shifting cultivation followed by Meghalaya and Nagaland. Soil erosion is one of the major problems of the North Eastern region. It turns cultivable lands into marginal lands by reducing its productivity. It also depleting ecological productivity of rivers, swamps and wetlands of the region. In short, unless we adequately safeguard our land and check undesirable man-induced erosion, we may eventually face irreversible serious consequences. To accomplish an ecologically sustainable, development and environment, we must work hard in hand with nature and use a scientific strategy based on existing knowledge on the natural process rather than waste our efforts in unproductive development.

Table 7.2 Different types of cultivation and soil loss

Sources/causes	Extent of soil loss (ton/ha/yr)
1. First year shifting cultivation	146.6
2. Second year shifting cultivation	170.2
3. Abandoned shifting fallow	30.2
4. Bamboo forest	8.2
5. Bun method of cultivation	40.0-50.0
6. Slope cultivation with contour bunds	68.0
7. Pineapple cultivation (1st Year)	24.0-62.6
8. Pineapple cultivation (2nd year)	6.3
9. Road constructions, etc	67.2

Source: Darlong, V.T and Prasad, N.L.N.S (1996) Soil erosion in the Northeast: Past, Present and Future, Zahid Hussain(ed): Environmental degradation and conservation in N.E. India, Omson Publicatios, New Delhi

The table 7.2 shows various types of cultivation and other land use practices viz; shifting cultivation, bamboo forest, bun method of cultivation, contours bunds, Pineapple cultivation and road construction and extent of soil loss (tones/ha/year). The experiment was conducted in ICAR research complex, Barapani in the year 1995, From the table it is cleared that second year shifting cultivation causes maximum soil loss as compared to other practices due to the fact that in the second year soil become naked and soils unable to retain water. It is interesting to note that bamboo forest has less soil loss than the other practices; it is only 8.2 tones/ha/year. So, the bamboo plantation can be used to check soil erosion problem in shifting cultivation areas.

Table 7.3: Soil erosion hazards associated with various land use practices

Land use System / Practices	Soil loss (t / ha / year)	Experimental plot size
1. Shifting cultivation	30.2 - 170.2	Small
2. Shifting cultivation	5.1 - 83.3	Field
3. Tuber crops on raised bed (bun)	40.0 - 50.0	Medium
4. Pineapple cultivation along the slope (first 2 years)	24.0 - 62.6	Small
5. Home stead areas	16.8	Field
6. Mixed crop of maize and rice	19.7 - 21.0	Small
7. Rice crop on slope	32.9 - 45.0	Small
8. Bare fallow	83.3	Small
9. Cropping systems	51.0 - 83.8	Medium
10.Grass cover (planted)	10.8	Medium
11.Natural bamboo forest	0.04 - 0.52	Field

Note : Area of small, medium and field size plots were in ranges of 2-5, 16.40 and 69,000 sq.m respectively

Source: Satapathy and Sarma, B.K (2001) Land degradation and conservation of Bio-diversity with special reference to North East India, Indian Journal of Hill Farming

Shifting cultivation causes environmental degradation by the way of soil loss. Various authors and organizations made an attempt to measure soil loss due to the Shifting cultivation and try to make comparisons with other type of cultivation. Satapathy and Sarma, B.K (2001) tried to experiment on various land use system in North East India and their soil loss (t/ha/year), the details presented in table 7.3. They have done their experiment on small field, medium field. They have found that shifting cultivation causes maximum soil loss, it was 30.2-170.2 t/ha/year and they found that natural bamboo forest has caused less soil loss, it was 0.04-0.52. The experiment proved that shifting cultivation causes soil erosion there by causing environmental degradation. Other cultivation practices viz; Pineapple cultivation along the slope, home stead areas, mixed cropping of maize and rice and grass cover have medium soil loss, it is ranges from 10.8 t/ha/year to 40-50 t/ ha/year.

From the experiment it may be useful knowledge for use that natural bamboo forest has little soil loss per ha per year. This natural bamboo forest can be used for prevention of soil erosion in shifting cultivation areas.

Table 7.4 Runoff and soil loss under different systems of land management, Burnihat, (1978)

Particulars	Jhuming	1/3 Terracing	Complete Terracing
Run off (mm)	114	81.4	32.8
Run off Percentage of Rainfall	5.3	3.9	1.5
Soil loss (t/ha)	40.9	5.8	5

Source: ICAR, N.E Hill Region Research Complex, Bulletin, 1978 Shillong

ICAR, Research complex, Shillong (1978) conducted an experiment on runoff and soil loss under different systems of land management at Burnihat. The results are presented in the table 7.4. From the table it was found that runoff (mm), Soil loss (t/ha) was more in shifting cultivation (114-mm, 40.9 t/ ha) and low in complete terracing (32.8 mm,5t)

Table 7.5 Soil erosion calendar of shifting cultivation

Month	Agricultural operation	Erosion problem	Soil erosion (t/ha Min	Max
January, February, March and April	Selection of plot, forest cutting, burning and clearing of hill slopes of burnt pieces, clearing of area of burnt pieces continues and sowing begins	Displacement of loose soil materials to down of earthworm castings, soil erosion as above and wash due to rains	0.0	22.4
May	Sowing/weeding	Heavy soil wash, faint nilling at foot hills on slit deposits	0.2	61.9
June	Weeding	Heavy wash of soil aggregates	0.2	45.4
July	Weeding/harvesting begins	Heavy wash of soil aggregates, crop root exposed, farm soil visible	1.8	21.9
August	Harvesting and occasional weeding	Soil wash continues	1.0	29.6
September	Harvesting	Moss appears, soil erosion slows down	0.1	13.8
October	Harvesting	Soil erosion appreciably reduced	0.0	2.7
November	Harvesting	No erosion, moss tums brackish	0.0	0.0
December	Harvesting/thrashing/carry harvest back to home	No erosion	0.0	0.0
Year	Cropping with zero tillage on steep slope	Heavy soil wash	3.3	201.4

Source: Satapathy and Sarma, B.K (2001) Land degradation and conservation of Bio-diversity with special reference to North East India, Indian Journal of Hill Farming

The process of soil erosion begins when farmers enter into the plots (hill slopes under forest) either for selection of site or cutting the forest vegetation. Satapathy and Sarma conducted experiment on soil erosion calendar of shifting cultivation at Burnihat in 2001. Farmers' movements on slopes causes loose soil aggregates, forest litter and earthworm castings to slide down the hill. Jungle cutting, burning, clearing and dibbling of seeds account for a considerable amount of loose soil material, ashes, earthworm castings and detached soil clods/stones to roll down the foot hills. With the onset of monsoon, soil erosion by water begins. Studies on this aspect under various stages of Shifting cultivation have indicated that soil erosion problem in Shifting cultivation is mainly of splash and wash. The table 7.5 presented soil erosion calendar of shifting cultivation.

Table: 7.6 Annual removals of various types of forest products in Meghalaya due to shifting Cultivation

Items of forest products	Average annual removal
Timber	2,53,206 cu.m
Firewood	0.2 cu.m per Capita
Bamboo	70,500 nos
Broomstick	65,220 qts
Thatch	38,790 bundles
Cane	1,12,460 R.M.

Source: Goswami, S.N (1996) Economic Appraisal of Indigenous Hill Farming System in West Garo Hills district Meghalaya, ICAR Research Complex for NEH Region

A huge amount of natural resources are lost due to cutting and burning process of shifting cultivation, which have also economic value. But precise data is not available, how much economic lost is incurred due to Shifting cultivation. But Government of Meghalaya made an attempt to estimate annual removal of various types of forest products in Meghalaya due to shifting cultivation, which is presented in table 7.6. The table shows that various type of forest products viz; timber, firewood, bamboo, broomstick, thatch and cane which are lost due to shifting cultivation with their respective average annual removal.

Loss of Bio-diversity:

The Shifting cultivation at the fringe of forest threatens the big loss of flora and fauna, which are the invaluable treasure of the country.

Shifting Cultivation, vegetation and habitat destruction

There are as many as 145 tribal communities in North East India of which 71 with more than 5000 population. About 5000 sq. km. of hill forest area which are under shifting cultivation supported a population of more than 2.5 millions. This destruction process of the forest severely affects the tropical rain forest, deciduous forest, broad leafed forests, and even scrubs and sub-alpine forests. The pattern of slash and burn method in different localities inflict destruction of the habitats of the small mammals and reptiles which is according to the distribution of the species concern. They keep a permanent scar on the micro-flora and fauna of the soil along with the undergrowth of the plants, which are important for the micro-habitant formation of the wild animals.

Table 7.7 Forest species as affected in the process of Shifting cultivation

Sl. No.	Local name	Botanical name
1	Koko bamboo	*Dendrocalamus hamiltoni*
2	Ahani	*Vitex pendun cularis*
3	Kokan	*Duabanga senerosites*
4	Jia	*Goruga pinnate*
5	Bahara	*Terminalia belerica*
6	Toon or Poma	*Cedrella toona*
7	Amliki	*Emblica officinalis*
8	Sunaroo	*Cassi fistula*
9	Oksi	*Dillenia pentagys*
10	Ghargra	*Schima wallichi*
11	Sida	*Lagurstromac parviflora*
12	Dhobisnut	*Semi corpus anacherdium*
13	Kanchan	*Bauhinia purpuria*
14	Gamari	*Gmelina arbonea*
15	Sal	*Shorea robusta*
16	Silikha	*Terminatia spp*

Source: Borthakur, D.N. (1992) Agriculture of the North Eastern Region, with special reference to hill agriculture, BEE CEE Prakashan, Guwahati

Large quantities of forest vegetation are burnt in the process of shifting cultivation. Loss of valuable wild life, wild plants of diverse gene pool and rare orchids have also been reported in this region. Table 7.7 shows forest species (flora) affected in the process of shifting cultivation, table 7.8 shows loss of fauna due to shifting cultivation. Ingty, a well known soil conservation officer quoted that the forest is in danger of disappearing irremediably in short tern, if nothing is done to arrest its degradation or destruction in the areas where agricultural crops are grown specially by way of shifting cultivation.

During Jhum cycle large number of edible vegetation's are cut and burnt to cause great hardship to semi-domestic and wild animals. The type of vegetation's destroyed depends upon the length of shifting cycle. A dense forest of long cycle has more tree species than grasses, whereas a forest of short cycle has more number of grasses.

Table: 7.8 Loss of fauna and endangered animals

Mammals

1.	Hoolock gibbon	*Hylobates hoolock*
2.	Slow Loris	*Nycticebus coucang*
3.	Pigtailed macaque	*Macaca nemstrica*
4.	Stumtailed macaque	*Macaca arctoides*
5.	Assamese macaque	*Macaca assamensis*
6.	Golden langure	*Presbytis seci*
7.	Silver leaf monkey	*Prebytis cristatus*
8.	Phayre's leaf monkey	*Prebytis phayrei*
9.	Lesser Panda	*Ailurus fulgens*
10.	Black bear	*Ursus thibetanus*
11.	Dhole	*Cuon alpinus*
12.	Golden cat	*Felis temmincki*
13.	Fishing cat	*Felis viverrinus*
14.	Marbled cat	*Felis marmorata*
15.	Clounded leopard	*Neofelis nebulosa*
16.	Pigmy hog	*Sus salvanius*
17.	Chital	*Axis axis*
18.	Swamp deer	*Cervus duvauceli*
19.	Banteng	*Bos banteng*

20.	Chiru	*Pantholops taxicolour*
21.	Takin	*Budorcas taxicolour*
22.	Serow	*Capricornis sumatrensis*
23.	Bhoral	*Pseudois naynur*
24.	Hispid hare	*Caprolagus hispidus.*

Source: Borthakur, D.N. (1983) Shifting cultivation in North East India by ICAR Research Complex, Barapani

Birds, Reptiles and Amphibian

1.	White winged wood duck	*Cairina scutulata*
2.	Golden eagle	*Aquila chrysaetos*
3.	Ospray	*Pandnoi haliaetus*
4.	Bamboo partridge	*Bambusicola fytchii*
5.	Blood pheasant	*Ithaginis cruentus*
6.	Satyr tragopan	*Ithaginis satyra*
7.	Blyth's tragopan	*Tragopan blythii*
8.	Peacock pheasant	*Polyplectron bicalcaratum*
9.	Great Pied hornbill	*Buceros bicornis*
10.	Pied Hornbill	*Anthracoceros malabricus*
11.	Rock Python	*Python molurus*
12.	Common monitor	*Varanus bengalensis*
13.	Reticulated python	*Python reticulates*
14.	Garo Hill tree toad	*Nectophryne kempi*

Source: Borthakur, D.N. (1983) Shifting cultivation in North East India by ICAR Research Complex, Barapani

Table 7.9 Soil erosion (in ha) under Karbi Anglong District and N.C.Hill District due to shifting cultivation

Districts Karbi Anglong	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rongbong Adong	8	0	0	7	0	5	0	4	8	7	3	6	4	5
Rang Nagar	5	15	20	25	0	11	3	4	9	3	0	15	9	7
Tikaklangso	3	0	9	0	0	10	40	0	0	0	0	11	12	14
Phanglangso	0	4	6	0	3	0	5	4	0	0	7	8	9	4
Musagong	4	0	0	7	0	15	11	23	0	0	0	25	14	11
Kaipani	0	8	0	9	0	16	24	18	16	21	0	9	8	5
Kekang Adong	9	7	11	0	0	20	0	7	0	5	4	13	10	8
Thijoklangso	11	5	3	0	12	8	7	5	4	0	0	12	5	7
Langhonjar	7	12	14	0	0	20	20	30	20	0	0	14	12	7
Rechoapam	8	13	7	4	3	14	20	20	25	0	12	13	7	8

Source: Department of soil conservation, Karbi Anglong, Govt. of Assam

Table 7.9 Soil erosion (in ha) under Karbi Anglong District and N.C.Hill District due to shifting cultivation

Districts N.C.HILLS	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Amrudisa	14	10	55	15	12	4	10	35	18.5	14.5	13.5	4	12	10
Indrimbuglow	7	4	13.61	20.96	13.42	12.5	18.5	14.40	17.10	11.30	12.5	4.3	4.5	5.9
Boromoulkoi	11	15.50	64.32	50.55	12	14.5	20	25.2	20.10	12.50	15.3	14.3	11.5	12.5
Natun Lekil	18.5	6.80	34.52	26.37	35	11.30	5	3.5	12	8	7	11.3	5	12
Digendu	14.25	11.00	14.00	12.33	13	7.8	5.5	9.3	8.9	11.5	7.4	13	11	14.5

Source: Department of soil conservation, Haflong, Govt. of Assam

Table 7.10: Nutrient losses run off and soil loss resulting from shifting cultivation areas of Karbi Anglong and N. C. Hills

Locations	Variable	1986*	1987**	1988***	1989	1990	1991	1992	1993*	1994**	1995***	1996	1997	1998	1999	2000*
Kheroni (Karbi Anglong)	P_2O_5 (g/ha)	1875	1135	890	1020	1350	1444	1795	1634	1445	1027	1225	1540	1635	1705	1590
	K_2O_5 (g/ha)	18.6	11.75	9.3	14.5	16.7	17.2	18.5	17.4	14.5	13.5	17.4	14.9	18.4	16.3	6.1
	pH	5.91	6.01	5.82	5.99	6.13	6.01	5.85	6.01	6.11	6.03	5.98	5.75	5.90	5.20	5.80
	Run off (mm)	15.2	147.7	11.9	0.3	11	3.72	45.9	62.4	10.4	6.5	69.5	41.4	25.2	41.4	25.3
	Soil loss (t/ha)	1.3	10.3	0.2	0.004	1.4	2.6	4.3	7.4	1.7	0.9	52.5	0.9	1.7	30.2	40.2

N.B: * indicates 1st year of shifting cultivation,
** indicates 2nd year of shifting cultivation,
*** indicates 3rd year of shifting cultivation, others are fallow period

Source: Department of soil conservation, Diphu and Haflong, Govt. of Assam

Table 7.10: Nutrient losses run off and soil loss resulting from shifting cultivation areas of Karbi Anglong and N. C. Hills

Locations	Variable	1986*	1987**	1988***	1989	1990	1991	1992	1993*	1994**	1995***	1996	1997	1998	1999	2000*
Indrim-bunglow (N.C.Hills)	P_2O_5 (g/ha)	2280	1211	875.4	975	1074	1243.5	1695	1445	1035	787	925	1120	1850	1790	1598
	K_2O_5 (g/ha)	21.6	12.5	8.5	12.76	14.50	19.5	17.4	16.3	12.4	11.5	12.3	13.15	15.70	16.5	6.3
	pH	5.49	6.07	5.78	6.01	6.00	6.11	5.98	5.75	5.90	5.03	5.98	6.05	5.95	5.15	5.50
	Run off (mm)	13.3	214.8	21.1	5.3	1.3	52.40	69.50	75.60	1.40	2.60	6.30	4.30	13.40	42.5	12.5
	Soil loss (t/ha)	5.1	76.8	0.9	0.8	0.04	40.9	52.5	70.4	0.90	0.60	0.90	0.50	32.5	40.6	40.8

N.B: * indicates 1st year of shifting cultivation.
** indicates 2nd year of shifting cultivation.
*** indicates 3rd year of shifting cultivation. others are fallow period

Source: Department of soil conservation, Diphu and Haflong, Govt. of Assam

Study area perspective:

In the table 7.9 an attempt has been made to give general view on soil erosion under Karbi Anglong and N.C Hills district due to the shifting cultivation. In Karbi Anglong district data has been taken from following areas, Rongbong Adong, Rangnagar, Tikaklangso, Phanglangso, Musagong, Kaipani, Kekang Adong, Thijok Langso, Langhonjar, Rechoapan. In N.C.Hills district data has been taken from Amurudisa, Indrimbunglow, Boromoulkoi, Natun Lekul and Digendu. Soil erosion in Karbi Anglong district showed a fluctuation level, although high in some years and no erosion in some years. Highest erosion was found in the year 1993 followed by 1992,1998 and 1994 moderate soil erosion was found in the years 1999,2000 and 1995.Low soil erosion was found in the year 1991, followed by 1997,1996 and 1987.Among the places Langhonjar was affected by highest soil erosion followed by Kaipani and Rangangar. Moderate soil erosion was found in Tikaklongso and Thijoklangso. Low soil erosion was found in Rongbong Adong and Phanaglangeso. Highest Soil erosion occurred at Tikaklangso in the year 1993. Langhonjar maintained a higher level of soil erosion through out the period. Rongbong Adong showed a decreasing trend, Kaipani showed a fluctuating level. On the other hand, soil erosion in N.C. Hills showed higher than Karbi Anglong district. Highest soil erosion was found in the year 1989 followed by 1994, 1991 and 1995. Moderate soil erosion was found in the years 1987, 1997 and 2000. Lowest soil erosion was found in the years 1999, 1998 and 1992. Among the places Boromoulkoi was affected by highest soil erosion followed by Amurudisa and Natun Lekul. Low soil erosion was found in Digendu. Highest soil erosion occurred at Boromoulkoi in the year 1989, Boromoulkoi also maintained higher level of soil erosion through out the period. While Digendu maintained a stable soil erosion and Indrimbunglow maintained a low level of soil erosion through out the period. The process of soil erosion begins when the farmers enter into the plots (hill slopes under forest) either for selection of site or cutting the forest vegetation. Farmers movements on slopes causes loose soil aggregates, forest litter and earthworm castings to slide down the hill Jungle cutting, burning, clearing and dibbling of seeds account for a considerable amount of loose soil material, ashes, earth worm castings and detached soil clods/stone to roll down the foot hills. Even though it is found N.C. Hills has got more erosion than Karbi Anglong district.

Fig 7.1 Soil erosion (in ha) in Karbi Anglong due to shifting cultivation

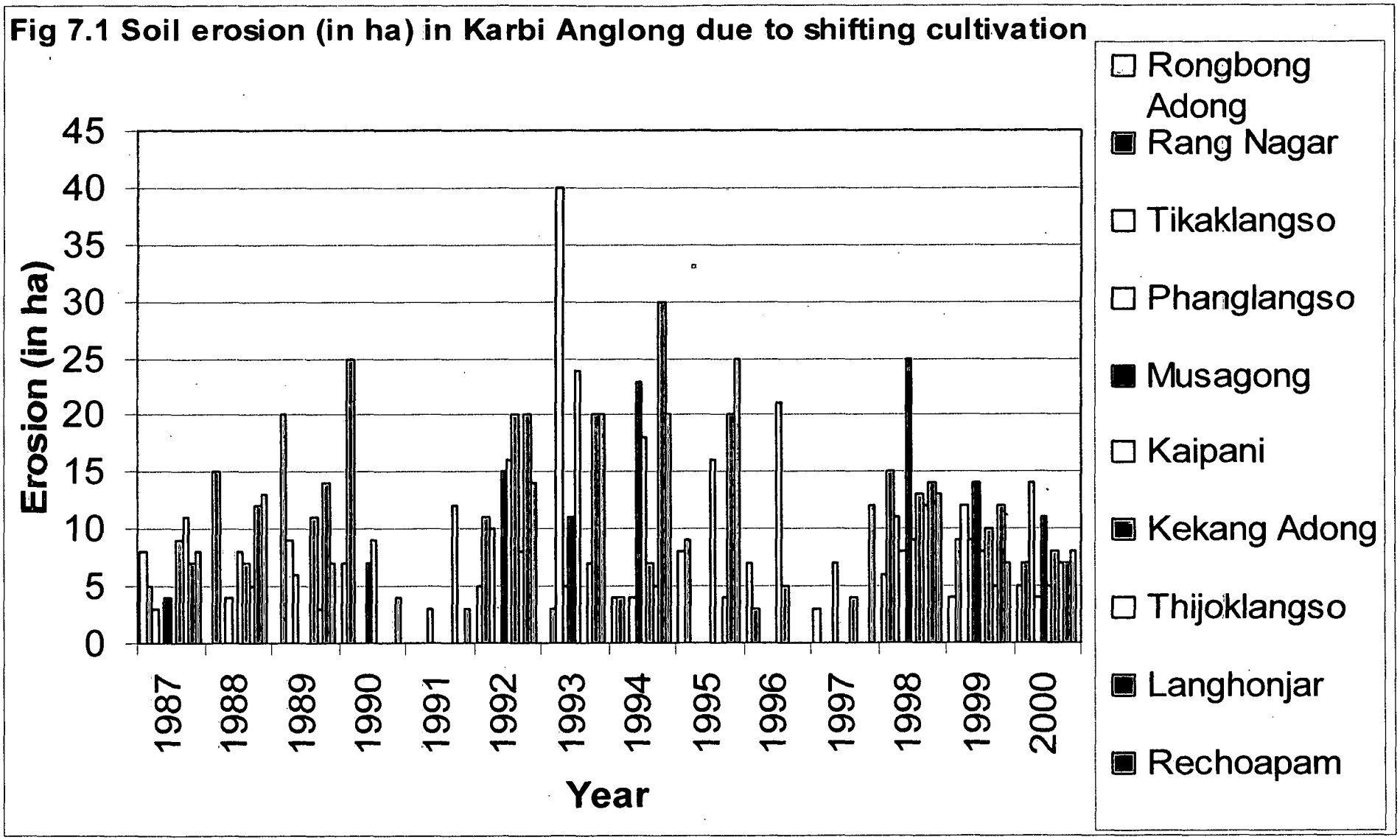


Fig: 7.2 Soil erosion in N.C.Hills due to shifting cultivation

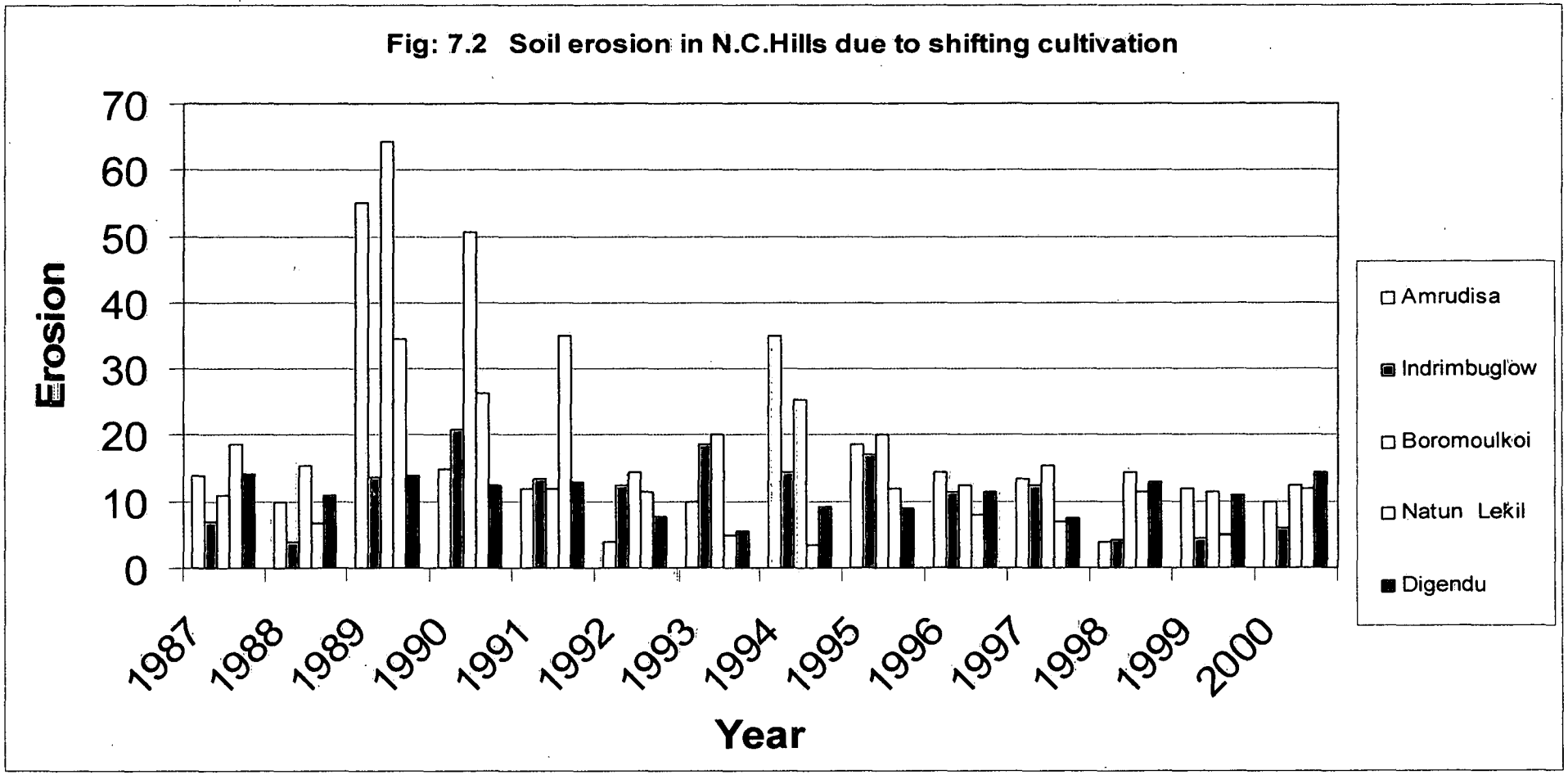


Figure 6.3 Loss of P_2O_5 due to shifting cultivation

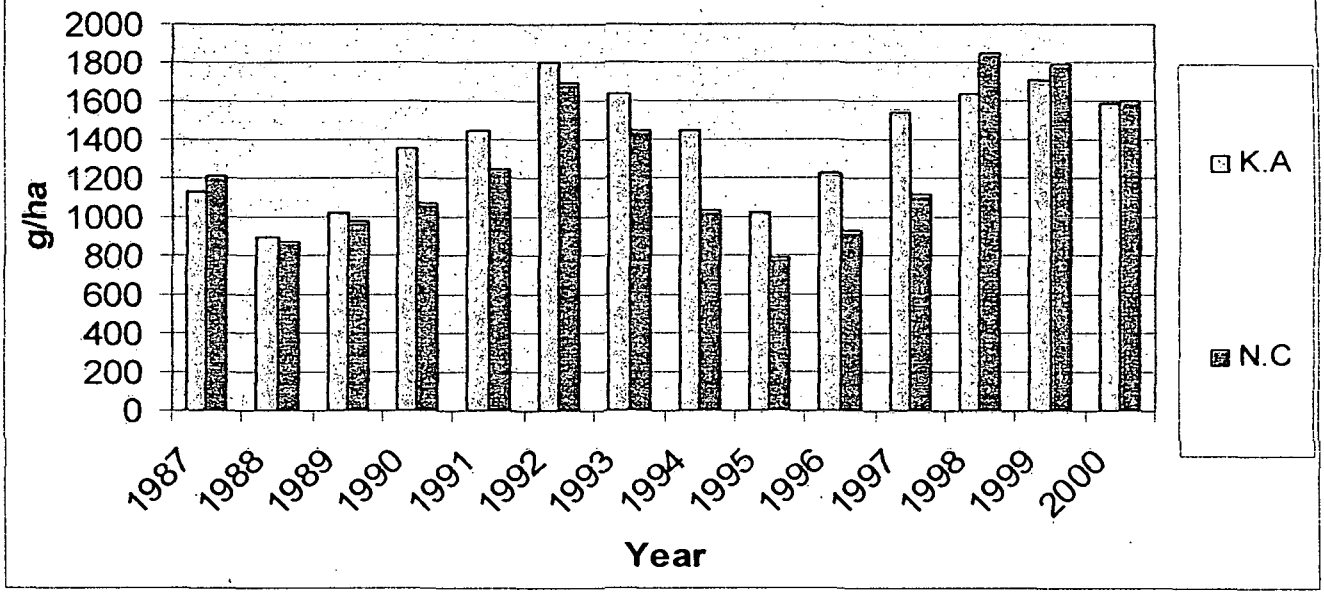


Fig: 7.4 Loss of K2O5 due to shifting cultivation

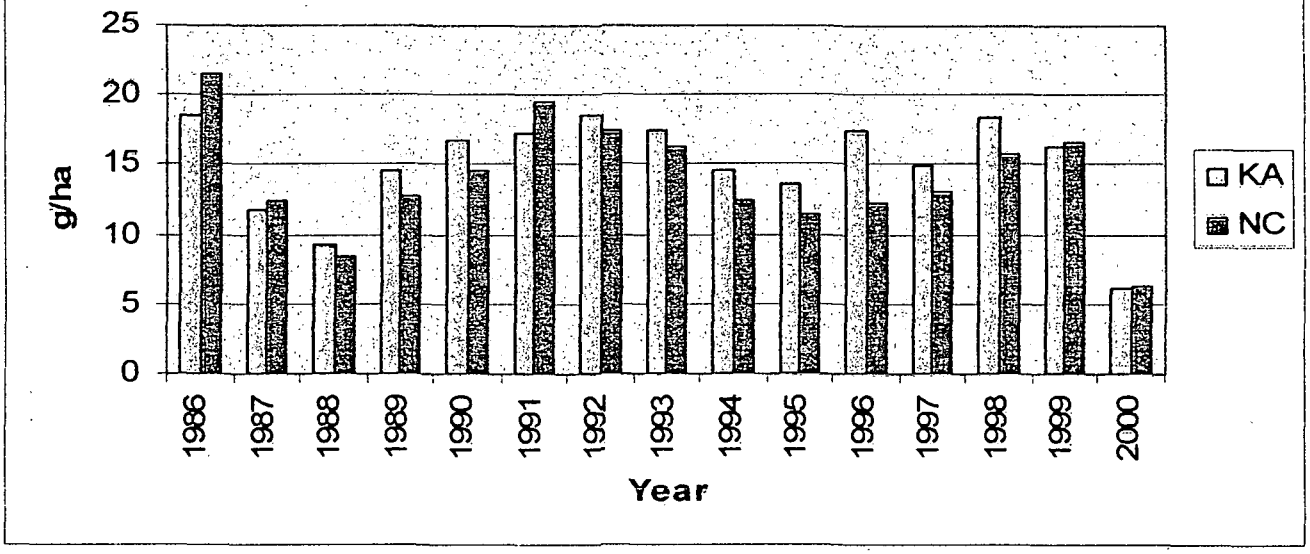


Table 7.10 shows nutritional losses, runoff and soil loss resulting from shifting cultivation areas of Karbi Anglong and N.C hill district of Assam. The table also showed chemical content of soil viz; P_2O_5 (g/ha), K_2O_5 (g/ha), pH of the soil, soil loss (t/ha) and runoff (mm) due to the shifting cultivation. Shifting cultivation practices in the hilly areas causes environmental degradation problems like soil erosion and removal of organic content of the

soil. The table shows the data from 1986 to 2000. In the table there are two cumulative cultivation period of shifting cultivation i.e. first, second and third year of shifting cultivation and two cumulative fallow periods which are the years of regeneration of forest vegetation respectively. Cultivation period was followed by fallow period again fallow period was followed by cultivation period. In the table, we have seen that 1986, 1993 and 2000 were the first year of shifting cultivation; 1987 and 1994 were the second year of shifting cultivation and 1988 and 1995 were the third year of shifting cultivation. In both the shifting cultivation period P_2O_5 and K_2O_5 content is decreasing trend in both the district. Regarding the pH of the soil, it shows a fluctuating trend through out the period in Karbi Anglong district. In Karbi Anglong district pH more than in the year 1993, 1994 and 1995 as compared to 1986,1987 and 1988. The pH of the soil also found more in the year 1996,1990 and 1997 than 1989,1997 and 1991.The runoff shows a fluctuating trend in the Karbi Anglong district, which was highest in the year 1987. The runoff higher in 1993 than 1986, 1988. As compared to runoff in the follow period, it was found higher in the years 1989,1990, 1991 and 1992 than 1996, 1997, 1998 and 1999.As regards soil loss, it shows a fluctuating level through out the year. It was found higher in the 1996. Regarding soil loss in the follow period it was found higher in the year 1990, 1991, 1992 than 1997, 1998 and 1999.In the N.C. Hills as regards pH of the soil, it was found more in 1993 than 1986. It was also found higher in 1987, 1988 than 1994, 1995. In the fallow period years it was found higher in the year 1989, 1990, 1991 and 1992 than 1996, 1997, 1998 and 1999.Regarding runoff in the N.C. Hills district it shows a fluctuating level, runoff show highest in the year 1987. The runoff found more in 1993 and 1988 than 1986 and 1995. As compared to runoff in the fallow period it was found more in 1996,1997 than 1989,1990.As regarding soil loss in the N.C. Hills it shows a fluctuating level through out the year. It was found highest in 1978, which was the second year of shifting cultivation. The soil loss was higher in the year 1988 than in the year 1995, which was the third year of shifting cultivation.

Observation on runoff and soil loss in two districts showed that N.C. Hills district has more soil loss and runoff than Karbi Anglong. The runoff and soil loss behaviour under shifting cultivation was found highly erratic from year to year that depends on rainfall characteristics.

People perception on Environment is degraded due to Shifting cultivation:

In the hilly areas shifting cultivation operation is carried out community wise or in group, sometimes independently. A survey was conducted to understand peoples' perception on environmental degradation due to the shifting cultivation.

Table 7.11 Nature of pursuing shifting cultivation by Jhumias

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
a) Independently	79	94	31	30	234
	(76.70)	(79.66)	(72.09)	(83.33)	(78.00)
b) In Group	11	16	7	4	38
	(10.68)	(13.56)	(16.28)	(11.11)	(12.67)
c) Community wise	13	8	5	2	28
	(12.62)	(6.78)	(11.63)	(5.56)	(9.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table 7.11 presents nature of pursuing shifting cultivation by Jhumias. 78.00 per cent respondents informed that they have carried out shifting cultivation independently, 12.67 per cent of population cultivated in group and only 9.33 per cent of population cultivated community wise. Ethnicity wise shows that 83.33 per cent non-tribal respondents carried out shifting cultivation independently, 16.28 per cent minor tribe respondents carried out shifting cultivation in group, on the other hand 12.62 per cent Karbi respondents carried out shifting cultivation with the help of community. Respondents were asked about process of shifting cultivation. The table 7.12 shows the details of shifting cultivation carried out by the Jhumias. Regarding selection of site/land, 56.66 per cent respondents cultivated their crops in community land, 43.33 per cent cultivated their crops in governmental land. Ethnicity wise shows that 66.67 per cent non-tribal respondents selected community land, where as 46.51 per cent minor tribe respondents selected Government land for shifting cultivation.

Table 7.12 : Process of Shifting cultivation

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
A) Selection of site/land					
(a) In community land	58	65	23	24	170
	(56.31)	(55.08)	(53.49)	(66.67)	(56.66)
(b) In Govt. land	45	53	20	12	130
	(43.69)	(44.92)	(46.51)	(33.33)	(43.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

B) Type of Site selected					
(a) New plot	25	19	2	6	52
	(24.27)	(16.10)	(4.65)	(16.67)	(17.33)
(b) 1 - 2 yr. fallow	38	45	25	25	133
	(36.89)	(38.14)	(58.14)	(69.44)	(44.33)
(c) 3 - 5 yr fallow	40	54	16	5	115
	(38.83	(45.76	(37.21)	(13.89)	(38.33)
Total	103	118	43	36	300
	(100.00	(100.00	(100.00)	(100.00)	(100.00)
C) Period of cultivation in a plot					
a) 1-2 year	15	23	19	12	69
	(14.56)	(19.49)	(44.19)	(33.33)	(23.00)
b) 2-3 year	46	52	15	10	123
	(44.66)	(44.07)	(34.88)	(27.77)	(41.00)
c) 3-5 year	30	28	5	8	71
	(29.13)	(23.73)	(11.63)	(22.22)	(23.66)
d) More than 5 year	12	15	4	6	37
	(11.65)	(12.71)	(9.30)	(16.67)	(12.33)
Total	103	118	43	36	300
	(100)	(100)	(100)	(100)	(100)
D) Shifting of house/agricultural plot					
a) Whole family/house	6	11	5	2	24
	(5.83)	(9.32)	(11.63)	(5.55)	(8.00)
b) Only shifting of agricultural plot	97	107	38	34	276
	(94.17)	(90.68)	(88.37)	(94.44)	(92.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
E)System of cutting and clearing the plot					
a) Completely cutting &burning	42	43	11	8	104
	(40.78)	(36.44)	(25.58)	(22.22)	(34.66)
b)Only branches & twigs cutting	35	57	29	24	145
	(33.98)	(48.31)	(67.44)	(66.67)	(48.33)
c) Burning the whole plot	26	18	3	4	51
	(25.24)	(15.25)	(6.98)	(11.11)	(17.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Table: 7.13 Preparing the land for shifting cultivation

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
(i) Keep in trees	45	53	24	20	142
	(43.69)	(44.92)	(55.81)	(55.56)	(47.33)
(ii) surrounding trees	25	19	13	8	65
	(24.27)	(16.10)	(30.23)	(22.22)	(21.67)
(iii) In between trees	33	46	6	8	93
	(32.04)	(38.98)	(13.96)	(22.22)	(31.00)
	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Regarding type of site selected by the respondents, 44.33 percent of the respondents selected 1-2 year fallow land, 38.33 per cent selected 3-5 year fallow land, only 17.33 per cent selected new plot. Community wise showed that majority (69.44) of the non-tribal selected 1-2 year fallow, 45.76 per cent Dimasa selected 3-5 year fallow and 24.27 per cent Karbi respondents selected a new plot for shifting cultivation.

Regarding period of cultivation in a plot, 41.00 percent of the respondents cultivated 2-3 year in a plot, 23.66 per cent respondent households cultivated 3-5 year continuously in a particular plot, 23.00 per cent cultivated 1-2 year in a plot, only 12.33 per cent cultivated continuously more than 5 year in a plot, community wise shows 44.66 per cent Karbi respondents cultivated 2-3 year in a plot, 44.19 minor tribe respondents cultivated 1-2 years in a plot, 29.13 per cent Karbi respondents cultivated 3-5 year in a plot on the other hand 16.67 per cent non- tribe cultivated more than 6 year in a plot.

In Shifting cultivation people shifted their plot as well as their house, which is shown by the above table. It is observed from the table that majority of the respondents (92.00 per cent) only shifted their plot, but 8.00 per cent shifted whole family/house. Government tried to abolish shifting of whole family/houses. Ethnicity wise shows that 11.63 per cent minor tribe shifted whole family/houses, on the other hand 94.44 per cent non-tribe shifted only their agricultural plot.

Regarding system of cutting and clearing the plot, 48.33 per cent of the farmers cut only branches and twigs, 34.66 per cent farmers perform completely cutting and burning of trees, 17 per cent burning the whole plot. Ethnicity wise shows that 67.44 per cent minor tribe cut only branches and twigs and on the other hand 40.78 per cent Karbi completely cut the trees, 25.24 per cent of Karbi also burnt the whole plot.

Regarding how shifting cultivator prepared the land, 47.33 per cent kept trees during shifting cultivation, 31.00 per cent respondents cultivated in between trees, 21.67 per cent respondents cultivated surrounding trees. Ethnicity wise shows that 55.81 per cent minor tribe kept tree, 38.98 per cent Dimasa cultivated surrounding trees.

Table 7.14 Numbers of times practiced shifting cultivation by respondents

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
(a) 1 to 3 years	25	28	13	19	85
	(24.27)	(23.73)	(30.23)	(52.78)	(28.33)
(b) 4 to 5 Years	29	31	18	11	89
	(28.16)	(26.27)	(41.86)	(30.56)	(29.67)
(c) 5 to 10 Years	27	24	7	4	62
	(26.21)	(20.34)	(16.28)	(11.11)	(20.67)
(d) More than 10 Years	22	35	5	2	64
	(21.36)	(29.66)	(11.63)	(5.55)	(21.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table 7.14 presents involvement of farmers in shifting cultivation in years. From the table it is seen that 29.67 per cent respondents cultivated 4 to 5 years in the same plot, 28.33 per cent cultivated 1 to 3 years, 20.67 per cent cultivated 5 to 10 years, 21.33 per cent cultivated more than 10 years in the same plot. Ethnicity wise shows that 52.78 per cent non-tribe involved 1 to 3 years in shifting cultivation 41.86 percent minor tribe involved 4 to 5 years on the other hand 29.66 per cent Dimasa involved more than 10 years and 28.16 per cent Karbi involved 4 to 5 years in shifting cultivation.

Table 7.15 Number of times shifted land for shifting cultivation

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
(a) 1 to 3 times	21	31	17	12	81
	(20.39)	(26.27)	(39.53)	(33.33)	(27.00)
(b) 3 to 5 times	24	28	13	6	71
	(23.30)	(23.73)	(30.23)	(16.66)	(23.67)
(c) 5 to 7 times	27	23	8	7	65
	(26.21)	(19.49)	(18.60)	(19.44)	(21.67)
(d) More than 8 times	31	36	5	11	83
	(30.10)	(30.51)	(11.64)	(30.57)	(27.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table 7.15 shows that how many times farmers have shifted the land in their life, 27.67 per cent respondents shifted the land more than 8 times, 27.00 per cent respondents shifted the land 1 to 3 times, 23.67 per cent respondents shifted 3 to 5 times, 21.67 per cent respondents

shifted 5 to 7 times for shifting cultivation. Ethnicity wise shows that 39.53 per cent minor tribe shifted 1 to 3 times, 30.57 per cent non- tribe shifted more than 8 times, on the other hands 30.23 per cent minor tribe shifted 3 to 5 times and 26.21 per cent Karbi shifted 5 to 7 times.

Table 7.16 Perception on the nature and benefits of shifting cultivation

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
(i) Not lucrative	39	32	14	12	97
	(37.86)	(27.12)	(32.56)	(33.33)	(32.33)
(ii) Labour intensive	42	39	17	9	107
	(40.78)	(33.05)	(39.53)	(25.00)	(35.67)
(iii) Low yield	22	47	12	15	96
	(21.36)	(39.83)	(27.91)	(41.67)	(32.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table 7.16 shows respondents perception on the nature and benefits of shifting cultivation. It is observed from the table that 35.67 per cent of the respondents experiences labour intensive, 32.33 per cent respondents said it is a non-profit making activity, 32.00 per cent said it gave low yield. Ethnicity wise showed that 41.67 per cent non-tribe have experienced low yield, 40.78 per cent Karbi experienced labour intensive and 37.86 per cent Karbi also experienced not lucrative.

Table 7.17: Respondents' view on level of erosion

Period	Before ploughing	During ploughing	After ploughing
Very high	0	0	48 (16.00)
High	0	64 (21.33)	56 (18.67)
Moderate	158 (52.67)	94 (31.33)	135 (45.00)
Low	58 (19.33)	39 (13.00)	23 (7.67)
Very low	84 (28.00)	103 (34.33)	38 (12.67)
Total	300 (100)	300 (100)	300 (100)

Source: Primary data

One of the major problem in shifting cultivation is soil erosion. Erosion washed away soil and nutrients makes the soil unfit for cultivation. An attempt has been made to know from respondents about level of erosion and amount of erosion, before, after and during ploughing. The views are presented in the table 7.17. From the table, it is seen that as per 52.67 per cent respondent erosion was moderate before ploughing and on the other hand as per 34.33 per cent respondents erosion was very low during ploughing. It is interesting to note that as per 45.00 per cent respondents' view erosion was moderate after ploughing.

Table 7.18 Respondents view on environment and Steps taken to control environment degradation

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
a) Maintaining long fallow period for regeneration					
(a) Yes	65	58	21	19	163
	(63.11)	(49.15)	(48.84)	(52.78)	(54.33)
(b) No	38	60	25	17	137
	(36.89)	(50.85)	(51.16)	(47.22)	(45.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
b) Are you maintaining natural method					
(a) Yes	75	69	24	15	183
	(72.82)	(58.47)	(55.81)	(41.67)	(61.00)
(b) No	28	49	19	21	117
	(27.18)	(41.53)	(44.19)	(58.33)	(39.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
c) Do you think long fallow period and rain create regeneration of growing crops					
(a) Yes	62	65	24	12	163
	(60.19)	(55.08)	(55.81)	(33.33)	(54.33)
(b) No	41	53	19	24	137
	(39.81)	(44.92)	(44.19)	(66.67)	(45.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Respondents were asked to give their views on environment and what steps they have taken to control environmental degradation. The results are presented in the table 7.18. The table shows that 54.33 per cent respondents maintained long fallow period for regeneration, 45.67 per cent did not maintained long fallow period for regeneration. Ethnicity wise shows majority of the (63.11) Karbi tribe maintained long fallow period for regeneration, 50.85 per cent Dimasa tribe maintained short fallow period for regeneration. The table also shows majority (61.00 per cent) of respondents maintaining natural method for regeneration. Ethnicity wise shows that majority (72.82) of the Karbi tribe maintained natural method for regeneration. Regarding people view on lo TABLE 7.9 soil erosion in KA

TABLE 7.9 soil erosion in KA

TABLE 7.9 soil erosion in KA

ng fallow period and rain create regeneration of growing crops, 54.33 per cent respondents agreed that long fallow period and rain create regeneration of growing crops, 45.67 per cent respondents did not support the view. Among the tribe, 60.19 per cent Karbi believed that

long fallow period and rain and rain created regeneration of growing crops. On the other hand, 66.67 per cent non-ride did not believed that long fallow period and rain create regeneration of growing crops rain create regeneration of growing crops.

Steps taken by respondents

Various steps have been taken by the farmers to control environmental degradation. These steps are improving soil fertility, controlling soil erosion, conservation of bio-diversity both flora and fauna.

Table 7.19 Steps taken to control environmental degradation

Details	Karbi	Dimasa	Minor-tribe	Non-tribe	Total
(i) Soil fertility					
(a) Applying nutrients	25	45	31	24	125
	(24.27)	(38.14)	(72.10)	(66.66)	(41.67)
(b) Pesticides for pest / diseases	0	15	6	9	30
	0	(12.71)	(13.95)	(25.00)	(10.00)
(c) Any other	45	29	5	3	82
	(43.69)	(24.58)	(11.63)	(8.33)	(27.33)
(d) Non-response	33	29	1	0	63
	(32.04)	(24.58)	(2.33)	0	(21.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(ii) Soil Erosion					
(a) Construction of bunds	15	21	9	11	56
	(14.56)	(17.80)	(20.93)	(30.56)	(18.67)
(b) Planting trees	45	53	14	14	126
	(43.69)	(44.92)	(32.56)	(38.89)	(42.00)
(c) Any other	25	27	12	9	73
	(24.27)	(22.88)	(27.91)	(25.00)	(24.33)
(d) Non-response	18	17	8	2	45
	(17.48)	(14.41)	(18.60)	(5.56)	(15.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(iii) Bio- Diversity (Flora)					
(a) Planting new trees	45	59	20	14	138
	(43.69)	(50.00)	(46.51)	(38.89)	(46.00)
(b) Not cutting all the trees	31	36	12	8	87
	(30.10)	(30.51)	(27.91)	(22.22)	(29.00)
(c) Any other	27	23	11	14	75
	(26.21)	(19.49)	(25.58)	(38.89)	(25.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(iv) Bio- Diversity (Fauna)					
(a) Not killing the animals	85	95	40	25	245

	(82.52)	(80.51)	(93.02)	(69.45)	(81.67)
(b) Any other	18	23	3	11	55
	(17.48)	(19.49)	(6.98)	(30.55)	(18.33)
Total	103	118	43	36	300
	(100.00	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Respondents were asked to give their views on environment and what steps they have taken to control environmental degradation. The views of the respondents are presented in the table 7.19. The respondents views are as follows, 41.67 per cent respondents applied nutrients to the soil to control environmental degradation, followed by 27.33 per cent respondents taken any other methods, 10 per cent respondents applied pesticides for pest and diseases control, 21.00 per cent respondents have not given their response in this regard. Ethnicity wise shows that majority (72.10) of the minor tribe applied nutrients, 43.69 per cent adopted any other methods, 25.00 per cent applied pesticides for pest/diseases control. On the other hand 32.04 per cent Karbi respondents have not given their views. Regarding steps taken to control soil erosion 42.00 per cent respondents planted trees to control soil erosion, 24.33 per cent respondents constructed bunds to control soil erosion. On the other hand 15.00 per cent respondents have not taken any measures to control soil erosion. Ethnicity wise shows that 43.69 per cent Karbi tribe planted trees, 30.56 per cent non-tribe, constructed bunds, 27.91 per cent minor tribe have taken any other method to control soil erosion. Regarding maintaining floral bio-diversity by the respondents 46.00 percent planted new trees, 29.00 per cent not cut all the trees, and 25.00 per cent adopted other methods for maintaining floral bio-diversity. Ethnicity wise shows that half of the Dimasa respondents planted new trees, 38.89 per cent non-tribe adopted any other method on the other hand 30.51 per cent Dimasa respondents not cutting all the trees. Regarding maintaining fauna bio-diversity by the respondent households, majority of the respondents (81.67) not killed the animals, 18.33 per cent of respondents adopted other methods. Ethnicity wise shows that 93.02 per cent minor tribe not killed any animal, 30.55 per cent non-tribe adopted any other method to conserve fauna diversity. Soil erosion is an abnormal and undesirable process caused by man's activities and thus, subject to his control. Unchecked erosion is already exhibiting chains of undesirable natural calamities and if allowed to continue, the end result may be deleterious than expected.

CHAPTER – VIII

INTEGRATED JHUMIAS DEVELOPMENT PROGRAMME – ITS IMPACT

Shifting cultivation method and practices causes environmental degradation which in turn leads to many economic and ecological problems. Therefore, Government has designed and implemented many schemes to regulate the shifting cultivation practices. An attempt has been made in this chapter to analyze the Governmental schemes from secondary data; the householders were also asked regarding the success of the schemes. In order to regulate and control the practice of shifting cultivation in the district of Karbi Anglong (In the beginning N. C. Hills district was part of Karbi Anglong) various measures have been adopted by the concerned authorities. In accordance with the provision of the sixth schedule to the constitution of India, the District Council passed the Mikir Hills District (Jhumming) Regulation in 1954. According to the Regulation, the District Council would fix the boundaries of each village. The shifting of the villages from the existing sites without the previous permission of the Executive Committee of the District council is prohibited. Nobody is allowed to practice jhumming or cut trees within a radius of half a mile form the boundary of the village. The Executive committee will also fix the rotation period of jhumming on certain portions of the village and the area to be jhummed by an individual cultivator. Any person who contrivances the provisions of the regulation will be liable to a fine extending up to Rs.500.00. In this context, it may be pointed out here that the rights of selecting jhum plots and distributing them among the families as per their requirement by the traditional village councils have been curtailed by this Regulation[1].

According to the Mikir Hills District (Jhuming) (Amended) Regulation, 1966, Jhuming shall be gregarious and restricted to one particular area for a village irrespective of the number of families jhuming and shall be selected by the villagers in consultation with Government village headman and the local Mouzadar in accordance with the provisions of this Regulation.

In case of any disagreement about selection of jhuming site among the villagers, Government village headman and Mouzadars shall refer to it, to the Executive Committee and the decision of the Executive Committee in this respect shall be final. The people themselves in consultation with the local Government village headman may select individual plots within the selected area. The villagers shall be jointly responsible for any damage to the areas not selected for jhumming by spreading of fire from jhum areas. Jhumming within two gunters's chain of any perennial stream on either or within one gunters's chain of any

state Public Works Department and District council roads respectively is prohibited. Any area, which is covered by Sal or other valuable trees, shall not be selected or allotted for jhum. The district council reserves the right to dispose of felled stuff in jhum areas in any manner it considers suitable without interfering jhuming "(District Council code, 1987:38) During the different Five Year Plan periods the Development Department viz; Agriculture, Irrigation, soil conservation, P.W.D, Sericulture, Forest and Assam Plantation Development Corporation etc., have adopted certain measures to do away with Shifting cultivation in the Karbi Anglong District.

In this context mention may be made of the schemes for establishment of model villages, cash crop plantation and composite projects etc. The scheme for establishment of model village was implemented in 1960s in ten villages of the district with financial assistance from the District Council and the Government of Assam. While dealing with the model village, for the rehabilitation of the jhumias the Mikir Hills District Council had established model villages (Adarsha Gaon) in different areas of the district, where in Karbi jhumias were brought down from the hill tops and settled in the plains portion of the district. The scheme is partially successful[2].

The reasons for partial failure of the schemes, Firstly there has been no follow up programme at all. After the establishment of a full fledges model village providing all the basic amenities nothing has so far been done to induce the people to stay there. As a consequences, many Karbi families have already left the model villages and gone to their old hill top habitats. Secondly, since the construction of the houses the people in spite of abundance of building materials near their abodes have done no repairing. In fact, the size of the typed house is too big for a family to manage. Thirdly, it is found that many families instead of living in the houses given by the District Council, are putting up in houses constructed by the District Council are not only too big but are quite different also from the traditional pattern. The people would not have abandoned these houses had they been constructed in traditional pattern with improvement. Thus in rehabilitating the jhumias in the model villages, these sociological factors have not at all been taken into consideration[3].

Cash crop plantation schemes involve the plantation of coffee, rubber, black pepper and cashew nut etc. Initially, the soil conservation Department, Government of Assam implemented the scheme. Later on, with the creation of the Assam Plantation Crops

Development Corporation (APCDC) on 1st September, 1974, the scheme was handed over to the corporation by the Department of soil conservation. The coffee and rubber plantations under the APCDC have shown encouraging results. In fact, the plantations after maturity have to be handed over to the jhumia beneficiaries at the rate of one hectare per family. But complete transfer has not yet taken place due to some reasons although the main objectives of the corporation are to rehabilitate the Jhumias and to accelerate the pace of economic development among the tribal people living in the hills[4].

With the intention of checking depletion of forest cover and inducing the Jhumias, for settled cultivation, the Planning Commission introduced the interdisciplinary programme "Composite Project" from 1974-75 with financial involvement of Rs.12.15 crore under special Centre Assistance in the two hill districts of Assam, The amount mentioned above was allocated to

1. Reclamation and Terracing
2. Minor Irrigation
3. Plantation
4. Agricultural Inputs and Extension
5. Afforestation and
6. Infrastructure and growth points

Altogether an amount of Rs.16.50 crore was utilized for this project from 1974-75 to 1981-82. The cash crop plantation programme formed the nucleus of the composite project. The other five components provided the subsidiary base for the resettlement programme. The activities of the interrelated sectors were sought to be brought under the common umbrella of supervision and implementation. Emphasis was given to coffee and Rubber Plantation on Jhum lands by encouraging Jhumia families. After maturity these plantations were expected to be handed over to the Jhumia families. For this purpose, Assam Plantation Crops Development Corporation (APCDC) was formed in the latter part of 1974. The objectives envisaged under the "Composite Project" could not be fully achieved primarily due to lack of effective irrigation of the inter sectoral schemes. The schemes were executed more or less on departmental lines somewhat to the detriment of the common goal for resettlement of the Jhumias. The other drawbacks were:

1. Non conferment of land rights to Jhumia families over developed lands
2. Non-involvement of beneficiary families at different stages of the project
3. Non-evaluation of a sound strategy based on local conditions, endowments and felt needs and
4. Starting of large scale schemes without first trying them on pilot scheme basis.

The planning commission reviewed the performance of the Composite Project in December 1981 and decided to replace it by the Integrated Jhumia Development Propgramme (IJDP) in the districts of Karbi Anglong and North Cachar Hills. The IJDP has been implemented out of the fund available through Special Central Assistance under the state plan. It is an entrusted scheme of the respective District Councils[5].

Implementation of IJDP schemes in Assam

A. Salient Features

Integrated Jhumias Development programme (IJDP) is an integrated approach to convert shifting cultivation into sustainable or permanent based cultivation for Jhumias. It is associated with different Schemes as composite schemes/Compact Areas Projects/Mini Compact Areas Projects erstwhile known IJDP.

It is entrusted subject of Karbi Anglong Autonomous Council (KAAC). Schemes were being implemented through various line departments under administrative control of the Council. The schemes are monitored by KAAC in co-operation with Development Commissioner for Hill Areas Department, Govt. of Assam.

The funds are allocated to KAAC as per budgetary provision in a financial year as onetime assistance.

The IJDP schemes are implemented by the following line departments

(1) Agriculture Department through Executive Engineer (Agriculture)

(2) Soil Conservation Department through Divisional Officers, Hamren/Kohora and Diphu.

(3) Forest Department through Divisional Officer East Division/West Division/Northern Afforestation Division, D.F.O. and Hamren Division.

B. Objectives[6] of IJDP

The main motto of IJDP is to wean away the Jhumias from the age-old Jhuming cultivation and bring them over to land based permanent cultivation, use of fertilizers and other

developed method of cultivation. The indigenous tribal community of the district mainly depends on agriculture for subsistence. Jhumming method of cultivation is largely practised. An area of 69,000 ha of hilly tract out of total geographical areas of 10,33,200 ha of the district is still covered under shifting cultivation. The integrated schemes under IJDP are therefore being implemented providing 100% assistance to the Jhumias farmers as incentive and the completed schemes/ plantations are handed over to the selected beneficiaries for ownership possession.

The IJDP scheme is beneficiary oriented and labour generated for Jhumias farmers for work executed by the Jhumias and thereby eliminates poverty and improves their economic condition.

C. Strategy for implementation[7]

There are no specific thrust areas for implementation of IJDP schemes as the Jhumias practise cover all over the district. The schemes under IJDP are normally selected for the Jhumias beneficiaries and plantation of cash crops in the areas of abandoned Jhum possessed by the beneficiaries. From 1995- 96 the Karbi Anglong Autonomous Council have taken up schemes of environmentally more friendly cash crop like tea, rubber, coffee, bamboo and sugarcane. These plantations are being taken up in fragmented way with maintenance provision for three years excluding the sugarcane cultivation, besides these schemes, there are also land developments/ land reclamation, water harvesting structure with water distribution system to paddy fields, dug out ponds to facilitate duckery/pisciculture. The Dighalpani special river training works have been implemented since 2002- 03 to decongested water stagnation the field of either sides of the river by stabilizing bankments/digging out the riverbed. Mini micro watershed based project as per WDPSCA guidelines are taken up and implemented in two or more Jhumias villages in a project for a year where people participation is ensured.

D. Plantation as per Departmental Norms

The schemes of tea, coffee, rubber, bamboo, and sugarcane cultivation ate executed as per departmental norms. The norm for tea plantation has been the lines formulated by Agriculture University and NABARD and duly approved by KAAC. The Schemes for land development/ and reclamation/ water harvesting structure with water distribution system etc are implemented as per plan and estimates prepared by line departments.

E. Technical and Administrative Approval

All line departments are technically capable of according technical approval to schemes as the schemes are prepared as per departmental norms, and the Karbi Anglong Autonomous Council gives administrative approval prior to execution of the schemes.

Tea Plantation: Under cash crop plantation, tea plantations are taken up as permanent source of income of the Jhumias families. From tea plantation the owner earn his income by selling tealeaves from the third year of the plantation. The tea plants yield production for a period of 70 to 80 years. Under this scheme about 242 ha was created and 248 families has been benefited so far.

Bamboo Plantation: Bamboo can be grown easily, everywhere in Karbi Anglong and getting a market value in local market is encouraging therefore bamboo plantation is in great demand among the Jhumias. The Jhumias are well conversant with bamboo plantation he does not require any expertise for its plantation. So far 244 ha has been planted and 264 families have been benefited.

Rubber Plantation: Under cash crop plantation rubber plantation has been taken up for the Jhumia farmer to replace the shifting cultivation. 43 ha have been created under rubber plantation during 2004-05.

Sugarcane cultivation: Special sugarcane cultivation is undertaken under IJDP scheme on the demand of the Jhumias since 2002-03 to replace the shifting cultivation as sustainable crop. Sugarcane is a popular cash crop grown in the district. The Agro-climate condition of the district is very suitable for sugarcane cultivation. Most of the weekly rural markets have well established gur market where the products can sell directly their produce. So far 900 Bighas was cultivated under IJDP with 930 families benefited.

Land development/reclamation: The purpose of this scheme is to bring the wastelands and barren land under cultivation and thus increase productivity. Unutilized land of the Jhumias are reclaimed for cultivation, So far 252 ha of land has been developed for 268 families.

Water harvesting structure cum water distribution system: Water Harvesting structures were constructed across perennial streams and water is diverted towards cultivated field for irrigation purpose. Under this scheme it reduces the run off water from up hill and also in the lower reaches. On the other hand it conserves water for cultivation and help to recharge

the groundwater level as well. Under this scheme 73 ha has been covered and 89 families benefited.

Mini Micro Project (Watershed based):Under the guidelines of Watershed project in shifting cultivation areas 10 numbers of Mini Micro Project under IJDP are being implemented in 25 villages with 283 numbers of families benefited in different schemes during 2004-05. These projects have been implemented based on watershed approach @Rs.10,000.00 per ha treatable areas within the projects. These projects emphasize on income generation of the Jhumias farmers/recharging natural resources and also reduce the process of Jhuming by taking schemes like short duration crops/land reclamation/land development/water house structures with water distribution system/run off management activities/bamboo/sugarcane cultivation. Jhumias beneficiaries are given adequate training/awareness Programme before taking up of the schemes.

Special River Training Works :A special river training works have been taken up on Dighalpani river under Howraghat Dev. Block since 2002-03. The Dighalpani river flows through the middle of vast paddy field under Howraghat Block. Its riverbed had been filled with silt as a result of which the water overflows on either sides of its banks and get water logged in the paddy fields for months together reducing the productions. To decongested water from the field and to increase rice production this river training works are being implemented as a special case. This scheme has so far covered 2000 Rmt with 105 nos. of families benefited.

Table 8.1: Amount sanctioned/spent on shifting cultivation and beneficiaries benefited in two hill districts of Assam

	1981		1982		1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1
	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T
A	4.20	4.01	4.85	4.50	4.93	4.70	4.15	3.95	4.50	3.85	5.75	5.15	6.40	6.00	7.50	7.00	8.58	8.10	9.50	8.75	9.5	9.0	9.5	8.95	8.5	8.2	8
B	98	89	109	94	121	108	93	85	100	95	125	103	140	125	150	140	160	150	210	190	225	203	211	195	195	180	1
U	4285	4505	4449	4787	4074	4351	4462	4647	4500	4052	4600	500	4571	4800	5000	5362	5400	4523	4605	4222	4433	4502	4589	4358	4555	4473	4
			3.82	6.26	4.92	-3.4	4.13	3.15	5.02	10.0	7.35	10.9	6.6	6.55	16.6	10.9	25.1	19	5.5	2.2	1.4	-1.6	5.0	1.8	1.7	1.1	4
N.C.HILLS																											
A	3.95	3.73	4.05	3.98	4.18	4.02	3.75	3.63	4.85	4.25	4.75	4.01	5.75	5.12	6.5	6.00	7.10	7.00	10.5	9.75	10	9.8	10.5	10.2	10.9	10.2	9.
B	98	88	93	85	101	93	89	78	104	91	105	90	135	125	151	138	163	158	253	225	229	200	255	240	255	235	2
U	4030	4238	4354	4682	4138	4322	4213	4653	4663	4670	4523	4455	4259	4096	4304	4347	4355	4430	4150	4333	4366	4925	4117	4270	4274	4361	4
			8.04	10.48	2.68	1.98	4.54	9.79	15.70	10.19	12.2	5.1	5.6	3.35	6.8	2.5	8.06	4.5	2.9	2.2	8.3	16.2	2.16	0.75	6.05	2.9	6.

A= Amount, B= Beneficiary U=Unit

Source: Office of the Development Commissioner for the Hill Areas, Guwahati, Assam.

Fig: 8.1 Amount spent on jhum actual and achievement

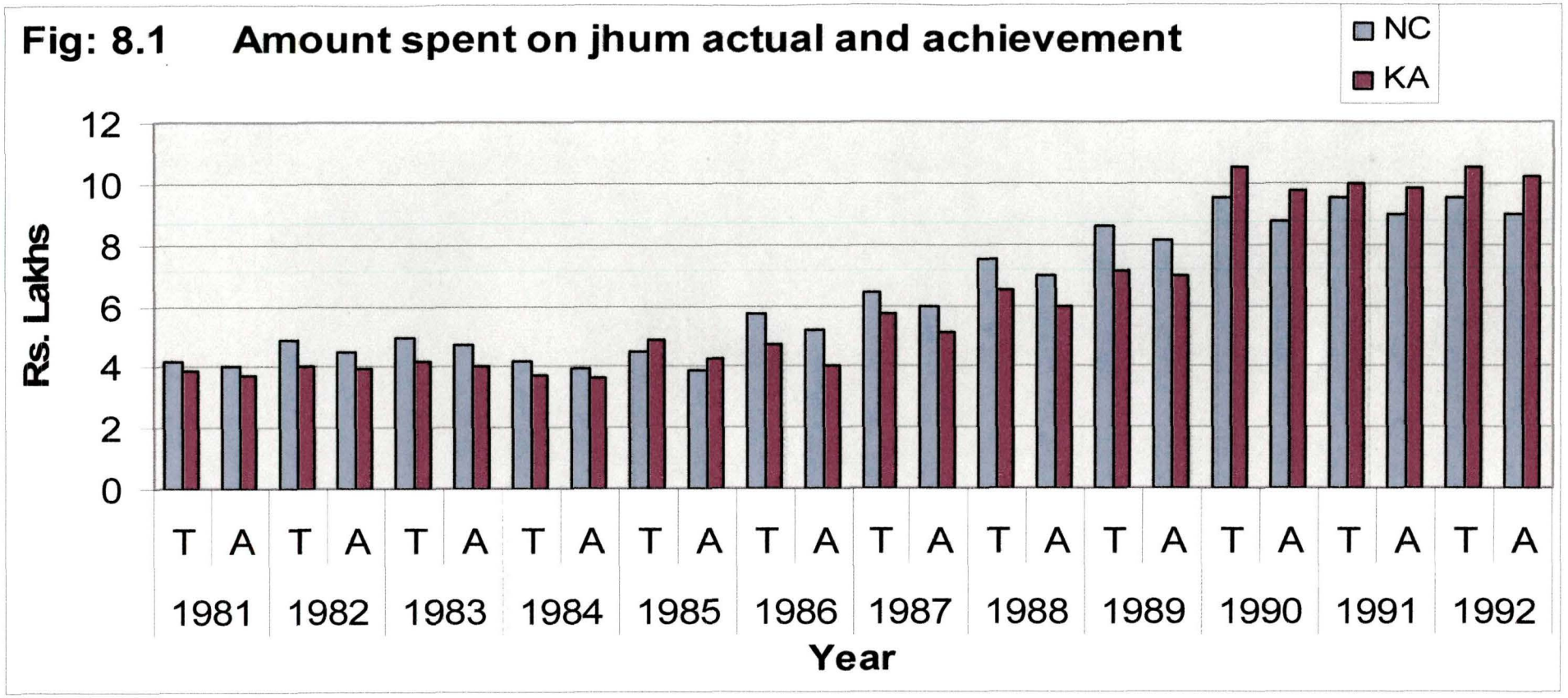


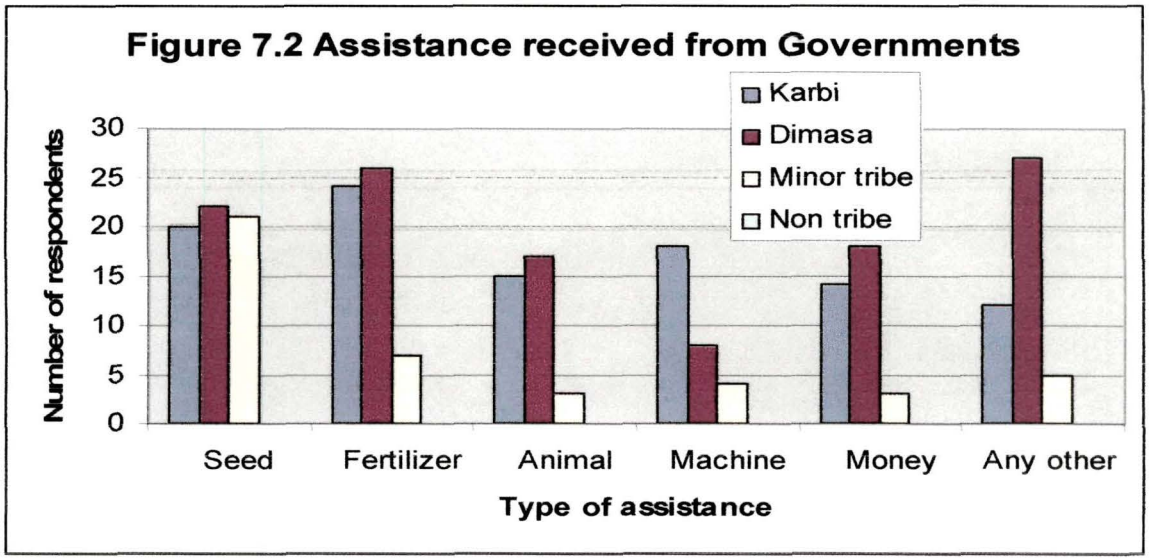
Table 8.1 presents achievement on IJDP for the period 1982-83 to 1985-86. The table also gives a general view on the target amount sanctioned by the Government and actual achievement amount spent on controlling shifting cultivation and also the number of beneficiaries in the two hill district of Assam for a period of sixteen years from 1981 to 1995. In the table an attempt has been made to find out the horizontal percentage taking 1981 as the base year. Moreover per unit has also been shown out in the table. It has been observed from the table that amount target for shifting cultivator and actual achievement and number of beneficiaries is not uniform for every year in the two-hill district.

The horizontal growth rate percent is also not uniform for all the year. There is a negative growth rate in the Karbi Anglong district in the year 1983 and 1991. In the Karbi Anglong district, the highest target amount was sanctioned in the year 1991 and 1992. In Karbi Anglong district, target amount is slowly increasing over the years except 1984, 1985. In these two-years there is a slight decrease in amount. It is seen from the table that they have not been able to achieve the target amount and the target beneficiaries. It is interesting to note that achievement amount is increasing but the years 1984 and 1985 have shown slight decrease then the previous year. As regards target beneficiaries and achievement beneficiaries, there is also an increasing trend, except in the years 1984 and 1985. Regarding per unit, it maintained a fluctuating trend. Target per unit was highest in the year 1988 and lowest in the year 1983. Regarding per unit for achievement, it was highest in the year 1988. Horizontal growth rate have shown a fluctuating trend. As regards N.C Hills, target amount is slowly increasing over the years, except 1984. Achievement amount is also increasing, except 1984 and 1986. It is seen from the table that they have not been able to achieve the target amount and the target beneficiaries. Target and actual beneficiaries is at an increasing trend, except in the years 1982 and 1984. Per unit have shown a fluctuating level. Target per unit is highest in the year 1985 and lowest in the year 1992. However, actual per unit is highest in the year 1991 and lowest in the year 1982.Horizontal growth rate have shown a fluctuating trend. It is seen from the table that Government has sanctioned more target amount in Karbi Anglong district than in N.C. Hills district.

Table 8.2 Assistance received from Government

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
(i) Seed	20	22	21	0	63
	(19.42)	18.64)	(48.83)		(19.28)
(ii) Fertilizer	24	26	7	0	57
	(23.30)	22.03)	(16.28)		(22.89)
(iii) Animal	15	17	3	0	35
	(14.56)	14.41)	(6.98)		(14.06)
(iv) Machine	18	8	4	0	30
	(17.48)	6.78)	(9.30)		(12.05)
(v) Money	14	18	3	0	35
	(13.59)	15.25)	(6.98)		(14.06)
(vi) Any other	12	27	5	0	44
	(11.65)	22.89)	(11.63)		(17.67)
Total	103	118	43	0	264
	(100.00)	100.00)	(100.00)		(100.00)

Source: Primary data



A household survey was undertaken to evaluate the Government schemes meant for controlling shifting cultivation. In the table 8.2 an attempt has been made to show the assistance received by the household from the Government. The Government has given seed, fertilizer, animal, machine, money and other assistance to householders shifting cultivators. From the table it is seen that 22.89 per cent received fertilizer, 19.28 per cent received seed, 14.06 per cent received animal, 12.05 per cent received machine and 17.67 per cent received other things from Government for not undertaking shifting cultivation. Ethnicity wise shows that 48.83 per cent minor tribe received seed, 23.30 per cent Karbi also received machine, 15.25 per cent Dimasa received money, 14.56 per cent Karbi

received animal and 22.89 per cent Dimasa received other assistance from the Government.

Table 8.3: The assistance/materials given on time

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
(i) Yes	15	38	27	0	80
	(14.56)	(32.21)	(62.79)		(30.30)
(ii) No	88	80	16	0	184
	(85.44)	(67.79)	(37.21)		(69.70)
Total	103	118	43	0	264
	(100.00)	(100.00)	(100.00)		(100.00)

Source: Primary data

Table 8.3 shows assistance received by shifting cultivators on time. It is interesting to note 69.70 per cent respondents have not received assistance and materials in time. Ethnicity wise shows that 85.44 per cent Karbi have not received materials on time and 67.79 per cent minor tribe have also not received assistance on time.

Table 8.4 Training received by the respondents

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
Number of respondent	58	79	15	0	152
	(56.31)	(66.95)	(34.88)		(57.58)
Total respondents	103	118	43	0	264
					(100.00
	(100.00)	(100.00)	(100.00)		)

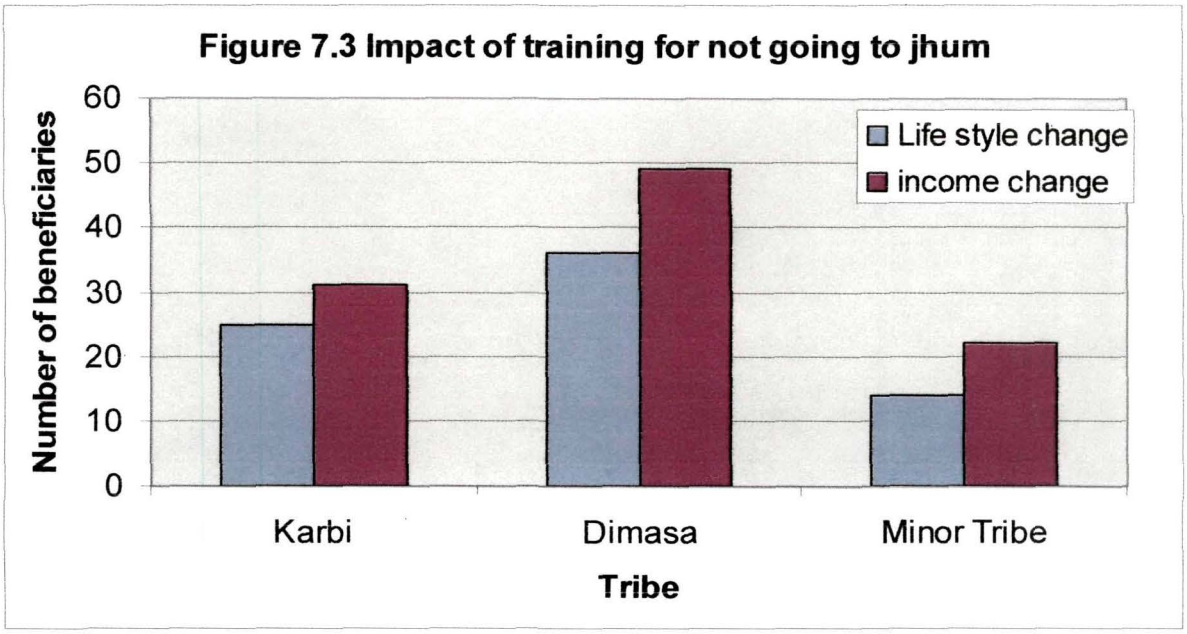
Source: Primary data

Table 8.4 shows the training received by the respondent. From the table, it is clear that 57.58 per cent respondents have undergone training for new methods of cultivation. Ethnicity wise shows that 66.95 per cent Dimasa respondent received training followed by 56.31 per cent Karbi respondent and 34.88 per cent minor tribe respondents received training from government.

Table: 8.5 Impact of training on not going for Shifting cultivation

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
(i) Changing life style	25	36	14	0	75
	(24.27)	(30.51)	(32.56)	0	(28.41)
(ii) Change in income	31	49	22	0	102
	(30.10)	(41.53)	(51.16)	0	(38.64)
Total respondents	103	118	43	0	264
	(100.00)	(100.00)	(100.00)	0	(100.00)

Source: Primary data



Regarding impact of training on not going for shifting cultivation which is presented in Table 8.5, 38.64 per cent respondents admitted change in income, 28.41 per cent respondents admitted change in life style. Ethnicity wise shows that 51.16 per cent Dimasa household had change in their income and also 32.50 per cent Dimasa households' had change in their lifestyle.

Table 8.6 Did the scheme make the Jhumias busy?

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
(i) Yes	27	34	12	0	73
	(26.21)	(28.82)	(27.91)	0	(27.65)
(ii) No	76	84	16	0	176
	(73.79)	(71.19)	(37.21)	0	(66.67)
Total respondents	103	118	43	0	264
	(100.00)	(100.00)	(100.00)	0	(100.00)

Source: Primary data

The respondents were asked whether the scheme made them busy, which is presented in the Table 8.6. Majority of the respondents (66.67 per cent) reported that the scheme did not make them busy; on the other hand 27.65 per cent respondents admitted that the scheme made them busy. Ethnicity wise shows that, according to 73.79 per cent Karbi respondents' the scheme did not make them busy. It is interesting to note that 28.82 per cent Dimasa respondents reported that the scheme made them busy.

Table 8.7: Is income sufficient for the shifting cultivator for not adopting Shifting cultivation?

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
Yes	17	13	8	0	38
	(16.51)	(11.02)	(18.60)		(14.39)
No	86	105	35	0	226
	(83.49)	(88.98)	(81.40)		(85.61)
Total	103	118	43	0	264
	(100.00)	(100.00)	(100.00)		(100.00)

Source: Primary data

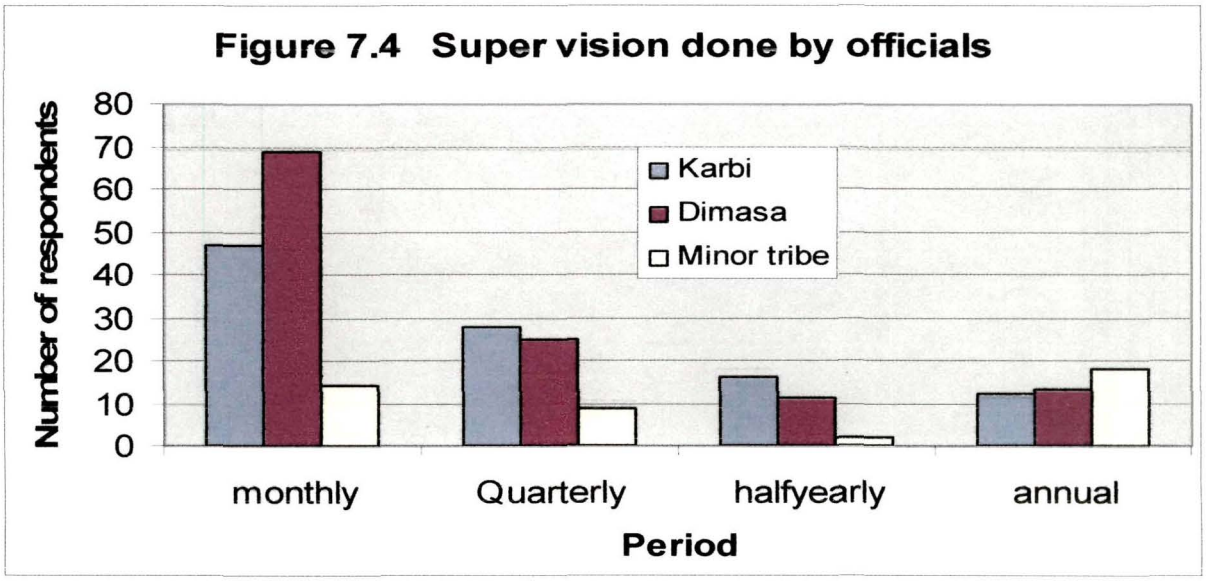
Table 8.7 shows the respondents view regarding their income generated from the scheme for not adopting shifting cultivation. 14.39 per cent respondent reported that income was sufficient. Ethnicity wise shows that, according to 88.98 per cent Dimasa, income was not sufficient. On the other hand 18.60 per cent minor tribe reported that income was sufficient.

Success of any schemes depends upon the followed up action by the government officials from time to time. Table 7.8 shows the frequency of supervision done by the officials. 49.24 per cent respondents reported that monthly supervision was done by the officials, 10.98 per cent respondents reported half yearly supervision done by officials and 16.29 per cent respondents reported annual supervision by the officials. Ethnicity wise, 58.47 per cent Dimasa respondents reported monthly supervision, 41.86 per cent minor tribe reported annual supervision, 27.18 per cent Karbi respondents reported quarterly supervision and 15.53 per cent Karbi respondents also reported that half yearly supervision was done by the officials

Table 8.8: Your observation on frequency of supervision done by officials

Details	Karbi	Dimasa	Minor tribe	Non tribe	Total
(i) Once in a month	47	69	14	0	130
	(45.63	(58.47)	(32.56)		(49.24)
(ii) Quarterly	28	25	9	0	62
	(27.18	(21.19)	(20.93)		(23.48)
(iii) Half Yearly	16	11	2	0	29
	(15.53	(9.32)	(4.65)		(10.98)
(iv) Annual	12	13	18	0	43
	(11.65	(11.02)	(41.86)		(16.29)
Total	103	118	43	0	264
	(100.00	(100.00)	(100.00)		(100.00)

Source: Primary data



Evaluation of Government Schemes:

From the above, we have seen that Government has taken many projects to control this age old tradition. For evaluation of any Shifting cultivation control Government projects, one have to observed population growth rate and Jhumias population growth rate. If the Jhumias population comes down it can be said that projects have some impact on shifting cultivation control schemes. It has been observed that population growth rate is more than Jhumias growth rate in both the districts. Therefore schemes have impact on jhum control measures.

The success and failure of Government schemes depends on wholehearted approach of Government officials and their follow up. Besides promotion of ecology, it should be acceptable to a tribal.

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3. *Ibid*
4. *Ibid*
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6. *Ibid*
7. *Ibid*

CHAPTER – IX

FINDINGS, SUGGESTIONS AND CONCLUSION

Findings of the study:

Socio-economic profile of the respondents:

Socio economic analysis helps in determining not only the size and quality of labour force and resources available in different categories, of households but also the type of crops and other economic activities that can be taken up so as to improve their socio-economic well being.

A great majority (78.00 per cent) of the respondent belonged to joint family only 22.00 percent respondents belonged to nuclear family. Academic attainment of an individual is an important factor, which attests the standard of living 35.33 per cent head of households illiterate. More illiteracy (40.78 per cent) was found in the Karbi respondents.44.00 per cent respondents have two male members followed by 33.00 per cent respondents have 3 and above male members, on the other hand 36.67 per cent respondents have 2 female members. Ethnicity wise shows that 43.69 per cent Karbi respondents have two male members. Numbers of family members is a very important variable in tribal economy, because most of the labours come from family members.

Relating to the employment status of the respondents, majority (85.00 per cent) worked as agricultural labour, 11.63 per cent have their own business that means they are self employed.29.00 per cent of the respondents belonged to the age group of 20-30 years, 9.00 per cent of the respondents were 60 and above group. Regarding religion of the respondents Hinduism dominated the other religion; pertaining to martial status of the respondent great majorities (66.67 per cent) of the respondent was married. Language is a medium of communication, each tribal community has its own language but most of the respondents also speak Assamese languages. Concentration of male population was slightly higher than the female population, 59.00 per cent respondent was male, and on the other hand 41.00 per cent respondent was female.

Shifting cultivation - Global and national perspectives:

The total area covered and the number of family involved in shifting cultivation in the South East Asian countries showed an increasing trend over the last thirty years (1970-2000). In case of area under shifting cultivation in South East Asian countries, Nepal-Bhutan, Ceylon, Thailand, Cambodia maintaining an increased growth rate over the base year, on the other hand Pakistan, India, Burma, Laos, Philippines and Indonesia maintaining a steady moderate growth rate. The countries, which shows lowest growth rate in area were Indonesia and New Guinea. Highest percent of Indonesian families

followed by India and China families involved in age old cultivation practices. India, Nepal-Bhutan, Ceylon, Thailand, Laos, Cambodia, South Vietnam, China and Formosa show an increasing growth rate. The countries, which showed steady growth rate were Pakistan, Burma, North Vietnam and New Guinea, Indonesia showed decreased growth rate.

In terms of growth rate of area among the Indian states, Orissa showed increasing rate at first than decreasing rate. Assam and Mizoram maintains an increasing trend over the years. Nagaland, Tripura, Andhra Pradesh and Bihar maintain a fluctuating rate. Manipur shows decreasing rate over the years, on the other hand Meghalaya maintains a stable growth rate over the Years. Regarding growth of population dependent on shifting cultivation, Manipur, Bihar, Kerala and Madhya Pradesh shows an upward increasing trend while Nagaland the rate is fluctuating, on the other hand Orissa, Arunachal Pradesh and Assam shows a decreasing trend. In case of growth of household dependent on shifting cultivation Mizoram, Andhra Pradesh, Bihar, Kerala and Madhya Pradesh maintain an upward increasing trend. Arunachal Pradesh, Meghalaya and Tripura maintain a fluctuating trend. On the other hand Manipur and Assam shows decreasing trend. In comparison to population and household dependent on shifting cultivation, both were at increasing trend with the base year. The state, which shows increased in population, also shows increased in households shifting cultivators' population.

In Assam, the area under shifting cultivation shows a fluctuating rate. In Karbi Anglong district in the Year 1978 shows highest area under shifting cultivation but in N.C. Hills in the year 1985, shows highest area. In Karbi Anglong and N.C. Hills district total Jhumias population, total scheduled tribe and total population are increasing with base year.

Economics of Shifting cultivation:

Karbi Anglong district has got good forest coverage (26.5 per cent) but N. C. Hills district has only 12.9 per cent forest area to total area of the state. In Karbi Anglong 20,000 families cultivated Shifting cultivation in 21,853 ha of land where as 7,000 families cultivated Shifting cultivation in 6,475 ha land in N.C.Hills district. Fertilizer consumption is less in both the district; this may be due to unavailability of fertilizer in time and proper demonstration and training by government department. Rice crop dominated in both the districts. The average yield of maize, wheat, pulse, sugarcane, turmeric and pineapple is more in Karbi Anglong than N.C. Hills. On the other hand the average yield of total rice, other cereals, oilseed, banana, arecanut and coconut is more in N.C. Hills. The average yield of most of the crops like cereals, pulse, potato, sugarcane, turmeric and banana is

more in two hill districts than the state of Assam. 38.97 percent respondent households' possessed below 2 bigha of permanent cultivation land and on the other hand majority of farmers (49.67 per cent) possess below 2 bigha of shifting cultivation land. Regarding input used by households under the survey, majority of respondents were not familiar with pesticides, 10.33 per cent respondents received pesticides from government sources. 40.00 per cent of the respondents' farmer not aware about organic fertilizer, only 4.33 per cent used more than 100 kg of organic fertilizer. Regarding labour used by the respondents, majority (75.33 per cent) of the farmers used 1-3 numbers own labour on the other hand majority of the farmers (68.33 per cent) not engaged hired labour. More than one third of the respondent (41.33 per cent) farmers cultivated cereal crops in 1-2 bigha of land. Pulse crop is an important crop, 38.00 per cent of the respondents cultivated pulse crop in 1-2 bigha of land, where as 33.00 per cent respondents not familiar with these types of crop. As regards area under vegetable crops, 35.33 per cent of the respondent farmers cultivated vegetables crop in 1-2 bigha land. Whereas, vegetables crop was not cultivated by 32.67 per cent of the respondents. On the other hand 31.67 per cent respondent farmers cultivated tuber crop in 1-2 bigha of land, only 2.00 per cent cultivated more than 8 and above bigha of land, 37.07 per cent farmers not cultivated tuber crop. Fruit crops plays an important role in human health and economy, 39.33 per cent respondent cultivated fruit crop in 1-2 bigha of land, only 1.33 per cent cultivated 8 and above bigha of land, it is interesting to note that 45.67 per cent respondent cultivators not cultivated fruit crop. Respondents were interviewed to learn about yield of crops. Majority of farmers' (52.34 per cent) getting cereal yields 100 kg/bigha. On the other hand 4.00 per cent farmers received more than 300 kg/bigha. The performance of oilseed crop yield was not very good, 26.67 per cent farmers received 40-100 kg oilseed per bigha and only 11.34 per cent farmers received 200-300 kg/bigha. Regarding the yield of pulse crops, 35.00 per cent of the respondents' farmers received 40-100 kg/bigha only. Dimasa household respondents' (8.47) received more than 300 kg/bigha. 32.67 per cent respondents' farmers received vegetable yields between 40-100 kg/bigha, only 3.33 per cent received more than 300 kg/bigha. Regarding the yield of tuber crop, it appears that 26.67 per cent farmers received yield 40-100 kg/bigha; only 6.00 per cent received more than 300 kg per bigha. As per yield of fruit crops, 23.67 per cent respondent farmers getting yield 40-100 kg/bigha only 7.33 per cent getting yield 200-300 kg/bigha.

Subsidiary economic activities:

Livestock plays an important role in rural economy. It is interesting to note that majority of the respondents farmers have no cows, 31.33 per cent respondents have 1-2 numbers of cows, only 4.33 per cent respondents have 5 and above numbers of cow. Goat is poor man friend. Goats are reared by most of the respondents except 21.33 per cent, 37.33 per cent respondents reared below 3 number, only 12.67 per cent reared 7 and above number of goats. Poultry is a popular livestock in tribal society, majority (55.00 per cent) of the respondents have below 4 number of poultry bird, only 4.33 per cent have 9 and above poultry bird. Pig rearing is common in tribal society. 30.67 per cent of the respondents have 2-4 numbers of Pig, only 12.00 per cent respondent have 5 and above number pigs. 27.66 per cent respondents have no pigs. It is interesting to note that 49.33 per cent of the respondents' farmers generated Rs.5,000.00 to Rs.10,000.00 per year from Agriculture. Regarding income generation from dairy farming it is seen from the survey that 33.66 per cent of the respondents earned Rs.1000.00 to Rs.2000.00. Regarding income from goattery farming, 41.33 per cent farmers received below Rs.500.00 only 2.67 per cent received above Rs.2000.00. 34.67 per cent of the respondents received income between Rs.500.00 to Rs.1000.00 from Piggery farming. On the other hand 47.00 per cent respondents have income below Rs.500.00 from poultry farming, it is interesting to note that 23.33 per cent farmers have no income from poultry farming. Regarding utilization of production for home consumption by the respondents, 38.33 per cent respondents consumed 60.00 per cent to 70.00 per cent, only 15.67 per cent of the respondents consumed 50 per cent to 60 per cent. 47.66 per cent of the respondents kept 1 to 5 per cent of production for seed, 13.67 per cent of respondents kept 10 per cent to 20 per cent of production for seed, only 9.34 per cent kept more than 20 per cent of production for seed. 45.00 per cent of the respondent farmers gave 1 per cent to 5 per cent as wages; only 18.00 per cent gave 10 per cent to 20 per cent as wages. Regarding marketing of produce, 38.67 per cent of the respondents sold one per cent to five per cent of produce in the market, 16.33 per cent sold more than 20 per cent of produce in the respective local markets. Input-output relationship reveals that low yield and less income from shifting cultivation. After meeting all home consumption and religious needs, the marketable surplus is sold. Income generation from agriculture and allied activities is not sufficient to meet changing needs. As most of the farmers are below poverty line, they are compelled to clear and burn more forestland for cultivation.

Environment Degradation and Shifting cultivation:

Soil erosion in Karbi Anglong district shows a fluctuation level, although high in some years and no erosion in some years. Highest erosion found in the year 1993, moderate soil erosion in 1999 and lowest soil erosion found in the year 1991, soil erosion in N.C. Hills shows higher than Karbi Anglong district. Highest soil erosion was found in N.C Hills in the year 1989, moderate soil erosion was found in the year 1987, and lowest soil erosion was found in 1999. P_2O_5 and K_2O_5 content in the shifting cultivation period is decreasing trend in both the district. Regarding the pH of the soil, it shows a fluctuating trend through out the period of shifting cultivation period in both the district. The runoff behaviour also shows a fluctuating trend in the Karbi Anglong district, which was highest in the year 1987. As regards soil loss it shows a fluctuating level through out the year. It was found highest in the 1996.In the N.C. Hills as regards pH of the soil, it was found more in 1993, runoff show highest in the year 1987, soil loss was highest in 1978. Observation on runoff and Soil loss in two districts showed that N. C. Hills district has more soil loss and runoff than Karbi Anglong. In hilly areas shifting cultivation operation is carried out community wise or in group, and sometimes independently. 78.00 per cent respondent informed that they carried out shifting cultivation independently, 83.33 per cent non-tribal respondents carried out shifting cultivation independently. Regarding selection of site/land 56.66 per cent respondents cultivated their crops in community land, 66.67 per cent non-tribal respondents selected community land. 44.33 per cent respondents selected 1-2 year fallow land; community wise shows that majority (69.44 per cent) of the non-tribe respondents selected 1-2 year fallow. Regarding period of cultivation in a particular plot, 41.00 per cent of the respondents cultivated 2-3 year in a plot and only 12.33 per cent cultivation continuously more than 5 year in a plot. 44.6 per cent Karbi respondents cultivated 2-3 year in a plot. Majority of the respondent (92.00 per cent) only shifted their plot and on the other hand ethnicity wise 94.00 per cent non-tribe shifted only their agricultural plot.48.33 per cent of the farmers cut only branches and twigs, 67.44 per cent minor tribe cut only branches and twigs. Regarding preparation of land. 47.33 per cent respondent households kept tress during shifting cultivation. 55.81 per cent minor tribe kept trees. Regarding involvement of farmers in shifting cultivation 29.67 per cent respondents cultivated 4 to 5 years in the same plot. On the other hand 21.33 per cent cultivated more than 10 years in the same plot.52.78 per cent non-tribe involved 1 to 3 years in shifting cultivation on the other hand 29.66 per cent Dimasa involved more than 10 years. 27.67 per cent respondent

households shifted the land more than 8 times in their life, 39.53 per cent minor tribe shifted 1 to 3 times. Respondent experience in case of shifting cultivation, (35.67 per cent) of the respondent experiences labour intensive. 41.67 per cent non-tribe has experienced low yield. Regarding erosion, as per 45.00 per cent respondent view erosion was moderate after ploughing. Respondents' views on environment reveals that 54.33 per cent respondents maintained long fallow period for regeneration, 63.11 per cent Karbi tribe maintained long fallow period for regeneration. 54.33 per cent respondents agreed that long fallow period and rain create regeneration. Majority (61.00 per cent) of the respondents maintaining natural method for regeneration. 72.82 per cent Karbi tribe maintained natural method for regeneration. Respondents were asked what steps they have taken to control environment degradation, 41.67 per cent respondents applied nutrients to the soil to control environmental degradation, 21.00 per cent respondents have not given their response in this regard. High majority (72.10 per cent) of minor-tribe applied nutrients. Regarding steps taken to control soil erosion 42.00 per cent Karbi planted trees, 30.56 per cent non-tribe constructed bunds, 27.91 per cent minor tribe have taken any other method to control soil erosion. Regarding maintaining floral bio diversity by the respondents 46.00 per cent planted new tress, majority (50.00 per cent) Dimasa respondents planted new tress. Regarding maintaining fauna bio-diversity by the respondent households, high majority of (81.67 per cent) the respondents not killed the animals, 18.33 per cent of respondents adopted other methods. A high majority (93.02 per cent) of minor tribe not killed any animal and 30.55 per cent adopted any other method to conserve fauna bio-diversity.

Effectiveness of Various Schemes: The government of India and the concerned state Governments has embarked upon a good number of schemes under the different five-year plans to regulate and control the Shifting cultivation practices in the highly affected areas of the country. The amount target for Jhumias and actual achievement and number of beneficiaries is not uniform for every year in the two hill districts. The negative growth rates shown in the Karbi Anglong district in the year 1983 and 1991. In the Karbi Anglong district highest amount sanctioned in the year 1991 and 1992.It is seen that target amount is more than achievement amount. It is observed that achievement is less than the target amount. As regards target beneficiaries, it is also an increasing trend except 1984 and 1985. As regards N.C. Hills target amount slowly increasing over the years except 1984. In 1985 target amount more than achievement. Target beneficiaries were increasing except 1984 and 1982. Overall, Karbi Anglong district has got more Target beneficiary and per

unit than N.C. Hills. The Government has given seed, fertilizer, animal, machine, money and any other assistance to householders Jhumias. 22.89 per cent respondents received fertilizer, 19.28 per cent respondents received seed, 14.06 per cent respondents received animal, 12.05 per cent respondents received machine and 17.67 per cent respondents received other things from Government for not going to the Shifting cultivation. Majorities of the (69.70 per cent) respondents have not received assistance and materials in time. Ethnicity wise shows that a high (85.44 per cent) majority of Karbi tribe received assistance in times. Regarding training received by the respondents; majority (57.58 per cent) percent of respondents have undergone training for new methods of cultivation.

Regarding impact of training on not going for shifting cultivation, 38.64 percent admitted change in income. Majority of the respondent (66.67 per cent) reported schemes did not make them busy on the other hand 27.65 percent respondents admitted schemes make them busy. Majority of (85.61 per cent) the respondents reported that income from scheme is not sufficient on the other hand 14.39 per cent reported that income is sufficient. 58.47 per cent Dimasa respondents reported supervision done by officials in a month.

Benefit – cost (B:C) ratio analysis of different activities:

An in-depth examination of different cost and corresponding income for different farming systems is very much necessary for the viability of the particular farming system.

The benefit –cost ratio analysis showed that among livestock farming minor tribe is efficient in pig farming (B:C ratio 1.39), Dimasa tribe is efficient in poultry farming (B:C ratio 2.48), Karbi tribe is efficient in Goat farming (B:C ratio 2.25)

Regarding horticultural activities Karbi-tribe is efficient in Mandarin cultivation (B:C ratio 1.80), Minor tribe is efficient in pineapple cultivation (B:C ratio 1.57). Shifting cultivation shows lower B:C ratio (1.07 to 1.12) among all other activities like livestock and horticultural farming.

Other findings from the study:

a) Agriculture was the dominant form of primary and secondary occupation in the area.

b) Rice was the major crop accounting about 64 per cent, Staple food Rice is grown on Shifting cultivation

c) There was scope to increase cropping intensity in all the size groups under Shifting cultivation through even with existing resources. Thus, it revealed that the existing resources were not properly distributed.

d) The farmers were used less input like fertilizers, pesticides etc in the production programme.

e) Some crops like ginger, cotton, hill jute etc. are grown only in the plots of Shifting cultivation and such crops given them a steady source of cash income.

f) A number of traditional vegetables can be grown in Shifting cultivation, which supplements their nutrient requirements in daily food.

g) As labour in the shifting plot is supplied both by males and females (rather in some respects females work more) Women's labour can be fruitfully utilized if Shifting cultivation is practiced side by side with settled agriculture.

h) In the Shifting cultivation, farmers cultivate cotton, which is used in handloom industry for making cloths, spinning of yarn from home grown cotton is a common sight in the interior hill areas.

i) Bamboo required for house construction and day to day domestic use is taken from Shifting cultivation fields.

j) Other housing materials, timber, cane are also collected from Shifting cultivation field.

k) The village council decides if the village is to be shifted to new Shifting cultivation sites and it distributes Shifting cultivation lands to be cultivated in a particular year to be families of the village.

l) Rongker festival and Hacha festival is related to Shifting cultivation. In these festival rice beer is used which is a produced from rice, cultivated in Shifting cultivation.

Model: An economic, sociological and environmental interaction model is constructed to explain the dynamics of shifting cultivation system. In the shifting cultivation system interconnection exists between production economics, social and cultural force, environmental degradation and government and non-government organizations intervention. In the shifting cultivation system production practices are associated with the use of indigenous tools and implements, low intercultural management, lack of pest and diseases control and lack of fertility management. On the other hand social and cultural forces involved in shifting cultivation are production for consumption, population growth, and low level of literacy and lack of awareness on environment. Production practices and social factors compelled hill people to cut and burnt the trees and leading to the deforestation. Deforestation causes environmental degradation. The environmental degradations due to the shifting cultivation are soil erosion, proliferation of weed, loss of bio-diversity and loss of fauna. Environmental degradation resulted less output and food production, which lead them vicious cycle of poverty. Poverty brings social unrest. To overcome this problem, government and non-government organization takes intervention. Farmers also themselves takes some own intervention. People mindset becomes change due to the government and non-government organization intervention and they involved in other allied activities which helps them to rise in their income and employment.

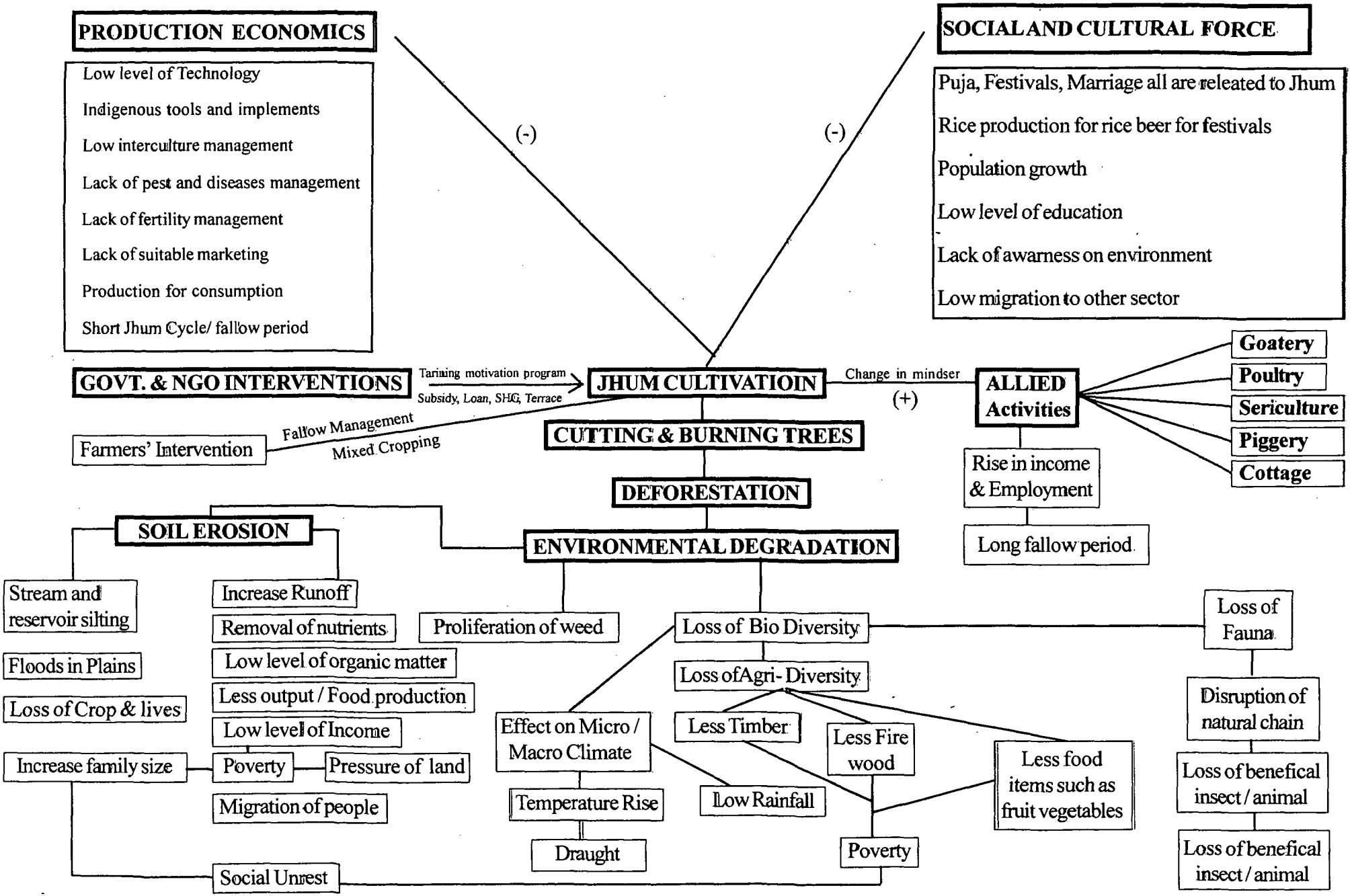

Figure: 9.1 ECONOMIC, SOCIOLOGICAL & ENVIRONMENTAL INTERACTION MODEL

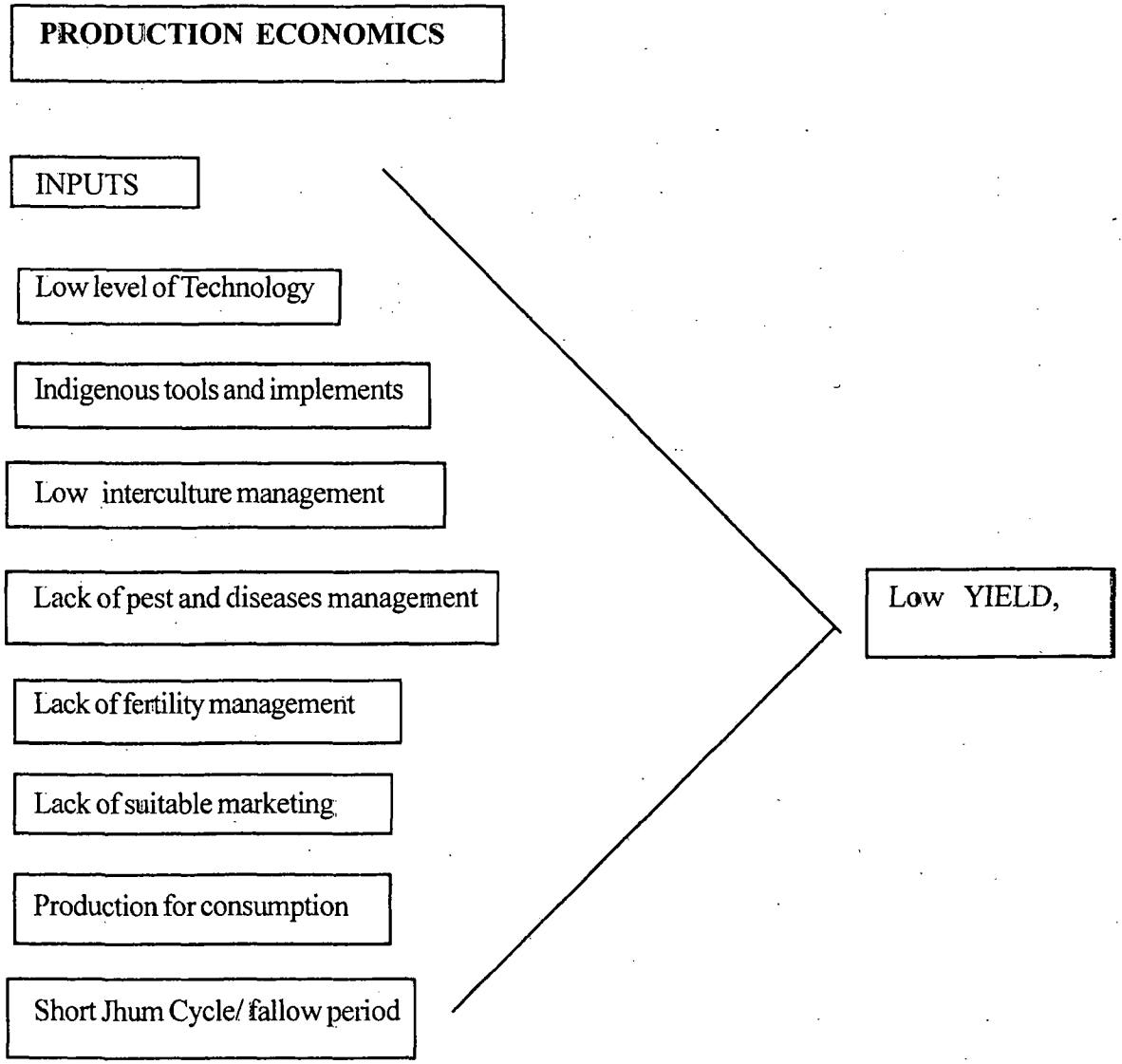

Figure: 9.1 ECONOMIC, SOCIOLOGICAL & ENVIRONMENTAL INTERACTION MODEL

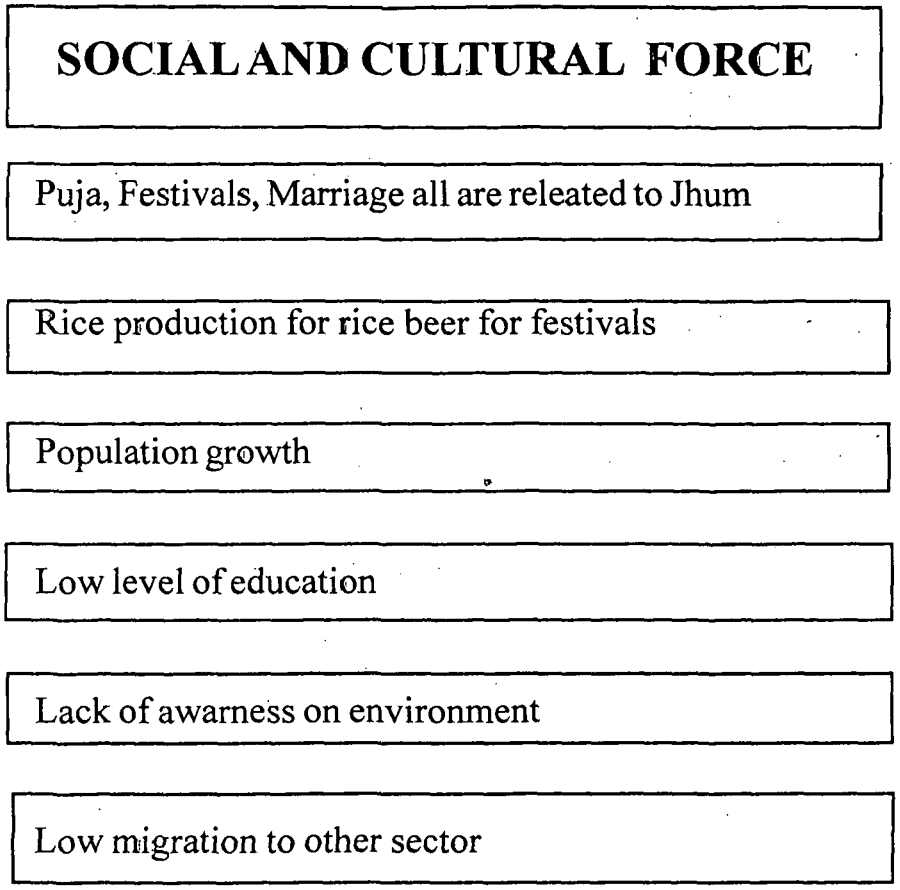

Figure: 9.1 ECONOMIC, SOCIOLOGICAL & ENVIRONMENTAL INTERACTION MODEL

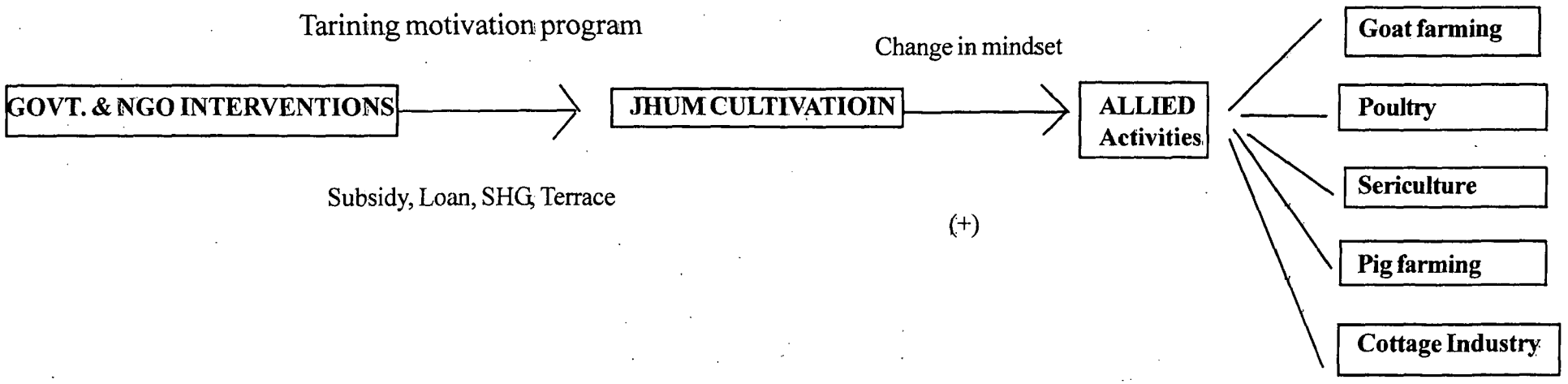

Figure: 9.1 ECONOMIC, SOCIOLOGICAL & ENVIRONMENTAL INTERACTION MODEL

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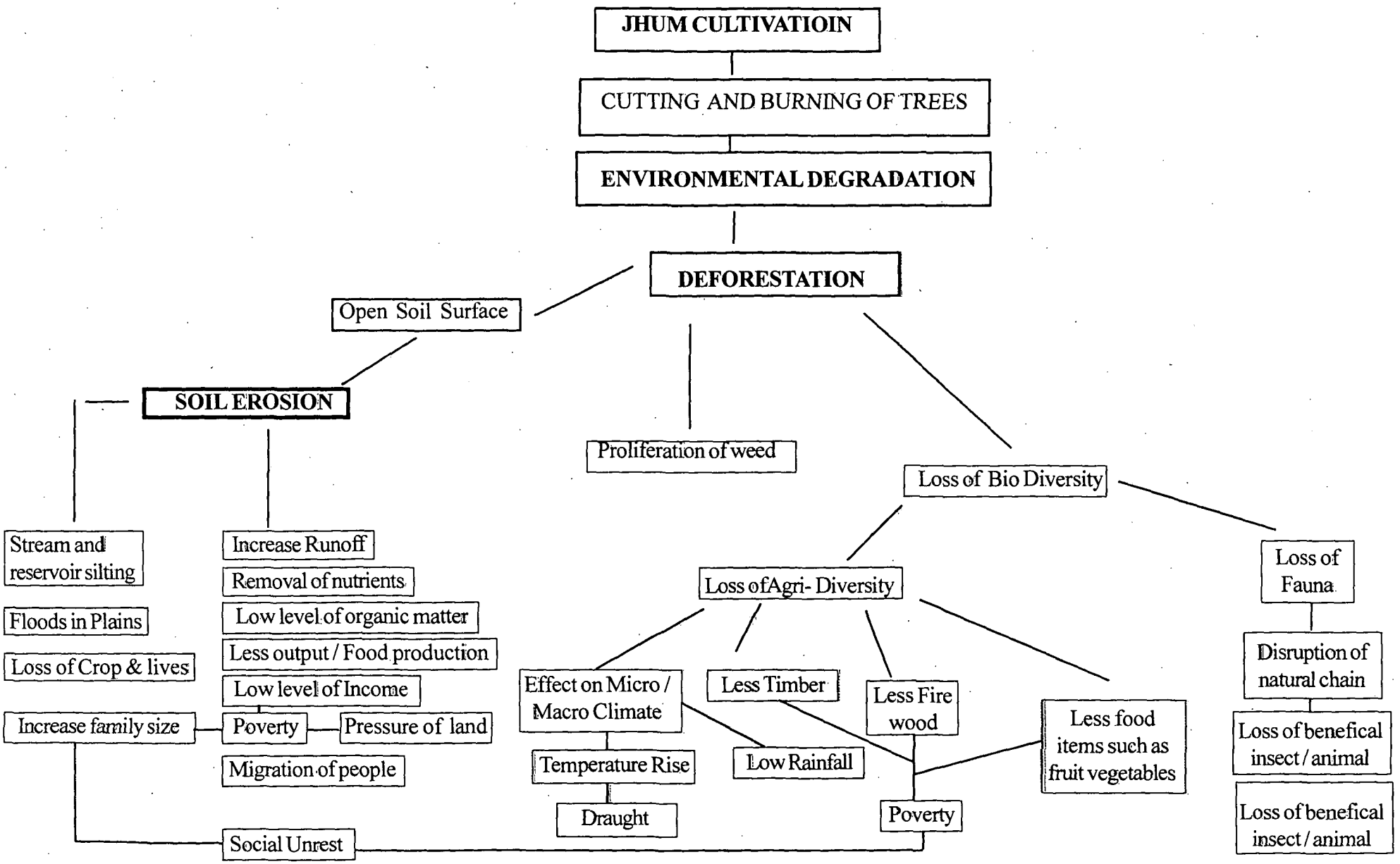

Conclusion:

Agriculture is an important economic activity for a large population of the developing world. The view that industrialization is the main hope of the developing countries has undergone remarkable changes in more recent times. Today, agriculture and rural development are viewed as the *sine qua non* of national development. A reorientation wherein rural development is well balanced with industrial growth is now considered essential to correct serious imbalances in the economy, for equitable distribution of wealth and for social justice. It is against this background that increases in agricultural production in the developing world need to be viewed and evaluated.

The various adverse effects of Shifting cultivation, the need for its replacement have been widely discussed at various levels. It has been a matter of concern not only for the Government of India and the Planning Commission but also to the various state governments and the union territories of the region. Although considerable data on the extent of Shifting cultivation and its various adverse effects including its effect on agricultural production have been discussed in various forums, yet detailed scientific studies on shifting cultivation from various angles were not taken up until recently. The prevalence of shifting cultivation is so extensive in the region that it would not be possible to tackle the problem within a short period of time whatever, large the efforts may be. It will, thus, be necessary to approach the problem so that alternative systems of farming can be introduced in areas where the cycle of rotation has been greatly reduced.

It may be necessary to adopt an improvement approach to Shifting cultivation in the other areas with the ultimate objective of weaning away the farmers to alternative system of settled farming. Thus it is necessary also to study the various aspects of improving the existing system so as to temporarily minimize soil erosion and increase productivity. The developmental agencies of the various states and union territories as well as North Eastern Council have taken up various schemes of Jhum control in order to wean away the farmers from shifting cultivation. These programmes have met with success in some areas while in others it has not been able to evoke the required favourable response from the farmers. Although, various studies have been made as well as developmental efforts are being made, yet there is so far no compilation where all information are readily available. It was, therefore, considered necessary to compile a comprehensive review on shifting cultivation. Conservation and sustainable development are closely interlinked; in that one cannot be achieved at the expense of the other. From a human angle, such an integrated approach

demands satisfying basic human needs in an equitable manner, maintenance and promotion of social, cultural and biological diversity, and ecological integrity of the system. Harmony with Nature implies that development cannot be sectoral; it has to be holistic.

In the context of rural development, land use, animal husbandry and the domestic sectors have to be looked at as an integrated whole for a given village. Holistic approach also implies that all the actors concerned with development, namely, the governmental agencies, non-governmental organizations, scientists and indeed the beneficiary local communities, all have to work together through appropriate institutional mechanisms. Further, sustainable development demands efficiency in resource use in such a manner that contributes to equity with social justice, at the same time avoiding social disruptions. This implies strong community participation.

The following problems were identified from the research:

1. **Low benefit cost ratio**: It has been observed from the study that some activities shows lower B:C ratio that means these activities are not remunerative

2. **Low use of input** : Respondents uses very less input in their production programmes.

3. **Target and achievement different** : Government unable to disburse target amount to the beneficiaries.

4. **Improper infrastructure**: It has been observed during the survey that roads, primary health care, power etc. are not proper in the two hill districts of Assam.

5. **Resources availability and improper utilization of resources**: The two hill districts are very much rich in natural resources but there is lack of proper harvesting plan.

6. **Low marketing surplus**: Most of the respondents do not get proper price for their produce due to lack of market and they produce only for their consumption purpose only.

Recommendations:

Based on the above problems recommendations are given below:

1. **Adoption of activities with high benefit cost ratio:** N.G.O and Government department should motivate people through training to adopt activities with high B.C ratio, for example poultry farming, goat farming and mandarin farming.

2. **Use of input:** Department of Agriculture and Animal Husbandry of Karbi Anglong district and N.C. Hills district should come forward and organize field level demonstration like other district regarding benefit of use of modern input like high yielding seed, organic and inorganic fertilizers, pest and diseases control measures.

3. **Bridge the gap between target and achievement:** Whole hearted approach of Government machinery is very much essential to bridge the gap between target and achievement.

4. **Development of infrastructure:** Government should allocate fund for infrastructure development.

5. **Proper utilization of resources:** Resources like bamboo, forest available in the two hill districts should be properly surveyed and make plan for proper utilization.

6. **Emphasis on marketing of tribal products:** Government should come forward and arranged for markeing of tribal produce. N.G.O.s can help farmers to formed self-help groups and marketing co-operative for marketing of tribal produce. This will help farmers to get better price for their produce.

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APPENDICES

Table 6.1 Socio-economic profile of the respondents

(a) Age

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
(i) 20 - 30 years	31	25	12	8	76
	(30.10)	(21.18)	(27.90)	(22.22)	(25.33)
(ii) 30 - 40 years	29	38	9	11	87
	(28.16)	(32.20)	(20.93)	(30.56)	(29.00)
(iii) 40 - 50 years	25	29	14	4	72
	(24.27)	(24.58)	(32.56)	(11.11)	(24.00)
(iv) 50 - 60 years	10	16	5	7	38
	(9.71)	(13.56)	(11.62)	(19.44)	(12.67)
(v) 60 & above	8	10	3	6	27
	(7.77)	(8.47)	(6.98)	(16.67)	(9.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table: Socio-economic profile of the respondents

(b) Religion

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
(i) Hinduism	98	99	22	24	243
	(95.15)	(83.89)	(51.16)	(66.67)	(81.00)
(ii) Christian	5	19	21	6	51
	(4.86)	(16.10)	(48.84)	(16.67)	(17.00)
(iii) Others	0	0	0	6	6
	0	0	0	(16.66)	(2.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table: Socio-economic profile of the respondents

c) Marital Status

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
i) Married	69	78	28	25	200
	(66.99)	(66.10)	(65.12)	(69.44)	(66.67)
ii) Unmarried	34	40	15	11	100
	(33.01)	(33.90)	(34.89)	(30.56)	(33.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table: Socio-economic profile of the respondents

(d) Languages known

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
(i)Assamese	78	85	25	31	219
	(28.06)	(28.52)	(22.52)	(36.90)	(22.30)
(ii)Dimasa	0	118	8	4	219
	0	(39.60)	(7.20)	(4.76)	(22.30)
(iii)Karbi	103	0	13	7	123
	(37.05)	0	(11.71)	(8.33)	(12.52)
(iv)Assamese - Dimasa	0	85	12	7	104
	0	(28.52)	(10.81)	(8.33)	(10.59)
(v)Assamese - Karbi	78	0	18	9	239.52
	(28.06)	0	(16.22)	(10.71)	(24.39)
(vi)Assamese-Dimasa-Hindi	0	10	14	14	38
	0	(3.36)	(12.61)	(16.67)	(3.87)
(vii)Assamese-Karbi-Hindi	19	0	21	12	52
	(16.83)	0	(18.92)	(14.29)	(5.30)
Total	278	298	111	84	982
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

N.B:: More than one languages known to a person.

Table: Socio-economic profile of the respondents

(e) Sex of the respondents:

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
(i) Male	65	70	23	19	177
	(63.10)	(59.32)	(53.49)	(52.78)	(59.00)
(ii) Female	38	48	20	17	123
	(36.89)	(40.68)	(46.51)	(47.22)	(41.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table: Socio-economic profile of the respondents

(f) Family System:

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
(i) Joint family	89	85	32	28	234
	(86.41)	(72.03)	(74.42)	(77.78)	(78.00)
(ii) Nuclear family	14	33	11	8	66
	(13.59)	(27.97)	(25.58)	(22.23)	(22.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Table: Socio-economic profile of the respondents

(g) Number of family members

(i) Male members					
(a) 1 members	20	25	15	9	69
	(19.42)	(21.19)	(34.89)	(25.00)	(23.00)
(b) 2 members	49	53	16	14	132
	(47.57)	(44.92)	(37.21)	(38.89)	(44.00)
(c) 3 & above members	34	40	12	13	99
	(33.00)	(33.90)	(27.91)	(36.11)	(33.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(ii) Female members					
(a) 1 members	36	45	12	14	107
	(34.95)	(38.14)	(27.91)	(38.89)	(35.67)
(b) 2 members	45	48	14	12	119
	(43.69)	(40.68)	(32.56)	(33.33)	(36.67)
(c) 3 & above members	22	25	17	10	74
	(21.36)	(21.19)	(39.54)	(27.78)	(24.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
(iii) Minor children					
(a)0-1 members	38	49	19	10	116
	(36.89)	(41.53)	(44.19)	(27.78)	(38.67)
(b)1–2 members	30	32	8	11	81
	(29.13)	(27.12)	(18.60)	(30.56)	(27.00)
(c) 3 & above members	20	27	10	9	66
	(19.41)	(22.88)	(23.26)	(25.00)	(22.00)
No response	15	10	6	6	37
	(14.56)	(8.47)	(13.95)	(16.67)	(12.33)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table: Socio-economic profile of the respondents

(h) Education

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
a) Illiterate	42	38	14	12	106
	(40.78)	(32.20)	(32.56)	(33.33)	(35.33)
b) Primary education	55	61	17	12	145
	(53.40)	(51.69)	(39.53)	(33.33)	(48.33)
c) Secondary education	5	15	5	3	28
	(4.85)	(12.71)	(11.63)	(8.33)	(9.33)
d) Higher Secondary	1	3	5	4	13
	(0.97)	(2.54)	(11.63)	(11.11)	(4.33)
e) Degree & above	0	1	2	5	8
	0	(0.84)	(4.65)	(13.89)	(2.67)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

Table: Socio-economic profile of the respondents

(i) Employment status

Details	Karbi	Dimasa	Minor tribe	Non-tribe	Total
(a) Working as agricultural labour	95	103	30	27	255
	(92.23)	(87.29)	(69.77)	(75.00)	(85.00)
(b) Working as non-agricultural labour	5	8	5	3	21
	(4.85)	(6.78)	(11.63)	(8.33)	(7.00)
(c) Working in Govt./Public/Private organization	3	5	3	4	15
	(2.91)	(4.24)	(6.98)	(11.11)	(5.00)
(d) Own business (self employed)	0	2	5	2	9
	0	(1.69)	(11.63)	(5.56)	(3.00)
Total	103	118	43	36	300
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Primary data

UNCOMMON WORD USED IN THE THESIS

Abreng	:	Second year of shifting cultivation
Adarsha gaon	:	Model village
Airl	:	Fallow period
Alal	:	First year of shifting cultivation
Gaon	:	Village
Jhum	:	Shifting Cultivation
Jhumias	:	Shifting Cultivators
Kharif crop	:	Crop grown in summer season
Panikheti	:	Rice grown in water
Rabi crop	:	Crop grown in winter season

SURVEY SCHDULE

District: Village: Block:

1.(a) Name of the farmer

(a)Age (b)Marital status : M/U

(c)Tribe:

(d) Religion:

(e)Languages known

2. No of family members: Male: Female:

Minor:

3. Family system: Joint Nuclear family

4. Education level: Literate Male: Literate Female:

Causes of school dropout:

5. Employment status:

Working as agril labour:	Male:	Female:
Working as non-agril labour:	Male:	Female:
Working in Govt. deptt:	Male:	Female:
Working in Private org:	Male:	Female:
Own business :	Male:	Female:
Others :	Male:	Female:
Unemployed:	Male:	Female:

6. (a)Area under shifting cultivation:

(b) Nature of carrying out shifting cultivation: Independently: GroupCommunity wise:

7. Input and technology used per year in production programme in shifting cultivation:

Input(unit)	Whether used or not	If used source	Rate per unit	Vale(Rs.)
Urea(KG)				
SSP(kg)				
MOP (Kg)				
Cowdung (ton)				
Vemicompost (ton)				
HYV seeds (kg)				
Insecticides (lt)				
Labour (Hired)				

8.Production from shifting cultivation process:

Crop/Season	Total area(bigha)	Yield/bigha	Rate per unit	Value(Rs.)
a)Rice				
b) Maize				
c) Wheat				
d) Oilseed				
e) Pulses				
f) Vegetables				
g) Ginger				
h) Turmeric				
i) Colocasia				
j) Potato				
k) Pine-apple				
l) Banana				
m) Citrus				

ANIMAL HUSBANDRY

a) Dairy	Milk Yield (lt/annum)	Rate	Value
b) Goattery	No of animal sold	Rate	Value
c) Poultry	No of birds sold	Rate	value
e) Piggery	No of animal sold	Rate	value
g) Sericulture	Total annual Income		
h) Bee-keeping	Total annual Income		

9.**Utilsation of production:** Rice Vegetables Oilseeds Milk Meat Egg

a) Amount used for home consumption:

b) Keeping as seed

c) Given for wages

d) Qty. sold

e) Price received:

10. Process of cultivation:

a) Selection of site/land: 1)Community land 2)Govt. land 3)own land:

b) Nature of plot : 1)Plain area 2)Slope area

c) Type of site(Fallow period maintained):1)New plot 2)1-2yr fallow 3)3-5 yr fallow:

d) Season of cultivation: 1)Kharif: 2)Rabi:

e) Period of cultivation in particular plot: 1)1-2yr 2)2-3 yr 3)3-5yr 4)5 to more

g) Shifting of: 1) whole family/house or 2) Only shifting of agril. Plot.

h) System of clearing the land/cutting trees:

a) Completely cutting and burning the trees

b) Only branches and twigs are cutting

c) Burning the whole plot:

i) System of preparation of land :a) Using plough b) Using animal power:

i) Practices/operation done during the crop period/crop wise

Practices	Cereal crop(Rice,Maize)		Vegetables		Pulses	
	Chemical	mechanical	Chemical	mechanical	Chemical	mechanical
a) Cleaning						
b) Weeding						
c) Fertilizer application						
d) Pest control						
e) Ploughing						

j) Crops grown after harvesting of one crop:

k) Fallow period maintained between two crops

l) How many times you have involved in jhum cultivation:
a) How many years as a whole
b) In jhum cultivation how many times you have shifted the land
c) What are your experiences in case of jhum cultivation practices and crop

11.**Environmental issues**
a) Your observation on yield of crop

Crop	1st yr	2nd yr	3rd yr	4th yr
a)Rice				
b) Maize				
c) Wheat				
d) Oilseed				
e) Pulses				
f) Vegetables				
g) Ginger				

b) Crop wise /time wise diseases in field and explain in detail nature and type of diseases:

Diseases	paddy	Maize	Vegetables	Oilseeds
Blast				
BLB				
Tungro				
Leaf yellow				
Stunted growth				
Weevil				
Leafhopper				

c) How you are preparing the land?
i)Slope wise/flat wise
ii)Keep in trees/Surrounding/in between trees:

d) Level of soil erosion and explain nature and amount of erosion:
i) Before Ploughing: a) Very high b)High c)Moderate d)Low e)Very low
ii) During Ploughing: a) Very high b)High c)Moderate d)Low e)Very low
iii) After Ploughing: a) Very high b)High c)Moderate d)Low e)Very low

e) Types of erosion a) Wind erosion b)Water erosion

f) Crop	1st yr Flora	2nd yr flora	3rd yr flora
Paddy			
Maize			
Vegetables			
Oilseeds			

f) Impact of earlier bio-diversity on environment and explain in detail.
Temperature a) Very high b)High c)Moderate d)Low e)Very low
Rainfall a) Very high b)High c)Moderate d)Low e)Very low

g) Impact of present day bio-diversity on environment and explain in detail.
Temperature a) Very high b)High c)Moderate d)Low e)Very low
Rainfall a) Very high b)High c)Moderate d)Low e)Very low

Regeneration

a) Fallow period maintained between two crops and what other natural methods that are follow.
b) What are your observation on how land itself regenerating its energy(fertility) for growing crops.
c) Steps taken to control environment degradation:

i) Soil fertility	a) Applying nutrients	b) Pesticides for pest/diseases	
ii) Soil erosion	a) Construction of bunds	b) Planting trees	
iii) Bio-diversity	a) Planting new trees	b) Not cutting all the trees	c) Planting trees

12. Programmes to control shifting cultivation:

a) Assistance/materials provided by govt.	Sources	Qtty	Frequency
1)Seed			
2) Fertilizer			
3) Animal			
4) Machine			
5) Money			
6) Any other			

b) Whether the assistance/materials given in time or not.

c) Whether any training is given with the materials needed.

d) Impact of training on not going for jhum cultivation, changing life style and income and explain :
Yes No

e) How schemes make them busy?

f) Whether the income is sufficient that made them not to go for shifting cultivation?

g) Frequency of supervision done by officials?
1) Once in a month 2) Quarterly 3) Half yearly 4)Annual

13. Cultural practices associated with shifting cultivation?
a) Before jhum cultivation

b) At the time of cutting and burning

c) Field preparation

d) Crop growth stage

e) At the time of harvesting

f) Rituals observed before/during/after jhum"

14.How many generations of your family involved in jhum?

15.How your day to day life linked with jhum?

16.Customs, cultural practices tradition still encourage them to jhum

17.If jhum cultivation stops, whether your life will be affected?

18.Willingness to protect the environment or community basis

19. People thinking and working on restoring the environment

20. What you have been doing in the past, present and future for environment protection?

21.What are your eco-friendly suggestion for jhum?

22.What kind of alternatives benefit should provide to you as alternative to jhum?