Designing Appropriate Forest Protection Methods to Check Deforestation in Assam: A case study of Charduar and Nameri Ranges of Sonitpur District

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ABSTRACT

Designing Appropriate Forest Protection Methods to Check Deforestation in Assam: A Case Study of Charduar and Nameri Ranges of Sonitpur District

INTRODUCTION

In the last decade, a group of scientists have been searching the relationships between livelihood strategies and woodland system in Zimbabwe (Campbell et al, 1991; Clarke et al, 1996; Frost, 1996; Goebel et al, 2000; Grundy et al, 1993; Mandondo, 2001; Mukamuri,1995). Woodland in the savanna regions in Southern Africa found in Zimbabwe, are livelihood input of the rural households which is prime output to urban households (Clarke et al,1996). Woodland has immense commercial use (Brigham et al, 1996). While some woodland products are commercialized and hence have more easily quantifiable values, most woodland products have non market values, including use values (subsistence products), and extra market or non use values based on ecological, spiritual or aesthetic benefits.

But local people have been found to have a clear sense of the ecological services provide by woodlands. They also respond to resource scarcity by adopting a conservative approach to resource use, as evidenced by reductions in fuel wood consumption. These challenges some of the conventional wisdom that peoples' use and about perception regarding woodlands are a barrier to sustainable use, rather than the building blocks for the future (Allison Goebel, 1998, 2000).

Since the 1980s, rural development research has gradually shifted from the use of conventional extractive approaches towards participatory investigation and analysis (IIED, 1997). The emphasis shifted to participatory rural appraisal (PRA) to enhance interactive participation by local communities in the process of learning about rural people's values with regard to trees and forests. PRA tools and techniques have also been used for quantifying and valuing forest benefits (N Nontokozo and R Michael, 2001).

It has been realized long back that one of the main causes of deforestation is people's dependency on forests for livelihood. As the population has been increasing, pressure

on forestland for settlement and dependency on forest products for livelihood have been increasing. Hence, researchers have been trying to find out solution to this problem. In an article, "Breakthrough Made in Forest Protection", published in Beijing Review; August 1999, Jiang Wandi cited the example of a project undertaken by International Tropical Timber Organization (ITTO). The project experimented with ways to protect natural forests by employing separate means simultaneously – growing substitute woods, helping local residents to eradicate poverty by doing profitable household business rather than tree chopping, working on an optimized method of chopping the natural forests and creating modern protection methods. This project was undertaken in the Hainan Province, the largest economic development zone of China. About one third of Hainan residents live in areas where agriculture, forestry and pasturing overlap. These areas are mainly home to such ethnic groups as the Li and Miao, whose living standards and production means are so primitive that they usually rely on chopping wood for living. The ITTO project that began in 1993 had its no. 1 demonstration area in Danzhou, flat lowland plain in west Hainan. It was a man made tropical forest plantation. It was designated to develop high yield and fast growing commercial woods with internationally advanced nursery techniques, and then promote the species and techniques to the rest of the province and even outside. ITTO also had a sub-project designed to help the people living near forests to wipe out poverty by providing them with the necessary facilities and skills for an alternative means of livelihood. Within a period of seven years, the project scientists and technicians turned a wasteland into an idyllic picture of flourishing vegetation, fine breed sheep and cows grazing and birds chirping happily. Apart from a piece of pasture, there are also farmland and orchards where sugar cane, mangoes, pineapples and sweet potatoes are grown. Rubber trees, teak, and Caribbean pines are also grown for both commercial purposes and as a farmland shelterbelt. Another sub project was to find out scientifically the best standard of felling so as to guarantee a fair cycle of regeneration. Finally, another sub project was undertaken to find out an effective protection of tropical virgin forests using scientific modern means. The work was conducted in Jianfengling hill, where the tropical virgin forests cover 8,000 hectares. Chopping was strictly forbidden in this area. A modern protection facility has been installed in this area that covered roads, telecommunication, fire control, research work and technical training for personnel. Mr. Wandi commented in the article that Hainan benefited a lot from the ITTO project. According to Huang Jincheng, an official with the Hainan Forestry Bureau and Director of the project office, it

has brought in not only new technology, but also internationally advanced forestry philosophy that is exerting a positive influence on the province's forestry and timber industry development.

Franz Schmithusen (1996) in his proposal on the Structure and Content of an International Instrument for the Protection, Conservation and Development of Forests, International Series Working Papers, Swiss Federal Institute of Technology, Zurich, opined that the structure and content of an instrument should reflect the proposed multilevel and process oriented approach. It should allow for phased policy formulation and implementation, as commensurate with the socio economic conditions of particular countries and take into account the specific conditions of forest ecosystems or geographical zones. The objectives of an instrument should be consistent with an expanding transfer of resources, technologies and financial means, in accordance with the principle of a common international solidarity. The sequence of issues addressed by an instrument could be a problem oriented one by referring to forest development and forest conservation, and to programmes for the establishment of new production and protection forests. An alternative approach is to structure problems and opportunities according to institutional and policy levels. In view of the multiple linkages that exist between forest protection, development and conservation, it may be advantageous to choose an institutionally oriented approach. The protection of forest ecosystems and forestlands, as well as for their conservation and development, require a balance between the principle of national sovereignty and stewardship and the principle of international solidarity. National forest problems need national efforts and solutions and if necessary, the support of the international community. Regional and transboundary forest problems require collaboration at the regional level, leading to mutually agreeable procedures to address issues of common concern. Global forest problems need global efforts and collective measures by the international community as a whole. A multilevel approach for maintaining and developing forests for the benefit of people, nations and mankind thus comprises three pillars: national commitment to the objectives of policies for sustainable resources management, regional and where relevant global measures for coordination and cooperation, and international solidarity in order to support common efforts.

He also opined that specific forest development and conservation policies should have emphasis on the following objectives:

- multipurpose approach in utilization forest ;
-sustainable management of forests;
- rehabilitation of degraded forests;
- creation of new forests;
- promotion of local participation and benefits;
- confirmation of local ownership and use rights;
- integration of forest activities in rural and social development;
- promotion of the use of trees in other land uses and production systems.

Indian forestry sector became decentralized and people oriented forestry (V Varalakshmi, 1998). The recent JFM approach makes a symbiotic relation between people and forest. The local people voluntarily agreed to cope up with forestry management taking initiative in participatory forestry programmes. But the result was not as expected. The curbing of rights of aborigines adversely affected their livelihood and at the same time deprived from collecting the forest produce. The rude forest policy alienated the people and detached from taking active part in conservation scheme. The population pressure along with other developmental programmes causes more reduction of forest capital such as timber, fodder, fuel etc. The National Forest Policy 1988 was formulated to meet the essential items food, fodder and small timber for the tribal and villagers living in and around forest areas.

Nitya Jacob (1997) viewed that community and private efforts have a considerable role to play in the sustainable management of our forests, and striking successes have been achieved in states like Haryana and West Bengal. Participatory action involving the government and local communities for regeneration of degraded forests through effective protection and improving the socio-economic condition of these communities through forestry activities was initiated as a pilot project at Arabari in West Bengal in 1971-72. The programme covered an area of 1270 hectares of degraded forests involving 618 families in 11 villages. This cooperative action demonstrated that closure of areas by villagers living on the fringe of the forest, to grazing and cutting, resulted in their rapid regeneration. Based on the Arabari experience, more than 1250 village forest

protection committees spread over an area of 0.152 million hectares of degraded forests were formed during the next eight years in the state. Today, over 2090 rural communities in the state participate with the government to manage 0.3 million hectares of natural forests.

Another success story is the regeneration of the lower Himalayas, in the foothills of the Shivaliks. The foothills of the Shivaliks, the lower Himalayas, assessed to be the most degraded hill ranges in the world (Varalakshmi. V, 1997). Removal of high classed timber combined with high intensity grazing and dependence for fuel wood, the forest land got completely denuded and barren. Then afforestation programme started as an experiment in Sukhomajiri village in late 70s, which highlighted the importance of providing alternative livelihood to the people depending on forest so that dependency on forest reduces. The local people were receptive to the alternatives of forest products and accepted the suggestions and advice of the Haryana Forest Department. The programme has been in operation in 60 villages in the Morni Pinjore and Yamunanagar forest divisions, which were organized into 55 hill resource management societies (HRMS).

Tata Energy Resource Institute's (TERI) involvement with Haryana Forest Department (HFD) could motivate local communities to protect and manage the forest in a sustainable manner for betterment of the local communities. The important point of the programme was to involve the local people irrespective of gender and equity and benefit distribution reflected the commitment of TERI and HFD.

The United Nations Environment Programme (UNEP) and the International Fund for Agriculture Development (IFAD) jointly awarded TERI, HFD and the enterprising people of the region for their significant contribution to controlling the dry land. The JFM programme of Haryana was presented with Saving the Dry land award for the year 1997-98.

Nicholas Hildyard, Pandurang Hegde, Paul Wolvekamp and Somasekhave Reddy (1997) in their article "Pluralism, Participation and Power" have given a total different view on participation of local people in forest protection. Their definition of forest has two divisions. For those who rely directly on them for their livelihoods, forests represent

secure water supplies, fodder for animals, medicines for friends and family, home for local deities and shelter for army patrols, tax collectors or (for playful children) from adults.

But for many middle ranking forest department officials, 'forests' are defined instead by the information that passes across their desks: the latest scientific paper on planting regimes; budgets for planting; tenders for logging; catalogues advertising new logging equipment or the latest jeep; curriculum vitae; training schemes and opportunities for promotion (Pluralism, Participation and Power).

Because of this difference in interest, according to (Nicholas Hildyard, Pandurang Hegde, Paul Wolvekamp and Somasekhave Reddy, 1997) differences in attitude develop. Degradation of forests has radically different meanings for different groups of people because of differing consequences. According to these authors, when development agencies actively begin to pursue participatory programmes, those who have had past experience of their projects have good reason to be wary. Often, it turns out that local people become a ghostly presence within the planning process - visible, heard even, but ultimately only there because their involvement lends credibility and legitimacy to decisions that have already been made. Far from being a transformative process in which local people are able to exert control over decision making, participation becomes a well honed tool for engineering consent to projects and programmes whose framework has already been determined in advance. Participation becomes a means for top down planning to be imposed from the bottom up.

It is perhaps unsurprising that many community groups are ways of the new vogue amongst development agencies for Joint Forest Management, Community Resource Management and other forms of participatory development. These are seen as attempts to actively undermine their attempts to reclaim control over the institutions, forests, fishing grounds, fields and rivers on which they rely for their livelihoods. For some groups and communities, the focus of that struggle has been the defense of existing commons regime against enclosure: for others, the reclaiming of those commons that have been enclosed; and in still others, the building of new commons.

RESEARCH GAP

It is evident from the above that a number of works have been carried out on community participation in forest protection measures. Several Forest Protection Instruments have been developed for different areas where local people were involved. But no recorded work has been done in the study region and no work has ever tried to evolve forest protection methods involving the local people after identifying the group, which is most willing on the basis of their attitude towards forests, deforestation and involvement in forest protection activities. To involve local people in forest protection activities after knowing their attitude, the following objectives of the study were developed.

OBJECTIVES OF THE STUDY

The Objectives of the study are

1)To measure the attitude of the people living in the fringe area towards forest Protection/deforestation;

2)To study the main causes of deforestation and the social issues related to it;

3)To study the measures to reduce dependency on forest;

4) To design methods for forest protection.

METHODOLOGY FOLLOWED

The study was carried out in four different phases

a) Phase one was to find out the demographic profile of the population in the study area.

b) Phase two was to find out the belief of the people in the study area about forest conservation and protection.

c) Phase three was to find out the total area of deforestation in the study area and the people involved in it. During survey, the causes of deforestation were also studied.

d) Phase three and four dealt with finding out alternative methods of livelihood for the people responsible for deforestation. It has been found that these people engage themselves in forest/environment unfriendly activities for subsistence only. For this, an expert opinion survey has been used. A panel of five experts from fields like academics, forest administration, horticulture, etc was formed.

Prior to preparation of a draft questionnaire, a preliminary survey has been done in the study area. An unstructured interview was conducted with different stake-holders like Village Headmen, school teachers, cultivators from the study locale, the forest officials with different ranks, the Personnel from different NGO's like 'Aranyak', WWF, etc., whose participation were indispensable to determine the variables included in the draft questionnaire to measure the attitude about forest protection/ conservation, causes of deforestation and probable remedy to solve the problem locally.

To finalize that draft questionnaire a pilot survey was conducted taking 27 respondents from different villages in the study area. The post pilot survey 'Reliability Test' has been done on the part work of that research. The calculated 'alpha value' (Cronbach's alpha) was 0.85 and then, the draft questionnaire was finalized and personally administered.

Surveyed Villages & Total Samples

• Total Village	41
• Total Population	22631
• Forest Village (FV)	07
• Population in Forest village	7009
• Revenue Village (RV)	14
• Population in Revenue village	7667
• Non Cadastral Village (illegal settlement on forest land)	20
• Population in Non Cadastral village	7955
• No. of samples	921
• Sample from forest village (FV)	317(34.4%)
• Sample from revenue village (RV)	295 (32%)
• Sample from Non Cadastral village (NC)	309(33.6 %)

COMPUTATION OF ATTITUDE

Attitude = $b_1e_1 + b_2e_2 + \ldots\ldots\ldots\ldots + b_ne_n$

In this study, attitude towards reserve forest, deforestation, conservation and participation in conservation process is

Measurement of Behavioural Intention

$$BI = f(A, SN, PBC)$$

$$A = \sum_{i=1}^{n} b_i e_i \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$SN = \sum_{i=1}^{k} n_i m_i \quad \ldots\ldots\ldots\ldots\ldots (2)$$

$$PBC = \sum_{i=1}^{h} c_i p_i \quad \ldots\ldots\ldots\ldots\ldots (3)$$

Where **BI** stands for Behavioural Intention, **A** for Attitude, **SN** for Subjective norm, **PBC** for Perceived Behavioral Control, $\mathbf{b_i}$ for behavioral belief, $\mathbf{e_i}$ for evaluation on that belief, $\mathbf{n_i}$ for normative belief, $\mathbf{m_i}$ for motivation to comply, $\mathbf{c_i}$ for control belief and $\mathbf{p_i}$ for perceived behaviour.

The value of attitude calculated using the above formula is as follows

A= 3512+ 2702-2849

A= 3365

SN=3412+ 2770

SN=6182

PBC= 3175+2009

PBC= 5184

Throughout the analysis, it has been checked whether there is any significant difference in perception towards forest, deforestation, forest conservation and protection and participation in conservation programme on the basis of different demographic variables. This was done to find out the segment of the population who has the maximum positive outlook towards forest and is willing to involve themselves in forest protection measures. After doing cross tabulation of the data on perception and attitude of the respondents with respect to different demographic variables, it has been found that the group whose education level is up to 12th is the group with positive feeling towards forests and is

willing to involve themselves in forest protection measures. Hence, this group can be used for sensitization of the other groups of population regarding ill effects of deforestation and other ecologically unfriendly activities.

Causes of deforestation as per views of the respondents are as follows

1) Human settlement in forest area and for rising population,
2) Weak forest administration,
3) Weak forest laws,
4) Political blessings to the encroachers,
5) Extreme poverty.

Remedial measures to check deforestation as per views of the respondents

1) Required well equipped trained staff and strong administration,
2) Introduction of effective forest laws,
3) Poverty eradication programme may reduce forest smuggling.

For the expert opinion survey to find out the causes of deforestation and different measures to be taken to find a solution to it, a panel of five members was selected from various backgrounds. The members were selected from academicians, forest officials (officiating and retired), and expert from the department of Agriculture with specialization in horticulture and soil conservation. The views of the experts on the given topic were sought and the process was carried out for three rounds. At the end of the third round of meeting with the experts the following conclusions have been drawn about causes of forest destruction, present forest rehabilitation programme like JFM, substitute wood to use as alternative fuel and for commercial use, poverty alleviation programme and forest protection methods etc.

Causes of deforestation: Experts' views

1) The "Scheduled Tribe and other Traditional Forest Dwellers (recognition of forest right) Act, 2006: Rule 207" has been cited as one of the chief causes of deforestation.
2) Direct political blessings encourages particular ethnic groups to claim rights on forest land,

3) Insurgency and political instability,

4) Growing school dropouts and high unemployment,

5) Fertile land inside the forest,

6) Easy money from illegal timber smuggling,

7) Lack of proper planning to meet the gap between demand and supply of forest products including firewood,

8) Shortage of efficient staff.

Checking deforestation: Experts' Views

Forest protection with a 'carrot and stick' policy is required to protect forests. In this respect, the following remedies are suggested to stop deforestation.

1) Implementation of rigid forest laws,
2) Drastic punitive measures for the violation of forest rules,
3) Posting of young energetic staff for field duty,
4) Use of forest armed forces,
5) Need of strong communication facility,
6) Integration between forest official and the information wing,
7) Development of skill of educated youth of surrounding villages.

The following species are suggested as fast growing for substitute wood to use as fuel and for commercialization too.

1) Forfirewood-Cassiasp.,Deloniasp.,Neem,Dhancia,Babul,Siris,Azar,Moj,Palas,Gohara and Rain tree etc.

2) For commercial purposes- Mango, Jackfruit, Rose apple, Amla, Silikha, Kadam, Sashi, Bamboo etc.

The following suggestions were put forwarded by the experts for poverty eradication programme

1) Introduction of eco- tourism including rural tourism,
2) Fruit preservation and processing,
3) The jobs like driver, carpenter, motor mechanics, T.V and refrigerator mechanics,
4) Assistance from Agricultural Department under Rashtriya Krishi Vikash Yojana, Agricultural Technology Management Agency, Tecchnology Mission etc,

5) Farming with leguminous crops, Ginger, Garlic, pumpkin etc.,
6) Schemes like Apiculture, Horticulture, Fishery, Goatery, Piggery, Poultry etc.,

CONCLUSION

It has been identified that the segment whose inclination towards actively participating in conservation related activities is the highest is that portion of the Rabha community, whose education level is up to the 12th standard, earning 1-2 lakh per year in the form of salary from service. Among the farmers, the small farmers are most willing to participate in conservation related activities.

After analyzing the responses of the people in the study area, experts' opinion and the observations made during field work, the major causes of deforestation are identified as

i) Flawed forest policy;
ii) Weak forest administration;
iii) Political influence in forest administration;
iv) Non implementation or under implementation of government forest policies;
v) Inadequate knowledge among the forest dwellers on the benefits of afforestation;
vi) Human settlement;
vii) Illegal logging operation;
viii) Poverty.

Hence, the areas that need attention for protecting forests are

i) Proper forest laws;
ii) Effective forest administration and strict implementation of government policies;
iii) Inculcating in the concerned people a sense of belongingness and responsibility towards forest conservation by imparting appropriate education on afforestation.

iv) Alternative method of meeting the need which are at present fulfilled by forest produce.

v) Eradication of poverty - finding alternative measures for livelihood for the people dwelling in the forest and fringe areas.

For tackling the above mentioned issues, the study proposes a few methods. For the first four factors, measures are to be undertaken at the level of policy makers. The Ministry of Environment and Forest (MOEF) has to take initiative for removing the flaws in the Forest Policy and its proper implementation.

For the rest of the areas, the study proposes the following measures

I. Mass awareness programme on ill effects of deforestation using the group that has been identified as having the most positive outlook towards the reserve forest.

II. Plantation drives on the already denuded area of trees that have been identified by the experts during the expert opinion survey.

III. Community based ecotourism, where the Forest Department and the Tourism Authority of the State invests in infrastructure development and local people runs them on profit sharing basis.

IV. Imparting training to local people and providing them soft loans so that they can go for offering 'home stay' programmes.

Declaration by the Scholar

I, Pradip Chandra Mahanta, Research Scholar in the Department of Business Administration, School of Management Sciences of Tezpur University, Assam, hereby declare that this research work entitled "Designing Appropriate Forest Protection Methods to check Deforestation in Assam: A case study of Charduar and Nameri Ranges of Sonitpur District" is a bona fide work carried out by me under the supervision of Dr. Chandan Goswami. This work has not been submitted elsewhere for any other purposes.

Pradip Chandra Mahanta

Date: December 30, 2010

Pradip Chandra Mahanta

Place: Tezpur

Registration Number: 069 of 2010

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Certificate from the Supervisor

This is to certify that the Thesis titled **Designing Appropriate Forest Protection Methods to Check Deforestation in Assam: A Case Study of Charduar and Nameri Ranges of Sonitpur District** submitted to Tezpur University in the Department of Business Administration under the School of Management Sciences in partial fulfillment for the award of the Degree of Doctor of Philosophy in Management is a record of research work carried out by Mr. Pradip Chandra Mahanta under my supervision and guidance.

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

No part of this Thesis has been reproduced elsewhere for award of any other Degree.

Date: December 30, 2010

Place: Tezpur

(Chandan Goswami)
Associate Professor
Department of Business Administration
Tezpur University

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Date: 30.12. 2010 (Pradip Ch. Mahanta)

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The Last Samurai

Photographed by- Dr. Chandan Goswami

Chapter One: Introduction

1.1. Meaning of forest

Different people look at forest from different viewpoints. The people living in big cities look at forest as a place for leisure and recreation. People in mountain areas treat it as an attraction to tourists. Farmers might look at the forest as an income-generating component. Nature lovers look at the uniqueness and scenic beauty of forest. Traders insist on economic benefits and employment opportunities from the use of forest. To local communities, it represents opportunities of many kinds and values. At national level, it is a commercial wood production centre and national wealth.

The word forest is derived from the Latin word **'foris',** which means uncultivated and uninhabited area outside the village boundary. The Indian word 'jungle' has been described in English language as a collection of trees, shrubs, lianas, climbers and creepers etc., in a systematic manner (Anon- Forests, Forestry and Man).

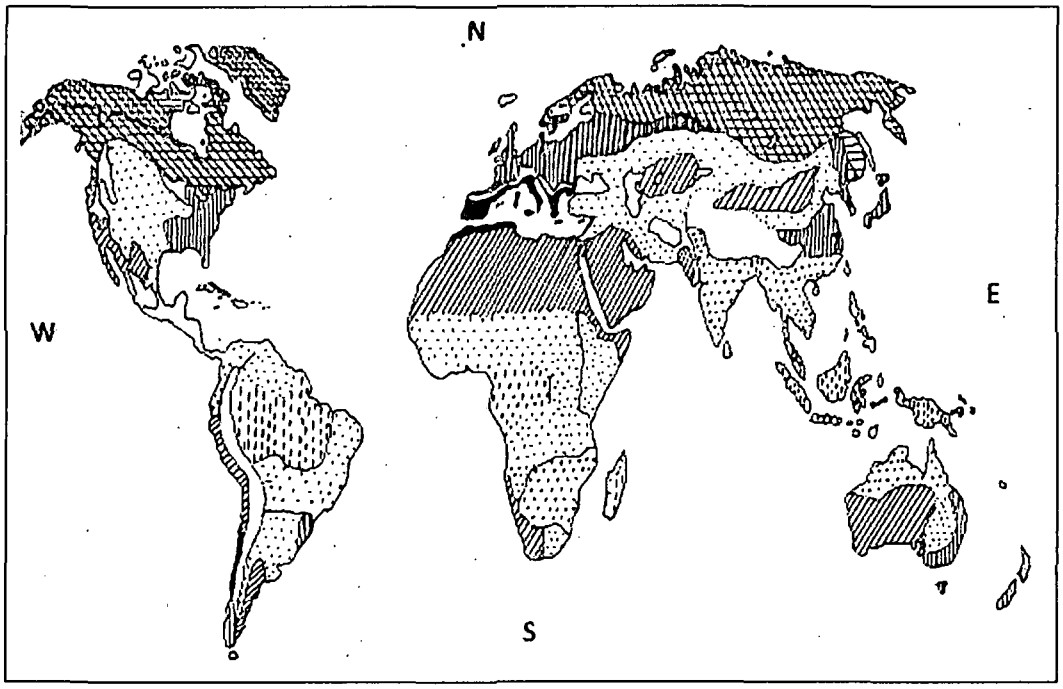
Forest Assessment Report revealed that 40% of the earth's landmass extending over 5.1 billion hectares was covered by woodlands and forests. Out of which 3.4 billion hectares land can be designated as forest while 1.7 billion hectares are either scrub, woodland or simple bush (UNFAO, 1990).

1.2. Definition of biome

Biomes are the world's major communities, classified according to the predominant vegetation and characterized by adaptations of organisms to that particular environment (Campbell, 1996). A biome is a community of plants and animals in equilibrium with the environmental characteristics, which means climate, soil, hydrology, etc., of a major geographical area. A biome is the composite functions of living and non- living objects on the surface of earth.

Campbell's classifications of biomes are: Freshwater, Marine, Desert, Forest, Grassland and Savannas.

Figure 1.1: Forest map of the world



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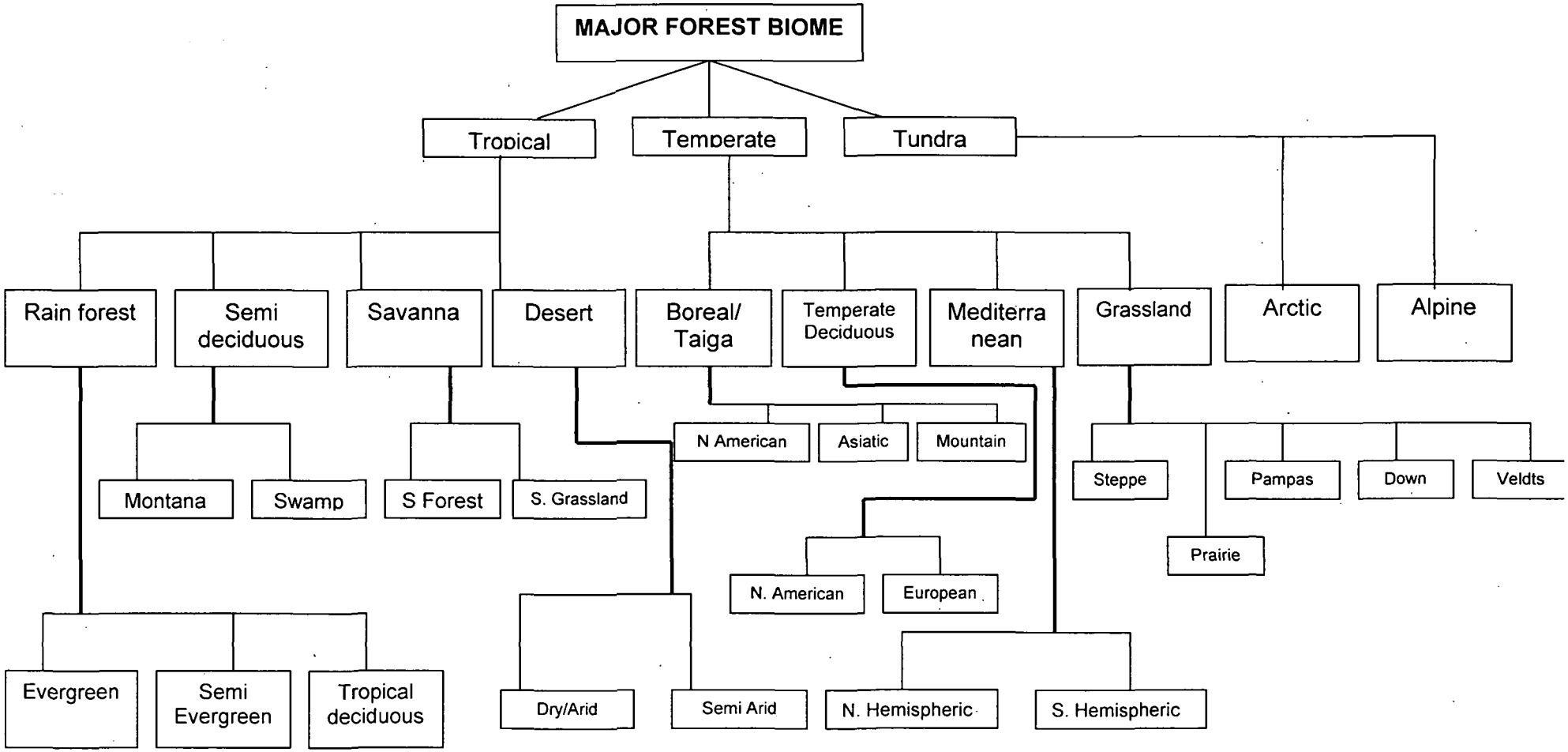
TUNDRA
TAIGA
DESERT(thorney bushes)
TEMPERATE DECIDUOUS
MEDITERRENEAN WOODLAND
TROPICAL DECIDUOUS
TEMPERATE GRASSLAND
TROPICAL GRASSLAND
TROPICAL RAIN FOREST,e.g., ebony, rosewood, mehogony, rubber etc.
MOUNTAIN RAIN FOREST
TROPICAL SHRUB FOREST
SAVANNA


MAJOR FOREST BIOME
Tropical
Temperate
Tundra
Rain forest
Semi deciduous
Savanna
Desert
Boreal/ Taiga
Temperate Deciduous
Mediterra nean
Grassland
Arctic
Alpine
Montana
Swamp
S Forest
S. Grassland
N American
Asiatic
Mountain
Steppe
Pampas
Down
Veldts
Prairie
N. American
European
Evergreen
Semi Evergreen
Tropical deciduous
Dry/Arid
Semi Arid
N. Hemispheric
S. Hemispheric

1.2.1. Tropical evergreen rainforest: location, extent and human intervention

This is also known as optimum biome because of uninterrupted supply of abundant moisture, water and heat throughout the year. This ensures continuous and normal growth of plants. Normally, the evergreen rainforest biome extends between 10^0N & 10^0S latitude. The presence of this biome is mainly distributed in Amazon basin in South America, Congo basin of Africa and Indo-Malaysian region of Asia (Java, Sumatra, Borneo, Malaysia and Guinea). It is not only confined to equatorial area, but far extends beyond this equator up to Vera Cruz in Mexico (about 19^0 N up to 30^0 S in South America).

Destruction of mega and rich bio-diversity of this eco-system has been started by the local aborigines thorough the means of expansionism and rapacious economic activities. A large portion of Amazonian rainforest has already been damaged through mining activities, establishment of industrial estates and agricultural extension. The construction of large dams and reservoirs on Amazon and its tributaries at the cost of rich forest cover has become threat to the ecological imbalances of this area. (Singh S, 2004)

1.2.2. Monsoon deciduous forest: location, extent and human intervention

The tropical deciduous forest is found in the regions of monsoon climate. The three major regions of tropical deciduous forest biome viz, I) the neo-tropics i.e., West Indies, II) south and southeast Asia beyond equatorial regions i.e., Indo Malaysian zone and III) eastern Africa and northern Australia. This tropical deciduous forest biome is also found in South Africa, Southern Brazil, Southeast USA, Formosa (Taiwan), Southern China and Japan.

Monsoon deciduous forest of both tropical and sub-tropical region is adversely affected by natural and anthropogenic factors. It is frequently disturbed by natural factors like forest fires or anthropogenic factor such as intentional or unintentional actions of men. That intentional action meant clearing of forest for agricultural purposes or settlement by the migrants and also large scale grazing. In the last fifty years this monsoon deciduous forest has reduced to a very critical size due to rapacious utilization of forest resources for commercial and industrial purposes.

This attitude towards forest has led to irreparable damage to the present environment and has created ecological crises. Even some endemic flora and fauna species have become endangered due to destruction and loss of their natural habitats. For instance, massive clearance of Gir forest in Gujarat (India) has made lions, along with other animals like leopards, spotted dear, nilgai, antelope, wild boar etc, into endangered species. Besides this, physical environment has also been damaged for deforestation and accelerated soil loss through erosion and siltation of riverbeds. As a consequence, it has started causing severe floods in the river basins.

1.2.3. Savanna: location, extent and human intervention

Savanna refers a typical type of vegetation community, which is dominated by grasses. This biome extends in both the hemispheres between 10^0 - 20^0 latitudes and includes Columbia and Venezuela; south central Brazil, Guiana, Paraguay; hilly areas of central America; central and east Africa; northern Australia and some parts of India (man induced grassland).

The rapid growth of population in the last fifty years has put pressure on this natural grassland and converted it into agricultural field under the scheme of green revolution. The animal population is gradually decreasing due to loss of their habitats in this savanna biome.

1.2.4. Mediterranean: location, extent and human intervention

The Mediterranean biome is known as sclerophyll eco-system. This eco-system is distributed between 30^0-40^0 latitudes in both the hemispheres in the western parts of the continent. This includes the lands bordering the Mediterranean sea of Europe, Central and southern California of the USA, central Chile of south America, north- western coastal lands of Africa and the coastal zones of western and southern Australia and the Asiatic coastal lands bordering the Mediterranean Sea, western Turkey, Syria, western Israel and Lebanon.

Man has destroyed the flora and fauna of this biome. It is most affected by natural or man induced fire. There is a common practice to burn the vegetation regularly with a gap of a year or even two to three years after heavy grazing and browsing by sheep and goats. The burning of vegetation at a regular interval has some certain good and bad consequences. Frequent burning may change the soil structure and also cause heavy erosion during monsoon and heavy rainstorm. Besides burning, there is much clearance of vegetation for both agricultural and commercial purposes, overgrazing of grasslands and large scale hunting of animals. This has led to disappearance of certain floral and faunal species, increase in the silt of major rivers and alteration of natural vegetation, habitat etc.

1.2.5. Temperate grassland: location, extent and human intervention

This biome is located in the interiors of the continents and because of their interior location, rainfall is not sufficient and hence this grassland is obviously without tree. Another feature of this biome is that it is close to the marine environment in both the hemispheres. The temperate grassland of Eurasia, known as steppes, are most extensive as they extend for a distance of more than 3200 kilometer from the shores of the Black sea across the great Russian plain to the foothills of the Altai mountains. But some isolated patches of steppes in Hungary known as PUSTAZ, and in the plains of Manchuria, it is Manchuria grassland.

No other eco-system is as victimized as this grassland. Major parts of this grassland have now been converted to agricultural farmlands, which are famous as the 'granaries of the world', and also the heartland of the world dairy industry. That once grassland is also used for producing cereal crops.

1.2.6. The Boreal or taiga: location, extent and human intervention

This biome includes the sub-Arctic region of North America extending from Alaska of the USA across Canada to the Hudson Bay in the east and Eurasia from the Scandinavian Peninsula across the Russian Siberia to the Bering sea. Besides this, small patches of natural coniferous forest at highlands of Germany, Poland, Switzerland, Austria and other parts of Europe and on the high Rocky mountains of North America. In fact, taiga

biome is located between the tundra biome in the north and the temperate grassland biome in the south.

This Taiga biome provides most of the soft wood in the world and, therefore, men have been exploiting this Taiga forest for commercial purposes. But clearance of forest for agricultural requirements failed due to its sandy soil structure. This resulted in growth of the secondary succession like deciduous broad-leaved trees.

1.2.7. Tundra: location, extent

Tundra means barren land. This biome includes the part of Alaska; extreme northern parts of Canada, the coastal strip of Greenland and the Arctic sea bound regions of Eurasia and northern Siberia and arctic Islands.

1.3. Forest coverage: the Indian scenario

Champion, Seth and Negi have differentiated the following climatic forest group on the basis of rainfall, temperature and altitude.

1.3.1. Tropical evergreen rainforest

Forest belonging to this category is found in western parts of Western Ghats, eastern parts of the sub-tropical Himalayas (Tarai), northeast India comprising Lushai, Cachar, Khasi Jayantia and Garo hills and most of the Andaman & Nicobar islands up to a height of 1070 meters.

1.3.2. Littoral or swamp forest

These forests are found in the thickets on the western coast at a few places but on the eastern coast they form a fairly continuous fringe along the delta of the Ganga, Mahanadi, Godabari, Krishna and Cauvery. They are found in their densest form in the Sundarban in the Ganga delta, where the predominant species occurs which provides a natural fence.

1.3.3. Dry Tropical forest

These forests are found on a very large area, especially in an irregular wide strip running north south from the foothills of the Himalayan to Kanyakumari (except in Rajasthan, Western Ghats and West Bengal).

1.3.4. Riparian forest

These forests are found along banks of river and other wetlands.

1.3.5. Subtropical broadleaved hill forest

These forests occur largely in the highlands of Mahabaleswar, Nilgiris, Palni and Khasi hills and lower slopes of the Himalayas in West Bengal and Assam. Such forest is also known as 'Shola' forest in south India.

1.3.6. Montana wet temperate forest

These are found in the high hills of Tamilnadu, Kerala, eastern Himalayas, West Bengal, Assam and Arunachal.

1.3.7. Montana moist temperate forest

They occur in the temperate eastern and western Himalayas, i.e., along the entire length of the Himalayas between the pine and the sub-alpine forest in Jammu and Kashmir, Himachal Pradesh, Punjab, U.P., Uttaranchal, Darjeeling and Sikkim.

1.3.8. Alpine forest

This type of forest is in the Alpine area of the Himalayas, beyond the limit of tree growth and consists of dwarf shrubs of juniper, fir, honey suckle etc.

1.3.9 Grassland

Though high grassland are not found like steppe, pampas etc. but locally in India, grassland may be found on wet soils and in frost pockets in the Sal belt and in the hills in other parts of the country. These grasslands are generally divided in to three categories: hilly or upland grass, low land grass and riverside grass.

1.3.10. State-wise distribution of forest coverage

Table 1.1: State wise distribution of forest cover: Forest Survey of India (FSI)

Forest types	Forest sub types	Area	Area of occurrence
Tropical	Evergreen and semi-evergreen	6.5	Western side of Western Ghats, upper Assam and Andaman island (rainfall 2500mm)
	Moist deciduous	22.4	Foothills of Himalayas, east side of Western Ghats, and Khasi hills (rainfall 1500-2500mm)
	Littoral and swamp	0.7	Along the coast
	Dry deciduous	29.7	Almost entire Indian peninsula with rainfall of 750-1500mm.
	Thorn	5.2	Rajasthan and adjoining areas with 250 to 750 mm rainfall.
	Dry evergreen	0.1	Karnataka coast with no or little summer rain.
Subtropical	Broad-leaved hill forest	0.3	Lower Himalayas
	Pine forest	3.7	Central and western Himalayas with 1000mm to 2000mm rainfall.
	Dry evergreen	0.2	Western Himalayas with lower rainfall
Temperate	Wet temperate	1.6	Eastern Himalayas between 1800 to 2000mtr. Elevation and tops of southern hills
	Dry temperate	0.2	Inner ranges of Himalayas with low rainfall.
	Moist temperate	2.7	Central and western Himalayas between 1500-3000m elevation
Alpine forest		1.8	In Himalayas above 3000m elevation
	TOTAL	**75.1**	

1.3.11. Types of forest in India

The Indian forests are classified (as per the following table) into different categories.

Table 1.2: Distribution of forest types (in square kilometer)

State and Union Territories	Dense Forest (Density above 40%)	Open forest (Density above 10-40%)	Mangroves	Tree-covered area
Andhra Pradesh	28580	21119	495	50194
Arunachal Pradesh	51096	9404	-	60500
Assam	18415	7971	-	26386
Bihar	13490	15258	-	28748
Goa,Daman,Diu	763	522	-	1285
Gujarat	7850	5293	427	13570
Haryana	43	601	-	644
Himachal Pradesh	9908	2974	-	12882
Jammu & Kashmir	12978	7902	-	20880
Karnataka	16394	15870	-	32264
Kerala	8569	1833	-	10402
Madhya Pradesh	72174	55575	-	127749
Maharastra	27244	20032	140	47416
Manipur	4670	13009	-	17679
Meghalaya	5749	10762	-	16511
Mizoram	2938	16154	-	19092
Nagaland	6379	7972	-	14351
Orissa	28573	24392	199	53163
Punjab	96	670	-	766
Rajasthan	3048	9430	-	12478
Sikkim	1867	972	-	2839
Tamilnadu	10866	7491	23	18380
Tripura	340	5403	-	5743
Uttar Pradesh	18876	12567	-	31443
West Bengal	3512	3224	2076	8811
A & N Islands	6807	110	686	7603
Chandigarh	-	2	-	2
Dadra Nagar Haveli	187	50	-	237
Delhi	-	15	-	15
Lakshadweep	-	-	-	-
Pondicherry	-	8	-	8
All India	**361412**	**276583**	**4046**	**642041**

(Source: Forest Survey of India)

1.3.12. Regional forest cover of Northeast India

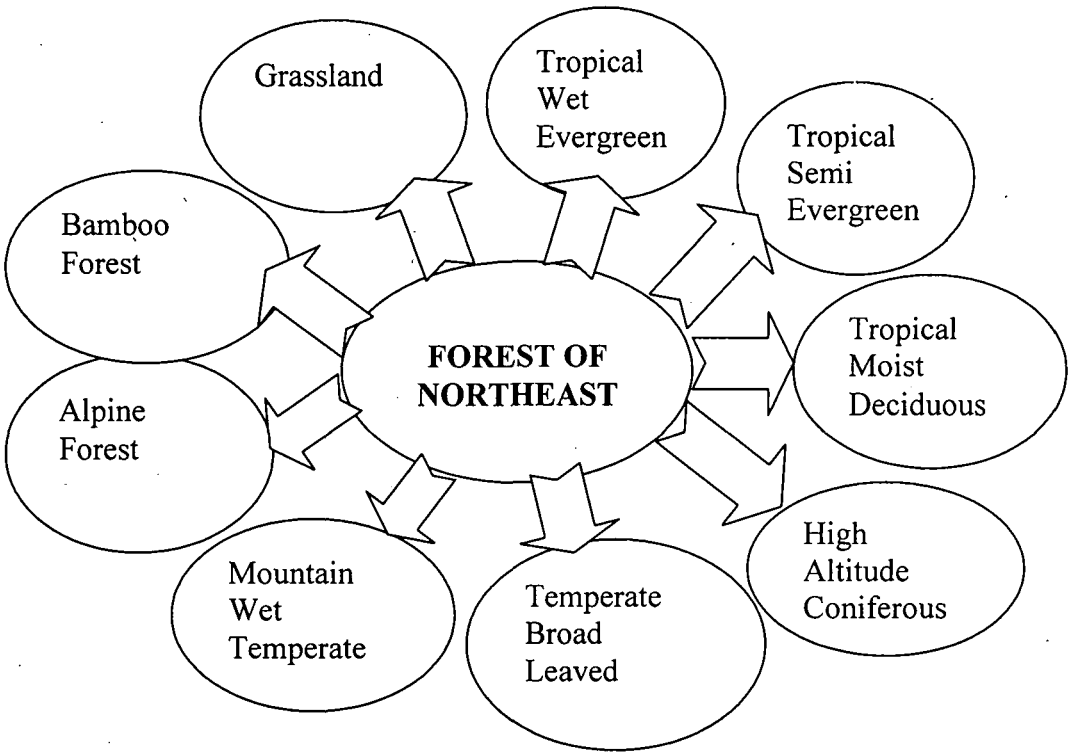
Northeast India comprises of 12 National Parks (32% of total protected area) and 38 Wild-Life sanctuaries, which include 68% area of forestland. The Forest Survey of India (FSI) has been regularly publishing the forest report of the region in a two year regular interval since 1991-2005. The Table 1.3 shows the forest cover change from 1991-2005.

Table 1.3: Forest cover in N-E India since 1991-2005 (in square kilometer)

STATE	Land Area	Forest cover							
		Year							
		1991	1993	1995	1997	1999	2001	2003	2005
Arunachal	83,743	68,757	68,661	68,621	68,602	68,847	68,045	67,692	67,777
Assam	78,438	24,751	24,508	24,061	23,824	23,688	27,714	27,735	27,645
Manipur	22,327	17,685	17,621	17,558	17,418	17,384	16,926	17,259	17,086
Meghalaya	22,429	15,875	15,769	15,714	15,657	15,633	15,584	16,925	16,988
Mizoram	21,081	18,853	18,697	18,576	18,775	18,338	17,494	18,583	18,684
Nagaland	16,579	14,321	14,348	14,291	14,221	14,164	13,345	14,015	13,719
Sikkim	7,096	3,014	3,119	3,127	3,129	3,118	3,193	3,262	3,262
Tripura	10,486	5,535	5,538	5,538	5,546	5,745	7,065	8,123	8,155

(Source: Forest Survey of India, State of Forest Report, 1999, 2001, 2003 and 2005)

The following types of forests are found in the northeastern part of India



The northeast India is described as Himalayan bio bank for its rare and endemic species of flora and fauna. But high dependency on forest for settlement, cultivation and livelihood has been influenced in reducing the forest coverage over the years.

1.3.13. Forest cover in Assam

The natural vegetation in Assam can be categorized in six major types. They are evergreen type, Sal forest, mixed deciduous, savanna, bamboo and cane and other mixed varieties. The evergreen species are mostly found in the districts of upper Brahmaputra valley, parts of Karbi Anglong, North Cachar hills and Barak plain. The Sal forest is an area of Sal trees found in Kokrajhar, Dhubri, Goalpara, Barpeta, Kamrup, Marigaon, Nowgoan, Karbi Anglong, Darrang and Sonitpur districts.The deciduous type of forest is found in the lower Brahmaputra valley in areas between Sal and savanna forests. These forests are found in some parts of upper Assam,

Karbi Anglong and North Cachar hills. The savanna vegetation is found in the well drained high land areas all throughout Assam. The deciduous forests are common in the central parts of Assam including the two hill districts.

Figure 1.2: Forest map of Assam

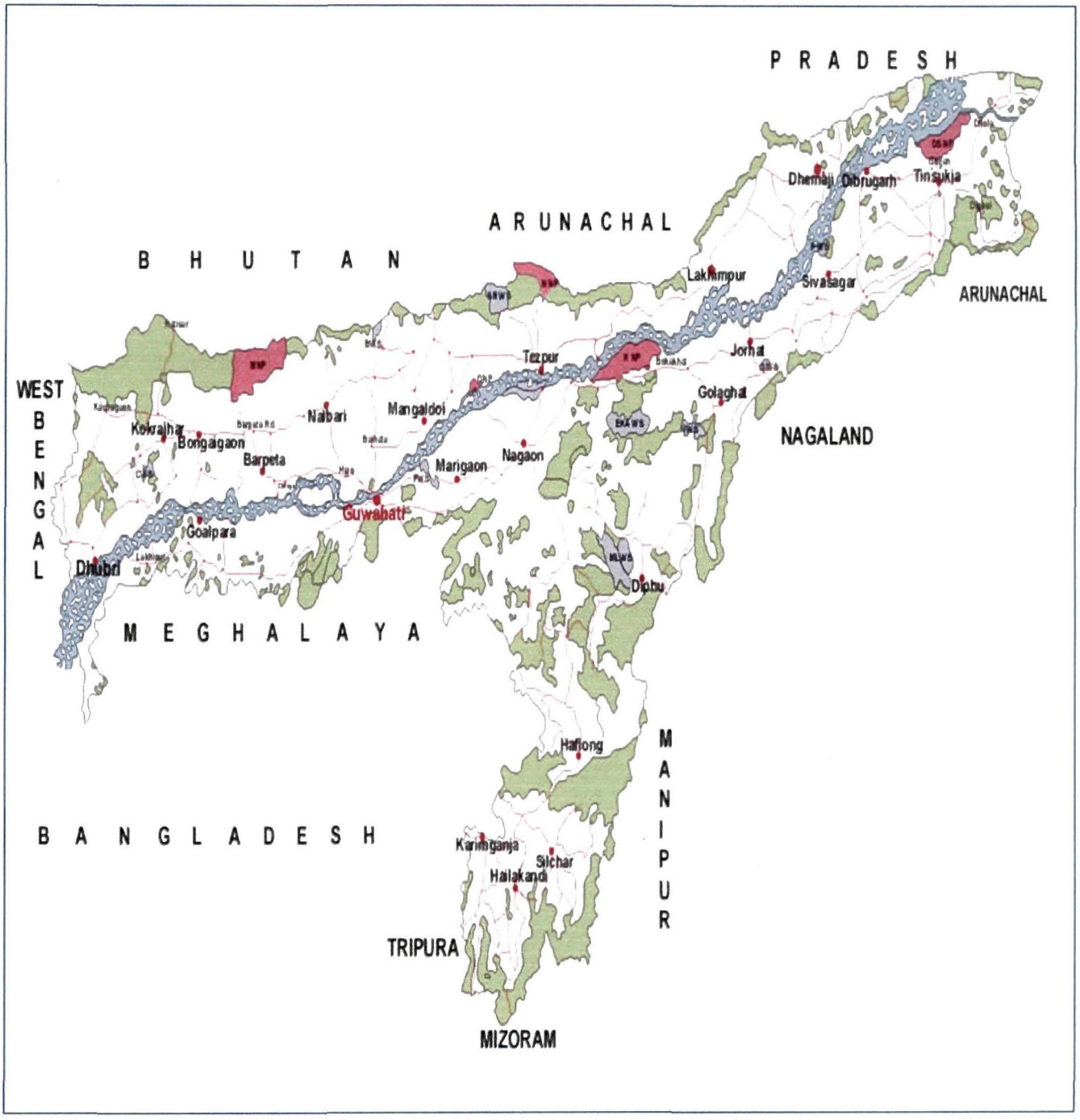


Table 1.4: Forest coverage in the districts of Assam (in square kilometer)

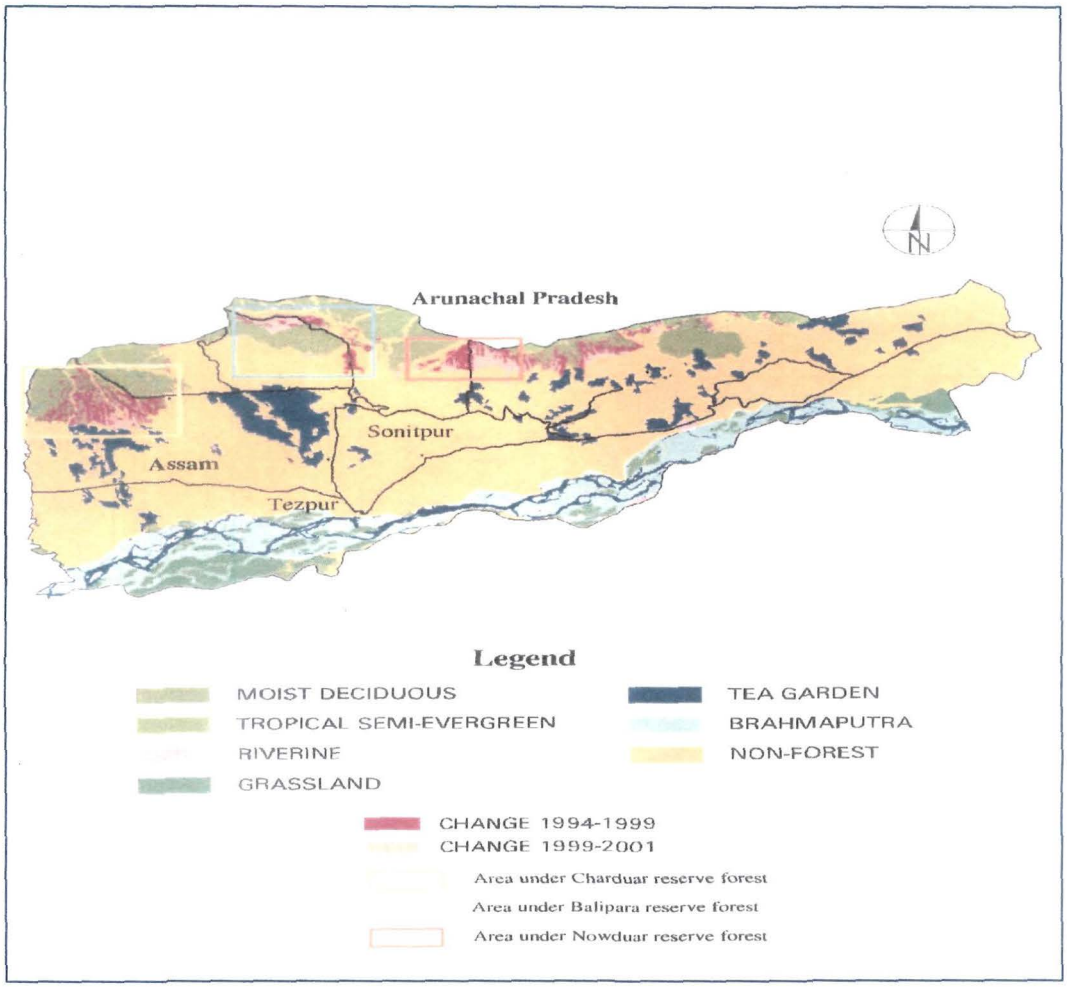
District	Forest Area, 1999	Forest Area, 2005	Change (+)	Change (-)
Barpeta	256	402	146	-
Cachar	1,375	2,225	850	-
Darrang	147	495	348	-
Dhuburi	117	117	0	-
Dibrugarh	1,349	754	-	515
Gaolpara	389	334	-	55
Golaghat	227	490	263	-
Jorhat	239	575	336	-
Kamrup	1,462	1,435	-	27
Karbi Anglong	8,820	7,994	-	826
Karimganj	544	833	289	-
Kokrajhar	1,630	1,283	-	347
Lakhimpur	380	286	-	94
Nalbari	40	282	242	-
Nowgaon	1,025	788	-	237
North-Cachar	4,437	4,269	-	168
Sibsagorh	217	670	453	-
Sonitpur	732	962	230	-
Assam	**23,688**	**27,645**	**3,957**	**2,269**

(Source: State Forest Department, Government of Assam, 2005)

1.3.14. Forest cover in Sonitpur district of Assam

The bank of the river Brahmaputra in Sonitpur district is covered by riverside forest. The ridge of the bank is mainly composed of grassland with elephant grass and reeds. The northwest side of the district is covered with moist deciduous forest; the central north with semi evergreen forest and the foothills of Arunachal Pradesh is covered with evergreen forest. The eastern side is mainly covered with deciduous and moist deciduous forest.

Figure 1.3: Forest map of Sonitpur district



1.3.15. Forest cover in the Brahmaputra river basin

The estimated forests cover in the Brahmaputra basin in India 55.6 percent (Goswami 1997). From the proportional variation of forest, forest is the highest in Arunachal Pradesh, followed by Nagaland, Meghalaya, and Bhutan. There are vast regional differences in forest cover. The basin covers an area of 14.07 million hectares (140,700 square kilometer) which is about 24.3 percent including the area of shifting cultivation. Evergreen needle leaf forest, evergreen broadleaf forest, deciduous broadleaf forest, mixed forest, closed scrublands, open scrublands, woody savannas, and grasslands are found in the river basin.

1.4. Scenario on global deforestation

The need of greater food production for human pressure has led to a massive increase in cropland. By early 1990s, 40% conversion has occurred either to cropland or to permanent pasture at the expense of forest and grassland ("Forest Resources Assessment 1990: Global Synthesis"). Global forest, woodland and scrub cover declined by 2% during the 1980s. Food and Agricultural Organization (FAO) estimated that deforestation was concentrated in the developing world, which lost nearly 200 million hectares between 1980 and 1995 with an average annual loss of nearly 14 million hectares (1995 report of the UNFAO). Global forest loss in tropical zone is a major global concern (Priya Syamsundar and Randall A. Kramer, 2004).

The constant increment of human pressure is disproportional on limited natural resources worldwide. World population currently stands at 6.15 b and is projected 7.18 b by the year 2015 (UNDP, 2003), while forest cover is eroding at a rate of 0.38% annually (FAO 2003). In Central America and the Brazilian Amazon region, increased population converted the rainforest to cattle ranching (Buschbacher 1986, Kaimowitz et al. 2004), in many cases irrevocably interrupting the forest ecosystem functioning on a local and watershed level (Maass 1995).

From 1850 to 1980, forest losses have been greatest in North Africa and the Middle East (-60%), South Asia (-43%) and China (-39%). Highest deforestation rates are in South America (-1.3%/ year) and Asia (-0.9%/ year) [p. 107 of (90W1)].

Table 1.5: Projected deforestation rates (in **1000 square kilometer)**

Year→ Continent↓	1995	2005	2015	2025	2035	2045
Africa	46	39	33	29	25	25
Asia	33	30	27	22	19	18
Latin America	78	63	51	42	36	36
Total	157	132	111	93	80	79

Source: Trexler and Haugen (1995) in (96N1).

In the end of 1995, estimated world tropical forest area was 1,792 m hectares. 52% is located in South America, 30% in Africa (529 m hectares), while 18% is located in Asia (338 million hectares). On the other hand, half of the tropical forests are distributed

among four countries in the tropical region- Brazil, Indonesia, Zaire and Peru. In the last 30 years (1965-1995), Asia, Africa and Latin America lost 33% and 18% each, respectively. Unfortunately, Brazil, Indonesia, Zaire along with Bolivia, Mexico and Venezuela registered 50% forest loss in tropical zones.

FAO estimates of forest loss rates are 50,000-100,000 square kilometer per year in Latin America, 20,000 square kilometer per year in Africa, and 50,000 square kilometer per year in Asia. But these figures reflect neither the loss of timber nor other biological resources in the remaining forests nor the severe destruction of open woodlands and countryside vegetation occurring in most third world countries (80S1).

More than 12% of the 5.2 million square kilometers of Brazilian Amazon forest has been cleared and converted to crop and pastureland. The Brazilian Space Research Institute (INPE) gives the information that 11,000 square kilometer in 1992, 15,000 square kilometer in 1994, 29,000 square kilometer in 1995, 18,000 square kilometer in 1996 was lost. Preliminary analysis gives a 1997 rate comparable to 1994. (D. Nepsted, C.J. Tucker, US Global Change, Seminar, Washington DC, 3/30/98).

Colombian forests are being converted to illegal drug crops at a rate of over 5600 square kilometer per year (Pittsburgh Post Gazette, 97). More than 405 square kilometers per year are deforested in Colombia to grow coca, marijuana, and opium poppies (93W5). 73% of the Andes, an area vital to the conservation of Colombia's water supply, have been deforested as a result of migration and drug cultivation (93W5). Deforestation rates in Central America (3.2% per year) are motivated mostly by conversion to cattle ranching (Nations and Komer, 1983). Much of the impetus is to provide low-grade beef for the US fast-food industry (Parsons, 1976, 86B1). In Indonesia, 66,000 square kilometer of forest was burned to establish palm oil plantations 22,000 square kilometer in the past 5 years. The Indonesian government plans to clear 6000 of tropical forest to croplands to grow soybeans (200,000 square kilometer of prime soybean kilometer lands lie non-cropped in the US and Argentina 92A1).

The amount of land cleared in Brazil's Amazon jungle rose sharply again in 2003-04. Brazil's Environment Ministry commented that destruction of the world's largest tropical forest rose to 10,088 square miles (26,130 square kilometer) in 2003-2004 from 9,496 square miles (24,597 square kilometer) in 2002-03. As Brazil grabs an ever-larger slice

of global agricultural trade, the expansion of soy growing and cattle farming into the Amazon basin may become impossible to stop. The worst year for Amazon destruction was 1994-95, when 11,216 square miles (29,050 square kilometer) were cleared. The 2003-04 figures are the second largest amount of land cleared.

The World Wildlife Fund (WWF) commented that 17.3% of the Amazon basin has been destroyed. Nearly half of the total deforestation took place in Brazil's Mato Grosso state, whose government Blairo Maggi's farming operations are the world's single largest soy producer. Soy is Brazil's biggest farm export. Sales were about $10 billion in 2004 (Axel Bugge, Reuters News Service http://www.reuters.com. 5/19/05). Soy production has overtaken logging and cattle ranching as the main source of Amazon rainforest destruction. In the past 3 years, nearly 27,000 square miles (70,000 square kilometer) of rainforest have been destroyed, most of it illegally. Much of the rainforest acreage was sold to soy producers, financed by Cargill. Brazil has become the world's leading exporter of soy ("Eating the Amazon: the Fight to Curb Corporate Destruction," The Independent, 7/17/06). Dr. Thomas Lovejoy of WWF estimated that 15-20 percent of species have been in the verge of extinct for deforestation by the end of this century (Global forest report, 2000).

The estimated forest in temperate region in 1990 was 2.4 billion hectares. It is mostly in China, USA, Russia, Sweden, Finland and Canada. Though forest loss is insignificant in comparison to tropical zone but in 1980, temperate forest loss alone in North America was 11% and in China was around 4% (Report from Economic Commission of Europe, 1991).

Aquaculture and shrimp farming are responsible for 52% of all mangrove deforestation worldwide, according to Greenpeace (Talli Nauman, "A Future Compromised: Agriculture and Aquaculture Compete for Water," (http://americas.irc-online.org/pdf/reports/0702Gulf4.pdf visited 3/9/07 & 2/28/07.).

Seiler and Crutzen (1980) estimated that forests were converted to grazing land at 60,000 square kilometer per year, mostly in Latin America (86V1). Houghton et al (1983) estimated a similar value (86V1). 2 million square kilometer of forest land have been converted to grazing ground in the past 30 years; 7 million square kilometer during human history (86V1).

The major causes of forest loss, which are common in almost all countries, were identified. Human settlement, conversion to arable land, lumbering, shifting cultivation and fuel wood collection, fragmentation, climate change, pollution, drought, nutrient loss and wild forest fires, intentional burning of forest land etc. Of course, the mode of deforestation is different in different regions.

The report of the Secretary General on programs in implementation on combating deforestation and forest degradation under UNFF (United Nations Forum on Forests) in UNO's Economic and Social Council on 4-15 March 2002, San Jose, Costa Rica highlighted and expressed grave concern about global forest loss which is tabulated as under

Table 1.6: Continental change in forest cover 1990-2000 (in 000 hectare)

Continent	Total forests	Total forest	Change in forest cover 1990-2000	
	1990	2000	Annual change	
	000 ha.	000 ha.	000 ha.	%
AFRICA	702502	649866	-5262	-0.78
ASIA	551448	547793	-364	-0.07
OCENIA	201271	197623	-365	-0.18
EUROPE	1030475	1039521	881	0.08
NORTH and CENTRAL AMERICA	555002	549304	-570	-0.10
SOUTH AMERICA	922732	885618	-3711	-0.41
WORLD	**3963429**	**3869455**	**-9391**	**-0.22**

(Source: Forest Resource Assessment)

Table 1.7: Annual change in area of planted forests, 1999 (million hectare)

Area	Conversion from natural	Afforestation	Net Change
Tropical	+1.0	+0.9	+1.9
Non-Tropical	+0.5	+0.7	+1.2
World	**+1.5**	**+1.6**	**+3.1**

Source: Center for International Forestry Research (CIFOR)

1.4.1. Deforestation: Indian scenario

Ram Prasad and Sashi Kant, IIFM, observed that though forest resources are renewable, they are in critical stage worldwide, especially in less developed states. Poor rural communities treat forests as provider of their basic amenities for maintaining their minimum subsistence level (i.e., as a source of livelihood). In India alone, almost 100 million people reside in forest areas and heavy dependency on forest products is solely responsible for huge destruction. Another 275 million people live in the forest fringe area and this lot also depends on forest products (World Bank, 1999; Poffenberger, 2000). 270 m livestock graze in the forest area. Grazers collect 170 million tones of green fodder annually from these forests (GOI, 1999).

During British regime, the administration directly controlled forest management and redistributed economic gain in favour of the empire entirely (Kent and Cooke, 1999). Large scale deforestation took place because of commercialization of timbers. But tight restrictions were imposed on local people by curtailing the forest right, which led to conflicts between local people and empire (Guha & Gadgil, 1989). The resultant consequences of forest restriction grew to non-violent movement as a symbol of non co-operation with the affairs of the empire. Such non-violent or violent movements compelled the authority to reframe the former policy and agreed to form community-based forest management in some forest areas in Himalayas. Van Panchayats in Uttar Pradesh and the forest co-operatives in Himachal Pradesh (Guha, 1983) are the outcomes of this new policy.

The latest (satellite) survey also indicated that more northeastern Indian forests are put to shifting cultivation than abandoned for post-shifting cultivation regeneration annually. The survey showed that 63,000 square kilometer in northeastern India is affected. Out of the 64% forest cover in the region, 35% cover is good (dense) and the remaining 29% comprises post shifting cultivation open or degraded secondary succession forests that require protection (95K1)

Assam is part of a global biodiversity hotspot (Myers, 1988; 1991) with widely differing habitats. Commercial felling, new agricultural and settlement frontier, shifting cultivation and above all, the intra-boundary conflicts, have been the major causes of forest destruction. The complete loss of forest in Nambor (south block), Dayang, Diphu and Rengma reserve forest in Golaghat district (tropical rain forest of 900 square kilometer) was a case of boarder dispute with Nagaland. The loss of forest in Balipara and Gohpur reserve forest of Sonitpur district (100 out of 189 square kilometer and 133 square kilometer; respectively), and Gali reserve forest in Dhemaji district (106 square kilometer) is a major concern. Estimated 2200 square kilometer of forest area has been cleared for tea plantation in Assam (tropical rain forest), and more than 2600 square kilometer for shifting cultivation.

1.4.2. Deforestation in the study area

The deforestation rate in entire northeastern region is increasing at a fast rate (Roy and Joshi, 2002). While comparing to other part of the northeastern region, the deforestation rate in Assam is higher. But it is a matter of grave concern that satellite imagery report highlights the deforestation rate in Sonitpur district is the highest and has already crossed the danger line (Roy and Joshi, 2002).

1.5. Measures to check deforestation

It is generally believed that poverty eradication is the key theme to restore the existing area and advocacy for direct participation of rural poor in conservation of environment. There is a tendency to believe that the main cause of deforestation is the dependency of the poor people on forests for livelihood. But exploitation of forest coverage for illegal economic activities is another major cause of deforestation. The flexible forest laws are

also responsible for rapid shrinkage in forest cover (Intergovernmental Forum on Forests).

In the last decade, a group of scientists have been searching the relationships between livelihood strategies and woodland system in Zimbabwe (Campbell et al, 1991; Clarke et al, 1996; Frost, 1996; Goebel et al, 2000; Grundy et al, 1993; Mandondo, 2001; Mukamuri, 1995). It has been found that local people have a clear sense of the ecological services provided by woodlands. They also respond to resource scarcity by adopting a conservative approach to resource use, as evidenced by reductions in fuel-wood consumption. These challenges some of the conventional wisdom that peoples' use and about perception regarding woodlands are a barrier to sustainable use, rather than the building blocks for the future (Allison Goebel, 1998, 2000).

Franz Schmithusen (1996), in his proposal on the Structure and Content of an International Instrument for the Protection, Conservation and Development of Forests, International Series Working Papers, Swiss Federal Institute of Technology, Zurich, opined that the structure and content of an instrument should reflect the proposed multilevel and process oriented approach. It should allow for phased policy formulation and implementation, as commensurate with the socio-economic conditions of particular countries and take into account the specific conditions of forest ecosystems or geographical zones. The objectives of an instrument should be consistent with an expanding transfer of resources, technologies and financial means, in accordance with the principle of a common international solidarity. The sequence of issues addressed by an instrument could be a problem-oriented one by referring to forest development and forest conservation, and to programmes for the establishment of new production and protection forests.

Nitya Jacob (1997) viewed that community and private efforts have a considerable role to play in the sustainable management of our forests, and striking successes have been achieved in states like Haryana and West Bengal. Participatory action involving the government and local communities for regeneration of degraded forests through effective protection and improving the socio economic condition of these communities through forestry activities was initiated as a pilot project at Arabari in West Bengal in 1971-72.

To protect the forests, the Indian government has a policy of allotting forestland to individuals to reside and carry out day-to-day activities including agriculture. This is done with the intention that these legal forest dwellers would protect the forests from illegal activities of man. But it has been observed that these forest dwellers, as well as villagers living in the fringe areas of the forests, encourage illegal felling of trees and poaching in return of financial benefits. The government has undertaken activities like converting wasteland into woodland with the aim of increasing the area of forest cover. But some scientists believe that wasteland too has a role to play in the maintenance of ecological balance of nature.

India has a tradition of conservation of forests. The *chipko* movement of the early seventies in the Tehri district of present Uttarakhand speaks a lot about people participation in conservation of forests. Similar is the case of the *silent valley* movement of Kerela in which the Nilgiri ecosystem was protected from inundation by construction of dam.

Chapter Two: Description of the Study Area

Nameri National Park covers an area of 200 square kilometer and is bounded by Pakke Tiger Reserve in Arunachal Pradesh on the north, the Jiabhoroli river and a few cadastral villages like Sikam and Balijan on the south, Naduar reserve forest on the east and Balipara reserve forest on the west. But, in the year 2000, the Nameri National Park was declared as Nameri Tiger Reserve with the inclusion of buffer zone of Naduar reserve forest to its east and Balipara reserve forest to its west. This increased the size of the park to an area of 344 square kilometers.

Initially Nameri National Park was a part of Naduar reserve forest. Naduar reserve forest consisted of Hatipati, Bardikarai and Nameri blocks. But the encroachers gradually reduced the green cover of that forest for extension of agricultural activities and settlement. As a consequence of frequent infiltration, the forest cover of Hatipati and Bardikarai blocks completely disappeared. But, fortunately, Nameri block of reserve forest was notified as wild life sanctuary by the government of Assam in 1985. Later, in 1998, it got the status of National Park under section-35 of Assam Forest Regulation Act, 1891. This has restricted the encroachment and deforestation process in this area. Nameri is a bio-diversity hotspot with rare and endemic species and occupies the second place after the Namdafa wildlife sanctuary of Arunachal Pradesh.

Adjacent to the Nameri National Park, Balipara reserve forest covers an area of 189 square kilometer of forest land demarcated by the Bhoroli river. The Balipara reserve forest is bounded by the river Bhoroli in the north, a few cadastral villages of Balipara revenue area (under Charduar revenue circle) on the south, a part of Nameri Tiger Reserve in the east and Charduar reserve forest and a part of Arunachal foothills in the west.

During British rule, the greater Charduar and Lokra areas (under Balipara reserve forest) were declared as political area and were administered by a political officer. Due to frequent conflict of the local tribes with the people of Arunachal Pradesh (then known as NEFA - North East Frontier Agency), these areas have suffered from lack of development. In 1875, the British administration established a few Garo families who hailed from the Garo hills of Assam for rubber plantation in the western part of Charduar

which was known as 'Rubber Paleng' i.e, rubber plantation. This is supposed to be the first human settlement in the form of a revenue village in these forest ranges. This started the process of settlement of villages in the study area. The original villages which served as feeder village to the settlement within the study area are located in the Balipara area. These villages include Udmari, Kamari, Dhekerigaon, Baligaon, Balijan, Madhupur, Bokagaon, Sarupatgaon, Bhakatgaon, Burhagaon, Adabari, Khelmati, Pakbil, Kalanibasti, Bhangabasti, Bamgaon, Dighalibasti, Aragaon, Majuligaon, Panipota, Ouhola, Bhobola, Molangaon, Amaribari, Bherbheri Upper- Kachari, Darjipatti, Mahalibasti, etc.

Under Section 72 of Assam Forest Regulation Act, 1891, the Government, in the year 1962, proposed to establish seven forest villages in the fringe areas of Balipara reserve forest. It has been decided to establish forest villages with local communities in the forest ranges of Assam. The purposes of allotting land to the communities and forming forest villages were

1. to protect forests from illegal encroachers;
2. to survey tree population in the forest from time to time;
3. to regenerate the endangered species so as to overcome the dangers of extinction as well as to take action plan as a step of afforestation;
4. to help in logging operations when required.

The State Forest Department allotted 10-12 bighas of land within reserve forest to each family for settlement and cultivation. They enjoyed some privileges like permission to collect raw materials free of cost (such as wood for fuel, food for themselves, fodder for their cattle and other non-timber forest products) from the forests for rendering the above free services to the Forest Department. The population of these forest villages took up the work with the right spirit in the beginning. But gradually they started depending more and more on forest area by extending agricultural holdings, rehabilitation etc., as a result of gradual increase in size of their families.

Villages found in and around the study area can be broadly classified into three different categories – revenue villages, forest villages and non cadastral villages. A revenue village has definite surveyed boundaries. Non surveyed area with settlement within

forest area with locally recognized boundaries are known as non-cadastral villages. Villages within forest area settled legally by the Forest Department for protection and conservation of forests are known as forest villages.

2.1. Forest villages in the study area

Bogijuli forest village is situated on the extreme west of Balipara reserve forest, and it is dominated by communities like Adivashi, Koch and Bodo. The approximate population of this village is 1750, as reported by the local village headman. On the western part of the fringe area of Charduar range of Balipara reserve forest Aralilaga forest village is situated with 130 households and 883 total populations as reported by the headman of that village. This village is entirely of Bodo community. The Sapalaga forest village consists of 72 households with a population of approximately 447. This village is inhabited by the Koch community. On the eastern part of Sapalaga village, Gamani forest village is situated consisting of nearly 110 households with a population of more than 700 and the village is dominated by the Koch community.

On the eastern part of the fringe areas of the Balipara reserve forest and west of the Nameri National Park, there exists the forest village Satai where inhabitants are from mixed communities such as Koch, Mishing, Garo, Dafala and Kachari with 367 households and a total population of 1494.

The forest village Satai is located on the upper most part of the Balipara reserve forest of Charduar range. It is near to the Nameri National Park. The forest village Tarajan is very close to the Nameri National Park. The Nameri range office is adjacent to this forest village and it is inside the declared buffer zone of Nameri Tiger Reserve. It consists of 65 households with 535 total populations and this village is primarily dominated by people belonging to Koch community. The forest village Dharikati has two parts, north and south. This forest village is situated at the lower part of the Balipara reserve forest and this village is inhabited entirely by the Mishing community with 255 households and more than 1200 population.

In the 1950s, another five forest villages were settled by the then government of Assam under Naduar reserve forest on the eastern part of the Nameri Tiger Reserve. These villages are Salaikhati, dominated by Karbi community, Salaikhati Bengali, where residents are Adivashis, Salaikhati Kachari, dominated by the Kachari community,

Morisuti, dominated by Mishing community, and Sikam Tanga village, which are also dominated by the Mishing community.

2.2. Revenue villages in the study area

As has already been mentioned, the Garo families settled in Charduar area by the British Government in the year 1875 was the first revenue village in the study area. After this, in the year 1933, eight Adivasi families were settled near Lokra in Charduar area from Panipota village of Balipara by the then political officer of Charduar political area as reported by the village headman. Later on, this village came to be known as Molan-Pukhuri gaon. Another village named Gorhmara was established by the neighbouring people of Charduar especially with those who migrated from the adjacent villages of Balipara by clearing a part of Balipara reserve forest.

The revenue villages that were settled within and around Balipara reserve forest are Chengalimara (1908) with mixed community of Koch and Bodo, Bhalukmari (1925) with Bodo community, Nagharia (1910) with Bodo community, Garogaon (1875) with Garo community, Dowangani, Bamunjuli, Amloga (1915) with Koch Community, and Amlaga Uttar (1915) with Bodo and Rabha Communities. Amlaga Dakhin village,which was established in 1953, was further subdivided into three small villages for administrative convenience, namely Dakhinsila, Monijharoni and Mansiri. The inhabitants of Dakhinsila and Monijharoni are Bodos and Adivashi, while that of Mansiri are Mishing and Nepali.

Apart from the forest villages and revenue villages of the Balipara reserve forest, people from within and outside the Charduar area also settled and established villages in the area by clearing reserve forest. Originally, Balipara reserve forest was covered by an area of 189 square kilometer. Now it has shrinked to an area of only 10-15 square kilometers of forest land (Report of the west forest division, Sonitpur, Assam).

Villages which settled in the Charduar range of the Balipara reserve forest initially as encroachers and later got converted to either revenue village or forest village. The number of villages in the forest area went on increasing. Dharikati forest village is the outcome of rehabilitation of people after the erosion of Mehrgaon revenue village of Naduar reserve forest in 1955. From Dharikati via Satai to Bogijuli, there are more than

40 villages and among them seven villages are classed as forest village, 14 as revenue villages and others as non cadastral villages. Most of the households of the villages are from the Bodo community. Gradually the northern part of the forest has been converted to settlement up to the sub Himalayan range (known as Guinazia hill). The lower ridge of the hill is occupied by the encroachers coming from both within and outside the original Charduar area. The continuous process of encroachment in the forest area coupled with illegal tree felling ultimately denuded the remaining part of the reserve forest.

It is reported by the local residents of the area that in the year 1951, the then Assam Chief Minister declared the greater Balipara area with 258133 hectares of land as tribal belt though there were only three tribal villages within Balipara reserve forest. These villages were a part of Chengalimara, Nagharia and Aralilaga among which Aralilaga was declared as forest village in the early part of 1960's. Though this declaration was not made through a formal ordinance, it went across the nearby Bodos as a formal declaration making the reserve forest a "Tribal Belt". Accordingly, they began to occupy parts of it. This practice was continued till 1985. Political interference directly helped the encroachers to clear the forest area for the political gain of the leaders. As a consequence, more than 35 villages got settled within the reserve forest clearing thick jungles and the territorial occupation got further extended for agricultural activities.

The encroached area in Balipara reserve forest extended from the village located between Uttar Amlaga to the west of Bogijuli forest village with the silent support of the government and inaction of the Forest Department. Dwellers in the villages are from Bodo community. The villages include Thekeralaga village (1970) with 80 households who migrated from Missamari of Tezpur, Jayantapur village (1977) with 32 households who migrated from Nowgaon, Tarabari village (1972) with 120 households who migrated from Kokrajhar, Odalguri, Harisinga, Karbi Anglong and Chirang districts, Gamarilaga village (1970) with 33 households who migrated from Jalpaiguri and Barpeta, and Ganeshpur village (1975) with 16 households who migrated from Goalpara.

The 46 households of Naharloga (1975), 81 households of Ajarlaga (1967), 26 households of Tamulpur (1977), 20 households of Habigaon (1977), 29 households of Mariyani (1978) are all migrated population from Missamari and Khelmati after they have been evicted for military purpose. But 79 households of Bogiguli- number four (1977) are

from Bijini, Gasguri and Bangaigaon, 14 households of Sijuguri (1985) are from Karbi Anglong, 18 households of Halapara (1985) from nearby areas, 24 households of Nepali community of Jaipur (1956) from Rangachakua and Gorhbill, 56 households of Dakhin Rangagara (1970) from Darrang, Kamrup and Goalpara, 89 households of Oujuli Rangagara (1969) from Dudhnai, Krishnai and Chilapathar. But the dwellers of the reserve forest Chengalimara and from the adjoining areas including forest villages Satai, two non cadastral villages, namely, Samlaga with 68 households dominated by the Bodo community from Goraimari and Nagharia. The other village Mekahi Bheeroni (1972) with 27 households is inhabited by Koch community from the nearby villages of Balipara.

The village headman of Dakhsin Amloga including the villages Manijharani, Dakhinsila and Mansiri (all revenue villages) reported that people have been involved in clearing jungles for the expansion of agricultural activities from two to three generations back. The inhabitants of Manijharani and Dakhinsila are from the Bodo community and those of Mansiri are Adivashi, Mishing and Nepali. The three villages were originally known as Dakhsin Amloga but for dissimilarities of customs of different sects, the original village got divided into three parts comprising 180 households. Most of the population of these villages belong to the ultra poor category and lacks the means to afford fuel other than that is collected from the forest. This, as has been reported by the people, was one of the main causes of large scale deforestation. The same picture has been seen in all villages located in the area. The survey revealed that the Mishing community is accustomed to hunting wild animals and are also expert in swimming even during heavy floods. The Garo community is expert in catching snakes. Bodos are expert in clearing, felling and trading of trees.

Local residents admitted occupying the forest territory despite knowing it to be illegal. But they blame circumstances for compelling them to do so. They also accuse the government of taking inconsistent policy measures in rehabilitating people. They allege that if settlement in forest area is illegal, they should have been evicted by now. But the government has not taken any step towards this end so far. Moreover, they also allege that the government offers periodic land patta (possessory rights over land) to some of the communities settling in government land while the same is not given to them. Another section of the population is of the view that people do not clear forest and settle there. They just settled on forest land which has already been cleared.

Lack of enforcement of action by the Forest Department is conspicuous. It has been observed that the dwellers of Dowangani village are carpenters and they make furniture with the timber easily available in the nearby forest areas. They collect timber wood for making furniture in broad daylight and carry it by the front of the range office located at Charduar. The traders sell their finished products at Lokra bazar near forest gate and range office on every Saturday. The same kind of products is also sold freely in a weekly market on Wednesday in another nearby place. These people involved in timber collection admit their wrong doing for survival purpose.

During British rule, the people of village Chengalimara took part in plantation programme in three acres of land near the village under the supervision of an expert. This expert was the British appointed range forest officer (RFO). His job was to look after proper policy implementation through plantation near the Chengalimara revenue village. This area of unnatural plantation started from a few gauge of Charduar forest gate. This 'sagun paleng' (Teak plantation) was started under the strict supervision of range forest officer. Later on, it came to be known as Chengalimara reserve forest with valuable teak trees under Balipara reserve forest with an area of three square kilometer.

Chapter Three: Literature Review

Forest resources, though renewable, are in critical stage worldwide especially in less developed countries (LDCs). As poor rural communities treat it as their basic amenities for maintaining their minimum subsistence level (i.e., as a source of livelihood). In India alone, almost 100 million people reside in forest areas and heavy dependency ratio on forest products is solely responsible for huge destruction. Another 275 million people live on the forest fringe area and depend on forest products too (World Bank, 1999; Poffenberger, 2000), while 270 million livestock graze in the forest area. Contrary to this, grazers collect 170 million tones of green fodder annually from these forests (Government of India, 1999).

Several studies revealed that the poverty has been strongly linked with natural forest loss (Nduma et al 2001, Swinton and Quiroz, 2003). The conversion of tropical, subtropical, grassland worldwide to cattle ranching, agricultural activities, and industrial as well as urban expansion resulted in environmental and economic problem at many scales. Cattle ranching are incorporated with the current socio political climate and employ few people to agriculture; forestry and industry require major part of land causing severe economic disparity as well as long term environmental disservices.

The report of the Intergovernmental Forum on Forests, poverty has been identified as a primary cause of major deforestation and forest shrinkage. This conclusion was drawn in a global workshop on the underlying causes of deforestation and forest loss. It has been reported that though the blame and burden of deforestation goes to the poor but the Commission on Sustainable Development, 8th session made a comment as "While poverty results in certain kinds of environmental stress, the major cause of the continued deterioration of the global environment is the unsustainable patterns of consumption and production, particularly in industrialized countries, which is a matter of grave concern, aggravating poverty and imbalances."

Comment recorded in the world forest report prepared by FAO (1997) supported Lovera on the fact that fuel wood collection does not cause massive deforestation or forest degradation. Fuel wood collection will damage if it is used as energy by the small, medium and large industries. She also pointed out with an another example of Chile that

major deforestation is caused due to large scale mono culture in tree plantation which is grown for paper and packaging. The same is with the Germany's black forest. Heavy destruction of forest here is not for the poor, but for the big trading companies. In South America too, over exploitation of forest land for soy cultivation is responsible for massive destruction of forest. This is not damaged by the poor but by the large farmers. The tropical forest of Amazon was intact till 1960. It has been stated that the large scale rubber plantations and exploitations were the major cause of Amazonian forest loss.

It has been realized long back that one of the main causes of deforestation is people's dependency on forests for livelihood. As the population has been increasing, pressure on forest land for settlement and dependency on forest products for livelihood have been increasing. Hence, researchers have been trying to find out solution to this problem. In an article, "Breakthrough Made in Forest Protection", published in Beijing Review; August 1999, Jiang Wandi cited the example of a project undertaken by International Tropical Timber Organization (ITTO). The project experimented with ways to protect natural forests by employing separate means simultaneously – growing substitute woods, helping local residents to eradicate poverty by doing profitable household business rather than tree chopping, working on an optimized method of chopping the natural forests and creating modern protection methods. This project was undertaken in the Hainan province, the largest economic development zone of China. About one-third of Hainan residents live in areas where agriculture, forestry and pasturing overlap. These areas are mainly home to such ethnic groups as the Li and Miao, whose living standards and production means are so primitive that they usually rely on chopping wood for living. The ITTO project that began in 1993 had its number one demonstration area in Danzhou, flat lowland plain in west Hainan. It was a man made tropical forest plantation. It was designated to develop high-yield and fast-growing commercial woods with internationally advanced nursery techniques, and then promote the species and techniques to the rest of the province and even outside. ITTO also had a sub-project designed to help the people living near forests to wipe out poverty by providing them with the necessary facilities and skills for an alternative means of livelihood. Within a period of seven years, the project scientists and technicians turned a wasteland into an idyllic picture of flourishing vegetation. Apart from a piece of pasture, there are also farmland and orchards where sugar cane, mangoes, pineapples and sweet potatoes are grown. Rubber trees, teak, and Caribbean pines are also grown for both commercial

purposes and as a farmland shelter belt. Another sub-project was to find out scientifically the best standard of felling so as to guarantee a fair cycle of regeneration. Finally, another sub project was undertaken to find out an effective protection of tropical virgin forests using scientific modern means. The work was conducted in Jianfengling hill, where the tropical virgin forests cover 8,000 hectares. Chopping was strictly forbidden in this area. A modern protection facility has been installed in this area that covered roads, telecommunication, fire control, research work and technical training for personnel. Wandi commented in the article that Hainan benefited a lot from the ITTO project. According to Huang Jincheng, an official with the Hainan Forestry Bureau (HFB) and Director of the project office, it has brought in not only new technology, but also internationally advanced forestry philosophy that is exerting a positive influence on the province's forestry and timber industry development.

Many scientists working in the area of forest protection have been developing methods and strategies for protecting forests from vanishing. Community support has been identified as one of the major pillar of forest protection. Strategies like ecotourism, eco-forestry, perm culture, corporate campaigning are some popular strategies for forest, protection that have been used with varied degree of success at various locations.

Franz Schmithusen (1996) in his proposal on the Structure and Content of an International Instrument for the Protection, Conservation and Development of Forests, International Series Working Papers, opined that the structure and content of an instrument should reflect the proposed multilevel and process oriented approach. It should allow for phased policy formulation and implementation, as commensurate with the socio economic conditions of particular countries and take into account the specific conditions of forest ecosystems or geographical zones. The objectives of an instrument should be consistent with an expanding transfer of resources, technologies and financial means, in accordance with the principle of a common international solidarity. The sequence of issues addressed by an instrument could be a problem oriented one by referring to forest development and forest conservation, and to programmes for the establishment of new production and protection forests. An alternative approach is to structure problems and opportunities according to institutional and policy levels. In view of the multiple linkages that exist between forest protection, development and conservation, it may be advantageous to choose an institutionally oriented approach.

The protection of forest ecosystems and forestlands, as well as for their conservation and development, require a balance between the principle of national sovereignty and stewardship and the principle of international solidarity. National forest problems need national efforts and solutions and if necessary, the support of the international community. Regional and transboundary forest problems require collaboration at the regional level, leading to mutually agreeable procedures to address issues of common concern. Global forest problems need global efforts and collective measures by the international community as a whole. A multilevel approach for maintaining and developing forests for the benefit of people, nations and mankind thus comprises three pillars: national commitment to the objectives of policies for sustainable resources management, regional and where relevant global measures for coordination and cooperation, and international solidarity in order to support common efforts.

He also opined that specific forest development and conservation policies should have emphasis on the following objectives:

- multipurpose approach in utilization forest ;
-sustainable management of forests;
- rehabilitation of degraded forests;
- creation of new forests;
- promotion of local participation and benefits;
- confirmation of local ownership and use rights;
- integration of forest activities in rural and social development;
- promotion of the use of trees in other land uses and production systems.

In the last decade, a group of scientists have been searching the relationships between livelihood strategies and woodland system in Zimbabwe (Campbell et al, 1991; Clarke et al, 1996; Frost, 1996; Goebel et al, 2000; Grundy et al, 1993; Mandondo, 2001; Mukamuri, 1995). Woodland in the savanna regions in southern Africa found in Zimbabwe, are livelihood input of the rural households which is prime output to urban households (Clarke et al, 1996). Woodland has immense commercial use (Brigham et al, 1996). While some woodland products are commercialized and hence have more easily quantifiable values, most woodland products have non market values, including use

values (subsistence products), and extra market or non use values based on ecological, spiritual or aesthetic benefits.

Nitya Jacob (1997) viewed that community and private efforts have a considerable role to play in the sustainable management of forests, and striking successes have been achieved in states like Haryana and West Bengal. Participatory action involving the government and local communities for regeneration of degraded forests through effective protection and improving the socio economic condition of these communities through forestry activities was initiated as a pilot project at Arabari in West Bengal in 1971-72. The programme covered an area of 1270 hectares of degraded forests involving 618 families in 11 villages. This cooperative action demonstrated that closure of areas by villagers living on the fringe of the forest, to grazing and cutting, resulted in their rapid regeneration. Based on the Arabari experience, more than 1250 village forest protection committees spread over an area of 0.152 million hectares of degraded forests were formed during the next eight years in the state. Today, over 2090 rural communities in the state participate with the government to manage 0.3 million hectares of natural forests.

Another success story is the regeneration of the lower Himalayas, in the foothills of the Shivaliks. The foothills of the Shivaliks, the lower Himalayas, assessed to be the most degraded hill ranges in the world (Varalakshmi. V.1997). Removal of high classed timber combined with high intensity grazing and dependence for fuel wood, the forest land got completely cleared and barren. Then afforestation programme started as an experiment in Sukhomajiri village in late 70s, which highlighted the importance of providing alternative livelihood to the people depending on forest so that dependency on forest reduces. The local people were receptive to the alternatives of forest products and accepted the suggestions and advice of the Haryana Forest Department. The programme has been in operation in 60 villages in the Morni Pinjore and Yamunanagar forest divisions, which were organized into 55 hill resource management societies (HRMS).

Tata Energy Resource Institute's (TERI) involvement with Haryana Forest Department (HFD) could motivate local communities to protect and manage the forest in a sustainable manner for betterment of the local communities. The important point of the

programme was to involve the local people irrespective of gender and equity and benefit distribution reflected the commitment of TERI and HFD. The United Nations Environment Programme (UNEP) and the International Fund for Agriculture Development (IFAD) jointly awarded TERI, HFD and the enterprising people of the region for their significant contribution to controlling the degraded dry land. The JFM programme of Haryana was presented with saving the Dry Land Award for the year 1997-98.

Nicholas Hildyard, Pandurang Hegde, Paul Wolvekamp and Somasekhave Reddy (1997) in their article "Pluralism, Participation and Power" have given a total different view on participation of local people in forest protection. Their definition of forest has two divisions. For those who rely directly on them for their livelihoods, forests represent secure water supplies, fodder for animals, medicines for friends and family, home for local deities and shelter for army patrols, tax collectors or (for playful children) from adults. But for many middle ranking forest department officials, 'forests' are defined instead by the information that passes across their desks: the latest scientific paper on planting regimes; budgets for planting; tenders for logging; catalogues advertising new logging equipment or the latest jeep; curriculum vitas; training schemes and opportunities for promotion (Pluralism, Participation and Power).

Because of this difference in interest, differences in attitude develop (Nicholas Hildyard, Pandurang Hegde, Paul Wolvekamp and Somasekhave Reddy, 1997). Degradation of forests has radically different meanings for different groups of people because of differing consequences. According to these authors, when development agencies actively begin to pursue participatory programmes, those who have had past experience of their projects have good reason to be wary. Often, it turns out that local people become a ghostly presence within the planning process - visible, heard even, but ultimately only there because their involvement lends credibility and legitimacy to decisions that have already been made. Far from being a transformative process in which local people are able to exert control over decision-making, participation becomes a well honed tool for engineering consent to projects and programmes whose framework has already been determined in advance. Participation becomes a means for top down planning to be imposed from the bottom up.

It is perhaps unsurprising that many community groups are ways of the new vogue amongst development agencies for joint forest management (JFM), community resources management and other forms of participatory development. These are seen as attempts to actively undermine their attempts to reclaim control over the institutions, forests, fishing grounds, fields and rivers on which they rely for their livelihood. For some groups and communities, the focus of that struggle has been the defense of existing common regimes against enclosure: for others, the reclaiming of those commons that have been enclosed; and in still others, the building of new commons.

But local people have been found to have a clear sense of the ecological services provided by woodlands. They also respond to resource scarcity by adopting a conservative approach to resource use, as evidenced by reductions in fuel wood consumption. These challenges some of the conventional wisdom that peoples' use and about perception regarding woodlands are a barrier to sustainable use, rather than the building blocks for the future (Allison Goebel, 1998, 2000).

Since 1980s, rural development research has gradually shifted from the use of conventional extractive approaches towards participatory investigation and analysis (IIED, 1997). The emphasis shifted to participatory rural appraisal (PRA) to enhance interactive participation by local communities in the process of learning about rural people's value with regard to trees and forests. PRA tools and techniques have also been used for quantifying and valuing forest benefits (N Nontokozo and R Michael, 2001).

Environmental good is protected through introduction of non market community based institution, known as joint forest management (JFM) was introduced in 1990 with the aim of proper protection and management of forest. JFM institutions have been introduced as a control and decision making authority of forestlands. JFM is supposed to frame the policy of forest planning and forest management and sharing rights and duties between departmental officials and local people involved in these activities. By 2001, 42000 village forest committees were formed under JFM programme all over India and managing over 11.5 million hectare forest land (Prasad. R, Kant S, 2003).

Indian Forestry sector became decentralized and people oriented forestry (V Varalakshmi, 1998). The recent JFM approach makes a symbiotic relation between people and forest. The local people voluntarily agreed to cope up with forestry management taking initiative in participatory forestry programmes. But the result was not as expected. The curbing of rights of aborigines adversely affected their livelihood and at the same time deprived from collecting the forest products. The rude forest policy alienated the people and detached from taking active part in conservation schemes. The population pressure along with other developmental programmes causes more reduction of forest capital such as timber, fodder, fuel etc. The National Forest Policy 1988 was formulated to meet the essential items food, fodder and small timber for the tribal and villagers living in and around forest areas.

Forest resources have two uses - subtractive use (like timber) and non subtractive use (like ecological and environmental services) what for it is categorized under common pool goods. Both Prasad and Kant also added that New Institutional Economics advocates an analytical approach to study the management of forest resources, because of market imperfections and inefficiencies and thereby suggest taking these institutions as an explanatory variable. It automatically acknowledges that not at all a priori conclusion is adopted possibly as to the welfare on sequences of a given institutional change (Rangachari and Mukherjee, 2000). In obtaining optimality criterion as some goods will gain more with complete loss of another good for which is very much critical to arrive at a conclusion and value judgments (Furubotn, 1987). But obviously, in economic theories, gains and losses are limited in nature in income prospect, but in sustainable human development (SHD), value judgment are multi dimensional as it indicates and reconcile the sustainable management and human development simultaneously.

The authors further pointed out that the SHD includes meeting the essential needs of commons like food, clothing, shelter, jobs of the present generation without compromising the ability of future generations to meet their own needs, and expansions of people's choices that include essential choices, success long vis-à-vis healthy life, knowledge, economic resources, as well as political, social, economic and cultural freedom and a sense of community. The importance of JFM in management and

protection of forest and participatory perspective planning to involve local people along with departmental officials for successful implementation of JFM programme as non market institutions in India since 1990. The co-author emphasized the need of JFM as a means of forest rehabilitations.

In pre British regime, forest deal was just and fair and rights envisaged to the forests localities equally. The health and size of the forest was optimal. During British rule extreme domination was proclaimed over forest that the right ensured with the state management. With complete exclusion of local communities from sharing and suspending all rights which were previously reserved on forest and forest products. After independence, the same practice was prevailed and, as a consequence, it led to devastation of forest tracts change the shape of forest ecosystem, rising conflicts between state agencies and local people etc. Then the machinery realized the actual fault of forest management regime in mid 1980s and in due course i.e. in 1988, the government revised the forest management policy (Second National Forest Policy) and it was the cause of outbreak of JFM.

Guha (1983) envisaged the need of the forest management institutions, which virtually optimize this branch of natural resource. It pointed out that in pre British regime; the ownership right was exclusively vested upon to the ruler across India. Forest management was aimed at the welfare of all sections of the society. In the regime of Maurya dynasty (324 BC to 180 BC), on the basis of requirements different social status, needed the forest classification. Sanctuary for the king or the state for hunting habits, forests was also donated to Brahmins for charitable Ashrama; and forests for the public (Dwivedi, 1980). With few exceptions, access to forests was largely unrestricted throughout the British period (Guha, 1983).

During British regime, the administration directly controlled the forest management and redistribute economic gain in favour of the empire entirely (Kant and Cooke, 1999). Large scale deforestation took place for commercialization of timbers but tight restrictions imposed on local people by curtailing the forest right which led to conflicts between local people and the empire (Guha & Gadgil, 1989). The resultant consequences of forest restrictions grew gradually voluntary non violent movement as a

symbol of non cooperation with the affairs of the empire. Sometimes, even violent movement also took place. Such non violent and violent movements compelled the British Government to revise the former policy and agreed to form the community based forest management in some forest areas in Himalayas in the form of van panchayats in Uttar Pradesh and the forest co-operations in Himachal Pradesh in India (Guha, 1983).

The British created conflicts between forest officials and local people and that was the beginning of the breakdown of a symbiotic relationship between the communities and the forests in which they were situated (Guha, 1996). In post independence era, from 1947 to 1987, the Government of India tried to redefine the social utility forest and social welfare forest. But importance was given on maximum exploitation of commercial timber by the administration with exclusion of local people from forest division (Kant & Cooke, 1999).The actual realization was appeared during 1970 when Government of India introduced the social forestry program. That was the first step to make an experiment by pulling back the local communities through participatory planning in forest management. It also admitted that the irreversible damage of forest products and bio-diversity loss was due to alienated and neglected forces for isolation. By mid 1980, both government and environmental groups found that the cause of failure of management of forest regime with exclusion of local people also fueled the conflicts between local people and the department. As a consequence the second forest policy was announced in 1988.

The second forest policy reintroduced the concepts of community based forest management institutions. Out of 28 provinces, 25 Indian states took resolutions to involve the forest dwellers in management of forest. Under JFM program, forest management and protection is mandatory with the joint effort of local people and Forest Department, the ownership of the area will be under the state itself. Committees are to be constituted for its proper management as Forest Protection Committee (FPC), Village Forest Committee (VFC), etc.

The concept of JFM has already crossed a decade. That decade long co-management efforts constituted 42000 VFCs, which were engaged in protection and sustainable management of forest cover an estimated area of 11.5 m hectare (about 18% of total forestland of degraded forest area in India). Some self styled voluntary organizations were found with the help of local NGOs and field supervisors these committees are

common in south west of West Bengal, southern Bihar, Orissa, central India and Western Ghats (Poffenberger, 2000). Different state forest department is trying to bring more and more forestland under JFM scheme. West Bengal alone has 3289 forest protection committees managing 449300 hectares of forests and transformed 50% of its forestland under JFM. Similarly, Madhya Pradesh has handed over about 25% (about 4 million hectare) of its total forest area (15.6 million hectare) to JFM committees.

These forest based management institution not only contributed to compensation of the degraded forests, but also helped to initiate the SHD. In fact, natural regeneration and other ecological processes are proceeding remarkably well under JFM (Kant and Cooke, 1999). On the other hand, JFM enhanced the interest of the people, especially youth and woman, in protecting forest from fire, and have increased their awareness about the efforts of deforestation on soil, water and agricultural product.

A case study from the lower Himalayas (Badola Ruchi, 1997) talked about the helpless poor of lower Himalayas whose attitude is favorable to the forests. They struggled to maintain their minimum subsistence level but have no alternative jut to extract the forest products. In some cases exploitation of forest products is "habitual" or "traditional". The rude laws usually antagonize the local people against the departmental officials and gradually the difference widened and they are compelled to steal forest products and developed negative attitude towards the officials of the forest department for their inability to manage the forest.

This paper also highlighted the conservation of fragile ecosystem with diversified rich and endangered, endemic flora and fauna on the Shivalik hill ranges with an objective to keep rare forests resources through Rajaji and Corbett National Park. This forest corridor was primarily used by large herbivores like Asiatic elephants (Sunderraj et.al, 1993). But unfortunately, this corridor contracted due to over exploitation of forests products by the local residents.

It is important to choose alternative means for local people to mitigate the biotic pressure on nature (Panwar, 1992). That can be substituted by rising incomes of the forest dependents as suggested by Leach (1994) or by providing specific alternative to forest products (Badola, 1995). Without having adequate incentives to support conservation.

programmes, such programmes will be proved futile in future, as the people in fringe areas of forests already enjoyed the legal or illegal freedom to exploit forest products (Badola, 1997, Boonzaier, 1996, Tisdell, 1995; Renard and Hudson, 1993). So, there is a need to study the attitude of local communities in respect of conservation programme, and to study the perceived needs and aspirations of the village people (Infield, 1988 and Jacobson, 1995).

Badola (1997) further suggested from his experiences of Rajaji and Corbett National Park that to design appropriate management policies to combat further damage of forest area through exact quantification of peoples need and to assess the impact of these dependencies on forests. Fuel wood and fodder is the principal non timber forest product collect either for personal or commercial purposes (Badola and Mishra, 1996). The main theme of this study is to examine the attitude of the local people and to validate the alternative resources instead of using forest product. He assumes the excess dependencies on forest due to lack of their alternative livelihood and to chalk out the policy of accepting the proposed alternative means of livelihood.

From 1991-93, intensive socio economic study has been carried out to collect the information regarding demography, land use pattern, occupational status and resources in these villages (Badola and Mishra, 1996, Badola, 1997 a). Stratified random sampling method was used to collect the primary data. Mixed response questions regarding conservation were asked to a few households about their attitude towards forest conservation causes of excessive dependency and proposed alternative to forest resources. The respondents were asked whether agree or disagree about some statements relating to forest conservation, dependency on forest and viable alternative. That process makes easier to interpret than open ended questions (Infield, 1988).

The study revealed that the respondents of each village regarded forest as a source of fuel, fodder and timber. The conservation concept was supported by 38.5%, 18.3% opinion was "no need" (against this concept) and 43.3% responses were neutral ('don't know' concept) while 25% used forests as their source of water, 13% responses were income earning source etc. when the questions are directed at the forest area under study, only 33.3% people agree with the need to conserve the forest. But 66.7% respondents blamed the forest department for stopping them from the collection of forest

products as a pretext of conservation. Most of the respondents expressed their inability to use alternative fuel as the reason for depending on forest for fuel wood. The people of southern villages use 10% fuel wood as the supplement to the commercial fuels.

The study tried to find out the possibility of alternative fuel that can substitute to fulfill the requirement of fuel need of the people living in the fringe area so that they voluntarily stop exploiting timber and non timber forest product. The alternative may be either biogas or fuel efficient stoves for acquiring fuel efficiency. But the targeted people lacked awareness regarding these products. Moreover, most of the people were not desirous to use dung of their livestock as fuel as it is an alternative to highly priced manures.

To improve the economic condition of the people living in the fringe area, income generation schemes have been developed. Handloom, handicrafts, agriculture etc. are the various income generation activities, which the local people can get involved instead of depending of forest products. These subsidiary occupations were not accepted by the residents of the study area due to lack of skill and technical know how. The lack of raw materials and market imperfections are the secondary causes of rejection of these alternative means of livelihood.

Mehta and Heinen (2001) in their research 'Does Community Based Conservation shape Favourable Attitudes Among Locals? An Empirical Study from Nepal' used the following method to study the attitude of locals in Nepal. Both the Researchers have found that the socioeconomic and demographic conditions influence people's attitude towards conservation. Good economic condition reflects more positive attitude and vise versa. Their area of research was Annapurna and Makalu Barun conservation areas, Nepal, where community based conservation (CBC) approach was strictly followed. This study has been done to examine the attitude of the local people towards these parks. The CBC approach needs to justify the local peoples' needs and aspirations such as improvement of economic welfare, social empowerment so as to seek active participation in local resource management (e.g., Western and Wright 1994, Stevens 1997, Mehta and Kellert 1998, Songorwa 1999).

The above study was done in 1996-97, and the data collection procedure was at random household questionnaire survey, informal interviews, information based official records

and borrowed literature. Both researchers used multi method approach i.e., both qualitative and quantitative techniques were followed in collection of both primary and secondary data. Multisite and multi method studies have been carried out for better understanding of the social phenomena (Creswell 1994, Rossman and Wilson 1994). The quantitative data were collected through structured interviews and qualitative data were collected from informal interviews with local informants and project staff. Probability sampling has a greater advantage to yield results for a larger population (Ward and others 1991). On the contrary, qualitative data help to verify, triangulate and enrich quantitative data (Stone and Campbell, 1984).

In structured interview, questions were framed to justify the people's attitude towards respective conservation area, forest use and wildlife depredation issues, and benefits from tourism, and demographic variables (gender, ethnicity, education, economic class, and age) etc. Most of the questions were close ended and a few open ended questions were also included in the questionnaire.

Qualitative data were collected from unstructured and informal interviews with the key informants like school teachers and community leaders. This additional information helped to design the management issues. Official documents were examined to know the present and past policy and programmes for future course of actions. Finally, the project staff was interviewed either individually or in a group to frame the important policy and management issues. Quantitative data were analyzed with the aid of Statistical Package for Social Sciences (SPSS) version 9. Attitude towards each conservation area were measured by three related statements (with five possible responses) which ultimately formed a single magnitude. The internal consistency was measured by the reliability co-efficient, cronbach's alpha (Cronbach, 1951).

Research Gap

It is evident from the above that a number of works have been carried out on community participation in forest protection measures. Several forest protection instruments have been developed for different areas where local people were involved. But no recorded work has been done in the study region and no work has ever tried to evolve forest protection methods involving the local people after identifying the group, which is most

willing, on the basis of their attitude towards forests, deforestation and involvement in forest protection activities. To involve local people in forest protection activities after knowing their attitude, the objectives of this study were developed, which are discussed in the next chapter.

Chapter Four: Objectives and Methodology

After studying the existing literature on the topic of involving local people in protection of forests, the following objectives have been developed.

The Objectives of the study are

- To measure the attitude of the people living in the fringe area towards forest protection /deforestation;
- To study the main causes of deforestation and the social issues related to it;
- To study the measures to reduce dependency on forest;
- To design methods for forest protection.

In this chapter, an attempt has been made to explain the methodology followed in carrying out the study of 'Designing Appropriate Forest Protection Methods to Check Deforestation in Assam: A Case Study in Charduar and Nameri Ranges of Sonitpur District.'

The study was carried out in four different phases

a) Phase one was to find out the demographic profile of the population in the study area.

b) Phase two was to find out the belief of the people in the study area about forest conservation and protection.

c) Phase three was to find out the total area of deforestation in the study area and the people involved in it. During survey, the causes of deforestation were also studied.

d) Phase three and four dealt with finding out alternative methods of livelihood for the people responsible for deforestation. It has been found that these people engage themselves in forest/environment unfriendly activities for subsistence only. For this, an expert opinion survey has been used. A panel of five experts from fields like academics, forest administration, horticulture, etc was formed.

Three rounds of questionnaire administration were carried out to come to a conclusion regarding causes of deforestation and measures to check deforestation.

One of the major works involved in the study was to measure the attitude of the people living in the fringe area of the reserve forest regarding deforestation, conservation and involvement in conservation related activities. The formula used in this study to evaluate is the sum of the product of beliefs and evaluation of beliefs, of the people in the study area about the particular cause, i.e.,

$$A = \sum_{i=1}^{n} b_i e_i$$

Attitude towards behavior is denoted by b_i is certain belief and e_i is the evaluation of the i^{th}, belief and $\sum b_i e_i$ is the sum of the product of belief and evaluation of these belief (where, i = 1.....n).

A similar work entitled "Attitude- Behaviour Framework in Contingent Valuation of Forest Conservation," by Eija Pouta was done in Finland. This model was applied and the framework of the questionnaire used in the present study is drawn mainly from the aforesaid study in Finland. But due to the differences in socio cultural and demographic pattern of the people for study, which was different in the two study localities, a few modifications in the model as well as the questions have been incorporated to make the study meaningful.

As the basic aim of the study was to find out methods for checking deforestation and formulating forest protection methods, the behaviour of the people mainly responsible for deforestation has been studied. Economic psychology and social psychological theories assume all kinds of behaviour (including economic behavior) to have conformity with a set of attitudes. Thus, it is believed that attitudes can predict an individual's behavior. Measurement of attitudes, therefore, leads to predicted behavior in case of the people under study.

The theory of planned behaviour (TPB) is a model to understand individual's behaviour and evaluations of that behaviour. It is based on long research tradition in social psychology focusing on attitude as the predictor of behavior.

An attitude can be defined as an outlook to respond favorably or unfavorably to an object. This object may be a commodity, service, event, concept or an individual. Attitude is a function of the individual's beliefs that the object has certain attributes and his/her evaluation of these attributes. Evaluation of attributes means the degree of importance the individual assigns to the particular attribute believed to be present or absent in that object.

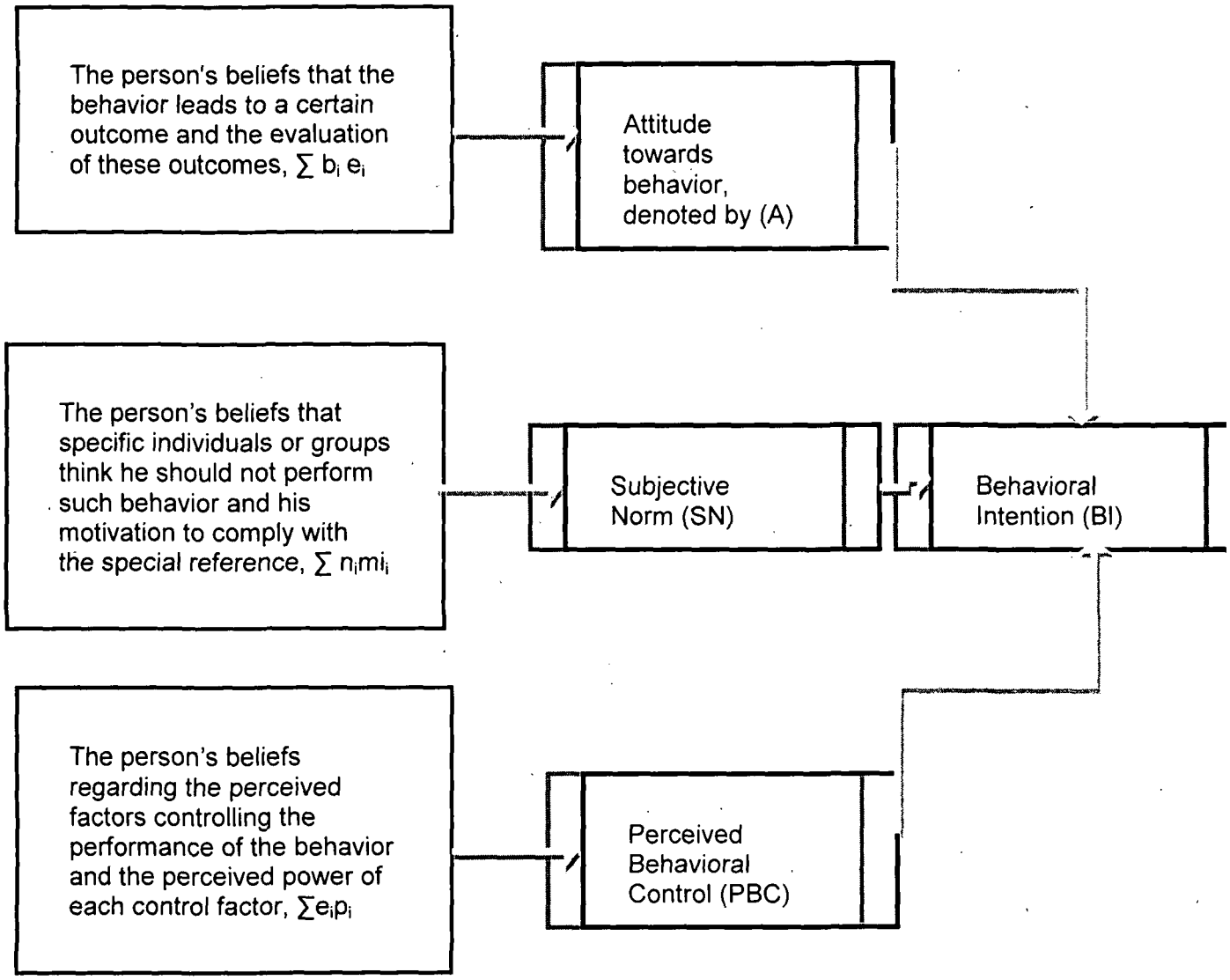
To explain attitude mathematically, it is the addition of the product of beliefs and the evaluations of these beliefs. Social psychologist like Ajzen and Fishbein (1980) believed that attitude measures an individual's feelings towards an object. But, when it comes to favorable or unfavorable actions towards the object, i.e., finding out the behavioral intention (BI), attitude has to be combined with subjective norm (SN) and perceived behavioral control (PBC).

Actual behavior can be illustrated with individual's behavioral intention. That behavioral intention (BI) is a composite function of attributes, such as respondent's attitudes (A), subjective norm (SN), and perceived behavioral control (PBC).

In this theory, attitude simply means the respondent's favorableness or unfavorableness towards any object. It is an outcome of the sum of belief regarding the outcome of an action (b_i) and the importance put to that particular outcome (e_i).

$$A = \sum_{i=1}^{n} b_i e_i \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The theory of planned behaviour (TPB) can be explained by the following flow diagram.



Behavioral belief is an individual's belief about consequences of particular action. The concept is based on the subjective probability that the behavior will produce a given outcome. Attitude towards behavior refers to an individual's positive or negative evaluation of self performance of the particular behavior. The concept is the degree to which performance of the behavior is positively or negatively valued. It is determined by the total set of accessible behavioral beliefs linking the behavior to various outcomes and other attributes.

Subjective norm (SN) refers to what the individual perceives others would think if he/she acts in a particular way. In this study, subjective norm would reflect how the local people perceive they would be treated by their peer group if they get involved in conservation related activities. Subjective norm gives the incentive to act or not to act in a particular way. Mathematically, it is the sum of the product of normative beliefs (ni) and motivation to comply (m_i) where i = 1 to k

$$SN = \sum_{i=1}^{k} n_i m_i \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Normative belief is an individual's perception about particular behavior, which is influenced by the judgment of others who are significant (e.g., parents, teachers, friends etc.). Subjective norm is an individual's perception of social normative pressures, or beliefs of peer group that he / she should or should not perform such behavior.

The theory of reasoned action (TRA) incorporates a feedback mechanism, i.e., the whole attributes like attitude; beliefs, norm and expectations are influenced by behavioral experiences. The theory of planned behavior (TPB) explains that behavior is never dependent on voluntary control (Ajzen and Madden 1986, Ajzen 1991). TPB includes perceived behavioral control (PBC) to explain behavioral intention (BI). PBC reflects past experiences as well as anticipation of impediments on the basis of knowledge gathered from experience of others. PBC is the sum of the product of control belief with i^{th} item (c_i) and the perceived power (p_i) (i varying from 1 to h), which can be represented as

$$PBC = \sum_{i=1}^{h} c_i p_i \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Perceived behavioral control implies an individual's perceived ease or difficulty of performing the particular behavior (Ajzen, 1988). It is assumed that PBC is determined by the total set of accessible control beliefs.

Control beliefs mean an individual's beliefs about the presence of factors that may facilitate or impede performance of the behavior (Ajzen, 2001). The concept of PBC is conceptually related to self efficacy.

All these attributes are the determinants of behavioral intention (BI). Hence, behavioral intention (BI) is a function of attitude (A), subjective norm (SN) and perceived behavioral control (PBC).

$$BI = f(A, SN, PBC) \ldots\ldots\ldots (4)$$

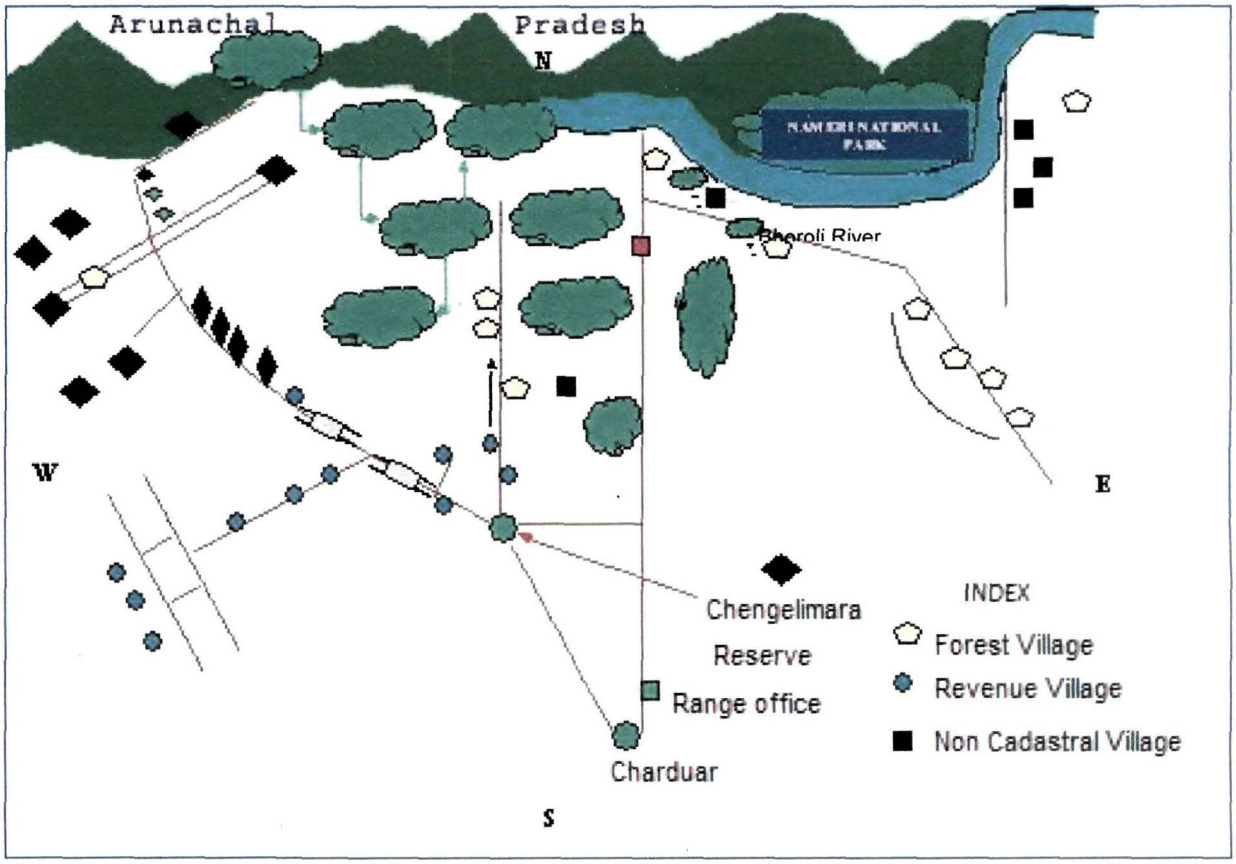
Behavioral Intention is an indication of an individual's readiness to perform a given behavior. It is assumed to be immediate antecedent of behavior (Ajzen, 2002). It is based on attitude towards behavior, subjective norm, and perceived behavioral control, with each predictor weighted for its importance in relation to the behavior and population of interest.

Behavior of an individual depends on observable responses in a given situation with respect to a given target. Ajzen said that a behavior is a function of compatible intentions and perceptions of behavioral control is that perceived behavioral control is expected to moderate the effect of intention on behavior, so that a favorable intention produces the behavior only when perceived behavioral control is strong.

Study Area

The people living in villages within and around Balipara reserve forest area i.e., at Charduar and Nameri Ranges of Sonitpur District, Assam.

Figure 4.1: Map of the Study Area



Methodology followed in Phases One, Two and Three

Phase one, two and three of the study were conducted to understand the demographic profile of the study area, to understand the attitude of the people towards forest conservation/protection and to analyze the role of the population in deforestation.

Information required for the above mentioned phases were collected using a questionnaire which was personally administered among the respondents in the study area. For this a sample of 1000 respondents has been selected. The Research project was undertaken from September 2003 and completed in December 2010. Socio economic observations were collected through interviews, questionnaire survey, self observation and discussions with Target Group (TG). Quota sampling was carried out for household survey. Perception based strategy analysis was done through self administered questionnaire.

Surveyed area: 36 villages within Balipara reserve forest and 2 villages outside the forest area in western part of Nameri National Park; and other 3 villages under Naduar reserve forest area on eastern part of Nameri National Park.

Extent: Villages on western and eastern part of Nameri National Park and within and outside of 38 villages in Balipara reserve forest and 3 villages under Naduar reserve forest.

Sampling Unit: Households.

Elements: Villagers.

Time taken to complete the survey: 9 months.

Sampling Procedure: 5% of total population from each village or 20% of total households was sampled from each village on the basis of quota sampling. To determine the percentage of population or the percentage of number of households a study on total population and households survey has been done in the study area to get a sampling frame (on page-53-56, ch-4).

Quota sampling: This is a special type of purposive sampling. Here the researcher takes explicit steps to obtain a sample that is similar to the population on some pre-specified controlled characteristics. In quota sampling, samples of prefixed size are taken from each stratum of a stratified population using judgement sampling techniques. Each enumerator of the survey is allotted a quota of units to be selected from each stratum and in quota sampling the enumerator fills his quota in each stratum. The enumerator selects representatives and quickly accessible units according to his personal judgment in each stratum using prior information. For this study, a quota of 5% of total population or 20% households of each village in this study area was determined in sample selection.

Sampling Frame: One of the features of Balipara reserve forest is the government's village rehabilitation policy within forest area. British administration established one revenue village in 1875 within dense forest area as a forest protection method. This

forest protection method became futile while the residents of the village themselves started expanding their villages and cultivated land. It paved the way of encroachment on forest land. Encroachment has started during 1970 and it is continuing till date. Increased population density leads to increase the number of villages. The total registered and non registered village within Balipara reserve forest at present is approximately 40 (forty).

Chapter Two of this dissertation highlights the description of the study area. The villages in this area have three distinct divisions. The survey reflects the category of villages, its geographical location with demographic profile. On the basis of the number of household of different villages 20% quota was determined for each village during survey. Initially, 1000 questionnaires were distributed to the enumerators to take samples from 41 villages and finally, 921 completed questionnaires were retained and 79 questionnaires were rejected due to sampling bias like non response error arising out of prevailing terror situation, especially in tribal dominated villages. Because of the aggressive nature of the respondents, some questionnaires were not completely filled up. These questionnaires were not considered for the analysis purpose.

On western side of Nameri National Park or within Balipara reserve forest, entire 36 villages were taken into the sampling frame. Two other villages were outside the boundary but neighbor to the Balipara reserve forest. Three villages were on the eastern side of Nameri National Park. Of the villages within and outside in forest area in the western part, 7 (seven) were forest villages, 14 (fourteen) were revenue villages, and remaining 17 (seventeen) were non revenue or non cadastral villages. Information regarding the villages is provided in Table 4.1.

Table 4.1: Description of the villages in the study area

Forest Village	Year of Settlement	Number of Households	Population (in '000)
Araliloga	1910	130	883
Bogijuli	1951	361	1750
Dharikati	1955	255	1200
Gamani	1950	110	700

Forest Village	Year of Settlement	Number of Households	Population (in '000)
Sapalaga	1951	72	447
Satai	1933	367	1494
Tarajan Potasali	1951	65	535

Revenue Village	Year of Settlement	Number of Households	Population (in '000)
Bakula	1915	62	490
Bamunjuli	1915	40	212
Bhalukmari	1925	90	753
Chengalimara	1908	130	925
Dakhinsila	1953	84	670
Dowangani	1915	40	180
Garogaon	1875	150	1090
Majuli amloga	1965	38	160
Mansiri	1953	52	345
Monijharoni	1953	44	250
Nagharia	1910	108	658
Uttar amloga	1915	70	575
*Gorhmara	1920	82	654
*Molanpukhuri	1933	88	705
***Villages outside the Balipara reserve forest**			

Non Cadestral Village	Year of Settlement	Number of Households	Population (in '000)
Ajarloga	1967	81	648
4 no. Bogijuli	1977	79	633
Chamloga	1910	68	552

Non Cadestral Village	Year of Settlement	Number of Households	Population (in '000)
Dakhin Rangagara	1970	56	445
Gamariloga	1970	33	122
Ganeshpur	1975	16	85
Habigaon	1977	20	102
Halapara	1985	18	110
Jaipur	1956	24	170
Jayantapur	1977	32	160
Mariani	1978	29	135
Mekahi	1972	27	130
Naharlaga	1975	46	280
Oujuli	1969	89	750
Sijuguri	1985	14	60
Tamulpur	1977	26	110
Tarabari	1972	120	848
Thekeraloga	1970	80	643
** Ajarguri Miri	1980	60	522
** Ajarguri Nepali	1982	140	890
** Janghalbasti	1985	70	560

**** Villages on the eastern part of Nameri National Park.**

(Source: Charduar Forest Range Office, West forest division, District: Sonitpur, Assam; and the report of the Village Head men from Voters list, published by Government of Assam, 2006).

The following steps were taken to fulfill the objectives one by one with consideration of the above four phases accordingly. The first objective was to study the attitude of the people living in and around the study area towards forest protection, conservation, deforestation and their active participation. In this regard, to serve the purpose of the study the following borrowed and self designed methods were undertaken. The steps are described below.

A preliminary survey in the study locality (findings given in chapter five) reflected the variables which were used to develop the questionnaire. The questions were included in the questionnaire with special consideration of the basic features found in the preliminary survey. The first part of the questionnaire was aimed at finding out the demographic profile of the people in the study area. The second part of the questionnaire included seven pairs of questions to guess the belief and evaluation of the respondents about forest, forest protection and deforestation, conservation, and participation in conservation process. The third part of the questionnaire included 18 sub questions about the belief regarding deforestation in the remaining forest area and perception of the people regarding forest protection measures.

Prior to data collection, a pilot survey was conducted in the study area taking 27 samples from forest villages (FV) of adjoining fringe area to make a reliability test on the draft questionnaire. The reliability test of the questionnaire was necessary to verify that the questionnaire developed was a reliable tool for collecting proper information about forest protection, conservation, and causes of deforestation and community participation in forest protection measures. The reliability test has been done taking responses from 27 respondents and the calculated alpha value was 0.85 (cronbach's alpha), where alpha value more than 0.6 is sufficient for declaring a questionnaire reliable. Then the draft questionnaire was finalized and it was administered among 1000 respondents in 41 villages, out of which seven are forest villages, 14 revenue villages, and 20 non cadastral villages (NCV). The alpha value of final survey was 0.806 of 921 responses. Finally, 921 responses retained and the rest rejected due to non completion error.

In the **Phase One** of analysis, it was tried to find out the demographic profile of the study area. The distribution of the population on the basis of demographic variables like

community, caste, occupation, education, and income group, category of farmer on the basis of landholding and distance was recorded during this phase.

During **Phase Two**, the attitude of the sample towards forest and deforestation was enumerated. 921 responses including dependent and independent variables were analyzed using the SPSS (statistical package for social science version 9 &16) and MS Excel software. Descriptive statistics, frequency distribution, percentage, mean, summation was used to analyze the data. Five point Likert scale was used to find out the degree of agreeing and disagreeing to seven explanatory variables by the respondents. These explanatory variables, along with the demographic variables, were used to find out the behavioral belief, normal belief and control belief of the respondents. Respondent's beliefs were expressed in percentage. To find out the presence of segmental variation in the mean belief of the respondents, one way ANOVA with Post hoc test using Least Significant Difference (LSD) method and including Descriptive analysis has been done. To find out the mean differences of explanatory statements with independent demographic variables like community, caste, occupation, education etc., post hoc test has been done using Fisher's Least Significant Difference method (LSD). In post hoc test, multiple comparisons was done with respect to different clans of the community that is the comparison of belief of one section to another, say Bodo with Koch or Koch with Garo etc., with an explanatory variable, say "intention of getting involved in conservation activities". Such comparisons have also been done with respect to caste, occupation, education level etc. These analyses have helped to find out the target group, which is interested in forest protection and conservation measures. This target group has come out from the analyses of the explanatory statements connecting with that of demographic variables together.

Completion of phase one and two fulfill the first two objectives of the study.

To trace out that target group which is interested in forest protection and conservation a step by step identification process was undertaken using one way ANOVA and Post hoc test. The variations to the responses to the explanatory statements by different groups on the basis of the demographic variables like community, caste, education, occupation, income, categories of farmer etc., were analyzed. From the cross tabulation analysis of each demographic variable, the group with the highest mean (implying highest

inclination towards the explanatory variable) was indentified. Clubbing of these groups ultimately found the target group to be used in conservation related activities.

Phase Three of the analysis also tried to find out the total area of deforestation in the study area and the people involved in it. During survey, the causes of deforestation were also studied.

To know the rate and total area of deforestation in the study area, information was collected from the office of the west forest division of Sonitpur district, Assam and from the published articles of Roy and Joshi, 2002, of Forest Research Institute, Dehra Dun. Another Article published by Shalini Srivastava, T.P. Singh, Harnam Singh, S.P.S. Kushwaha, and P.S. Roy, 2002, Indian Institute of Remote Sensing, Dehra Dun, India, contained in," Assessment of large scale deforestation in sonitpur district of Assam." Rate of deforestation and huge forest loss in Sonitpur district highlighted in the article "Forest Fire and Degradation Assessment Using Satellite Remote Sensing and Geographic Information System" by P.S Roy, 1990, IIRS, Dehra Dun. The ground reality and forest stories of the aborigines also supported the above articles about forest loss.
The Phase Three of analysis deals with finding out alternative methods of livelihood for the people responsible for deforestation. It has been found that these people engaged themselves in forest/environment unfriendly activities for subsistence only.

Poverty is the main consideration of excess forest dependency. Viable alternative measures are asked from the group of experts to reduce the intensity of forest dependency in the study area. Another problem is fuel scarcity. Expert opinion also asked for fuel wood substitution which is fast growing too. To design an appropriate forest protection method has been arrived in a conclusion on the basis of expert opinion survey, respondent's opinion on used hypothesis and through government measures, adapting self styled policy etc.

Methodology followed in Phase Four:

A panel of five experts was selected among academicians, state forest administration, horticulturists, experts from forest-based institutions etc. The experts were selected on the basis of their credentials and experience in the field of conservation and environment

protection. One of the experts was an academician in the field of Environmental Science. Another expert was selected from Rain Forest Research Institute, Jorhat (RFRI). His career started as a Divisional Forest Officer in the state's Forest Department. As an IFS in Assam cadre he rendered his service as the chief of Kaziranga National Park before taking the charge as head of RFRI. Another expert was a retired Principal Chief Conservator of Forest (PCCF) in the Forest Department of Assam. The Divisional Forest Officer of West Forest Division, Sonitpur district was another expert for the study. Another expert was taken from the Department of Agriculture, Government of Assam. He was a horticulturist and has been rendering service as District Agriculture Officer to the Government of Assam.

Expert's comments were asked for control of present deforestation rate, new alternative and situation based techniques of forest conservation in addition to existing forest policies, increase the interest of local people for voluntary participation in protecting forest those initially involved in forest area encroachment group, elimination of poverty to reduce complete forest dependency etc. The views of the experts on the given topic were sought and the process was carried out for three rounds. At the end of the third round of meeting with the experts the conclusion have been drawn about causes of forest destruction, present forest rehabilitation programme like JFM, substitute wood to use as alternative fuel and for commercial use, poverty alleviation programme and forest protection methods etc.

Phases three and four fulfill objectives three and four of the study.

Chapter Five: Report on the Primary Survey of the Study Locale

The major objective of the study is to find out the attitude of the people living in the fringe area of the study locale towards the reserve forest, deforestation and conservation. For doing this a model developed by Ejja Pouta of Finland has been adopted. But since this model has been developed for Finland, and this particular study is to be carried out in Assam, the variables on the basis of which attitude is measured were to be changed because the socio cultural and demographic profile of the area for which the model was developed are different from those of the study locale. To determine the variables, on the basis of which attitude of the people of the study area was measured, a preliminary study was conducted. This study was an unstructured survey with the aim to find out the belief towards the reserve forest, deforestation and conservation of the people of the study area. To find the factors on which the attitude of the people living in the fringe area of the Nameri National Park towards Nameri as an object and deforestation and conservation as behaviour will be measured an unstructured survey has been conducted.

During survey, opinion has been collected from the stakeholders like forest officials, village headmen, teachers, cultivators and other influential individuals of the area regarding Nameri National Park and remaining part of the forest located in Charduar range.

A summary of the observations made during this survey is presented below.

Charduar range is situated in Balipara reserve forest. This is the only range in this reserve forest. This reserve forest was originally spread over an area of 189 square kilometer. But due to excessive deforestation and illegal felling of trees, major part of the reserve forest has turned barren reducing the actual forest coverage to just 10- 15 square kilometer. The barren land has gradually been encroached for settlement and people started agricultural activities clearing forest coverage. The remaining 10-15 square kilometer of forest coverage is adjacent to Nameri National Park and currently constitutes the buffer zone of Nameri Tiger Project.

Initially, for the protection and conservation of the existing forest coverage, the government of Assam constituted seven forest villages within the Balipara reserve forest. According to the forest official and other stakeholders, this forest policy of protection and conservation of the government failed due to lack of proper maintenance and insensitivity of the rural communities towards the forest. As a consequence, many revenue villages settled in the reserve forest and the communities extended their agricultural activities along with settlement operations.

On the other hand, Nameri block was originally included under Naduar reserve forest along with Bordikarai and Hatipoti blocks. For the protection, conservation and logging operations of reserve forest, the government planned to allot land to the five forest villages there. But, unfortunately Naduar reserve forest has been completely disappeared and people from different localities started encroachment over barren land for settlement and simultaneously extended agricultural activities. But, an area of 200 square kilometer was declared as wild life sanctuary and later it was declared as Nameri National Park.

Opinion from higher officials of the Department of Forest about the causes of destruction and remedy to prevent from further destruction of existing coverage has been sought. As per the opinion of the forest officials, local people get involved in deforestation activities due to a number of reasons. One of the reasons is that they get monetary benefit from the activities and at the same time, makes it easy for them to settle in the open land thus created. Lack of awareness regarding forest laws and the ill effects of deforestation is another cause of deforestation according to the forest officials of the region. Political intervention is also observed as one of the causes of deforestation in the study area. The forest officials are of the opinion that the local people are well organized and highly trained in logging and transporting operation even during natural calamities like flood etc. As the local people excel in expertise in such activities compared to the forest guards, it becomes impossible to stop deforestation by force. Hence the Forest Department tried motivating the local people to stop getting involved in deforestation. The motivating tactics adopted by the forest department included organizing awareness camps, providing free medical treatment, distributing cattle to groups of villagers etc. They also organized workshops to train up the villagers for employment avenues. All these combined with frequent surprise visits inside the forest by forest guards are some of the

measures taken by forest officials to reduce the rate of deforestation. Fourteen observatory camps are established within the park area for proper vigilance. But forest official's allegation was clear that lack of proper networking as a major constraint in checking deforestation.

5.1. Tarajan Potasali forest village

As per report of the headman of this village, during the last twenty three years, the Forest Department has distributed five to six piglets to a few members of the unemployed youth of the village under employment generation scheme. Moreover, JFM launched forest regeneration programme in fellow lands under reserve forest and provided selected species like neem (Azadiracta indica), gamari (Gmelina arborea), ajar (Lagerstroemia flos reginae), and simolu (Bombax cieba). He reported that the factors leading to deforestation are poverty, weak forest administration, political interference and shortage of agricultural lands.

5.2. Dharikati forest village

The village headman of this village blamed the Forest Department for non implementation of rules. According to him, JFM provides saplings of ghoraneem, bhelkor, ajar, simolu etc. and wildlife division offers agar, leeche etc., to join in afforestation programme.

5.3.Satai forest village

The village headman alleged that Nameri is open and free for all. He even alleged the forest official's involvement in destruction of forest and wildlife in the region.

He agreed that JFM provides seeds for plantation but villagers get no benefit from that programme. He admitted that the Forest Department distributed the following items among the poor communities – sewing machines, weaving sets, ring wells, dug wells; desk benches etc., and the department of wild life repaired the school building.

5.4. Gamani forest village

The village headman told that poor people collect fuel wood, fodder for cattle from the reserve forest and even sometimes these collected materials are used for commercial purposes to maintain the minimum subsistence level. In spite of the excessive dependencies of the village artisans, he denied to blame the poor people alone. According to him, departmental officials are equally responsible for major deforestation because the forest officials instigate the timber brokers to exploit more forest resources in exchange of monetary benefit.

5.5. Sapalaga forest village

The village headman has been rendering twenty eight years of service as unofficial forest guard and retrieved his past memories about the strength and shape of the earlier reserve forest size. The jungle supplied available fuel wood, cattle fodder and other forest produce and fishes were abundant.

5.6. Aralilaga forest village

The villagers blamed the departmental officials and political leaders for massive harnessing of forest products. Some members of the village reported that the primary cause of today's deforestation is absolute poverty of the poor people. Though this forest village was established for the safety of the forest, but needy poor people compelled to help the illegal timber merchants in exploitation of valuable timbers. Gradually, the poor people realized the necessity of the forest in terms of fuel wood, cattle fodder, and other non timber forest products which were available prior to the total extinction. They believe that there are two main causes behind this deforestation are poverty and illiteracy. Awareness about the far reaching consequences of depletion of forest and at the same time self sufficiency in the food and raw materials are necessary to stop deforestation.

As a counter measure, the Forest Department constructed two roads for communication and distributed sewing machines, ring well, pigs for farming etc. The department also helped to construct a club house with educated youths to educate the rural masses. The central government formed an Eco Task Force with armed guards to patrol and protect

the remaining forest area of Balipara reserve forest. That task force supplied food and basic necessities to the villages at subsidized rates.

5.7. Bogijuli forest village

The headman of this village blamed the migrants and political leaders for occupying the forest lands for settlement. The village headman with people from the village took part in the afforestation programme under JFM in Guinazia hillock.

In between Aralilaga and Bogijuli forest village there are permanent settlement of twelve revenue villages that among others damage the reserve forest for the extension of agricultural activities. These revenue villages occupied a large area of forest land. The villages are Bhalukmari, Nagharia, Chengalimari, Phulaguri (garogaon), Bakula, Bamunjuli (Amlaga), Majuli Amlaga, Dwangani, Dakhinsila, Mansiri, Manijharoni, Uttar Amloga, and non revenue villages-Thekeralaga, Rangagara, Barshapur, and Tarabari.

The inhabitants migrated from nearby areas of Balipara and Bihaguri and permanently settled by clearing jungles. But the Bodos migrated from lower Assam.

Another picture of encroachment of forest land depicted clearly the departmental failure and constant political pressure on the reserve forest. From Charduar forest gate the sub-way is sub-divided to other villages and power station. These villages are situated on the southwestern side of the Balipara reserve forest. One defense enclave and Charduar cotton mill occupy a vast area of forest land. These establishments took place in between 1962-63. Now this private sector enterprise has shut down. The employees occupied forest land near ahead of the Charduar forest range office. This village was named as Dolongbasti. Initially, the employees established a colony, and the colony gradually converted to a village. As a result, the encroachment started in other parts too.

5.8. Gowjengpuri

This village is situated in front of a barren forest area where dwarf bushy plants and a few sal trees are in the area. It is on the south of the sub way which separated the village and forest lands.

That barren and fellow reserve forest is gradually occupied by the Bodo community and has established two villages on the west side of the abandoned forest.

The forest range officer of the Charduar range office has made opinion that the encroachment over forest land is not only in Sonitpur district alone. It is a normal practice in entire northeastern region as well as in India. He added that the departmental failure, people's greediness, political pressure etc. are the major causes of large scale deforestation. He further admitted that due to the total system failure to tackle the present problem of protecting the forest from further loss, the central government deployed Eco Task Force to protect the area as last effort.The range officer demanded that the department planted the trees in this open field but villagers denied and added that this is the natural vegetation.

Five forest villages are situated in Naduar reserve forest Area. Initially, Nameri block was annexed with Naduar reserve forest along with Bordikarai and Hatipati blocks prior to the declaration as wild life sanctuary and national park in subsequent phases. Due to the close proximity and peaceful co-existence with the park area till 1982, but the forceful dislocation of the people of neighbouring areas obviously expressed anger over the park authority.

It has been alleged that the departmental negligence and assistance to the timber smugglers resulted in deforestation. Before the declaration of Nameri as a protected area they collected firewood, grass for cattle, cane, thatch and other direct forest produce. The grazers also used the edge of the jungle area for cattle ranching. The people of the neighbouring area of the park belong to the Nepali community and they are habituated in dairy farming. Their dairy farm was within the jungle area. The park authority restricted the villagers to enter into the protected area and instructed them to lift the dairy post as soon as possible. The department also refused to accept the royalty from the villagers for collection of thatch and other housing materials from the protected area.

The village headman of Morisuti Mishing bongaon (forest village) added that in 1996, the political barons patronized the encroachers to rehabilitate new villages clearing an area of eight square kilometer within the reserve forest. These newly established villages are

Ara Dekorai, Joipur, Ganeshpur, Lakhipathar, Akshibari etc. The new immigrants encroaches a major portion of the park area. These areas are dominated by tribal people (Bodos) and Adivashis.

An NGO official (Aranyak) opined that the cause of destruction of forest is anthropogenic because poverty stricken community's dependency ratio was more on forest together with direct patronization of political leaders to fulfill their political interest. Forest became the weak prey due to flexible forest laws and weak administration. The direct involvement of political leaders is the major concerns for the increasing rate of deforestation.

Poverty, overcrowding, habit, excess dependency, weak forest administration, weak forest laws, lack of sensitivity, ignorance and lack of respect to the existing laws and lack of love to the nature are the primary causes of deforestation.

On the basis of this survey, the variables on the basis of which attitude of the people are to be measured were developed. The list of variables so identified, are:

1. People living in the fringe area of the forest depend on forests for livelihood and extract forest products;
2. people perceived that forest is required for overall ecological balance;
3. people perceived that the human activities are the major cause of deforestation;
4. there is lack of forest protection policy and forest administration is weak;
5. strict enforcement of laws may lead to forest protection;
6. community involvement in forest protection may have positive outcome.

Chapter Six: Demographic Profile of the Sample

For this study, the sample for data collection was selected from 41 villages. These 41 villages included seven forest villages, 14 revenue villages and 20 non cadastral villages. Responses have been collected from 1000 respondents, out of which 921 were selected for analysis. The rest 79 responses have been rejected due to incomplete responses. Out of the 921 respondents, 317(34.4%) were from forest villages, 295 (32%) were from revenue villages and 309 (33.6%) from non cadastral villages.

During the survey, it has been found that the population of the study area is mainly from seven communities, namely, Bodo, Koch, Garo, Mishing, Adivashi, Nepali and Rabha and they belong to any of the four castes, namely, General (GEN), Other Backward Caste (OBC), Scheduled Tribe Plains- ST (P) and Scheduled Tribe Hills -ST (H). No scheduled caste was found in the study area. Four occupational activities prevailed in the study area. The respondents were either cultivators, or service holders, or in business or daily wage earners. Educational qualification of the respondents varied from illiterate to graduates. The respondents' belonged to different income categories, the lowest group fell in below rupee one lakh per annum and the highest belonged to the category of above four lakh per annum. On the basis of land holdings, the respondents can be divided into five categories – Marginal Farmer (having land holding of 0 to 1 hectare), Small Farmer (having land holding 1 to 2 hectare), Semi Medium Farmer (having land holding 2 to 4 hectare), Medium Farmer (having land holding 4 to 10 hectare) and Large Farmer (having land holding above 10 hectare).

The demographic break up of the sample is discussed in the following section of this chapter.

It has been found that 41% of the sample belongs to the Bodo community, followed by the Koch community who constituted 27% of the respondents. The total break up of the sample is shown in figure 6.1.

Figure 6.1: Different Communities in the study area

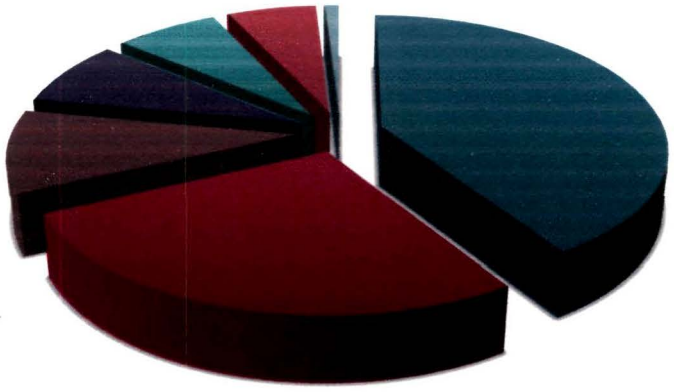
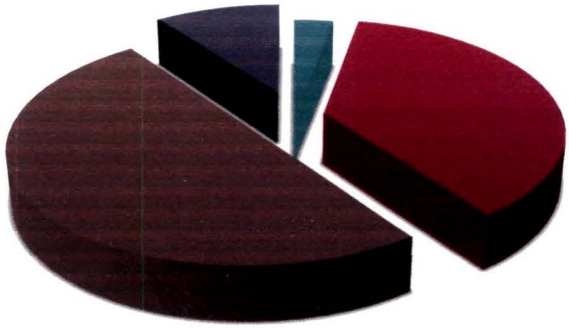


Figure 6.2: Different castes in the study area



If we look at the composition of the respondents on the basis of caste, it is found that 50% of the respondents are of Scheduled Tribe (plains). It is followed by Other Backward Castes consisting of 37% of the respondents

Break up of the respondents on the basis of occupation is given in figure 6.3.

Figure 6.3: Different occupation group in the study area

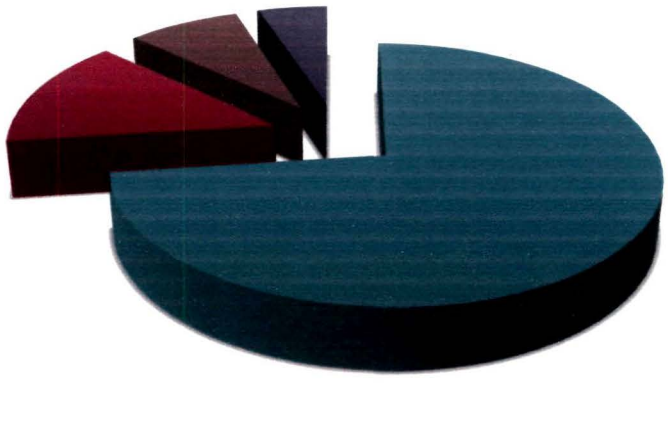


Figure 6.4: Different education group in the study area

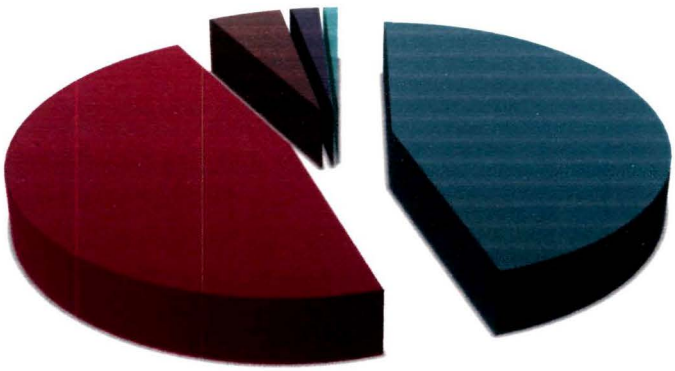
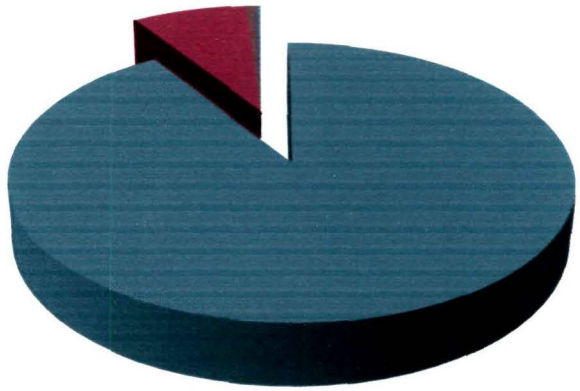


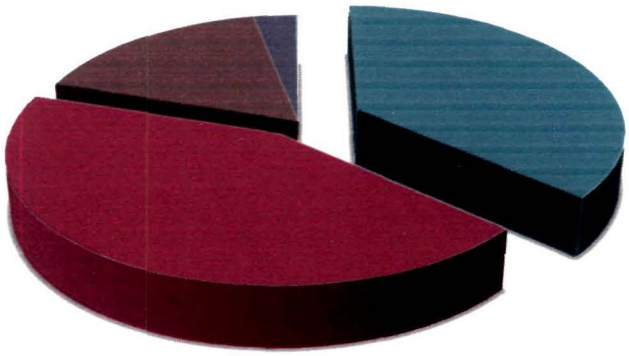
Figure 6.4 shows the composition of the sample with respect to education level. It is seen that 92% of the respondents are educated up to primary standard. The factor to be noticed here is that 45% of the respondents are illiterate.

Figure 6.5: Different icome group in the study area



It is evident from Figure 6.5 that 91% of the respondents earn less than rupees one lakh *per annum*.

Figure 6.6: Different category of farmers in the study area



It has been found that per capita land holding is small. 44% of the respondents belong to the small category whose per capita land holding is one to two hectare. This segment is followed by the category of marginal farmers who constitutes 37% of the respondents and whose per capita land holding is less than one hectare.

Apart from these variables, it has been found that 85% of the respondents are Hindu and 15% are Christian. It has also been found that 80% of the respondents use forest land for private purposes.

Chapter Seven: Attitude and Segmental Variation

In this study, different explained and explanatory variables have been used to take responses from the local people of the study area regarding attitude, subjective norm and perceived behavioral control. This has been done so that the behavioral intention (BI) of the people can be identified. Here the object of behavioral intention is the willingness of the local people to check deforestation and involve in conservation related activities.

It has been already discussed in the methodology chapter that attitude is measured by adding the values arrived at by multiplying the beliefs and evaluation of the beliefs.

Attitude = $b_1e_1 + b_2e_2 + \ldots\ldots\ldots\ldots + b_ne_n$

Attitude towards the forest has been measured from two different points of view. One angle of measuring the attitude towards the forest is the forest as the provider of livelihood to the people living in the fringe area. The other angle is the forest providing protection to wild life. The variables that have been used to measure attitude of the people towards the reserve forest were role of the reserve forest in providing subsistence to the local people and the role of human interference in the destruction of forests. Variable used for finding attitude regarding the other aspect was forest providing protection to wild life. Respondents were asked to respond with the degree of acceptance to the statements provided in the questionnaire. The belief regarding whether the forest has been providing subsistence to the people living in the fringe area, whether it has been able to give protection to precious wild lives and the role of human interference in deforestation have been quantified by assigning values to different degree of acceptance or rejection of the statements provided. Similarly the importance given to the different variables were also quantified by assigning values to the degree of acceptance and rejection of statement. Values of each pair of belief and evaluation were quantified and ultimately the value of attitude has been arrived at adding the values of each pair.

For this study,

Attitude$_1$ with respect to livelihood and deforestation = belief that forest provide for subsistence (b_1) X importance given to getting livelihood from the forest (e_1) + belief that human interference is leading to deforestation (b_2) X importance of stopping human interference (e_2).

Attitude$_2$ with respect to protection to wild life = belief that forest provides protection to wild life (b_3) X importance of wild life (e_3)

The respondents have been presented with statements and they are asked to respond to a five point Likert scale having degree of acceptance from 'strongly agree' to 'strongly disagree'. 'Strongly agree' was assigned the value of +2 and gradually to 'strongly disagree', -2. After compiling the responses collected from 921 respondents, the following calculations have been made.

$\sum b_1e_1 = 3512$

$\sum b_2e_2 = 2702$

Attitude$_1$ = 3512 (b_1e_1) + 2702 (b_2e_2)

Attitude$_1$ = 6214

This shows that the attitude of the people towards the reserve forest with respect to the forest as a provider of livelihood is positive.

$\sum b_3e_3 = -2849$

Attitude$_2$ =- 2849

Hence, it is found that the local population has positive attitude towards the reserve forest when it comes to the forest providing livelihood to them. But they feel that the forest has not been successful in providing protection to wild life.

Overall attitude towards the reserve forest $A_{rf} = b_1e_1 + b_2e_2 + b_3e_3$

$= 3365$

Hence, the overall attitude towards reserve forest is positive.

After measurement of the attitude, the subjective norm has to be calculated. The equation used for calculation of subjective norm is

$SN = n_1m_1 + n_2m_2 + ... + n_nm_n$

For calculation of subjective norm, the variables considered were forest needing protection for maintaining ecological balance and extraction of forest product by villagers.

Subjective Norm = belief that forest needs protection for overall ecological balance (n_1) X importance given to ecological balance (m_1) + belief that village people extract forest products (n_2) X importance given to stop extraction of forest product (m_2).

$\sum n_1m_1 = 3412$

$\sum n_2m_2 = 2770$

Hence, subjective norm $= n_1m_1 + n_2m_2$

$= 3412 + 2770$

$= 6182$

So, it is found that the local population does not feel any social pressure if they get involved in conservation related activities.

After calculation of the subjective norm, perceived behavioral control has to be calculated. Perceived behavioral control denotes the belief and evaluation of an individual regarding the outcome of an action. To measure PBC, the variables considered in the study were strict conservation measures as a tool for forest protection and involvement of the local people in conservation related activities.

PBC = belief that strict conservation measures will stop deforestation (c_1) X importance of forest conservation (p_1) + belief that active participation will check deforestation (c_2) X degree of willingness to participate in conservation related activities (p_2).

$\sum c_1p_1 = 3175$ $\sum c_2p_2 = 2009$

PBC = 3175 + 2009 = 5184

It is seen that the perceived behavioral control is also positive.

Positive value for attitude implies positive attitude. Higher the value, stronger is the positive attitude towards the object. In the above calculation, it has been found that except for attitude towards the forest as a safe habitat for wild life, all are positive and values are quite high. The overall attitude is also positive and the high value indicates strong positive attitude.

It has been mentioned earlier that the main occupation of the population of the study area is agriculture. Because of the rise in the population, pressure on land is increasing leading to a tendency to convert forest to agricultural land. Hence, in the study area, it is a choice between survivals of human versus wild life. Therefore, perceptions on maintenance of ecological balance and reducing forest dependency have been considered for understanding social norm.

Hence, it can be safely assumed that the population living in the fringe area of the reserve forest have positive attitude towards the reserve forest, they do not feel any social pressure if they want to get involved in conservation related activities and they have a conviction that their involvement in conservation related activities will check deforestation.

But the objective of the study was to identify the group of the population that has the strongest feeling towards the reserve forest so that they can be used to implement the strategies developed for checking deforestation. Hence the segmental variation of the perception regarding deforestation and conservation has been studied with the demographic variables as the independent variables.

Analysis of variation in belief regarding different aspects of the reserve forest on the basis of different demographic variables

Table7.1. Overall responses to the statement that reserve forest provides food, fuel and fodder to the people living in nearby villages

Opinion↓	Frequency	Percent	Mean
Strongly Agree	860	93.4	1.93
Agree	61	6.6	
Neither agree nor disagree	0	0	
Disagree	0	0	
Strongly disagree	0	0	
Total	921	100	

Table 7.2: Community wise opinions of the respondents regarding forest provides food, fuel and fodder to the people living in nearby villages (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	97	3	-	-	-	1.97
Koch	94	6	-	-	-	1.94
Garo	100	-	-	-	-	2.00
Mishing	86	14	-	-	-	1.86
Adivasi	82	18	-	-	-	1.82
Nepali	77	23	-	-	-	1.77
Rabha	100	-	-	-	-	2.00

To find out whether this variation in mean belief regarding reserve forest provides food, fuel and fodder to people living in nearby villages on the basis of communities is statistically significant. ANOVA was carried out with the null hypothesis that the mean belief regarding the said attribute do not vary with respect to community.

H_o: $\mu_1 = \mu_2 = \mu_3 = \ldots\ldots = \mu_7$

Where, μ_1, μ_2, ..., μ_7 are the mean belief of the different communities regarding forest provides food, fuel and fodder to people living in nearby villages

Table 7.3: ANOVA test results on forest provides livelihood

	Sum of Squares	Degree of freedom	Mean Square	F	Sig.
Between Groups	3.441	6	.573	9.794	.000
Within Groups	53.519	914	5.855E-02		
Total	56.960	920			

Table 7.3 shows that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that belief about forest provides food, fuel and fodder to the people living nearby villages varies on the basis of community.

Post hoc test (using Fisher's LSD) was carried out to compute the pair of communities whose belief varies generates the following information. To find out the significant differences of mean beliefs of different communities regarding the statement 'The reserve forest provides food, fuel and fodder to people living in the nearby villages.

Table 7.4: Significant differences in mean belief regarding forest provides livelihood to people living in nearby villages on the basis of community

Community↓	Communities having significant difference (Mean belief of different communities are given in bracket)				
Bodo (1.97)	Mishing (1.86)	Adivashi(1.82)	Nepali(1.77)	-	-
Koch (1.94)	Garo(2.00)	Mishing(1.86)	Adivashi(1.82)	Nepali(1.77)	-
Garo(2.00)	Koch(1.94)	Mishing(1.86)	Adivashi(1.82)	Nepali(1.77)	-
Mishing(1.86)	Bodo(1.97)	Koch(1.94)	Garo(2.00)	Nepali(1.77)	-
Adivashi(1.82)	Bodo(1.97)	Koch(1.94)	Garo(2.00)	Rabha(2.00)	-
Nepali(1.77)	Bodo(1.97)	Koch(1.94)	Garo(2.00)	Mishing(1.86)	Rabha(2.00)
Rabha(2.00)	Adivashi(1.82)	Nepali(1.77)	-	-	-

It is seen from the table 7.4 that most of communities mean beliefs vary with each other regarding the statement that reserve forest provides food, fuel and fodder to the people living in nearby villages. This mean belief is the strongest among the Garo and the Rabha communities (2.00). The mean beliefs of Bodo with 1.97 and Koch with 1.94 are stronger about the statement the reserve forest provides food, fuel and fodder to the people living in nearby villages because both the communities represent a major fraction of total sample with 42% and 28% respectively.

Similar analyses have been done on the variables 'the reserve forest provides protection to many precious wild lives, forest needs overall ecological balance, villagers extract forest products, reserve forest is shrinking due to human interference, strict conservation measures can save reserve forest from degradation, and my active role will help in checking deforestation' taking 'community' as an independent variable. The statements that were presented to the respondents to record their degree of acceptance were

The reserve forest provides protection to many precious wild lives

The reserve forest needs protection for overall ecological balance

Village people extract forest products

The reserve forest is continuously shrinking due to human interference

Strict conservation measures can save the reserve forest from degradation

My active role in conservation will help in checking deforestation

7.1.2. Analysis of responses to the statement: 'the reserve forest provides protection to many precious wild lives'

Table 7.5: Community wise opinions of the respondents regarding forest provides protection to wild lives

(in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	-	-	-	45	55	-1.55
Koch	-	-	-	34	66	-1.66
Garo	-	-	-	45	55	-1.55
Mishing	-	-	-	39	61	-1.61
Adivasi	-	-	-	31	69	-1.69
Nepali	-	-	-	45	55	-1.53
Rabha	-	-	-	38	62	-1.62

In one way ANOVA test result states that p value (.125) < α value (.1), therefore, the null hypothesis is not rejected. This implies that mean belief of the statement forest provides protection to many precious wild lives do not vary on the basis of different communities.

7.1.3. Analysis of responses to the statement: 'The reserve forest needs protection for overall ecological balance

Table 7.6: Community wise opinions of the respondents on the statement that forest needs overall ecological balance (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	80	20	-	-	-	1.80
Koch	92	8	-	-	-	1.92
Garo	100	-	-	-	-	2.00
Mishing	87	13	-	-	-	1.87
Adivasi	100	-	-	-	-	2.00
Nepali	100	-	-	-	-	2.00
Rabha	88	12	-	-	-	1.88

In one way ANOVA test result states that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that the mean belief about the statement that the reserve forest needs protection for overall ecological balance varies on the basis of communities. The mean beliefs of the Garo, Adivashi and Nepali communities are the strongest to other sampled communities.

Table 7.7: Significant differences in mean belief regarding the reserve forest needs protection for overall ecological balance on the basis of community

Community↓	Communities having difference with) (Mean belief of different communities are given in bracket)				
Bodo (1.80)	Koch (1.92)	Garo(2.00)	Mishing(1.87)	Adivashi(2.00)	Nepali(2.00)
Koch (1.92)	Bodo (1.80)	Garo(2.00)	Adivashi(2.00)	Nepali(2.00)	-
Garo(2.00)	Bodo (1.80)	Koch (1.92)	Mishing(1.87)	-	-
Mishing(1.87)	Bodo (1.80)	Garo(2.00)	Adivashi(2.00)	Nepali(2.00)	-
Adivashi(2.00)	Bodo (1.80)	Koch (1.92)	Mishing(1.87)	-	-
Nepali(2.00)	Bodo (1.80)	Koch (1.92)	Mishing(1.87)	-	-
Rabha(1.88)	-	-	-	-	-

7.1.4. Analysis of the statement: 'Village people extract forest products'

Table 7.8: Community wise opinions of the respondents on the statement that village people extract forest products (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	70	30	-	-	-	1.70
Koch	77	23	-	-	-	1.77
Garo	91	9	-	-	-	1.91
Mishing	68	32	-	-	-	1.68
Adivashi	48	52	-	-	-	1.48
Nepali	68	30	2	-	-	1.66
Rabha	100	-	-	-	-	2.00

In one way ANOVA test result states that p value (.000) < α value (.1), therefore, the null hypothesis is rejected about 'village people extract forest products' varies.

Table 7.9: Significant differences in mean belief regarding the statement that village people extract forest products on the basis of community

Community↓	Communities having difference with) (Mean belief of different communities are given in bracket)					
Bodo (1.70)	Koch (1.77)	Garo (1.91)	Adivasi (1.48)	Rabha (2.00)	-	-
Koch (1.77)	Bodo (1.70)	Garo (1.91)	Adivasi (1.48)	Nepali (1.66)	-	-
Garo (1.91)	Bodo (1.70)	Koch (1.77)	Mishing (1.68)	Adivasi (1.48)	Nepali (1.66)	-
Mishing (1.68)	Garo (1.91)	Adivasi (1.48)	Rabha (2.00)	-	-	-
Adivasi (1.48)	Bodo (1.70)	Koch (1.77)	Garo (1.91)	Mishing (1.68)	Nepali (1.66)	Rabha (2.00)
Nepali (1.66)	Koch (1.77)	Garo 1.91)	Adivashi (1.48)	Rabha (2.00)	-	-
Rabha (2.00)	Bodo (1.70)	Mishing (1.68)	Adivasi (1.48)	Nepali (1.66)	-	-

7.1.5. Analysis of the responses to the statement: 'The reserve forest is continuously shrinking due to human interference'

Table 7.10: Community wise opinions regarding the statement that forest is shrinking due to human interference (in Percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	77	23	-	-	-	1.77
Koch	82	18	-	-	-	1.82
Garo	73	27	-	-	-	1.73
Mishing	80	20	-	-	-	1.80
Adivashi	49	51	-	-	-	1.49
Nepali	74	26	-	-	-	1.74
Rabha	88	12	-	-	-	1.88

In one way ANOVA test result states that p value (.000) < α value (.1), therefore, the null hypothesis is rejected about 'forest is shrinking for human interference' varies.

Table 7.11: Significant differences in mean belief regarding the statement that the reserve forest is shrinking due to human interference on the basis of community

Community↓	Communities having difference with) (Mean belief of different communities are given in bracket)					
Bodo (1.77)	Koch (1.82)	Adivasi (1.49)	-	-	-	-
Koch (1.82)	Bodo (1.77)	Garo (1.73)	Adivasi (1.49)	-	-	-
Garo (1.73)	Koch (1.82)	Adivasi (1.49)	-	-	-	-
Mishing (1.80)	Adivasi (1.49)	-	-	-	-	-
Adivasi (1.49)	Bodo (1.77)	Koch (1.82)	Garo (1.73)	Mishing (1.80)	Nepali (1.74)	Rabha (1.88)
Nepali (1.74)	Adivasi (1.49)	-	-	-	-	-
Rabha (1.88)	Adivasi (1.49)	-	-	-	-	-

7.1.6. Analysis of the responses to the statement 'strict conservation measures can save the reserve forest from degradation'

Table 7.12: Community wise opinions of the respondents regarding strict conservation measures can save forest from degradation (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	81	19	-	-	-	1.81
Koch	93	7	-	-	-	1.93
Garo	86	14	-	-	-	1.86
Mishing	70	30	-	-	-	1.70
Adivashi	90	10	-	-	-	1.90
Nepali	98	2	-	-	-	1.98
Rabha	100	-	-	-	-	2.00

Table 7.13: Significant differences in mean belief regarding strict conservation measures can protect forest on the basis of community

Community↓	Communities having difference with (Mean belief of different communities are given in bracket)					
Bodo(1.81)	Koch(1.93)	Mishing(1.70)	Adivasi(1.90)	Nepali(1.98)	-	-
Koch(1.93)	Bodo(1.81)	Garo(1.86)	Mishing(1.70)	-	-	-
Garo (1.86)	Koch(1.93)	Mishing(1.70)	Nepali(1.98)	-	-	-
Mishing(1.70)	Bodo(1.81)	Koch(1.93)	Garo(1.86)	Adivasi(1.90)	Nepali(1.98)	Rabha(2.00)
Adivasi(1.90)	Bodo(1.81)	Mishing(1.70)	-	-	-	-
Nepali(1.98)	Bodo(1.81)	Garo (1.86)	Mishing(1.70)	-	-	-
Rabha(2.00)	Mishing(1.70)	-	-	-	-	-

7.1.7. Analysis of the responses to the statement: 'My active role in conservation will help in checking deforestation'

Table 7.14: Community wise opinions of the respondents regarding active role in conservation will help to check deforestation (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	39	61	-	-	-	1.39
Koch	45	53	2	-	-	1.44
Garo	51	49	-	-	-	1.51
Mishing	58	42	-	-	-	1.58
Adivashi	33	65	2	-	-	1.31
Nepali	34	51	15	-	-	1.19
Rabha	25	75	-	-	-	1.25

Table 7.15: Significant differences in mean belief regarding the statement that active role will check deforestation on the basis of community

Community↓	Communities having difference with (Mean belief of different communities are given in bracket)				
Bodo(1.39)	Garo(1.51)	Mishing(1.58)	Nepali (1.19)	-	-
Koch(1.44)	Mishing(1.58)	Adivasi(1.31)	Nepali(1.19)	-	-
Garo(1.51)	Bodo(1.39)	Adivasi(1.31)	Nepali (1.19)	-	-
Mishing(1.58)	Bodo(1.39)	Koch (1.44)	Adivasi (1.31)	Nepali(1.19)	Rabha(1.25)
Adivasi(1.31)	Koch(1.44)	Garo (1.51)	Mishing (1.58)	-	-
Nepali(1.19)	Bodo(1.39)	Koch(1.44)	Garo(1.51)	Mishing (1.58)	
Rabha (1.25)	Mishing(1.58)	-	-	-	-

Differences in mean belief about the following variables on the basis of community are presented in table 7.16 and diagrammatic representation is given in diagram -7.1

The reserve forest provides food, fuel and fodder to people living in the nearby villages **(Help).**

The reserve forest provides protection to many precious wild lives **(Protect).**

The reserve forest needs protection for overall ecological balance **(Eco-need).**

Village people extract forest products **(Extract).**

The reserve forest is continuously shrinking due to human interference **(Human).**

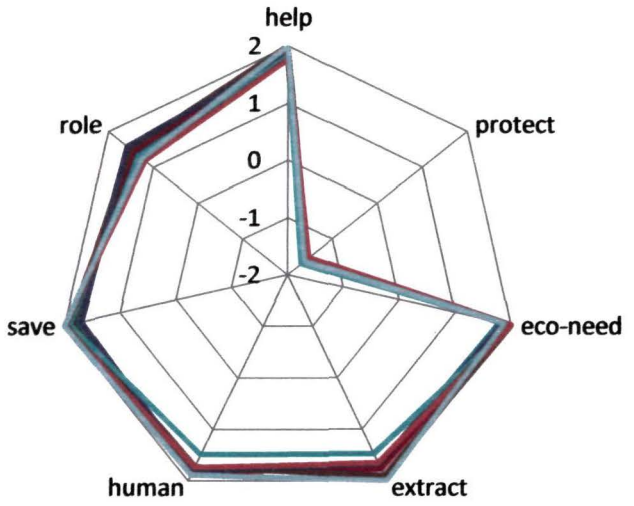
Strict conservation measures can save the reserve forest from degradation **(Save).**

My active role in conservation will help in checking deforestation **(Role).**

Table 7:16: Communities mean belief about the explanatory variables

Variables→ Community↓	Help	Protect	Eco-need	Extract	Human	Save	Role
Bodo	1.97	-1.55	1.80	1.70	1.77	1.81	1.39
Koch	1.94	-1.66	1.92	1.77	1.82	1.93	1.44
Garo	2.00	-1.55	2.00	1.91	1.73	1.86	1.51
Mishing	1.86	-1.61	1.87	1.68	1.80	1.70	1.58
Adivasi	1.82	-1.69	2.00	1.48	1.49	1.90	1.31
Nepali	1.77	-1.53	2.00	1.66	1.74	1.98	1.19
Rabha	2.00	-1.62	1.88	2.00	1.88	2.00	1.25

Figure 7.1: Community wise mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation



The figure 7.1 shows the mean belief of the different communities as the various explanatory attributes presented to them on conservation related topics. The diagram reveals that on the topic of 'reserve forest is shrinking due to human interference' almost all the communities have the significant differences in mean beliefs. The mean belief of the Rabha community is the highest with 1.88. The significant differences have been found within communities regarding the statements 'reserve forest needs protection for overall ecological balance, reserve forest provides food, fuel and fodder and strict conservation measures can save reserve forest'. The mean beliefs of Rabha community are stronger of the last two statements 'reserve forest provides food, fuel and fodder' and 'strict measures can save reserve forest' with 2.00. But significant differences in mean belief of the respondents are not found to the statement that 'the reserve forest provides protection to many precious wild lives'. Regarding the statement 'active role can check deforestation', the mean belief of the Mishing community is the highest with 1.58 and significant differences in mean beliefs have been found among communities.

Similar analyses have been done to trace out the variation in responses to the statement on the basis of the demographic variables like caste, level of education, occupation, income groups, category of farmer on the basis of landholding and distances. The following tables show the results of the analyses carried out using caste, level of education, occupation, income groups and category of farmer on the basis of landholding and distances.

7.2.1. Analysis of the responses to the statement: The reserve forest provides food, fuel and fodder to the people living in nearby villages

Table 7.17: Caste wise opinions on forest provides food, fuel and fodder (in percentage)

Opinion→ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
General	59	41	-	-	-	1.59
Other Backward Caste	92	8	-	-	-	1.92
Scheduled Tribe (Plain)	95	5	-	-	-	1.95
Scheduled Tribe (Hill)	100	-	-	-	-	2.00

Table 7.18: ANOVA Test results on forest provides food, fuel and fodder to people

	Sum of Squares	Degree of freedom	Mean Square	F	Sig.
Between Groups	3.768	3	1.256	21.653	.000
Within Groups	53.192	917	.058		
Total	56.960	920			

Post hoc analysis (Fisher's LSD) was carried out to show the multiple comparisons among the pair of castes whose belief varies. To find out the significant differences of mean beliefs of different castes regarding the statement 'the reserve forest provides food, fuel and fodder to people living in nearby villages.'

Table 7.19: Significant differences in mean belief on forest provides livelihood on caste

Caste↓	Castes having difference with (Mean belief of different castes are given bracket)		
General [GEN] (1.59)	OBC (1.92)	ST-P(1.95)	ST-H (2.00)
Other Backward Caste (OBC) (1.92)	GEN (1.59)	ST-P (1.95)	ST-H (2.00)
Scheduled Tribe (Plain)[ST-P] (1.95)	GEN (1.59)	OBC (1.92)	ST-H (2-00)
Scheduled Tribe (Hill)[ST-H] (2.00)	GEN (1.59)	OBC(1.92)	ST-P (1.95)

7.2.2. Analysis of the responses to the statement: 'The reserve forest provides protection to many precious wild lives'

Table 7.20: Caste wise opinions that reserve forest provides protection to wild lives

Opinion→ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
General	-	-	-	44	56	-1.56
Other Backward Caste	-	-	-	35	65	-1.65
Scheduled Tribe (Plain)	-	-	-	44	56	-1.56
Scheduled Tribe (Hill)	-	-	-	45	55	-1.55

Table 7.21: Significant differences in mean belief on wildlife protection on caste

Caste↓	Castes having difference with (Mean belief of different castes are given bracket)		
General [GEN] (-1.56)	-	-	-
Other Backward Caste (OBC) (-1.65)	ST-P (-1.56)	ST-H (-1.55)	-
Scheduled Tribe (Plain)[ST-P] (-1.56)	OBC (-1.65)	-	-
Scheduled Tribe (Hill)[ST-H] (-1.55)	OBC (-1.65)	-	-

7.2.3. Analysis of the responses to the statement: 'The reserve forest needs protection for overall ecological balance'

Table 7.22: Caste wise opinions on forest needs protection for ecological balance

Opinion→ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
General	96	4	-	-	-	1.96
Other Backward Caste	94	6	-	-	-	1.94
Scheduled Tribe (Plain)	81	19	-	-	-	1.81
Scheduled Tribe (Hill)	100	-	-	-	-	2.00

Table 7.23: Significant differences in mean belief about forest needs protection for overall ecological balance on caste

Caste↓	Castes having difference with (Mean belief of different castes are given bracket)		
General [GEN] (1.96)	ST-P (1.81)	-	-
Other Backward Caste (OBC) (1.94)	ST-P (1.81)	-	-
Scheduled Tribe (Plain)[ST-P] (1.81)	GEN (1.96)	OBC (1.94)	ST-H (2.00)
Scheduled Tribe (Hill)[ST-H] (2.00)	ST-P (1.81)	-	-

7.2.4. Analysis of the responses to the statement: 'Village people extract forest products'

Table 7.24: Caste wise opinions on village people extract forest products (in percentage)

Opinion→ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
General	67	29	4	-	-	1.63
Other Backward Caste	72	28	-	-	-	1.72
Scheduled Tribe (Plain)	71	29	-	-	-	1.70
Scheduled Tribe (Hill)	91	9	-	-	-	1.91

Table 7.25: Significant differences in mean belief on forest product extraction on caste

Caste↓	Castes having difference with (Mean belief of different castes are given bracket)		
General [GEN] (1.63)	ST-H (1.91)	-	-
Other Backward Caste (OBC) (1.72)	ST-H (1.91)	-	-
Scheduled Tribe (Plain)[ST-P] (1.70)	ST-H (1.91)	-	-
Scheduled Tribe (Hill)[ST-H] (1.91)	GEN (1.63)	OBC (1.72)	ST-P (1.70)

7.2.5. Analysis of the responses to the statement: 'The reserve forest is continuously shrinking due to human interference'

Table 7.26: Caste wise opinions on forest is shrinking for human interference

Opinion↓ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
General	78	22	-	-	-	1.78
Other Backward Caste	76	24	-	-	-	1.76
Scheduled Tribe (Plain)	77	23	-	-	-	1.77
Scheduled Tribe (Hill)	73	27	-	-	-	1.73

One way ANOVA was carried out and found that the p value > α value, therefore, the null hypothesis is not rejected. This implies that mean belief is homogeneous on the basis of caste about 'reserve forest is shrinking for human interference'. The significant differences are not found in mean belief in the above statement on the basis of caste.

7.2.6. Analysis of responses to the statement: 'Strict conservation measure can save reserve forest from degradation'

Table 7.27: Caste wise opinions on strict conservation measures can save forest

(in percentage)

Opinion→ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
General	100	-	-	-	-	2.00
Other Backward Caste	93	7	-	-	-	1.93
Scheduled Tribe (Plain)	80	20	-	-	-	1.80
Scheduled Tribe (Hill)	86	14	-	-	-	1.86

Table7.28: Significant differences in mean belief on strict conservation measures can save the reserve forest from degradation on caste

Caste↓	Castes having difference with (Mean belief of different castes are given bracket)		
General [GEN] (2.00)	ST-P (1.80)	ST-H (1.86)	-
Other Backward Caste [OBC] (1.93)	ST-P (1.80)	-	-
Scheduled Tribe (Plain) [ST-P] (1.80)	GEN (2.00)	OBC (1.93)	-
Scheduled Tribe (Hill) [ST-H] (1.86)	GEN (2.00)	-	-

7.2.7. Analysis of the responses to the statement: 'My active role in conservation will help in checking deforestation'

Table 7.29: Caste wise opinions on active role to check deforestation (in percentage)

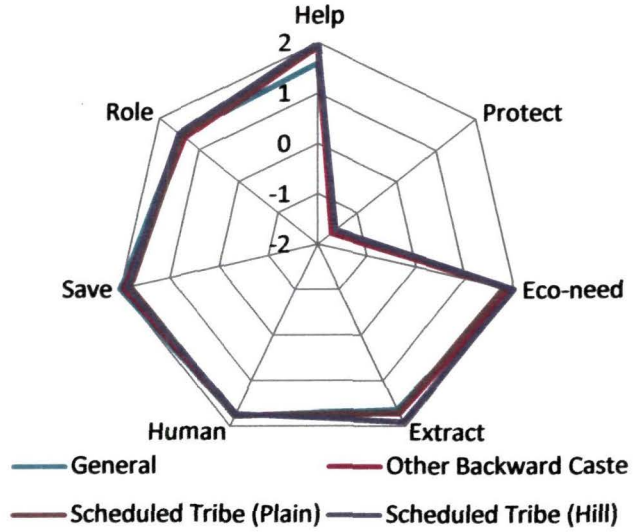
Opinion→ Caste↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
General	48	52	-	-	-	1.48
Other Backward Caste	41	55	4	-	-	1.37
Scheduled Tribe (Plain)	42	58	-	-	-	1.42
Scheduled Tribe (Hill)	51	49	-	-	-	1.51

One-way ANOVA test results reveal that p value (.125) > α value (.1), therefore, the null hypothesis is not rejected. This implies that there are no significant differences in mean beliefs of the respondents on the basis of caste about the statement that 'my active role will check deforestation.'

Table 7.30: Caste wise mean belief about the explanatory variables

Variables→ Caste↓	Help	Protect	Eco-need	Extract	Human	Save	Role
General	1.59	-1.56	1.96	1.63	1.78	2.00	1.48
Other Backward Caste	1.92	-1.65	1.94	1.72	1.76	1.93	1.37
Scheduled Tribe (Plain)	1.95	-1.56	1.81	1.70	1.77	1.80	1.42
Scheduled Tribe (Hill)	2.00	-1.55	2.00	1.91	1.73	1.86	1.51

Figure 7.2: Caste wise mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation



The figure 7.2 stated that the significant differences in mean beliefs have been found of the respondents on explanatory variables 'reserve forest provides food, fuel and fodder to people, reserve forest provides protection to many precious wild lives, reserve forest needs ecological balance, strict conservation measures can save reserve forest from degradation and village people extract forest products'. The differences in mean beliefs have not found regarding the statements, 'reserve forest is continuously shrinking for human interference, and my active role will help in checking deforestation'. However, the opinion of the Scheduled Tribe (Hill) is stronger among others regarding the above six statements with mean beliefs [2.00, -1.55, 2.00, 1.91, 1.86 and 1.51] respectively but mean belief about the statement 'reserve forest is shrinking for human interference' is weaker with 1.73.

7.3.1. Similarly no significant differences in opinions of the respondents regarding forest provides food, fuel and fodder to people on the basis of level of education

Table 7.31: Respondents mean belief on forest provides food, fuel and fodder on the basis of education level (in percentage)

Opinion → Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Illiterate	94	6	-	-	-	1.94
Primary	93	7	-	-	-	1.93
10 Pass	98	2	-	-	-	1.98
10+2	87	13	-	-	-	1.87
Graduate	88	12	-	-	-	1.88

In one way ANOVA test results reveal that p value (.431) > α value (.1), therefore, the null hypothesis is not rejected about the statement the reserve forest provides food, fuel and fodder to people living in nearby villages is homogeneous.

7.3.2. Significant differences in mean belief of the respondents have been found on forest provides protection to many precious wild lives on the basis of level of education

Table 7.32: Respondents mean belief on wildlife protection on level of education

(in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Illiterate	-	-	-	46	54	-1.54
Primary	-	-	-	35	65	-1.65
10 Pass	-	-	-	34	66	-1.66
10+2	-	-	-	60	40	-1.40
Graduate	-	-	13	62	25	-1.12

In one way ANOVA test results reveal that p value (.000) < α value (.1), therefore, the null hypothesis is rejected regarding the statement that the reserve forest provides protection to many precious wild lives.

Table 7.33: Significant differences in mean belief on wildlife protection on education

Education↓	Education wise having difference with (Mean belief of different education level are given in bracket)			
Illiterate (-1.54)	Primary (-1.65)	Graduate (-1.12)	-	-
Primary (-1.65)	Illiterate (-1.54)	10+2 (-1.40)	Graduate (-1.12)	-
10 pass (-1.66)	10+2 (-1.40)	Graduate (-1.12)	-	-
10+2 (-1.40)	Primary (-1.65)	10 pass (-1.66)	-	-
Graduate (-1.12)	Illiterate (-1.54)	Primary (-1.65)	10 pass (-1.66)	-

7.3.3. Significant differences in mean belief of the respondents has been found on statement that forest needs protection for overall ecological balance on the basis of levels of education

Table 7.34: Respondents mean belief on reserve forest needs protection for ecological balance on the basis of education level (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	86	14	-	-	-	1.86
Primary	91	9	-	-	-	1.91
10 Pass	91	9	-	-	-	1.91
10+2	80	20	-	-	-	1.80
Graduate	62	38	-	-	-	1.62

Table 7.35: Significant differences in mean belief on the statement that forest needs protection for overall ecological balance on the basis of levels of education

Education↓	Education wise having difference with (Mean belief of different education level are given in bracket)		
Illiterate (1.86)	Primary (1.91)	Graduate (1.62)	-
Primary (1.91)	Illiterate (1.86)	Graduate (1.62)	-
10 pass (1.91)	Graduate (1.62)	-	-
10+2 (1.80)	-	-	-
Graduate (1.62)	Illiterate (1.86)	Primary (1.91)	10 pass (1.91)

7.3.4. No significant differences have been found in mean belief of the respondents on statement that village people extract forest products on the basis of level of education

Table 7.36: Respondents mean belief on village people extract forest products on the basis of level of education (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Illiterate	75	25	-	-	-	1.75
Primary	71	28	1	-	-	1.71
10 Pass	72	28	-	-	-	1.72
10+2	67	33	-	-	-	1.67
Graduate	62	38	-	-	-	1.62

7.3.5. The mean belief of the respondents regarding the statement that reserve forest is shrinking for human use on the basis of levels of education is not varied

Table 7.37: Respondents mean belief on forest is shrinking for human interference on the basis of levels of education (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Illiterate	78	22	-	-	-	1.78
Primary	74	26	-	-	-	1.74
10 Pass	89	11	-	-	-	1.89
10+2	73	27	-	-	-	1.73
Graduate	75	25	-	-	-	1.75

7.3.6. The significant differences have been found in mean belief of the respondents regarding the statement that strict conservation measures can save forest from degradation on the basis of level of education

Table 7.38: Respondents mean belief about strict conservation measure can save forest on the basis of levels of education (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Illiterate	82	18	-	-	-	1.82
Primary	90	10	-	-	-	1.90
10 Pass	94	6	-	-	-	1.94
10+2	73	27	-	-	-	1.73
Graduate	75	25	-	-	-	1.75

Table 7.39: Significant differences in mean belief about strict conservation measure can save reserve forest on the basis of level of education

Education↓	Education wise having difference with (Mean belief of different education level are given in bracket)			
Illiterate (1.82)	Primary (1.90)	10 pass (1.94)	-	-
Primary (1.90)	Illiterate (1.82)	10+2 (1.73)	-	-
10 pass (1.94)	Illiterate (1.82)	10+2 (1.73)	-	-
10+2 (1.73)	Primary (1.90)	10 pass (1.94)	-	-
Graduate (1.75)	-	-	-	-

7.3.7. The significant differences have been found in mean belief of the respondents regarding the statement that my active role in conservation will help in checking deforestation on the basis of level of education

Table 7.40: Respondents mean belief on active role to check deforestation on the basis of level of education (in percentage)

Opinion→ **Education↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	43	56	1	-	-	1.43
Primary	40	58	2	-	-	1.38
10 Pass	51	49	-	-	-	1.51
10+2	73	27	-	-	-	1.73
Graduate	12	88	-	-	-	1.12

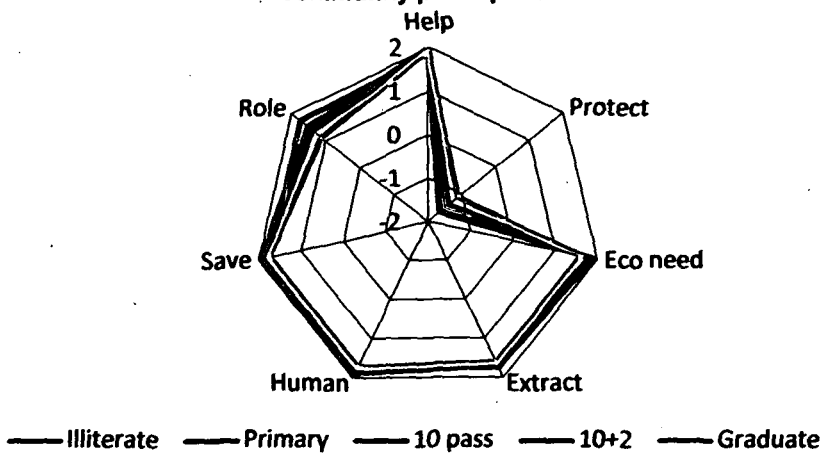
Table 7.41: Significant differences in mean belief about active role will help to check deforestation on the basis of level of education

Education↓	Education wise having difference with (Mean belief of different education level are given in bracket)			
Illiterate (1.43)	10+2 (1.73)	-	-	-
Primary (1.38)	10 pass (1.51)	10+2 (1.73)	-	-
10 pass (1.51)	Primary (1.38)	Graduate (1.12)	-	-
10+2 (1.73)	Illiterate (1.43)	Primary (1.38)	Graduate (1.12)	-
Graduate (1.12)	10 pass (1.51)	10+2 (1.73)	-	-

Table 7.42: Education wise mean belief about the explanatory variables

Variables→ **Education↓**	Help	Protect	Eco-need	Extract	Human	Save	Role
Illiterate	1.94	-1.54	1.86	1.75	1.78	1.82	1.43
Primary	1.93	-1.65	1.91	1.71	1.74	1.90	1.38
10 pass	1.98	-1.66	1.91	1.72	1.89	1.94	1.51
10+2	1.87	-1.40	1.80	1.67	1.73	1.73	1.73
Graduate	1.93	-1.12	1.62	1.62	1.75	1.75	1.12

Figure 7.3: Education wise mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation



The figure 7.3 states that the significant differences in mean belief in all education levels have not found regarding the statements 'reserve forest provides food, fuel and fodder to people in nearby villages (1), villagers extract forest products (4), reserve forest is shrinking for human interference (5)'. But significant differences have been found regarding the statements 'reserve forest provides protection to many precious wild lives (2), reserve forest needs protection for overall ecological balance (3), strict conservation measures can save reserve forest (6) and my active role will help in checking deforestation(7)'. Variations in mean belief was significant between 10 pass and graduates regarding the statements 'reserve forest provides protection to many precious wild lives, reserve forest needs protection for ecological balance and strict conservation measures can save reserve forest'; the significant differences in mean belief was also seen between 10+2 and graduate regarding the statement 'my active role will help in checking deforestation'. Regarding the statements 2 & 3, education level 10 pass has the highest inclination. Regarding the statement 7, the education level 10+2 has the highest mean belief.

7.4.1. Significant variations in mean belief have been found of the respondents regarding the statement that the reserve forest provides food, fuel and fodder to people living in nearby villages on the basis of occupation

Table 7.43: Occupation wise mean belief of the respondents about the statement that reserve forest provides livelihood to people living nearby villages (in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	94	6	-	-	-	1.94
Labour	96	4	-	-	-	1.96
Service	88	12	-	-	-	1.88
Business	90	10	-	-	-	1.90

Table 7.44: Significant differences in mean beliefs about the reserve forest provides livelihood to people in nearby villages on the basis of occupation

Occupation↓	Occupation wise having difference with (Mean belief of different occupation level are given in bracket)			
Cultivation (1.94)	Service (1.88)	-	-	-
Labour (1.96)	Service (1.88)	-	-	-
Service (1.88)	Cultivation (1.94)	Labour (1.96)	-	-
Business (1.90)	-	-	-	-

7.4.2. Significant differences in mean belief have been found of the respondents regarding the statement that forest provides protection to many precious wild lives on the basis of occupation

Table 7.45: Occupation wise mean belief of the statement that reserve forest provides protection to many precious wild lives (in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	-	-	-	41	59	-1.59
Labour	-	-	-	46	54	-1.54
Service	-	-	-	38	62	-1.62
Business	-	-	-	20	80	-1.80

Table 7.46: Significant differences in mean belief of the statement that reserve forest provides protection to many wild lives on the basis of occupation

Occupation↓	Occupation wise having difference with (Mean belief of different occupation level are given in bracket)			
Cultivation (-1.59)	Business (-1.80)	-	-	-
Labour (-1.54)	Business (-1.80)	-	-	-
Service (-1.62)	Business (-1.80)	-	-	-
Business (-1.80)	Cultivation (-1.59)	Labour (-1.54)	Service (-1.62)	-

7.4.3. Significant differences in mean beliefs have not been found of the statement 'the reserve forest needs protection for overall ecological balance' on occupation

Table 7.47: Occupation wise mean belief that forest needs protection (in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	88	12	-	-	-	1.88
Labour	89	11	-	-	-	1.89
Service	90	10	-	-	-	1.90
Business	92	8	-	-	-	1.92

In one way ANOVA test results reveal that the p value (.731) > α value (.1), therefore, the null hypothesis is not rejected. The mean belief of the respondents about the statement that the reserves forest needs protection for overall ecological balance is homogeneous.

7.4.4. No significant differences have been found in mean belief of the respondents regarding the statement that village people extract forest products on the basis of occupation

Table 7.48: Occupation wise mean belief that people extract forest products (in %)

Opinion→ **Occupation↓**	Strongly *Agree*	Agree	Neither *Agree nor* Disagree	Disagree	Strongly *Disagree*	**Mean**
Cultivation	74	26	-	-	-	1.74
Labour	69	30	1	-	-	1.68
Service	66	34	-	-	-	1.66
Business	69	31	-	-	-	1.69

In one-way ANOVA test results reveal that the p value (.228) > α value (.1), therefore, the null hypothesis is not rejected. The mean belief of the respondents about the above statement that village people extract forest products is homogeneous.

7.4.5. The mean belief of the statement that the reserve forest is shrinking for human interference on the basis of occupation is not varied

Table 7.49: Occupation wise mean belief of the statement the reserve forest is shrinking

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither *Agree nor* Disagree	Disagree	Strongly *Disagree*	**Mean**
Cultivation	77	23	-	-	-	1.77
Labour	73	27	-	-	-	1.73
Service	74	26	-	-	-	1.74
Business	78	22	-	-	-	1.78

In one way ANOVA test was carried out and found that p value (.773) > α value (.1), therefore, the null hypothesis is not rejected about the statement that the reserve forest is shrinking for human interference.

7.4.6. The variations in mean belief have not been found of the statement that strict conservation measures can save reserve forest from degradation on the basis of occupation

Table 7.50: Occupation wise mean belief about the statement that strict conservation measures can save reserve forest (in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Cultivation	85	15	-	-	-	1.85
Labour	91	9	-	-	-	1.91
Service	89	11	-	-	-	1.89
Business	86	14	-	-	-	1.86

In one way ANOVA test results reveal that the p value (.334) > α value (.1), therefore, the null hypothesis is not rejected. The mean belief of the respondents is homogeneous about the statement that strict conservation measures can save reserve forest on the basis of occupation.

7.4.7. Significant variations have not been found in mean belief of the respondents regarding the statement that my active role will help in checking deforestation on the basis of occupation

Table 7.51: Occupation wise mean belief on active role to check deforestation

(in percentage)

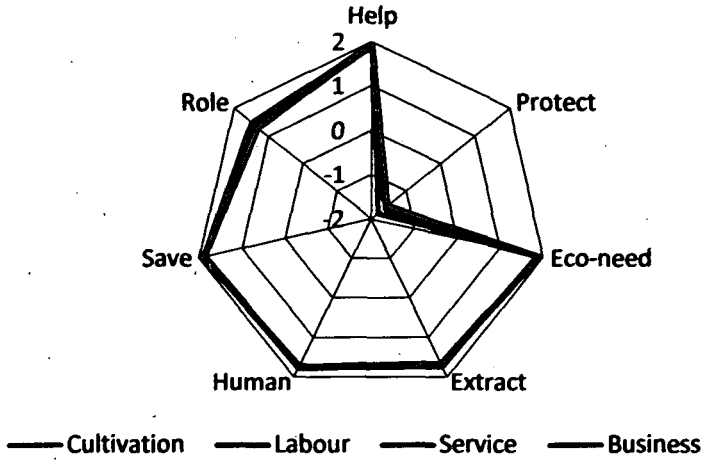
Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	43	55	2	-	-	1.41
Labour	40	60	-	-	-	1.40
Service	48	52	-	-	-	1.48
Business	31	67	2	-	-	1.29

In one-way ANOVA test results reveal that the p value (.273) > α value (.1), therefore, the null hypothesis is not rejected. The mean belief of the respondents is not varied about the statement that active role to check deforestation on the basis of occupation.

Table 7.52: Occupation wise mean belief about the explanatory variables

Variables→ **Occupation↓**	Help	Protect	Eco-need	Extract	Human	Save	Role
Cultivation	1.94	-1.59	1.88	1.74	1.77	1.85	1.41
Labour	1.96	-1.54	1.89	1.68	1.73	1.91	1.40
Service	1.88	-1.62	1.90	1.66	1.74	1.89	1.48
Business	1.90	-1.80	1.92	1.69	1.78	1.86	1.29

Figure 7.4: Occupation wise mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation



The figure 7.4 reveals that the significant variations in mean belief have been found regarding the statements 'reserve forest provides food, fuel and fodder to people living in nearby villages and reserve forest provides protection to many precious wild lives.' Occupation status labour has the highest inclination regarding the statements 'reserve forest provides food, fuel and fodder to people living in nearby villages' and 'reserve forest provides protection to wild lives'. No significant variations have been found irrespective of occupation status regarding the statements 'reserve forest needs protection for overall ecological balance, village people extract forest products, reserve forest is shrinking for human interference, strict conservation measures can save reserve forest and my active role will help in checking deforestation'.

7.5.1. Significant variations in mean belief have been found of the respondents regarding the statement that forest provides food, fuel and fodder to people living in nearby villages on the basis of income

Table 7.53: Respondents mean belief on forest provides food, fuel and fodder to the people living in nearby villages on different income levels (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	94	6	-	-	-	1.94
1-2 lakh	86	14	-	-	-	1.86
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	33	67	-	-	-	1.33
>4 lakh	100	-	-	-	-	2.00

Table: 7.54: ANOVA test results on forest provides food, fuel and fodder to people

	Sum of Squares	Degree of freedom	Mean Square	F	Sig.
Between Groups	1.537	4	.384	6.351	.000
Within Groups	55.423	916	.061		
Total	56.960	920			

Post hoc tests are not performed on the statement that forest provides food, fuel and fodder to the people in nearby villages because at least one group has fewer than two cases. The income group <1 lakh has the highest mean belief of (1.94). Out of 921 responses 841 responses alone lie in this category. Both categories of income 2-3 lakh and above 4 lakh have the highest mean belief with 2.00. Contrary to this, 3 responses in the income group of 3-4 lakh have the lowest mean belief with 1.33. Post hoc tests cannot be performed for other statements too for the same reason as stated above though differences in mean beliefs were found among respondents.

7.5.2. Significant variations in mean beliefs have been found of the respondents regarding the statement that forest provides protection to wild lives on the basis of different categories of income

Table 7.55: Respondents mean beliefs regarding forest provide protection to many precious wild lives on the basis of different categories of income (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	-	-	-	41	59	-1.59
1-2 lakh	-	-	1	37	62	-1.62
2-3 lakh	-	-	25	50	25	-1.00
3-4 lakh	-	-	-	-	100	-2.00
>4 lakh	-	-	-	-	100	-2.00

7.5.3. Significant differences in mean belief of the respondents have not been found regarding the statement that forest needs overall ecological balance on the basis of different categories of income

Table 7.56: Income wise mean belief of the statement that forest needs protection for overall ecological balance (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	88	12	-	-	-	1.88
1-2 lakh	89	11	-	-	-	1.89
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

In one way ANOVA test results reveal that p value (.897) > α value (.1), therefore, the null hypothesis is not rejected about the statement that forest needs overall ecological balance on the basis of different categories of income.

7.5.4. No significant differences have been found in mean belief of the respondents regarding the statement that villager extracts forest products on the basis of income

Table 7.57: Beliefs about villager extracts forest products on income (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	73	27	-	-	-	1.73
1-2 lakh	76	24	-	-	-	1.76
2-3 lakh	75	25	-	-	-	1.75
3-4 lakh	67	33	-	-	-	1.67
>4 lakh	-	100	-	-	-	1.00

In one way ANOVA test was carried out and found p value (.546) > α value (.1), therefore, the null hypothesis is not rejected and the mean belief of the respondents is not varied about village people extract forest products on the basis of income.

7.5.5. The mean beliefs of the respondents are not varied regarding the statement that the reserve forest is shrinking for human interference on the basis of income

Table 7.58: Beliefs of the respondents regarding the statement that the reserve forest is shrinking for human interference (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	76	24	-	-	-	1.76
1-2 lakh	78	22	-	-	-	1.78
2-3 lakh	75	25	-	-	-	1.75
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	-	100	-	-	-	1.00

In one way ANOVA test results reveal that p value (.375) > α value (.1), therefore, the null hypothesis is not rejected. No significant differences in mean beliefs of the respondents about the statement that reserve forest is shrinking for human interference on the basis of income.

7.5.6. Significant variations in mean belief of the respondents have not been found regarding the statement that strict conservation measures can save forest from degradation on the basis of different income levels

Table 7.59: Income wise mean belief of the respondents on strict conservation measures can save reserve forest (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	85	15	-	-	-	1.85
1-2 lakh	92	8	-	-	-	1.92
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

In one way ANOVA test results reveal that p value (.492) > α value (.1), therefore, the null hypothesis is not rejected. No significant differences in mean beliefs of the respondents about the statement that strict conservation measures can save reserve forest on the basis of income.

7.5.7. Significant variations have not been found in mean belief of the respondents regarding the statement that my active role will help in checking deforestation on the basis of different income levels

Table 7.60: Income wise mean belief of the respondents on active role will help to check deforestation (in percentage)

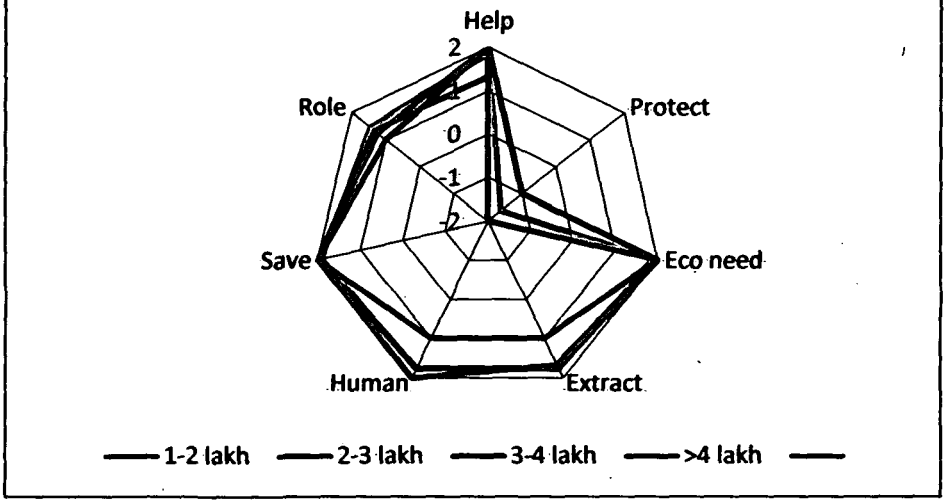
Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
<1 lakh	42	57	1	-	-	1.41
1-2 lakh	49	48	3	-	-	1.46
2-3 lakh	50	25	25	-	-	1.25
3-4 lakh	67	-	33	-	-	1.33
>4 lakh	-	100	-	-	-	1.00

In one way ANOVA test results reveal that p value (.791) > α value (.1), therefore, the null hypothesis is not rejected. No significant differences in mean beliefs of the respondents about the statement that my active role will help to check deforestation on the basis of income.

Table 7.61: Income wise mean belief about the explanatory variables

Variables→ Income level↓	Help	Protect	Eco-need	Extract	Human	Save	Role
<1 lakh	1.94	-1.59	1.88	1.73	1.76	1.85	1.41
1-2 lakh	1.86	-1.62	1.89	1.76	1.78	1.92	1.46
2-3 lakh	2.00	-1.00	2.00	1.75	1.75	2.00	1.25
3-4 lakh	1.33	-2.00	2.00	1.67	2.00	2.00	1.33
>4 lakh	2.00	-2.00	2.00	1.00	1.00	2.00	1.00

Figure 7.5: Income wise mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation



The figure 7.5 states that variations in mean belief have not occurred regarding the statements 'reserve forest needs protection for overall ecological balance and strict conservation measures can save reserve forest from degradation' as the mean beliefs of all levels of income are equal though post hoc test cannot perform using Least Significant Difference (LSD) method because the frequency of income level more than 4 lakh is less than 2. The mean beliefs of income level 2-3 lakh and > 4 lakh is the highest and income level 3-4 lakh is the lowest regarding the statement 'reserve forest provides food, fuel and fodder to people in nearby villages'. Regarding the statement 'reserve forest provides protection to wild lives' the mean belief of income level 2-3 lakh is the highest and income level more than 4 lakh is the lowest. But in case of the statements 'village people extract forest products, reserve forest is shrinking for human interference and active role can check deforestation', the mean belief of the income level 1-2 lakh is the highest and the mean beliefs of income level more than 4 lakh are the lowest. The mean beliefs of the income levels 2-3 lakh, 3-4 lakh and more than 4 lakh are the highest to the statement 'reserve forest needs protection for overall ecological balance'.

7.6.1. Significant variations in belief have been found of the respondents regarding the statement that the reserve forest provides food, fuel and fodder to people in nearby villages on the basis of category of farmer according to land holding

Table 7.62: Respondents mean belief on forest providing livelihood on the basis of category of farmer on land holding (in percentage)

Opinion→ Category of Farmer↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Marginal Farmer	92	8	-	-	-	1.92
Small Farmer	95	5	-	-	-	1.95
Semi Medium Farmer	94	6	-	-	-	1.94
Medium Farmer	74	26	-	-	-	1.74
Large Farmer	50	50	-	-	-	1.50

In one way ANOVA result states that, p value (.000) < α value (.1), therefore, the hypothesis is rejected. Post hoc tests reveal that the mean differences are statistically significant regarding the statement 'the reserve forest provides food, fuel and fodder to people in nearby villages' on the basis of category of farmers.

Table 7.63: Significant differences in mean belief on forest provides food, fuel and fodder on the basis of category of farmer

Category of farmer↓	Category of farmer having difference with (Mean belief of different category of farmer are given in bracket)		
Marginal Farmer(1.92)	Small Farmer (1,95)	Medium Farmer (1.74)	Large Farmer (1.50)
Small Farmer (1,95)	Marginal Farmer(1.92)	Medium Farmer (1.74)	Large Farmer (1.50)
Semi Medium Farmer (1.94)	Medium Farmer (1.74)	Large Farmer (1.50)	-
Medium Farmer (1.74)	Marginal Farmer(1.92)	Small Farmer (1,95)	Semi Medium Farmer (1.94)
Large Farmer (1.50)	Marginal Farmer(1.92)	Small Farmer (1,95)	Semi Medium Farmer (1.94)

7.6.2. No significant differences in mean beliefs were found as p value (.393)> α value (.1), regarding the statement that forest provides protection to many precious wild lives on the basis of category of farmer according to land holding

Table 7.64: Mean belief of category of farmer on forest provides protection to wild lives

Opinion→ Category of Farmer↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Marginal Farmer	-	-	-	41	59	-1.59
Small Farmer	-	-	-	42	58	-1.58
Semi Medium Farmer	-	-	1	35	64	-1.64
Medium Farmer	-	-	-	30	70	-1.70
Large Farmer	-	-	-	-	100	-2.00

7.6.3. No significant differences in mean beliefs of the respondents have been found as p value (.586)> α value (.1), regarding the statement that forest needs protection for overall ecological balance on the basis of category of farmer according to land holding

Table 7.65: Belief according to category of farmer on reserve forest needs protection for overall ecological balance (in percentage)

Opinion→ Category of Farmer↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Marginal Farmer	90	10	-	-	-	1.90
Small Farmer	88	12	-	-	-	1.88
Semi Medium Farmer	86	14	-	-	-	1.86
Medium Farmer	83	17	-	-	-	1.83
Large Farmer	100	-	-	-	-	2.00

7.6.4. No significant differences in mean beliefs have been found regarding the statement that village people extract forest products on the basis of category of farmer according to land holding, where, [p value (.268)> α value (.1)].

Table 7.66: Beliefs according to the category of farmer on village people extract forest products (in percentage)

Opinion→ Category of Farmer↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Marginal Farmer	70	30	-	-	-	1.69
Small Farmer	73	27	-	-	-	1.72
Semi Medium Farmer	78	21	1	-	-	1.78
Medium Farmer	83	17	-	-	-	1.83
Large Farmer	50	50	-	-	-	1.50

7.6.5. Mean beliefs of the respondents regarding the statement that forest is continuously shrinking for human interference is not varied on the basis of category of farmer according to land holding as p value (.609)> α value (.1).

Table 7.67: Beliefs according to the category of farmer on forest is shrinking for human interference (in percentage)

Opinion→ Category of Farmer↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Marginal Farmer	76	24	-	-	-	1.76
Small Farmer	77	23	-	-	-	1.77
Semi Medium Farmer	73	27	-	-	-	1.73
Medium Farmer	83	17	-	-	-	1.83
Large Farmer	50	50	-	-	-	1.50

7.6.6. The significant differences have not been found in mean beliefs of the respondents where p value (.925)> α value (.1), regarding the statement that strict conservation measures can save reserve forest from degradation on the basis of category of farmer according to land holding

Table 7.68: Beliefs according to the category of farmer on strict conservation measures can save reserve forest (in percentage)

Opinion→ **Category of Farmer↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Marginal Farmer	85	15	-	-	-	1.85
Small Farmer	86	14	-	-	-	1.86
Semi Medium Farmer	88	12	-	-	-	1.88
Medium Farmer	87	13	-	-	-	1.87
Large Farmer	100	-	-	-	-	2.00

7.6.7. The significant variation have been found in mean belief of the respondents regarding the statement that my active role will help in checking deforestation on the basis of category of farmer according to land holding

Table 7.69: Mean beliefs according to the category of farmer on active role will help to check deforestation (in percentage)

Opinion→ **Category of Farmer↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Marginal Farmer	41	59	-	-	-	1.40
Small Farmer	46	53	1	-	-	1.45
Semi Medium Farmer	38	59	3	-	-	1.34
Medium Farmer	44	52	4	-	-	1.39
Large Farmer	-	50	50	-	-	0.50

In one way ANOVA test results reveal that the null hypothesis is rejected as p value (.030) < α value (.1) on active role will help to check deforestation.

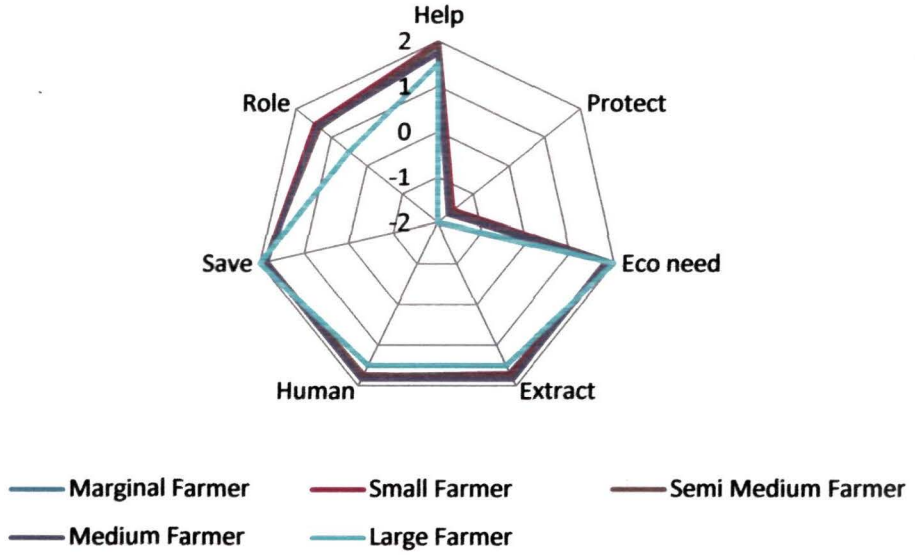
Table 7.70: Significant differences in mean beliefs on the statement that my active role will help to check deforestation on the basis of category of farmer

Category of farmer↓	Category of farmer having difference with (Mean belief of different Category of farmer are given in bracket)		
Marginal Farmer(1.40)	Large Farmer (.50)	-	-
Small Farmer (1.45)	Semi Medium Farmer (1.34)	Large Farmer (.50)	-
Semi Medium Farmer (1.34)	Small Farmer (1,45)	Large Farmer (.50)	-
Medium Farmer (1.39)	Large Farmer (.50)	-	-
Large Farmer (.50)	Marginal Farmer(1.40)	Small Farmer (!,45)	Semi Medium Farmer (1.34)

Table 7.71: Mean belief according to category of farmer about the explanatory variables

Variables→ **Category of Farmer↓**	Help	Protect	Eco-need	Extract	Human	Save	Role
Marginal Farmer	1.92	-1.59	1.90	1.69	1.76	1.85	1.40
Small farmer	1.95	-1.58	1.88	1.72	1.77	1.86	1.45
Semi medium Farmer	1.94	-1.64	1.86	1.78	1.73	1.88	1.34
Medium Farmer	1.74	-1.70	1.83	1.83	1.83	1.87	1.39
Large Farmer	1.50	-2.00	2.00	1.50	1.50	2.00	0.50

Figure 7.6: Mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation according to farmer



The figure 7.6 reveals that significant differences in mean beliefs have been found only in case of medium and large farmers with that of others regarding the statement 'reserve forest provides food, fuel and fodder to people living in nearby villages'. The mean beliefs of small farmer are the highest with 1.95. To the statements 'reserve forest provides protection to many precious wild lives, the reserve forest needs protection for overall ecological balance, village people extract forest products, reserve forest is continuously shrinking for human interference and strict conservation measures can save reserve forest', significant differences in mean beliefs have not been found. But in case of variable 'my active role will help in checking deforestation' the significant differences in mean beliefs have been found in the category of farmers.

7.7.1. Significant variations in mean beliefs have been found of the respondents regarding the statement that forest provides food, fuel and fodder to people in nearby villages on the basis of distance

Table 7.72: Distance wise opinions of the respondents regarding forest provides food, fuel and fodder to people in nearby villages (in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	**Mean**
0-1 kilometer	89	11	-	-	-	1.89
1.1-3 kilometer	96	4	-	-	-	1.96
3.1-5 kilometer	100	-	-	-	-	2.00
5.1-6 kilometer	100	-	-	-	-	2.00

Table 7.73: ANOVA test results on forest provides food, fuel and fodder

	Sum of Squares	Degree of freedom	Mean Square	F	Sig.
Between Groups	1.388	3	.463	7.635	.000
Within Groups	55.572	917	.061		
Total	56.960	920			

Table 7.73 shows that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that belief about forest provides livelihood to people of the fringe villages varies on the basis of distance.

Post Hoc analysis (Fisher's LSD) was carried out to trace out the variation on mean beliefs of the people living in different distances from the forest area. To find out the significant differences of mean beliefs of different distances regarding the statement 'Reserve forest provide livelihood to the people living nearby area of forest'.

Table 7.74: Significant differences in mean belief regarding forest provides livelihood on the basis of distance

Distance↓	Distance having significant difference (Mean belief of different distances are given in bracket)		
0-1 kilometer(1.89)	1.1-3 kilometer(1.96)	3.1-5 kilometer(2.00)	5.1-6 kilometer(2.00)
1.1-3 kilometer(1.96)	0-1 kilometer(1.89)	-	-
3.1-5 kilometer(2.00)	0-1 kilometer(1.89)	-	-
5.1-6 kilometer(2.00)	0-1 kilometer(1.89)	-	-

7.7.2. Significant variations in belief have been found of the respondents regarding the statement that reserve forest provides protection to many precious wild lives on the basis of distance

Table 7.75: Distance wise opinions of the respondents regarding forest provides protection (in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
0-1 kilometer	-	-	-	43	57	-1.57
1.1-3 kilometer	-	-	-	42	58	-1.57
3.1-5 kilometer	-	-	-	16	84	-1.84
5.1-6 kilometer	-	-	-	34	66	-1.66

In one way ANOVA test result shows that p value (.001) < α value (.1), therefore, the null hypothesis is rejected. This implies that mean beliefs about the statement reserve forest provides protection to many precious wild lives varies on the basis of distance.

Table 7.76: Significant differences in mean belief regarding forest provides protection to wildlife on the basis of distance

Distance↓	Distance having significant difference (Mean belief of different distances are given in bracket)		
0-1 kilometer(-1.57)	3.1-5 kilometer(-1.84)	-	-
1.1-3 kilometer(-1.57)	3.1-5 kilometer(-1.84)	-	
3.1-5 kilometer(-1.84)	0-1 kilometer(-1.57)	1.1-3 kilometer(-1.57)	5.1-6 kilometer(-1.66)
5.1-6 kilometer(-1.66)	3.1-5 kilometer(-1.84)	-	-

7.7.3. Significant variations in belief have been found of the respondents regarding the statement that reserve forest needs protection for overall ecological balance on the basis of distance

Table 7.77: Distance wise opinions of the respondents regarding reserve forest needs protection for overall ecological balance

(in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
0-1 kilometer	83	17	-	-	-	1.83
1.1-3 kilometer	90	10	-	-	-	1.90
3.1-5 kilometer	100	-	-	-	-	2.00
5.1-6 kilometer	100	-	-	-	-	2.00

In one way ANOVA test result shows that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that mean beliefs about the statement reserve forest needs protection for overall ecological balance varies on the basis of distance.

Table 7.78: Differences in mean beliefs regarding reserve forest needs protection for overall ecological balance on the basis of distance

Distance↓	Distance having significant difference (Mean belief of different distances are given in bracket)		
0-1 kilometer(1.83)	1.1-3 kilometer(1.90)	3.1-5 kilometer(2.00)	5.1-6 kilometer(2.00)
1.1-3 kilometer(1.90)	0-1 kilometer(1.83)	3.1-5 kilometer(2.00)	5.1-6 kilometer(2.00)
3.1-5 kilometer(2.00)	0-1 kilometer(1.83)	1.1-3 kilometer(1.90)	-
5.1-6 kilometer(2.00)	0-1 kilometer(1.83)	1.1-3 kilometer(1.90)	-

7.7.4. Significant variations in belief have been found of the respondents regarding the statement that village people extract forest products on the basis of distance

Table 7.79: Distance wise opinions of the respondents regarding village people extracts forest products (in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
0-1 kilometer	69	31	-	-	-	1.68
1.1-3 kilometer	80	20	-	-	-	1.79
3.1-5 kilometer	71	29	-	-	-	1.71
5.1-6 kilometer	55	45	-	-	-	1.55

In one way ANOVA test result shows that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that mean beliefs about the statement village people extracts forest products varies on the basis of distance.

Table 7.80: Differences in mean belief regarding the statement village people extracts forest products on the basis of distance

Distance↓	Distance having significant difference (Mean belief of different distances are given in bracket)		
0-1 kilometer(1.68)	1.1-3 kilometer(1.79)	5.1-6 kilometer(1.55)	-
1.1-3 kilometer(1.79)	0-1 kilometer(1.68)	5.1-6 kilometer(1.55)	-
3.1-5 kilometer(1.71)	5.1-6 kilometer(1.55)	-	-
5.1-6 kilometer(1.55)	0-1 kilometer(1.68)	1.1-3 kilometer(1.79)	3.1-5 kilometer(1.71)

7.7.5. Significant differences in mean beliefs have been found of the respondents regarding the statement that the reserve forest is continuously shrinking due to human interference on the basis of distance

Table 7.81: Distance wise opinions of the respondents regarding the reserve forest is continuously shrinking due to human interference (in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
0-1 kilometer	71	29	-	-	-	1.71
1.1-3 kilometer	85	15	-	-	-	1.85
3.1-5 kilometer	71	29	-	-	-	1.71
5.1-6 kilometer	53	47	-	-	-	1.53

In one way ANOVA test result shows that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that mean beliefs about the statement reserve forest is continuously shrinking due to human interference varies on the basis of distance.

Table 7.82: Differences in mean belief regarding the statement reserve forest is continuously shrinking for to human interference on the basis of distance

Distance↓	*Distance having significant difference* (Mean belief of different distances are given in bracket)		
0-1 kilometer(1.71)	1.1-3 kilometer(1.85)	5.1-6 kilometer(1.53)	-
1.1-3 kilometer(1.85)	0-1 kilometer(1.71)	3.1-5 kilometer(1.71)	5.1-6 kilometer(1.53)
3.1-5 kilometer(1.71)	1.1-3 kilometer(1.85)	5.1-6 kilometer(1.53)	-
5.1-6 kilometer(1.53)	0-1 kilometer(1.71)	1.1-3 kilometer(1.85)	3.1-5 kilometer(1.71)

7.7.6. No significant Differences in mean beliefs have been found of the respondents regarding the statement that the strict conservation measures can save reserve forest from degradation on the basis of distance

Table 7.83: Distance wise opinions of the respondents regarding the strict conservation measures can save reserve forest (in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	**Mean**
0-1 kilometer	71	29	-	-	-	1.71
1.1-3 kilometer	85	15	-	-	-	1.85
3.1-5 kilometer	71	29	-	-	-	1.71
5.1-6 kilometer	53	47	-	-	-	1.53

In one way ANOVA test result shows that p value (.315) > α value (.1), therefore, the null hypothesis is not rejected. This implies that the mean beliefs about the statement strict conservation measures can save reserve forest do not vary on the basis of distance.

7.7.7. Significant variations in belief have been found of the respondents regarding the statement that 'my active role will help in checking deforestation' on the basis of distance

Table 7.84: Distance wise opinions of the respondents regarding 'my active role will check deforestation' (in percentage)

Opinion→ Distance↓	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Mean
0-1 kilometer	46	53	1	-	-	1.44
1.1-3 kilometer	45	53	2	-	-	1.43
3.1-5 kilometer	18	82	-	-	-	1.18
5.1-6 kilometer	24	76	-	-	-	1.24

In one way ANOVA test result shows that p value (.000) < α value (.1), therefore, the null hypothesis is rejected. This implies that belief about the statement 'my active role will help in checking deforestation' varies on the basis of distance.

Table 7.85: Differences in mean belief regarding 'my active role will help in checking deforestation' on the basis of distance

Distance↓	Distance having significant difference (Mean belief of different distances are given in bracket)		
0-1 kilometer(1.44)	3.1-5 kilometer(1.18)	5.1-6 kilometer(1.24)	-
1.1-3 kilometer(1.43)	3.1-5 kilometer(1.18)	5.1-6 kilometer(1.24)	-
3.1-5 kilometer(1.18)	0-1 kilometer(1.44)	1.1-3 kilometer(1.43)	-
5.1-6 kilometer(1.24)	0-1 kilometer(1.44)	1.1-3 kilometer(1.43)	-

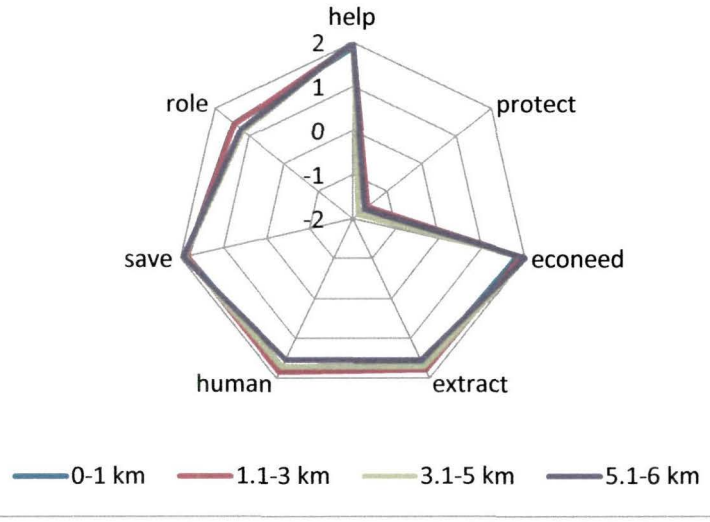
The above table 7.85 reveals that the variations have been found in mean belief between the distances 0-1 kilometer with 3.1-5 kilometer and 5.1-6 kilometer; distances between 1.1-3 kilometer with 3.1-5 kilometer and 5.1-6 kilometer. The mean beliefs of the distances within 3 kilometers to the forest area are stronger than the mean beliefs of the distances more than 3 kilometers to the forest area. The Table 7.86 states the different mean beliefs of the respondents living short and long distance from the forest area. The cross-tabulated data between communities with distances gives a clear understanding that 33% (132 out of 383 samples) of Bodo community and 44% (176 out

of 257 samples) of Koch community within 0-1 kilometer distance and 49.5% (205 out of 383 samples) of Bodo and 15.2% (63 out of 257 samples) of Koch community within 1.1-3 kilometer distances have the highest mean belief with 1.44 and 1.43 respectively regarding the statement "*my active role will help in checking deforestation*'.

Table 7.86: Mean beliefs according to the distances about the explanatory variables

Distance	Help	Protect	Econeed	Extract	Human	Save	Role
0-1 km	1.89	-1.58	1.83	1.68	1.71	1.86	1.44
1.1-3 km	1.96	-1.57	1.9	1.79	1.85	1.85	1.43
3.1-5 km	2	-1.84	2	1.71	1.71	1.9	1.18
5.1-6 km	2	-1.66	2	1.55	1.53	1.93	1.24

Figure 7.7: Distance wise mean beliefs of the respondents about reserve forest, deforestation, conservation and community participation



The Figure 7.7 states that people living in the different distances within 0-6 kilometer from the forest area admitted that the reserve forest provides food, fuel and fodder to people in nearby villages. The mean beliefs are highest to the people living in distances between 3.1- 5 kilometer and 5.1- 6 kilometers with 2.00. The mean beliefs of 1.1-3 kilometer distances vehemently opposed the statement that 'the reserve forest provides protection to many precious wild lives'. The people living in 3.1- 5 kilometer and 5.1-6 kilometer distances supported the statement that 'reserve forest needs protection for overall ecological balance'. The people living in the distances 1.1-3 kilometer admitted

that 'village people extracts forest products' with highest mean belief of 1.79. The statement that 'reserve forest is continuously shrinking for human interference' was supported by the people living in distances within 1.1- 3 kilometers with highest mean belief of 1.85. The people living in the different distances within 0-6 kilometers from the forest area believed that the statement 'strict conservation measures can save the forest from deforestation' (mean beliefs of the respondents almost same within 1.85-1.93). In case of active participation in conservation activities people belong to the distances from 0-1 and 1.1-3 kilometers distances believed that the community's participation will check deforestation (with stronger mean beliefs with 1.44 & 1.43 respectively).

Regarding active participation in conservation related activities, the Mishing community has the strongest inclination. Their perception regarding strict forest rules checking deforestation also is the highest compared to the rest of the communities. While analysis from the caste point of view, it has been observed that the scheduled tribes, both plains and hills, have the highest inclination towards participating in conservation related activities. Analysis from the point of view of education, it has been observed that respondents having education up to the 12^{th} standard are most willing to participate in conservation related activities. Among the different occupation holders, the respondents in service are the most willing to participate in conservation related activities. Respondents whose income is in between 1-2 lakh per year have the higher motivation to participate in conservation related activities compared to other respondents. Among farmers, the small farmers are most willing to participate in conservation related activities.

Hence, the segment whose inclination towards actively participating in conservation related activities is the highest is that portion of the Rabha community, whose education level is up to the 12^{th} standard, earning 1-2 lakh per year in the form of salary from service.

Among the farmers, the small farmers are most willing to participate in conservation related activities.

Chapter Eight: Causes of Deforestation and Proposed Methods for Forest Protection

During the course of the study, it has been tried to find out the causes of deforestation and remedial measures thereof. This has been done from two different angles. First, the opinion of the people of fringe villages has been taken with respect to certain statements on issues related to causes of deforestation and remedial measures. In the second stage, a committee of experts has been formed and their opinions on the said topics have been sought.

To get the opinion of the people of fringe villages on the said issues, the following statements were presented to them and they were asked to give their opinion for the degree of acceptance of the statements. The statements presented to them were

1. There has been widespread felling of trees in the reserve forest
2. Excess dependency on forest is contributing to shrinkage of forest coverage
3. Human settlement in forest area is another factor of shrinkage of forest coverage
4. Most of village dwellers extract forest product
5. Villagers collect forest products for household use
6. Villagers collect forest products for commercial purposes too
7. Weak forest administration leads deforestation possible
8. Political intervention encourages encroachers and illegal extraction of forest products

Analyses of responses to each statement is presented below

8.1: Analysis of the responses to the statements of the causes of deforestation

8.1.1:'There has been widespread felling of trees in the reserve forest.'

Table 8.1: Overall perception of widespread felling of trees in the reserve forest

Opinion	value	Frequency	Mean
Strongly Agree	2	807	1.88
Agree	1	114	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.2: Community wise mean belief regarding widespread felling of trees in the reserve forest (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	78	22	-	-	-	1.78
Koch	92	8	-	-	-	1.92
Garo	100	-	-	-	-	2.00
Mishing	96	4	-	-	-	1.96
Adivasi	92	8	-	-	-	1.92
Nepali	98	2	-	-	-	1.98
Rabha	100	-	-	-	-	2.00

8.1.2: 'Excess dependency on forest is contributing to shrinkage of forest coverage'

Table 8.3: Overall perception regarding excess forest dependency reduces forest cover

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	737	1.79
Agree	1	180	
Neither Agree nor Disagree	0	03	
Disagree	-1	01	
Strongly Disagree	-2	-	

Table 8.4: Community wise mean belief of excess dependency reduces forest (in %)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	84	16	-	-	-	1.84
Koch	69	31	-	-	-	1.68
Garo	100	-	-	-	-	2.00
Mishing	91	9	-	-	-	1.92
Adivasi	82	18	-	-	-	1.82
Nepali	56	38	-	-	-	1.51
Rabha	88	12	-	-	-	1.88

8.1.3:'Human settlement in forest area is another factor of shrinkage in forest cover'

Table 8.5: Overall perception regarding shrinkage in forest cover for human settlement

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	778	1.84
Agree	1	143	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.6: Community wise mean belief about forest reduction for human settlement

(in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	79	21	-	-	-	1.79
Koch	91	9	-	-	-	1.91
Garo	100	-	-	-	-	2.00
Mishing	94	6	-	-	-	1.94
Adivasi	82	18	-	-	-	1.82
Nepali	55	45	-	-	-	1.55
Rabha	87	13	-	-	-	1.88

8.1.4:'Most of village dwellers extract forest product'

Table 8.7: Overall perception regarding forest product extraction by villagers

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	667	1.72
Agree	1	251	
Neither Agree nor Disagree	0	03	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.8: Community wise perception regarding forest extraction by villagers

(in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	67	32	1	-	-	1.67
Koch	76	32	-	-	-	1.75
Garo	98	24	-	-	-	1.98
Mishing	62	38	-	-	-	1.62
Adivasi	87	13	-	-	-	1.87
Nepali	45	53	2	-	-	1.45
Rabha	88	12	-	-	-	1.88

8.1.5:'Villagers collect forest products for household use'

Table 8.9: Overall perception regarding collection of forest product for household use by villagers

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	288	0.57
Agree	1	261	
Neither Agree nor Disagree	0	101	
Disagree	-1	228	
Strongly Disagree	-2	43	

Table 8.10: Community wise mean belief regarding household use of forest product

(in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	31	38	12	15	4	.76
Koch	30	17	3	41	9	.18
Garo	19	31	25	24	1	.43
Mishing	23	13	18	45	1	9.86E-02
Adivasi	46	31	15	5	3	1.11
Nepali	49	28	10	13	-	1.13
Rabha	63	25	-	12	-	1.38

8.1.6: '*Villagers collect forest products for commercial purposes too*'

Table 8.11: Overall perception regarding use of forest product in commercial purpose

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	765	1.79
Agree	1	126	
Neither Agree nor Disagree	0	22	
Disagree	-1	08	
Strongly Disagree	-2	-	

Table 8.12: Community wise mean belief about use of forest product in commercial purposes too (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	76	18	4	2	-	1.68
Koch	86	13	1	-	-	1.84
Garo	100	-	-	-	-	2.00
Mishing	94	6	-	-	-	1.94
Adivasi	85	15	-	-	-	1.85
Nepali	79	13	8	-	-	1.72
Rabha	75	12	-	13	-	1.50

8.1.8: 'Weak forest administration leads deforestation possible'

Table 8.13: Overall perception regarding deforestation and weak administration

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	879	1.95
Agree	1	42	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.14: Community wise mean belief about deforestation and weak forest administration (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	92	8	-	-	-	1.92
Koch	95	5	-	-	-	1.95
Garo	98	2	-	-	-	1.98
Mishing	100	-	-	-	-	2.00
Adivasi	100	-	-	-	-	2.00
Nepali	100	-	-		-	2.00
Rabha	100	-	-	-	-	2.00

8.1.9: 'Political intervention encourages encroachers and illegal extraction of forest product'

Table 8.15: Overall perception regarding extraction of forest product for political intervention

Opinion	**value**	**Frequency**	**Mean**
Strongly Agree	2	897	1.97
Agree	1	24	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.16: Community wise mean belief about illegal forest extraction for political intervention (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	96	4	-	-	-	1.96
Koch	97	3	-	-	-	1.96
Garo	100	-	-	-	-	2.00
Mishing	100	-	-	-	-	2.00
Adivasi	100	-	-	-	-	2.00
Nepali	100	-	-		-	2.00
Rabha	100	-	-	-	-	2.00

8.1.10: Differences in mean belief about the following variables on the basis of community are presented in table 8.17 and a diagrammatic representation is given in 8.1.

There has been widespread felling of trees in the reserve forest **(Felling)**

Excess dependency on forest is contributing to shrinkage of forest coverage **(Excess)**

Human settlement in forest area is another factor of shrinkage of forest coverage **(Human)**

Most of village dwellers extract forest product **(Extract)**

Villagers collect forest products for house-hold use **(Collect)**

Villagers collect forest products for commercial purposes too **(Commercial)**

Weak forest administration leads to deforestation possible **(Weak)**

Political intervention encourages encroachers and illegal extraction of forest products **(Political)**

Table 8.17: Mean belief of the community of the explanatory variables

Variables→ Community ↓	Felling	Excess	Human	Extract	Collect	Commercial	Weak	Political
Bodo	1.78	1.84	1.79	1.67	.76	1.68	1.92	1.96
Koch	1.92	1.68	1.91	1.75	.18	1.84	1.95	1.96
Garo	2.00	2.00	2.00	1.98	.43	2.00	1.98	2.00
Mishing	1.96	1.92	1.94	1.62	9.86E-02	1.94	2.00	2.00
Adivasi	1.92	1.82	1.82	1.87	1.11	1.85	2.00	2.00
Nepali	1.98	1.51	1.55	1.45	1.13	1.72	2.00	2.00
Rabha	2.00	1.88	1.88	1.88	1.38	1.50	2.00	2.00

Figure 8.1: Community wise mean belief on the causes of deforestation

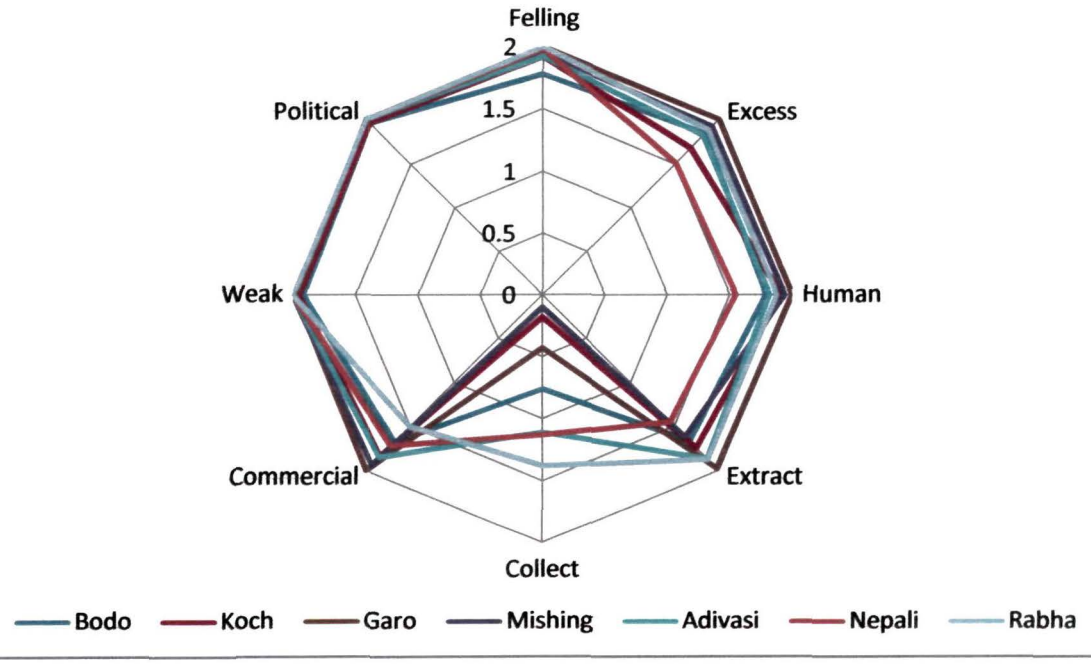


Figure 8.1 reveals that differences in mean belief have been found only in case of Bodo community with that of others regarding the attribute 'widespread felling of trees in the reserve forest.' Regarding attributes 'the reserve forest is shrinking due to excess dependency, human settlement is another factor of reducing forest area', differences in mean belief have been found in case of Nepali community with others. Regarding variable 'the forest dwellers extract forest product', the mean beliefs of Bodo and Nepali communities have the differences with that of other community. Regarding attribute 'villagers collect forest product for household use' the significant differences in mean belief have been found within communities, Koch, Mishing and Garo community's opinion were built on 'strongly disagree' But in case of variable 'the village people collects forest products for commercial purposes too' the mean beliefs of all the communities were almost same. Regarding statements 'weak forest administration leads to deforestation' and 'political intervention encourages encroachers'; the mean beliefs of all the communities were strong enough. On the basis of people's opinion, these two causes were identified as the main causes of deforestation.

Similarly significant perceptual differences in the belief regarding the causes of deforestation have been analyzed on the basis of the demographic variables like occupation, level of education and different income levels'.

8.1.2: Occupation wise variation in the perception with respect to the causes of deforestation

Table 8.18: variation in perception about widespread felling of trees (in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	88	12	-	-	-	1.88
Labour	87	13	-	-	-	1.87
Service	86	14	-	-	-	1.86
Business	90	10	-	-	-	1.90

Table 8.19: Variation in perception about excess dependency reduces forest cover

(in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	78	22	-	-	-	1.78
Labour	85	15	-	-	-	1.85
Service	85	15	-	-	-	1.85
Business	82	16	2	-	-	1.80

Table 8.20: Variation in perception about forest reduction for human settlement

(in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	84	16	-	-	-	1.84
Labour	82	18	-	-	-	1.82
Service	89	11	-	-	-	1.89
Business	84	16	-	-	-	1.84

Table 8.21: Variation in perception about forest product extraction by villager

(in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	70	30	-	-	-	1.70
Labour	81	19	-	-	-	1.81
Service	68	32	-	-	-	1.68
Business	78	22	-	-	-	1.78

Table 8.22: Variation in perception about forest product collection for household use

(in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	31	27	12	27	3	.55
Labour	39	32	6	15	8	.80
Service	22	34	8	22	14	.29
Business	35	23	16	20	6	.63

Table 8.23: Variation in perception about collection of forest product for commercial use

(in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	84	12	3	1	-	1.79
Labour	76	21	2	1	-	1.72
Service	84	15	1	-	-	1.82
Business	84	16	-	-	-	1.84

Table 8.24: Variation in perception about deforestation and weak administration

(in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	95	5	-	-	-	1.95
Labour	98	2	-	-	-	1.98
Service	93	7	-	-	-	1.93
Business	94	6	-	-	-	1.94

Table 8.25: Variation in perception about political intervention encourages encroachers

(in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	98	2	-	-	-	1.98
Labour	97	3	-	-	-	1.97
Service	95	5	-	-	-	1.95
Business	96	4	-	-	-	1.96

Table 8.26: Occupation wise mean belief of the statements

Variables→ Occupation ↓	**Felling**	**Excess**	**Human**	**Extract**	**Collect**	**Commercial**	**Weak**	**Political**
Cultivation	1.88	1.78	1.84	1.70	.55	1.79	1.95	1.98
Labour	1.87	1.85	1.82	1.81	.80	1.72	1.98	1.97
Service	1.86	1.85	1.89	1.68	.29	1.82	1.93	1.95
Business	1.90	1.80	1.84	1.78	.63	1.84	1.94	1.96

Figure 8.2: Occupation wise mean belief on the causes of deforestion

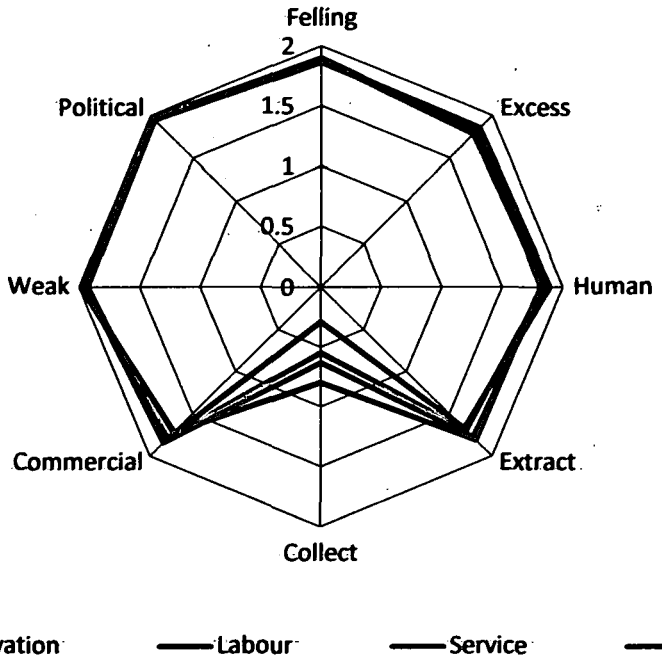


Figure 8.2 reveals that the variation in mean belief of the different occupation levels have been distinctly appeared regarding the explanatory variable 'the village people collect forest product for household use', the service holder's mean belief is the lowest with 0.29, it is followed by cultivators and businessmen with smaller mean belief 0.55 and 0.63 respectively. Contrary to this, the occupation level labour has the highest mean belief with 0.80.

8.1.3: Statements regarding causes of deforestation on the basis of different levels of education

Table 8.27: Variation in perception with respect to widespread felling of trees

(in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	85	15	-	-	-	1.85
Primary	90	10	-	-	-	1.90
10 pass	94	6	-	-	-	1.94
10+2 pass	73	27	-	-	-	1.73
Graduate	75	25	-	-	-	1.75

Table 8.28: Variation in perception regarding excess dependency leads to deforestation

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	82	18	-	-	-	1.82
Primary	78	21	1	-	-	1.77
10 pass	79	21	-	-	-	1.79
10+2 pass	80	20	-	-	-	1.80
Graduate	87	13	-	-	-	1.88

Table 8.29: Variation in perception regarding reduction of forest for human settlement

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	83	17	-	-	-	1.83
Primary	85	15	-	-	-	1.85
10 pass	92	8	-	-	-	1.91
10+2 pass	80	20	-	-	-	1.80
Graduate	100	-	-	-	-	2.00

Table 8.30: Variation in perception with respect to forest product extraction by villager

(in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	69	31	-	-	-	1.69
Primary	76	23	1	-	-	1.76
10 pass	77	23	-	-	-	1.77
10+2 pass	53	47	-	-	-	1.53
Graduate	50	50	-	-	-	1.50

Table 8.31: Variation in belief with respect to forest product collection for household use

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	33	32	9	24	2	.70
Primary	31	25	12	25	6	.50
10 pass	26	30	13	28	4	.45
10+2 pass	7	27	33	7	27	-.20
Graduate	-	25	13	50	12	-.50

Table 8.32: Variation in belief was that forest product collection for commercial purposes

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	84	13	2	1	-	1.80
Primary	82	14	3	1	-	1.77
10 pass	87	13	-	-	-	1.87
10+2 pass	87	6	7	-	-	1.80
Graduate	75	25	-	-	-	1.75

Table 8.33: Variation in perception with respect to deforestation and weak administration

(in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	96	4	-	-	-	1.96
Primary	95	5	-	-	-	1.95
10 pass	96	4	-	-	-	1.96
10+2 pass	93	7	-	-	-	1.93
Graduate	100	-	-	-	-	2.00

Table 8.34: Variation in perception with respect to political intervention encourages encroachers

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	98	2	-	-	-	1.98
Primary	96	4	-	-	-	1.96
10 pass	98	2	-	-	-	1.98
10+2 pass	100	-	-	-	-	2.00
Graduate	100	-	-	-	-	2.00

Table 8.35: Mean belief of the statements on different education levels

Variables→ Education↓	Felling	Excess	Human	Extract	Collect	Commercial	Weak	Political
Illiterate	1.85	1.82	1.83	1.69	.70	1.80	1.96	1.98
Primary	1.90	1.77	1.85	1.76	.50	1.77	1.95	1.96
10 pass	1.94	1.79	1.91	1.77	.45	1.87	1.96	1.98
10+2	1.73	1.80	1.80	1.53	-.20	1.80	1.93	2.00
Graduate	1.75	1.88	2.00	1.50	-.50	1.75	2.00	2.00

Figure 8.3: Education wise mean belief on the causes of deforestation

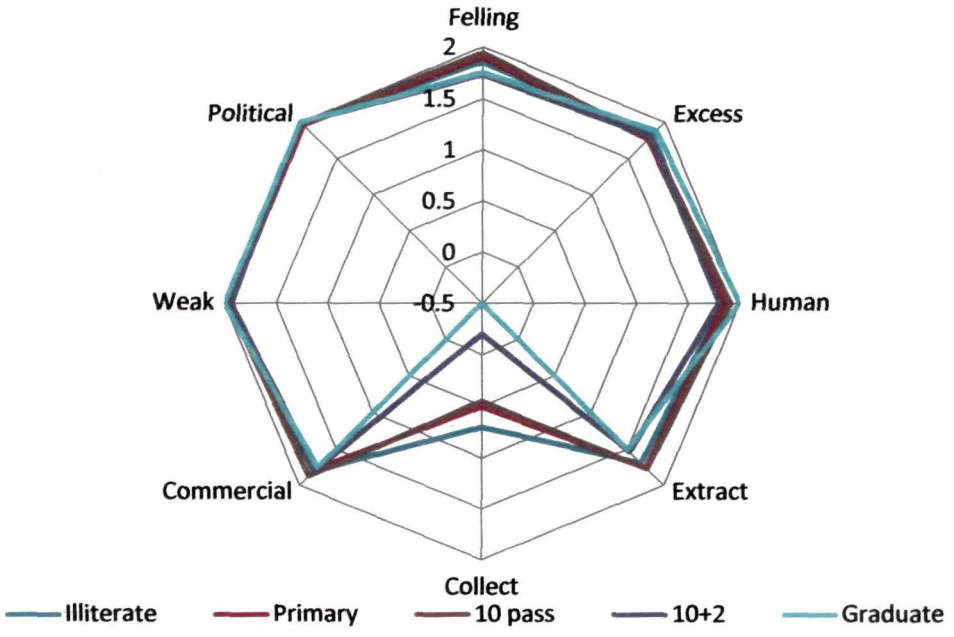


Figure 8.3, the variation in mean belief of the respondents has been found only in explanatory variable 'village people collect forest products for household use'. Except this explanatory variable, no differences in mean beliefs have been found significant in case of other variables.

8.1.4: Statements regarding causes of deforestation on the basis of different levels of income

Table 8.36: Variation in perception with respect to widespread felling of trees

(in percentage)

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	88	12	-	-	-	1.88
1-2 lakh	86	14	-	-	-	1.86
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

Table 8.37: Variation in perception with respect to excess dependency reduces forest cover

(in percentage)

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	80	20	-	-	-	1.79
1-2 lakh	82	17	1	-	-	1.81
2-3 lakh	50	50	-	-	-	1.50
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

Table 8.38: Variation in perception with respect to human settlement reduces forest cover (in percentage)

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	85	15	-	-	-	1.85
1-2 lakh	82	18	-	-	-	1.82
2-3 lakh	50	50	-	-	-	1.50
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

Table 8.39: Variation in perception with respect to forest product extraction by villagers

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	73	27	-	-	-	1.72
1-2 lakh	71	26	3	-	-	1.68
2-3 lakh	50	50	-	-	-	1.50
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

Table 8.40: Variation in perception with respect to forest product collection for household use (in percentage)

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	31	28	11	26	4	.55
1-2 lakh	35	32	11	11	11	.68
2-3 lakh	50	50	-	-	-	1.50
3-4 lakh	67	-	-	33	-	1.00
>4 lakh	100	-	-	-	-	2.00

Table 8.41: Variation in belief in forest product collection for commercial purposes

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	84	13	2	1	-	1.79
1-2 lakh	75	22	3	-	-	1.72
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	67	33	-	-	-	1.67
>4 lakh	100	-	-	-	-	2.00

Table 8.42: Variation in perception with respect to deforestation and weak administration

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	96	4	-	-	-	1.96
1-2 lakh	92	8	-	-	-	1.92
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

8.43: Variation in perception with respect to political intervention helps encroachers

(in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	97	3	-	-	-	1.97
1-2 lakh	97	3	-	-	-	1.97
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

Table 8.44: Mean belief of the statements on different levels of income

Variables→ Level of income↓	**Felling**	**Excess**	**Human**	**Extract**	**Collect**	**Commercial**	**Weak**	**Political**
<1 lakh	1.88	1.79	1.85	1.72	.55	1.79	1.96	1.97
1-2 lakh	1.86	1.81	1.82	1.68	.68	1.72	1.92	1.97
2-3 lakh	2.00	1.50	1.50	1.50	1.50	2.00	2.00	2.00
3-4 lakh	2.00	2.00	2.00	2.00	1.00	1.67	2.00	2.00
>4lakh	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Figure 8.4: Income wise mean belief on the causes of deforestation

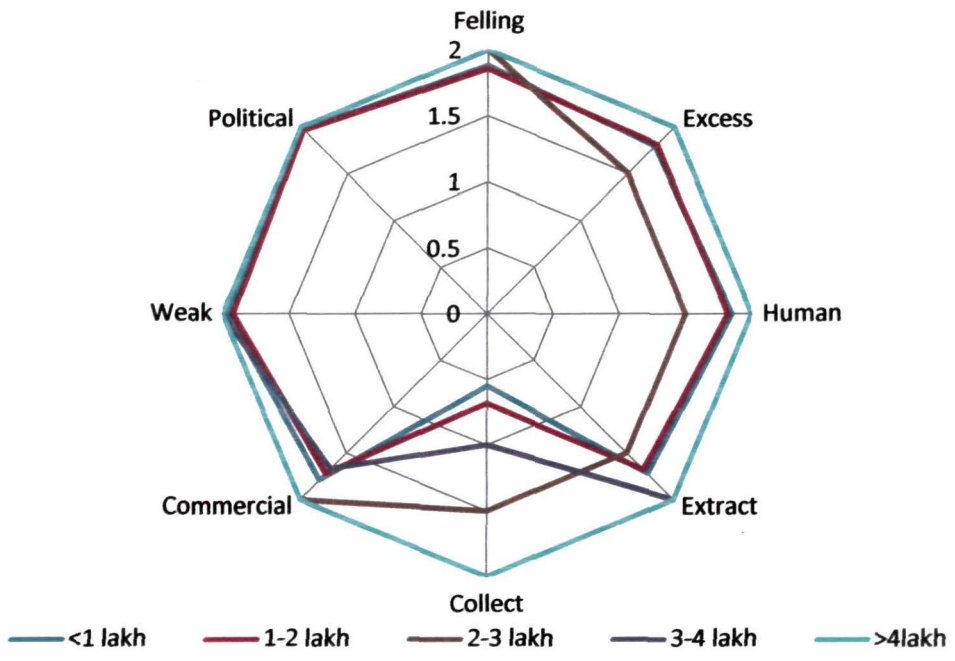
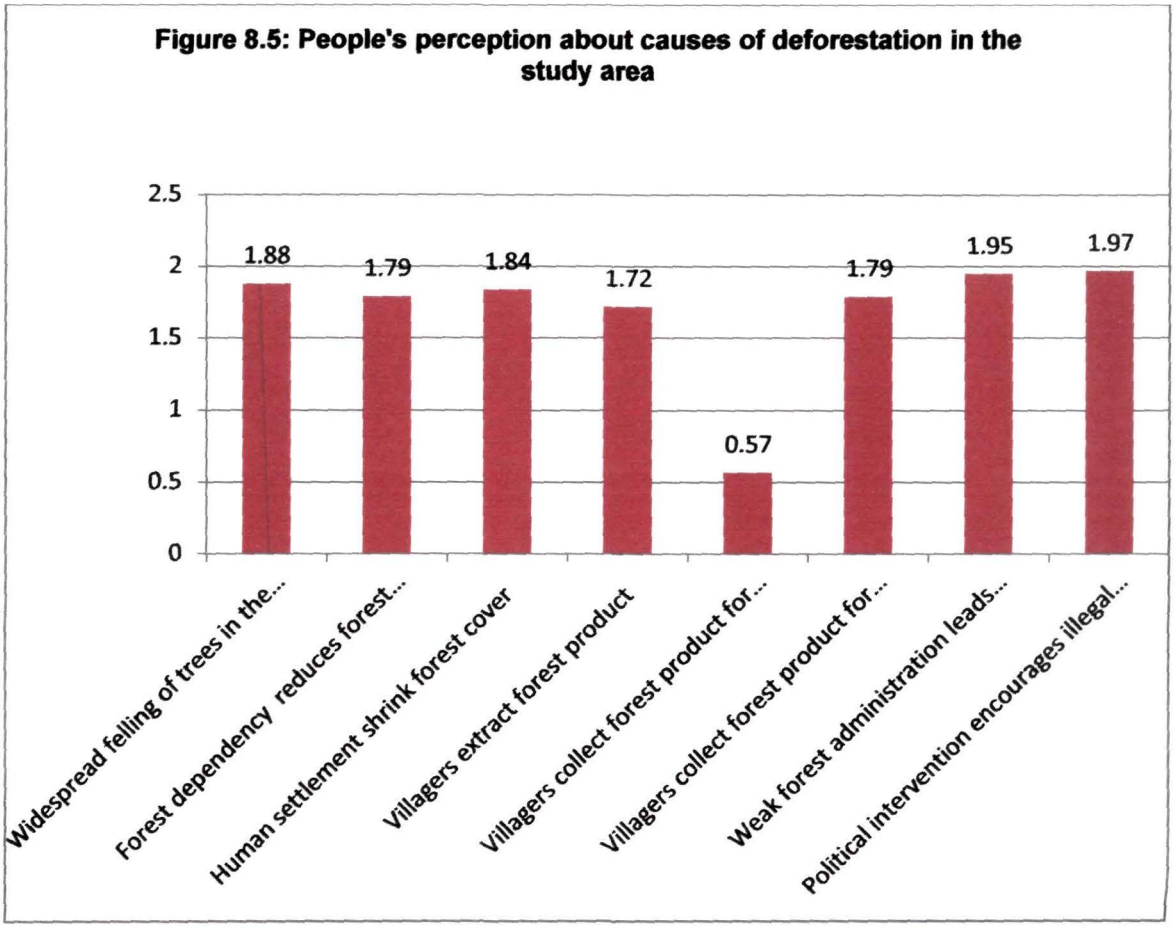


Figure 8.4 indicates that the significant perceptual differences of the respondents regarding the variables 'excess dependency reduces forest area, forest shrinking is for human settlement, village people extract forest products and villagers collect forest product for household use' have been found. The mean belief of the respondents between income level 2-3 lakh has the lowest and >4 lakh is the highest in case of explanatory variables 'excess dependency reduces forest area, forest area is shrinked for human settlement, village people extract forest products'. But the mean differences of the explanatory variable 'villagers collect forest product for household use' have been found among the different income groups. Here, the mean belief of income level <1 lakh is the lowest and it is followed by income level 1-2 lakh, then income level 3-4 lakh and income level 2-3 lakh. But the income level >4 lakh has the highest mean belief regarding this attribute.

Table 8.45: Respondents mean belief to the statements about the causes of deforestation

Statement	Mean
Widespread felling of trees in the Reserve Forest	1.88
Forest dependency reduces forest coverage	1.79
Human settlement shrink forest cover	1.84
Villagers extract forest product	1.72
Villagers collect forest product for house-hold use	0.57
Villagers collect forest product for commercial purposes	1.79
Weak forest administration leads deforestation	1.95
Political intervention encourages illegal extraction	1.97

Figure 8.5: People's perception about causes of deforestation in the study area



8.2: Analysis of the statements on the causes of dependency on forest

8.2.1: 'Demand for inexpensive timber products encourages illegal timber harvesting'

Table 8.46: Overall perception regarding timber demand leads to illegal harvesting

Opinion	value	Frequency	Mean
Strongly Agree	2	827	1.90
Agree	1	93	
Neither Agree nor Disagree	*0*	-	
Disagree	-1	01	
Strongly Disagree	-2	-	

Table 8.47: Respondents mean belief about illegal timber harvesting on the basis of community (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	85	15	-	-	-	1.85
Koch	92	8	-	-	-	1.92
Garo	98	2	-	-	-	1.98
Mishing	94	6	-	-	-	1.94
Adivasi	89	11	-	-	-	1.89
Nepali	98	-	-	2	-	1.94
Rabha	88	12	-	-	-	1.88

Table 8.48: Respondents mean belief about illegal timber harvesting on the basis of occupation (in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	91	9	-	-	-	1.90
Labour	86	14	-	-	-	1.86
Service	90	10	-	-	-	1.90
Business	90	10	-	-	-	1.90

Table 8.49: Respondents mean belief about illegal timber harvesting on the basis of different education levels (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	88	12	-	-	-	1.88
Primary	91	9	-	-	-	1.91
10 pass	92	8	-	-	-	1.91
10+2 pass	80	20	-	-	-	1.80
Graduate	100	-	-	-	-	200

Table 8.50: Respondents mean belief about illegal timber harvesting on income levels

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	90	10	-	-	-	1.90
1-2 lakh	90	10	-	-	-	1.90
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	67	-	33	-	-	1.34
>4 lakh	100	-	-	-	-	2.00

8.2.2: 'Extraction of forest product is habitual rather need-based'

Table 8.51: Overall perception regarding forest product extraction is habitual

Opinion	value	Frequency	Mean
Strongly Agree	2	769	1.83
Agree	1	152	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.52: Respondents mean belief about habitual extraction of forest product on the basis of community (in percentage)

Opinion→ **Community↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	77	23	-	-	-	1.77
Koch	80	20	-	-	-	1.80
Garo	99	1	-	-	-	1.99
Mishing	94	6	-	-	-	1.94
Adivasi	89	11	-	-	-	1.89
Nepali	100	-	-	-	-	2.00
Rabha	100	-	-	-	-	2.00

Table 8.53: Respondents mean belief about habitual extraction of forest product on the basis of occupation (in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	83	17	-	-	-	1.83
Labour	84	16	-	-	-	1.84
Service	84	16	-	-	-	1.84
Business	88	12	-	-	-	1.88

Table 8.54: Respondents mean belief about habitual extraction of forest product on the basis of different education levels (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	85	15	-	-	-	1.85
Primary	82	18	-	-	-	1.82
10 pass	85	15	-	-	-	1.85
10+2 pass	67	33	-	-	-	1.67
Graduate	75	25	-	-	-	1.75

Table 8.55: Respondents mean belief about habitual extraction of forest product on the basis of different income levels (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	83	17	-	-	-	1.83
1-2 lakh	83	17	-	-	-	1.83
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

8.2.3: 'Dependency on forest is mainly due to poverty of the people'

Table 8.56: Overall perception on excess dependency on forest due to poverty

Opinion	value	Frequency	Mean
Strongly Agree	2	766	1.77
Agree	1	115	
Neither Agree nor Disagree	0	21	
Disagree	-1	18	
Strongly Disagree	-2	01	

Table 8.57: Respondents mean belief about excess forest dependency for poverty on the basis of community (in percentage

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean
Bodo	82	16	2	-	-	1.79
Koch	83	6	4	7	-	1.65
Garo	91	8	1	-	-	1.90
Mishing	87	11	-	2	-	1.85
Adivasi	64	36	-		-	1.64
Nepali	94	6	-		-	1.94
Rabha	100	-	-		-	2.00

Table 8.58: Respondent's mean belief about excess forest dependency for poverty on occupation (in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	85	11	1	3	-	1.78
Labour	80	11	9	-	-	1.72
Service	71	25	3	1	-	1.66
Business	86	14	-	-	-	1.86

Table 8.59: Respondents mean belief about excess forest dependency for poverty on the basis of different education levels (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	87	10	1	2	-	1.82
Primary	81	14	3	2	-	1.73
10 pass	83	11	4	2	-	1.74
10+2 pass	67	27	6	-	-	1.60
Graduate	37	63	-	-	-	1.38

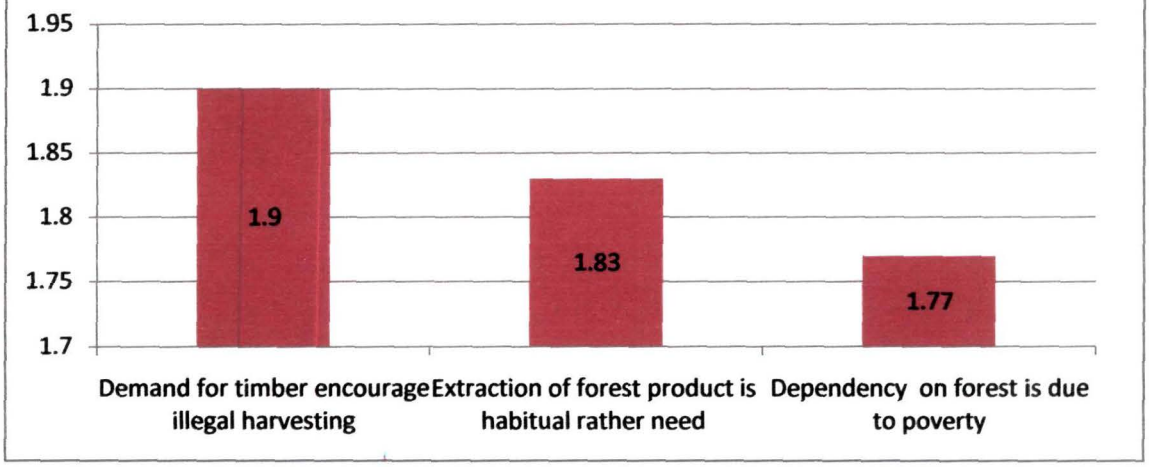
Table 8.60: Respondents mean belief about excess forest dependency for poverty on the basis of different income levels (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	84	12	2	2	-	1.78
1-2 lakh	79	17	3	1	-	1.74
2-3 lakh	75	25	-	-	-	1.75
3-4 lakh	67	33	-	-	-	1.67
>4 lakh	100	-	-	-	-	2.00

Table 8.61: Respondents mean belief to the statements on causes of dependency on forests

Statement	Mean
Demand for timber encourage illegal harvesting	1.90
Extraction of forest product is habitual rather need	1.83
Dependency on forest is due to poverty	1.77

Figure 8.6: Mean belief regarding dependency on forest



8.3: Analysis of the statements on probable solution of deforestation

8.3.1: 'A strong administration is likely to save the reserve forest'

Table 8.62: Overall perception regarding strong administration to save forest

Opinion↓	value	Frequency	Mean
Strongly Agree	2	901	1.98
Agree	1	20	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.63: Respondents mean belief about strong forest administration on the basis of community (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	97	3	-	-	-	1.97
Koch	97	3	-	-	-	1.96
Garo	100	-	-	-	-	2.00
Mishing	100	-	-	-	-	2.00
Adivasi	100	-	-	-	-	2.00
Nepali	100	-	-		-	2.00
Rabha	100	-	-	-	-	2.00

Table 8.64: Respondents mean belief about strong forest administration on the basis of occupation (in percentage)

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	98	2	-	-	-	1.98
Labour	99	1	-	-	-	1.99
Service	93	7	-	-	-	1.93
Business	94	6	-	-	-	1.94

Table 8.65: Respondents mean belief about strong forest administration on the basis of levels of education (in percentage)

Opinion→ Education↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	99	1	-	-	-	1.99
Primary	97	3	-	-	-	1.97
10 pass	98	2	-	-	-	1.98
10+2 pass	87	13	-	-	-	1.87
Graduate	75	25	-	-	-	1.75

Table 8.66: Respondents mean belief about strong forest administration on different income levels (in percentage)

Opinion→ Income level↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	98	2	-	-	-	1.98
1-2 lakh	94	6	-	-	-	1.96
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

8.3.2: 'Effective forest laws are indispensable to stop deforestation in the reserve forest'

Table 8.67: Overall beliefs about the necessity of strict forest laws to stop deforestation

Opinion↓	**value**	**Frequency**	**Mean**
Strongly Agree	2	898	1.98
Agree	1	23	
Neither Agree nor Disagree	0	-	
Disagree	-1	-	
Strongly Disagree	-2	-	

Table 8.68: Respondents mean belief about the necessity of effective forest laws on the basis of community (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	97	3	-	-	-	1.97
Koch	97	3	-	-	-	1.96
Garo	99	1	-	-	-	1.99
Mishing	100	-	-	-	-	2.00
Adivasi	100	-	-	-	-	2.00
Nepali	100	-	-		-	2.00
Rabha	100	-	-	-	-	2.00

Table 8.69: Respondents mean belief about the effective forest laws on occupation

Opinion→ Occupation↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	98	2	-	-	-	1.98
Labour	98	2	-	-	-	1.98
Service	93	7	-	-	-	1.93
Business	96	4	-	-	-	1.96

Table 8.70: Respondents mean belief about the necessity of effective forest laws on the basis of different levels of education (in percentage)

Opinion→ **Education↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	98	2	-	-	-	1.98
Primary	98	2	-	-	-	1.98
10 pass	94	6	-	-	-	1.94
10+2 pass	80	20	-	-	-	1.80
Graduate	87	13	-	-	-	1.88

Table 8.71: Respondents mean belief about the necessity of effective forest laws on the basis of different income levels (in percentage)

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	98	2	-	-	-	1.98
1-2 lakh	94	6	-	-	-	1.94
2-3 lakh	100	-	-	-	-	2.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	100	-	-	-	-	2.00

8.3.3: 'Programme to eradicate poverty will reduce dependency on forest products'

Table 8.72: Overall perception regarding eradication of poverty means reducing forest dependency

Opinion	value	Frequency	Mean
Strongly Agree	2	244	0.58
Agree	1	333	
Neither Agree nor Disagree	0	145	
Disagree	-1	111	
Strongly Disagree	-2	88	

Table 8.73: Respondents mean belief about poverty eradication to reduce forest dependency on the basis of community (in percentage)

Opinion→ Community↓	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Bodo	24	30	18	15	13	.37
Koch	23	37	16	13	11	.46
Garo	52	39	2	4	3	1.33
Mishing	21	52	6	20	1	.72
Adivasi	20	52	26	2	-	.90
Nepali	36	34	21	4	5	.91
Rabha	38	25	13	12	12	.63

Table 8.74: Respondents mean belief about eradication of poverty to reduce forest dependency on the basis of occupation (in percentage)

Opinion→ **Occupation↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Cultivation	28	37	15	12	8	.66
Labour	22	36	15	8	19	.35
Service	19	25	27	15	14	.21
Business	27	39	14	16	4	.71

Table 8.75: Respondents mean belief about eradication of poverty to reduce forest dependency on the basis of different education levels (in percentage)

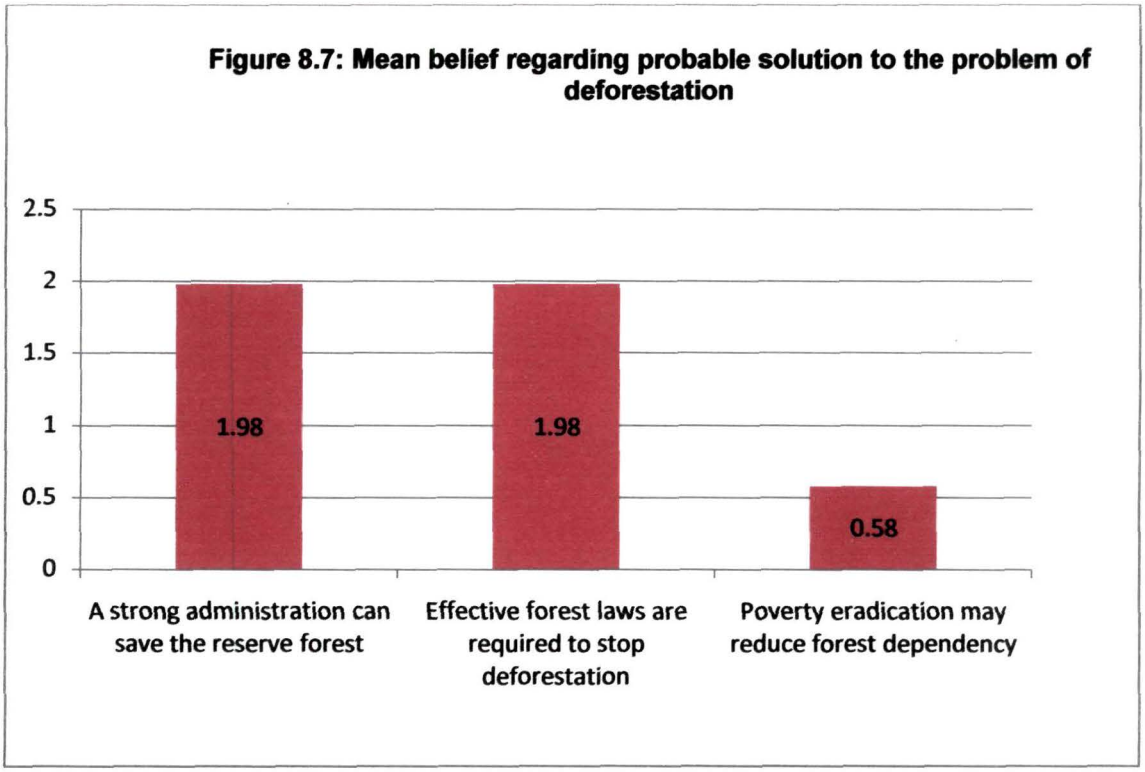
Opinion→ **Education↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
Illiterate	28	38	13	12	9	.64
Primary	26	35	18	11	10	.57
10 pass	26	32	21	13	8	.53
10+2 pass	13	20	20	27	20	-.20
Graduate	-	38	12	50	-	-.13

Table 8.76: Respondents mean belief about eradication of poverty to reduce forest dependency on different income levels (in percentage)

Opinion→ **Income level↓**	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	**Mean**
<1 lakh	27	36	16	12	9	.59
1-2 lakh	21	37	18	11	13	.43
2-3 lakh	-	25	50	25	-	.00
3-4 lakh	100	-	-	-	-	2.00
>4 lakh	-	100	-	-	-	1.00

Table 8.77.: Respondents mean belief to the given statements on probable solution to stop deforestation in the study area

Statement	Mean
A strong administration can save the reserve forest	1.98
Effective forest laws are required to stop deforestation	1.98
Poverty eradication may reduce forest dependency	0.58



Throughout the analysis, it has been checked if there is any significant difference in perception towards forest, deforestation, forest conservation and protection and participation in conservation programme on the basis of different demographic variables. This was done to find out the segment of the population that has the maximum positive outlook towards forest and is willing to get involved in forest protection measures. After

detailed analysis of the data collected from different strata of the population, it has been found that the segment whose inclination towards actively participating in conservation related activities is the highest is that portion of the Rabha community whose education level is up to the 12th standard and whose earning is 1-2 lakh per year in the form of salary from service. Among the farmers, the small farmers are most willing to participate in conservation related activities.

Hence, this group can be used for sensitization of the other groups of population regarding ill effects of deforestation and other ecologically unfriendly activities.

For the expert opinion survey to find out the causes of deforestation and different measures to be taken to find a solution to it, a panel of five members was selected from various backgrounds. The members were selected from academicians, forest officials (officiating and retired), and an expert from the Department of Agriculture, Government of Assam, having knowledge on horticulture and soil conservation. The views of the experts on the given topic were sought and the process was carried out for three rounds. At the end of the third round of meeting with the experts, the following conclusions have been drawn about the causes of forest destruction, present forest rehabilitation programmes like JFM, substitute wood for use as alternative fuel and for commercial use, poverty alleviation programme and forest protection methods, etc.

Causes of deforestation: Experts' views

1) The "Scheduled Tribe and other Traditional Forest Dwellers (recognition of forest right) Act, 2006: Rule 207" has been cited as one of the chief causes of deforestation. This is regarded as one of the "self contradictory" government policies on forest. During the British rule in India, forest policies were rigid and strict; restrictions were imposed on fringe villagers even to enter into the forest area for the collection of non timber forest products. Forest right was exclusive to the British legacy during pre-independence India. In independent India, since 1970s, the rate of deforestation has been high and thereafter in the forest policy of 1988, the government decided to involve the people living in and around the forest area in conservation activities. Gradually, the forest right was enacted in the reserve forest areas as a guarantee of rights to the people living within the forest area. For protection, conservation, logging operation in the reserve forest, the process of rehabilitation was started with the aid of state government and the forest department. Ultimately, the people in forest areas got the right of periodic patta over forest land. The

present Forest Act, 2006, ensured the land right to the people living in forest areas. But, meanwhile, the Forest Department has been delaying the implementation of the government ordinance. As a result, conflicts are arising between the forest department and community living within the forest area. The Forest Department believes that once the community procures forest land, they will expand their estate even within the park area. Therefore, on one hand, the government put pressure on the Forest Department to save the forest and on the other; the forest right is given to the forest community. This is self contradictory.

2) Direct political intervention has been encouraging a particular ethnic group to assert claim on forest land referring to the recent government declaration of forest rights. Simultaneously, this Forest Right Act, 2006, has helped the tribal community to encroach forest land to extend their livelihood activities.

3) Insurgency and political instability is another cause of forest destruction. A faction of an insurgent group lives with the mainstream and selects the valuable timber resource as their source of livelihood. The self styled organization with the direct aid of the government causes damage to the wild habitat. It was also an uphill task to the Forest Department to protect the irreparable loss to the existing forest.

The systematic encroachment coupled with the presence of the insurgent groups in the forest along with the deteriorating law and order situation in the state has made it impossible for the Forest Department to tackle the menace of deforestation alone. Another major problem could be that, with the change in society, the Forest Department is not well equipped to face the situation.

4) The high rate of unemployment and the growing school dropouts in the fringe areas help increase the number of timber smugglers. Particularly, in the fringe areas of forest, the excess greed for easy money encourages the uneducated youth to engage themselves in activities causing harm to the forest. Failure of some government schemes, such as, the Sarva Siksha Abhijan (Universalisation of Education) among the rural forest dwelling communities has only added to the growth of unemployment which has led to poverty and to get relief from the grip of poverty, people take forest as the softest and the nearest target.

5) Fertile land inside the forest is another cause of massive deforestation. The tendency to expand farmland increases day by day within the forest area for high rate of population growth. Taking advantage of the shortage of forest staff, villagers have easily entered the forest area while pursuing their efforts to expand the areas of cultivation and cropping. The relatively well organized forces among the forest dwelling communities have sharply risen and the Department of Forest has become helpless to save forest land from encroachment carried out by these forces.

6) Lack of proper planning to meet the gap between demand and supply of forest products including firewood, timber products and non timber forest produce is another cause of deforestation. Fastest urbanization, excess requirement of timber products, large scale furniture demand within the region, total negligence of proper plantation, people's non-cooperation with the Forest Department, throwing plantation habit, felling of young timber, etc. pave the way of forest destruction which is detrimental to the existing environment.

7) Shortage of efficient staff causes heavy damage to the forest resources. With the lack of a well trained Forest Protection Task Force, unabated encroachment to sanctuaries and uncontrolled tree felling therein have become easier and possible. The central as well as the state governments overlook the present threat to the forests. Unless proper priority is given to saving forests without any further delay, it will be very difficult not only to restore the destructed forests, but also to sustain the present size of forest land.

Checking deforestation: Experts' views

A 'carrot and stick' policy is required to protect forests. In this respect, the following remedies are suggested to stop deforestation:

1) Implementation of rigid forest laws is inevitable to combat the growing indiscriminate clearance of forest areas. Without strict conservation ordinances of both the governments, it will be an impossible task to save forests from the needy and greedy ones. Otherwise, all efforts will be in vain to check deforestation.
2) Drastic punitive measures should be imposed for violation of forest laws. The government ought to treat the habitat equal with the wild lives.

3) Posting of young energetic staff for field duty will be a measure to check deforestation. A strong, healthy and committed group of workers with a positive attitude towards forest protection will contribute extensively to the conservation and protection of forests.
4) Recruitment and deployment of forest armed forces with strict instructions and accountability would check further deforestation.
5) A strong communication facility is needed to strengthen the department as well as the patrolling units. There is no alternative to strict vigilance in the restricted areas of the scheduled forest land.
6) The Forest Department should take up a strong coordination between forest officials and the information wing. This will be an effective force to stop illegal tree felling and animal hunting.
7) Imparting a positive education on forests to the educated youths of the surrounding villages will certainly increase the goodwill of the young generation about forest protection. This will, to a great extent, diminish the scale of forest reduction because of their enhanced understandability on the benefits of forest conservation that is capable of serving as their future livelihood.

The following species are suggested by the expert panel in conformity with the original composition of the forests of the west forest division (WFD) of Sonitpur district, Assam, India, as fast growing for substitute wood to use as fuel and for commercialization too

Table 8.75: List of Substitute Trees

1) Fast Growing species.:
i) Kadam *(Anthocephalus caddamba)*
ii) Casia siamea
iii) Rain tree *(Samania Samon)*
iv) Cotton tree *(Bombax ceiba)*
v) Ficus Spp.
vi) Mango *(Magnifera indica)*
vii) Jack fruit *(Artocarpus integrifolia)*
viii) Amla *(Emblica officinalis)*

ii)House building purpose:	i) Gamari *(Gmelina arborea)*
	ii)Cham *(Artocarpus chaplasa)*
	iii) Teak *(Tectona grandis)*
	iv) Titasopa *(Michalia champaka)*
	v) Amari *(Amoora wallichi)*
	vi) Bogipoma *(Chakrasia tabularis)*
	vii) Urium *(Bischofia javanica)*
	viii)Myrobalan *(Terminalia chebula)*
iii) Construction Purpose:	i) Moj *(Albizzia lucida)*
	ii) Siharu *(Albizzia odoratissima)*
	iii) Cham *(Artocarpus chaplasa)*
	iv) Poma *(Cedrela toona)*
	v) Khokan *(Duabanga Sonneratioides)*
	vi) Ajar *(Lagerstroemia flos-reginae)*
	vii)Titasopa *(Michalia champaka)*
	viii) Bogipoma *(Chakrasia tabularis)*
	ix) Makrisal *(Schima wallichi)*
	x) Ahoi *(Vitex peduncularis)*

The following suggestions were put forward by the experts for poverty eradication:

1) Introduction of eco-tourism including rural tourism to generate income and employment opportunities to combat deforestation habit of the present generation in the study area. In this connection, a prospective tourism movement has been initiated recently by the Forest Department as a first move to change the mindset and habit of the local people.
2) Fruit preservation and processing programme is also introduced with the aid of District Agricultural Department as a means of livelihood by providing micro-finance to the small group of village women.
3) The training programme is also undertaken in the study locale to motivate the attitude towards work culture among job seekers providing jobs like plumber, electricians, mason, mobile repairing technology, driver, carpenter, motor

mechanics, T.V. and refrigerator mechanics, etc, to generate self employment and income.

4) Financial assistance is provided under various schemes under Agricultural Department, Government of Assam, through Rashtriya Krishi Vikash Yojana (RKVY), Agricultural Technology Management Agency (ATMA), Technology Mission (TM) etc,
5) Farming with leguminous crops, Ginger, Garlic, Pumpkin etc. in the form of multiple cropping to inculcate the habit of self dependence.
6) Schemes like Apiculture, Horticulture, Fishery, Goatery, Piggery, Poultry, etc. are fruitful tools to eradicate poverty among indigenous people in the study area as a precautionary measure to restore forest resources.
7) Plantation of 'Strawberry' is another fruitful means of livelihood for the young generation.
8) Since the land is suitable for growing plants like cardamom, cinnamon, olive, etc., this can also be taken up as a form or revenue generation.

Conclusion

It has been indicated in Chapter Seven that the segment whose inclination towards actively participating in conservation related activities is the highest is that portion of the Rabha community, whose education level is up to the 12th standard, earning 1-2 lakh per year in the form of salary from service.

Among the farmers, the small farmers are most willing to participate in conservation related activities.

After analyzing the responses of the people in the study area, experts' opinions and the observations made during field work, the major causes of deforestation are identified as

i) Flawed forest policy;
ii) Weak administration;
iii) Political influence in forest administration;
iv) Non implementation or under implementation of government forest policies;
v) Inadequate knowledge among the forest dwellers on the benefits of afforestation;
vi) Human settlement;
vii) Illegal logging operation;
viii) Poverty.

The main cause of dependency of people on forest is poverty. People have learnt to depend on forest for survival. This has led to their settlement in the forest areas clearing forest coverage for extending agricultural activities, illegal logging and extraction of forest produce for household purposes.

Hence, the areas that need attention for protecting forests are

i) Proper forest laws;
ii) Effective forest administration and strict implementation of government policies;
iii) Inculcating in the concerned people a sense of belongingness and responsibility towards forest conservation by imparting appropriate education on afforestation.

iv) Alternative method of meeting the need which are at present fulfilled by forest produce.

v) Eradication of poverty, finding alternative measures for livelihood for the people dwelling in the forest fringe areas.

To tackle the first two areas identified for protecting forest, the Ministry of Environment and Forest (MOEF) have to take initiative to remove the flaws in the Forest Law. Politics must be delinked from forest administration for the effective and total implementation of forest policies as political intervention in settling people in forestland and encouragement of illegal tree felling cannot lead to a healthy administration.

Hence, the study proposes to address the rest of the areas identified as measures for forest protection. In the first step, the study proposes to carry out mass awareness programmes to sensitize the concerned population in the study area on the benefits of forest conservation. For such programmes, the study proposes that the group that has been mentioned at the beginning of this chapter be used. It has been found during the study that the relationship between the Forest Department officials and the local people of the study area is not very cordial. Hence, awareness programmes if undertaken by a group of their own people will fetch much better results than such programmes undertaken by Forest Department officials.

It has been found that people's dependency on forest is mainly due to the need for timber and fuel wood. To meet this need, the expert opinion survey has resulted in a list of names of trees that can be planted in an organized manner. The list has different categories of trees based on the purposes they can serve. This plantation drive can be undertaken on forestland that has already lost its natural cover. Such an exercise can bring back the green canopy to many such areas. For example, in the study area, both sides of the Tezpur Bhalukpong *via* Balipara road running through the Balipara reserve forest which has been completely denuded due to illegal logging, can be rejuvenated through this process. The Forest Department, with the help of the local people, can start the plantation drive on this stretch of forestland. Apart from recovering the forest canopy, this drive will help in fulfilling the different needs that trees can fulfill and, at the same time, generate employment opportunities for the local community.

For improving the employment scenario of the local people, a community based eco-tourism model like Manas Mouzigendri Ecotourism Society (MMES) is proposed. The Manas Mouzigendri Ecotourism Society (MMES) is a registered society formed by former student leaders, extremists, poachers and illegal timber merchants. This society deals in conservation and tourism activities. They operate in the Koklabari range of Manas National Park, a world heritage site. The society was formed in 2003, when the Manas National Park was under serious threat from human influence in the form of poaching and illegal logging. They have converted around 50 poachers and employed them as forest guards who now patrol the forest areas with their handmade guns which were formerly used for poaching. At present, they have around 200 volunteers who are carrying out conservation and tourism related activities. The prime activities they carry out include

i) Awareness creation regarding protection of Manas National Park among villagers;
ii) Patrolling;
iii) Building roads and maintaining them inside the park;
iv) Providing food and accommodation to tourists;
v) Guiding tourists.

Though the MMES has been receiving fund from various sources as donation, this is not sufficient for sustaining the conservation activities and livelihood of the converted poachers. Therefore, they have been undertaking tourism activities, and the fund so generated is being used for conservation activities.

As a result of such activities, wildlife population in the range has been on the rise, denuded areas are again converting back to green canopy and the local people are finding a means to sustain their livelihood without harming the forest.

Manas and the study area have the same problem - deforestation due to human interference. A major difference between the two areas is that the population of Manas is homogeneous while that of the study area is heterogeneous. But in the study area also, as in Manas, people belonging to the Bodo community dominate the population. But, the propagators of the MMES were a self motivated group with a missionary zeal. This is lacking among the people of the study area. Hence, slight modification will be required in the MMES model for its effective implementation in the study area.

As the self motivation among the population in the study area is missing, an initiative has to be undertaken by the administration for integration of the mindset of the local groups. In order to generate necessary motivation, either the Forest Department alone or along with the Department of Tourism, has to develop tourism infrastructure in the study area and invite local youths to manage these on profit sharing basis. As the tourist inflow is directly related to the upkeep and maintenance of the forest, the local people will become stakeholders in conservation of the forest. This will encourage them to work for conservation of the reserve forest.

Apart from this, the study also proposes to impart especial training to selected local households or tenants and provide them with soft loans so that they can go for 'home stay' progress or run small scale tourism related commercial ventures.

The overall analysis revealed that the population of the study area has positive attitude towards the reserve forest and they are willing to participate in conservation related activities. Deforestation is mainly due to dependency on forest because of poverty. Hence while proposing measures for protecting the reserve forest; it has been kept in mind that income earning sources are to be provided to the local population if their dependency on forest is to be reduced. Proper implementation of the proposed measures will result in rejuvenation of the study area leading to increase in forest coverage and bringing back the ecological balance of the region.

Designing forest protection method after studying the attitude of the local community is the contribution of this study to the body of knowledge regarding forest protection. Previous studies developed methods that were judged to be appropriate without considering whether local community would accept it or not. This has been overcome in this study.

Further research can be carried out in this field regarding finding out the motivating factor amongst the local community that would lead to their active participation in conservation related activities. At present, only a small group is motivated enough to get themselves involved in protecting the forest. Identifying this factor would go a long way in checking deforestation in the region, nation and worldwide.

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ANNEXURE – I (QUESTIONNAIRE)

Dear Respondent,

The following questionnaire has been prepared for carrying out a survey for finding out the attitude of the villagers towards Nameri National Park, on the basis of which conservation strategy for the Park will be developed. Your cooperation in filling up the questionnaire will go a long way in my academic pursuit and conservation of the Park. The information collected will be used for academic purpose only.

Thanking you,

Pradip Chandra Mahanta
Ph. D. Research Scholar
Department of Business Administration
Tezpur University

Date of survey

1. Name of the village .....
2. Whether it is a forest village or a revenue village: FV RV
3. House Serial No .....
4. Name of the Head of household .....
5. Community/Caste .....
6. Religion .....
7. Occupation .....
8. Educational qualification i) Illiterate ii) Primary iii)10 pass iv) 10+2
   v) Graduate vi) PG vii) Vocational course
   vii) Others (specify)
9. Family Size Male: Female: Total:
   Minor: Adult: Total:
10. Number of dependents .....
11. Year of settling in this village .....
12. Place where from shifted .....
13. Type of House: (R.C.C/ A.T/ Thatch Hut/ Traditional Tribal Hut/others)
14. Income pattern (Annual income in Rs) :
    i. Income from Agriculture : Rs.....
    ii. Income from Business : Rs.....
    iii. Income from Service : Rs.....
    iv. Daily Wage : Rs.....
    v. Handicraft/ Handloom : Rs.....
    vi. Income from Minor Forest Product : Rs.....
    vii. Total Income : Rs.....
15. Distance to the Forest Area from the Village ..... km
16. Forest Use:
    a) House-hold purposes: Fuel/ Fodder/ MFP/ Timber Products
    b) Commercial purposes: Timber Products/ Firewood/ Fodder
17. Total land holding ..... hectre
18. Whether cultivation is done on forest land: yes/no (if yes, area .....hectre)

ANNEXURE – I (QUESTIONNAIRE)

19. Please indicate your response to the following statements

SA = Strongly agree; **A** = Agree; **NAND** = Neither agree nor disagree; **D** = Disagree; **SD** = Strongly disagree

i) The Reserve Forest provides food, fuel and fodder to people living in the nearby villages

SA — A — NAND — D — SD

Forest product is essential for subsistence of the people of the nearby villages

SA — A — NAND — D — SD

ii) The Reserve Forest provides protection to many precious wild lives.

SA — A — NAND — D — SD

Protection of wild life is necessary.

SA — A — NAND — D — SD

iii) The reserve forest needs protection for overall ecological balance.

SA — A — NAND — D — SD

Maintaining ecological balance is necessary

SA — A — NAND — D — SD

iv) Village people extracts forest products.

SA — A — NAND — D — SD

Extraction of forest products is bad

SA — A — NAND — D — SD

v) The Reserve Forest is continuously shrinking due to human interference.

SA — A — NAND — D — SD

Human interference is unwarranted.

SA — A — NAND — D — SD

ANNEXURE – I (QUESTIONNAIRE)

vi) Strict conservation measure can save the reserve forest from degradation

Conservation of the reserve forest is important

vii) My active role in conservation will help in checking deforestation.

My active role is necessary.

20. Tick your opinion in the appropriate box

i) Forest coverage in this forest reserve is gradually diminishing

ii) There has been widespread felling of trees in the reserve forest.

iii) Diminishing Forest Coverage is leading to bio-diversity degradation.

iv) Excess dependency on Forest is contributing to shrinkage of forest coverage.

v) Human settlement in Forest area is another factor of shrinkage of forest coverage.

vi) Most of village dwellers extract Forest Products.

vii) Villagers collect Forest products for household use.

ANNEXURE – I (QUESTIONNAIRE)

viii) Villagers collect Forest products for commercial purposes too.

ix) Extraction of Forest products from the reserve forest is the birth right of the forest dwellers.

x) Demand for inexpensive timber products encourages illegal timber harvesting.

xi) Extraction of Forest Products is habitual rather need -based.

xii) Weak Forest Administration leads deforestation possible.

xiii) Leakage in Forest Laws encourages timber brokers for excessive tree felling.

xiv) Political intervention encourages encroachers and illegal extraction of forest products.

xv) A Strong Administration is likely to save the reserve forest.

xvi) Effective Forest Laws are indispensable to stop deforestation in the reserve forest.

xvii) Dependency on forest is mainly due to poverty of the people.

xviii) Programmes to eradicate poverty will reduce dependency on forest products.

ANNEXURE - II

Post hoc tests to study multiple comparisons of mean belief of the statement 'The reserve forest provides food, fuel and fodder to people living in the nearby villages between sampled communities in the study area using least significant difference (LSD) method

Community (I)	Compared with (J)	Mean difference (I-J)	Standard error	significance
Bodo	Koch	.031	.020	.113
	Garo	-.031	.029	.274
	Mishing	.110*	.031	.000
	Adivasi	.149*	.033	.000
	Nepali	.195*	.035	.000
	Rabha	-.031	.086	.717
Koch	Bodo	-.031	.020	.113
	Garo	-.062*	.030	.038
	Mishing	.079*	.032	.016
	Adivasi	.118*	.034	.001
	Nepali	.164*	.037	.000
	Rabha	-.062	.087	.474

ANNEXURE - II

Garo	Bodo	.031	.029	.274
	Koch	.062*	.030	.038
	Mishing	.141*	.039	.000
	Adivasi	.180*	.040	.000
	Nepali	.226*	.042	.000
	Rabha	.000	.089	1.000
Mishing	Bodo	-.110*	.031	.000
	Koch	-.079*	.032	.016
	Garo	-.141*	.039	.000
	Adivasi	.039	.042	.350
	Nepali	.086*	.044	.052
	Rabha	-.141	.090	.119
Adivasi	Bodo	-.149*	.033	.000
	Koch	-.118*	.034	.001
	Garo	-.180*	.040	.000
	Mishing	-.039	.042	.350
	Nepali	.046	.045	.311
	Rabha	-.180*	.091	.048

ANNEXURE - II

Nepali	Bodo	-.195*	.035	.000
	Koch	-.164*	.037	.000
	Garo	-.226*	.042	.000
	Mishing	-.086*	.044	.052
	Adivasi	-.046	.045	.311
	Rabha	-.226*	.092	.014
Rabha	Bodo	.031	.086	.717
	Koch	.062	.087	.474
	Garo	.000	.089	1.000
	Mishing	.141	.090	.119
	Adivasi	.180*	.091	.048
	Nepali	.226*	.092	.014

*The mean difference is significant at 0.1 levels

ANNEXURE – III

Post hoc test to the statement that forest provides food, fuel and fodder to people on the basis of farmer according to landholding

Category of farmer on land holding (I)	Compared with (J)	Mean Difference (I-J)	Std. Error	Sig.
Marginal Farmer	Small Farmer	-.030*	.018	.096
	Semi Medium Farmer	-.019	.024	.435
	Medium Farmer	.184*	.053	.001
	Large Farmer	.423*	.175	.016
Small Farmer	Marginal Farmer	.030*	.018	.096
	Semi Medium Farmer	.012	.023	.621
	Medium Farmer	.214*	.053	.000
	Large Farmer	.453*	.175	.010
Semi Medium Farmer	Marginal Farmer	.019	.024	.435
	Small Farmer	-.012	.023	.621
	Medium Farmer	.202*	.055	.000
	Large Farmer	.442*	.175	.012
Medium Farmer	Marginal Farmer	-.184*	.053	.001
	Small Farmer	-.214*	.053	.000
	Semi Medium Farmer	-.202*	.055	.000
	Large Farmer	.239	.181	.188
Large Farmer	Marginal Farmer	-.423*	.175	.016
	Small Farmer	-.453*	.175	.010
	Semi Medium Farmer	-.442*	.175	.012
	Medium Farmer	-.239	.181	.188

ANNEXURE - IV

POST hoc (LSD) test for multiple comparisons to the statement reserve forest provides protection to many precious wild lives of respondents living within and around forest area on the basis of different distances

(I) distance to the forest area	(J) distance to the forest area	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
					Lower Bound	Upper Bound
1	2	.002	.034	.962	-.06	.06
	3	.271*	.073	.000	.15	.39
	4	.083	.069	.228	-.03	.20
2	1	-.002	.034	.962	-.06	.06
	3	.270*	.073	.000	.15	.39
	4	.082	.069	.234	-.03	.19
3	1	-.271*	.073	.000	-.39	-.15
	2	-.270*	.073	.000	-.39	-.15
	4	-.188*	.094	.046	-.34	-.03
4	1	-.083	.069	.228	-.20	.03
	2	-.082	.069	.234	-.19	.03
	3	.188*	.094	.046	.03	.34

*. The mean difference is significant at the 0.1 level.