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DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES, INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

NATURE AND EXTENT OF DEPENDENCY ON THE FORESTS BY VARIOUS LOCAL COMMUNITIES

KULEN CHANDRA DAS
ROLL NO. 11614110
SUPERVISOR: PROF MRINAL KANTI DUTTA,
PROFESSOR
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES, IITG

List of Abbreviations

CPR: COMMON PROPERTY RESOURCES

DPSIR: DRIVERS, PRESSURES, STATE, IMPACT, RESPONSES.

ESS: ECO SYSTEM SERVICES

FAO: FOOD AND AGRICULTURAL ORGANISATION

FSI: FOREST SURVEY OF INDIA

GIS: GEOGRAPHICAL INFORMATION SYSTEM

GoA: GOVERNMENT OF ASSAM

GPS: GLOBAL POSITIONING SYSTEM

IG: INSPECTOR GENERAL

JFM: JOINT FOREST MANAGEMENT

NER: NORTH EASTERN REGION

NP: NATIONAL PARK

NSSO: NATIONAL SAMPLE SURVEY ORGANISATION

NTFPS: NON-TIMBER FOREST PRODUCTS

NWFPs: NON-WOOD FOREST PRODUCTS

PA: PROTECTED AREA

PRA: PARTICIPATORY RURAL APPRAISAL

SFR: STATE OF THE FOREST REPORT

SOFO: STATE OF THE WORLD FOREST

ToF: TREE OUT OF FOREST

UNCED: UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT

VFC: VILLAGE FOREST COMMITTEE

VFPC: VILLAGE FOREST PROTECTION COMMITTEE.

Content:

NATURE AND EXTENT OF DEPENDENCY BY VARIOUS LOCAL COMMUNITIES ON THE FORESTS

1. INTRODUCTION:

Natural resources are components of the natural environment, which fulfill functions in eco-system processes, and which are also useful or beneficial for humans. In other words, matters supplied exclusively by nature and redressed by human actions are called Natural Resource. According to Gouldie "that fraction of the matter found in natural environment and is worth consumption by human being are called Natural Resource". Thus, geographical location of a country, its size, topography, climate, vegetation, soil, wind, water, animal wealth, minerals, solar light, etc. are its natural resources (Jat, 2007). Some of these are suitable for longer period of time and others like coal, petroleum, etc. are for short period only.

Natural Resources are derived from the environment and can be classified as biotic and abiotic on the basis of origin; as potential and actual on the basis of stage of development and as renewable and non-renewable on the basis of renewability. Resources have always been used by human societies and arguably even non-human societies to a limited degree. What have changed over time and space is the variety of resources used and the magnitude of resources extracted from natural systems and consumed (Wikipedia, 2013).

Pannerselvam (2008) discussed the natural resources to be the ingredients that provide the inputs for production and consumption. With population and consumerism growing all over the world, the stock of natural resources has severely been affected. Therefore, the question of natural resource adequacy is gaining momentum. However, Field (2001) remarked that it was not a new concern. Before the industrial revolution, when economies were tied more closely to the local resource endowments, fear of local shortages of items such as food, fodder, fuel wood, and water were very common. When the industrial revolution did arrive, with its heavy reliance on coal, concern shifted to the possibility that the resources, since it was non-renewable, would grow scarce.

We cannot live without nature and therefore need to understand the fact that the resources are limited. Extraction beyond a certain limit creates problems like depletion of the resources culminating into environment pollution and ecological imbalance. This

is, indeed, not a country specific problem, but the whole globe is experiencing it. Given the harnessing process of natural resources and the characteristic pattern of their exploitation and use, the interaction between human society and nature has thus unveiled three aspects of the man-nature problem (Mishra, 2001). Firstly, the technological and economic aspects relating to the depletion of natural resources; secondly, the ecological aspects, concerning environmental pollution and disturbance of biological balance; and thirdly, the socio-political aspect relating to conservation and management of natural resources, and to the preservation of irreplaceable resources.

The economic growth of a region depends upon the proper exploitation of its natural resources. The resources like land; water, minerals, forests, fisheries and livestock are the natural gifts and are transformable into tangible wealth on exploitation to produce agricultural, industrial and energy outputs. These are the most significant ingredients for stimulating the economic growth of the region.

Forest resource is one of the most important components of natural resources. Forests are the precious gift of nature (Ramakrishnan, 2004). The State of the World Forest (SOFO, 1995) explains forests to be a complex ecosystem capable of providing a wide range of economic, social and environmental benefits. Forests provide products and services which contribute directly to the well-being of people everywhere and are vital to our economies, our environment and our daily lives. While forests and woodlands are now recognized as essential for human life, their benefits and services are valued differently by different people and different groups. The world's total forest area in 2010 is estimated to be just over 4 billion hectares, which is 31% of the total land area, corresponding to an average of 0.6 ha of forest per capita (FAO, 2010). About 55 percent of the world's forests are located in developing countries, with the remaining 45 percent in developed countries. Analyzing the state of the forest in Asia and Pacific region, the FAO forest report says "While forest area will stabilize and increase in most of the developed countries and some of the emerging economies, the low and middle income forest rich countries will witness continuing decline as a result of expansion of agriculture, including the production of bio fuel feedstock" (FAO, 2009).

Many Asian developing countries have not only experienced rapid economic growth in the past but also have rapidly lost or degraded their valuable natural resources base. Man, while drawing resources from the environment, continue to strengthen his economic system, but at the same time use to change the physical environment, depending on his interest, knowledge, technological development and strength. But, there is always a limit for physical conversion of environment beyond which the natural

resources start depleting rather than generating. Consequently, today there are several environmental problems and natural resource management related issues that represent immediate concerns for sustainable development of a region (Schmidt-Vogt, D. and Shrestha, 2004).

It is common knowledge that forests are intricately connected to the livelihoods of rural people: they provide timber, non-timber forest products (NTFPs), and a host of non-forestry services - climate control, water recharge, storm protection, fertility and nutrient balance, etc - that are commonly called 'ecosystem services' (Kumar, 2001). The eco-system services control floods, filter pollutants, assimilate waste, recycle nutrients, regenerate soil. They also pollinate crops, operate the hydrological cycle, and maintain the gaseous composition of the atmosphere. The quantity and quality of the ecological service by the ecosystems are adversely affected by degradation of the environmental resources base. Degradation of natural capital also challenges the ecosystems' resilience, which is its capacity to absorb disturbances without undergoing fundamental changes. The ecosystems have limited resilience and when they lose it, a small disturbance can change it into a fully new state (Samal, 2007). Forest ecosystem provides the raw materials for housing. Wood products are extracted from the forests. Wood, in many parts of the world, is an important fuel. Paper products are derived from wood fiber. Moreover, they play vital role in controlling and regulating climate, water runoff, providing shelter and food for wildlife and also purify air. Furthermore, forests have scenic, cultural and historic values that deserve to be protected.

The poor fringe villagers of the forests across the world are dependent on the forests for a variety of different goods. Handique (2004) explains that forests are closely related with the basic needs and survival of rural poor livelihood where dependency on fuel wood for cooking and house heating represent a significant portion of energy consumption. While fodder collection and grazing are traditionally practiced for livestock production, a major food resource for the people. In a similar line Saikia (2000) also wrote that though the association of the indigenous people with the forest was not new but it was confined to collection of wood for house building, boat building and other materials of daily necessity including fuel logs, thatch, reeds and canes. Rural populace, especially forest dwellers in India depend on the forests not only to supplement their domestic requirements for foods, fodder, fibre and medicines but also to supplement their incomes by selling part or all of their collection in local markets. Thus, the people-forest interface is gaining importance in the forestry development discourse. In India, more than 41 million tribal and forest dwellers derive their earnings

from these products after consuming about 60% of collected NTFPs for personal use (Das, 2005).

There is realisation of this interface between forest and forest dwelling communities among the researchers. Panayotou and Ashton (1992) understood that the interaction between forest and forest dwelling communities received increasing attention from social scientists and policy makers due to its significance from the view point of community welfare and sustainable forest management. Community-forest relation assumes importance in social development policies also because people who depend on forest for their livelihood suffer from geographical isolation and social exclusion. Panta et. al., (2009) in a study in Central Terai of Nepal found that the rural poor tend to be disproportionately dependent on forest resources in the sense that a higher proportion of their total income comes from forest resources. She further noticed that lack of alternative energy sources and high profit margins of fuel wood economy are important causes of deforestation. Hegde and Enters (2000) observed that the poor fringe villagers depend on forest mostly due to non-availability of any meaningful alternative sources of livelihood. The overall socio-economic up-liftment of forest dependent community will reduce human pressure on Protected Areas (PAs) and promote conservation of biological diversity. However, Shylajan and Mythili (2007) opined that the intensity of extraction of various products and forest dependency may vary among different communities, among households within communities and between locations in the forest. This view was earlier held by World Bank (2006), which represented that the degree and nature of dependence on forests and livelihood options differs from one community to another. Villages closer to towns tend to rely less on forests for livelihoods and more on agriculture and wage labor. Villages in more remote areas tend to rely more on agriculture and forestry. Subsistence products, in particular fuel wood and fodder, are the main contributors to local livelihoods from the forests. It is apparent now that the most forest fringe communities depend primarily on agrarian based economies, with forests playing an important supporting role by providing subsistence fuel wood, fodder and limited NTFPs on a seasonal basis for some people and serving as a safety net for others.

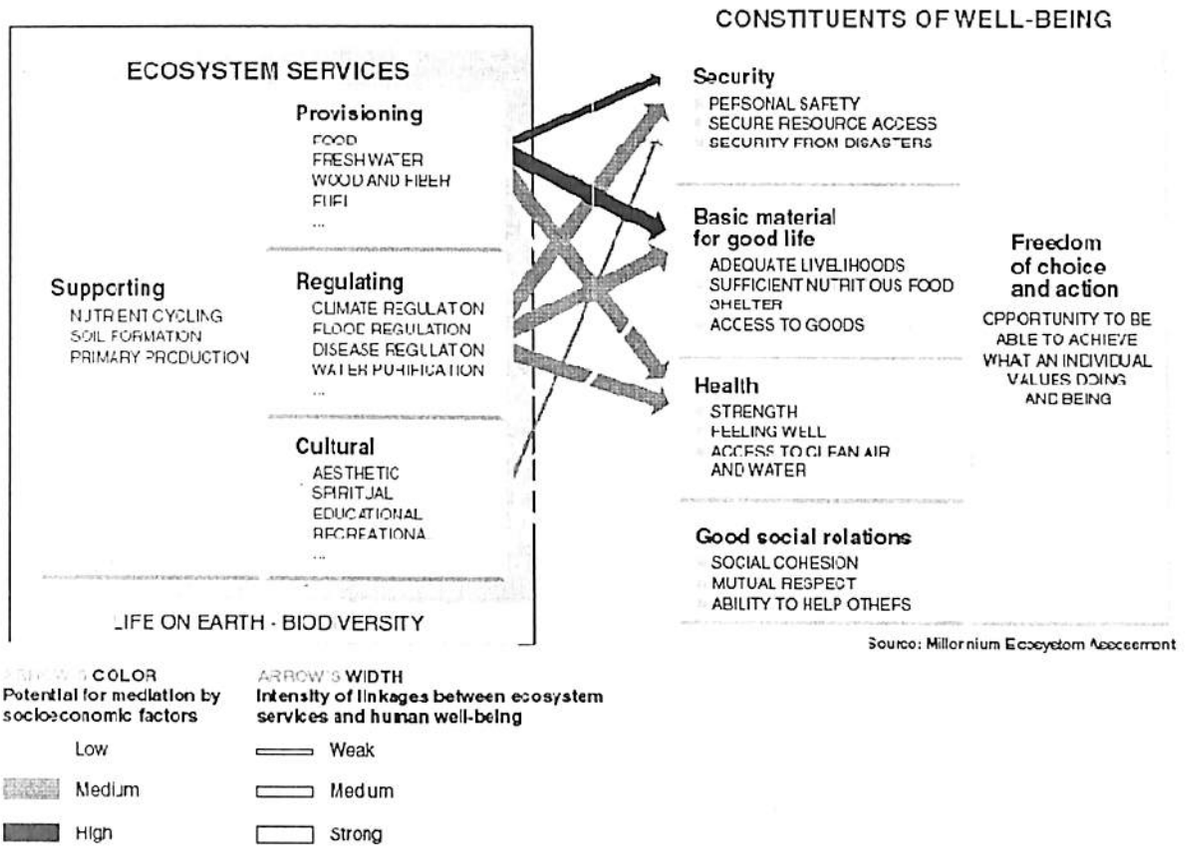
Different State of the Forest Reports published by Food and Agricultural Organisation show a gloomy picture of the forest cover of the world. The Global Forest Resources Assessment 2010 which was released in October, 2010, noted that the overall rate of deforestation remained alarmingly high, although the rate is slowing down. In India also the forest cover shows a negative change in between 2000 and 2005 from 67,782 to 67,709 thousand hectares only to show a slight increase in next five

of tangible benefits to human society. Hassan et al. (2005) define these to include supporting, provisioning, regulating and cultural services.

> **Supporting services** are those that are necessary for the production of all other ecosystem services, such as primary production, production of oxygen, and soil formation
> **Provisioning services**, such as products i.e., food (including game, roots, seeds, nuts and other fruit, spices, fodder), fibre (including wood, textiles) and medicinal and cosmetic products (including aromatic plants, pigments).
> **Regulating services**, which are of paramount importance for human society such as (a) carbon sequestration, (b) climate and water regulation, (c) protection from natural hazards such as floods, (d) water and air purification, and (e) disease and pest regulation.
> **Cultural services** are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences.

2.1.3. Ecosystem Services and Human Well-being: We can describe the ecosystem services and its importance in the light of the linkage between it and the human wellbeing. People modify the environment for their purposes and obtain benefits called ecosystem services from it which are essential for very survival and well being of the people. The Millennium Ecosystem Assessment analysed how ecosystem services and constituent human well being are interlinked. This can be shown with the help of the following diagram where the left panel represents the ecosystem services and the right panel shows the constituents of well being. The arrows width indicates the intensity of linkages between ecosystem services and human well being.

Millennium Ecosystem Assessment Conceptual Framework of Interaction between Ecosystem Services and Human Well-being

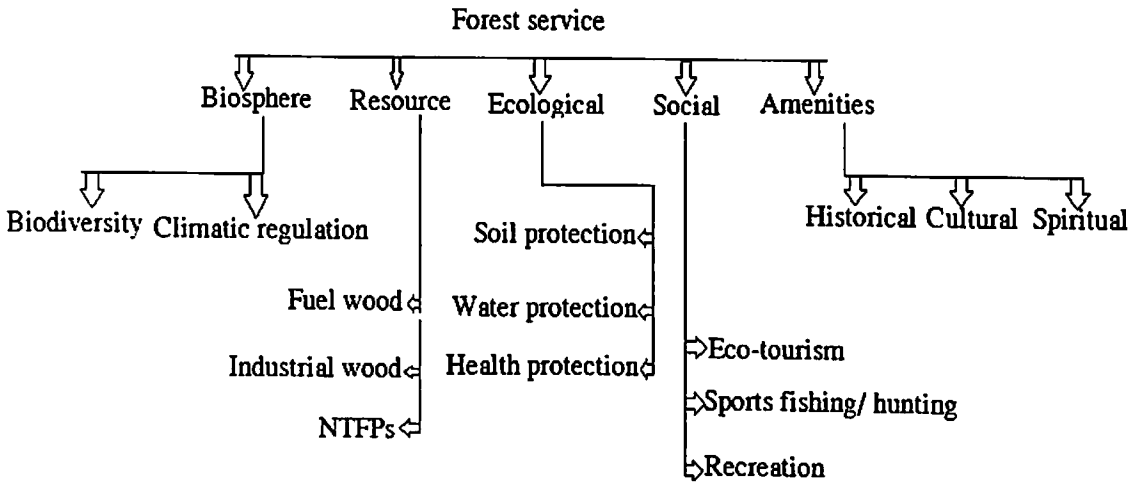


Source: MEA, 2005

The demand for all these ecosystem services is now so great that tradeoffs among services have become the rule. A country can increase food supply by converting a forest to agriculture, for example, but in so doing it decreases the supply of services that may be of equal or greater importance, such as clean water, timber, ecotourism destinations, or flood regulation and drought control (Carpenter, 2005). Lan (2002) says this demand to be basically for increased population and their ever increasing demand for such services. High population density is one of the threats to a country's natural resources and long term persistence of its biological diversities, he says. With the increased population their demands on ecosystems will grow still greater in the coming decades. This formidable increase in demand for and consumption of biological and physical resources would put massive pressure on ecosystems and the services they provide. The capability of the ecosystem to provide the desired services has been dwindling. This degradation of ecosystem services is exacerbated by the associated loss of the knowledge and understanding held by local communities— knowledge that sometimes could help to ensure the sustainable use of the ecosystem.

Forests and woodlands supply essential services to human wellbeing across the world, and human-forest interactions manifest themselves in many direct and indirect ways, each depending variously on the amount of forest, its condition, and its distribution over the landscape. Forests can serve as reservoirs, sinks and sources of greenhouse gases and thus have a significant role in moderating the flux of greenhouse gases between the land and the atmosphere (FAO, 1999). Forests not only provide for timber and fuel wood and other material resources, but for a wider set of public goods and services such as water retention, soil erosion prevention, biodiversity conservation, carbon sequestration, recreation etc. It is further estimated that more than 1 billion people, mostly poor, depend on forests in varying ways for their livelihoods (Kamanga, 2009).

The following flowchart shows us different services forests provide with the human being:



Source: Trivedi et al., 2005

The environmental and social services of forests and trees include, among others the conservation of biological diversity, carbon storage and sequestration for mitigation of global climate change, soil and water conservation, provisions of employment and recreational opportunities, enhancement of agricultural systems, improvement of urban and peri-urban living conditions and protection of natural and cultural heritage. These services have received increasing emphasis and in some cases, global legal commitment since the UNCED.

2.1.4. Forest Ecosystem Services as utilized by men:

It is important here to know that the forests help in balancing oxygen and carbon dioxide level in atmosphere, regulate earth's temperature regime and hydrological cycle. Forests increase local precipitation and water holding capacity of soil, thus, preventing drought situation. Vegetation cover provided by forest impedes the velocity of runoff on soil surface checks soil erosion, silting and landslides, thus reducing the danger of flood. The litter derived from fallen leaves maintain fertility of soil by returning the nutrients. Forests also act as a refuge to wild animals and provided protection to them against strong, cold or hot and dry winds, solar radiation, rain and enemies (Trivedi et al., 2005).

People's lives have been intimately associated with the forests. They collect fuel wood, building materials (such as timber, bamboo, cane, grass, etc.) for dwelling houses, materials for construction of agricultural implements, furniture, utensils, besides many other useful articles (Ganguli, 2006). In quoting the recent Anthropological Survey of India report Madhab Gadgil said that there are substantial dependency of the people on the biomass. The report says, as quoted, that 5% of the communities being engaged in hunting-gathering; 7% in fishing; 2% in trapping birds; 2% in woodwork; 7% in basket and mat weaving; 3.5% in shifting cultivation; 20% in animal husbandry; and 50% in settled cultivation (Gadgil, 1993). Such dependency is basically due to the absence of gainful alternative sources of livelihood. A seminal study by Narain and others (2005) in the Jhabua district measures specific components of annual household income and subsequent dependence on natural resources, including forests. As household income increases, the share of income from agriculture declines, offset by increases in wage employment and home enterprise income. As a percentage of income from natural resources, income from fuel wood declines as household income increases. This is due largely to the fact that other forms of energy become more affordable as income increases and the opportunity cost of the time spent collecting fuel wood becomes too high. The share of fodder income from natural resource income increases with household income largely because richer families own more assets in the form of livestock (World Bank, 2006).

Forests and other uncultivated lands provide firewood, grazing and cut fodder for livestock, timber for buildings and agricultural implements and a variety of medicinal plants and other NTFPs for local consumption and sale (Menon, 2007). State of the World Forest recognised the fact that the environmentally fragile areas tend to be isolated and economically marginalized. Under such conditions, people generally have a relatively high dependence on local forest resources for various goods (FAO, 1999).

The poor people depend directly on natural resource environment for their livelihood (Nadkarni, 2001). In a report, World Bank estimates that fuel wood is a source of livelihood for more than 11 million people in India, making it the largest employer (formal and informal) in the Indian energy sector (World Bank, 2006). Gunatilake (1993) did an extensive study on the peripheral community of wilderness area and found that the poor and destitute peripheral communities of the forests were bound to extract a number of non-timber forest products (NTFPs) from the nearby reserves knowing the fact that if they were caught they wouldn't be spared with impunity. In a similar way Mukherjee (2003) is also of the opinion that the poor local communities are associated with natural forests, woody landscape and community forests and of recent origin, social plantations or social forestry. In saying so she further stressed that local communities have historical ties with local forests, trees and CPRs which provide both direct and indirect benefits to them. The benefits provided by such natural resources are basic to such communities and amongst direct benefits, following are included:

- Food such as nuts, wild fruits, vegetables, leaves, flowers, roots, stems, honey, wild animals, insects, etc.
- Habitat and shelter
- Raw materials like bamboo, canes, fibers, oils, waxes, resins; gums, dyes and wood furniture and capital equipments for agriculture, artisanship, etc.
- Fuel wood
- Medicines and drugs
- Fodder such as grass, branches, twigs and leaves
- Grazing sites
- Means of livelihood, both seasonal and annual
- Shade
- Ornaments, religious items and cultural symbols
- Drought relief.

One has to keep in mind that over 65 per cent of the protected areas were characterized by human settlement and resource use ((Kothari, 1989). These forest dwelling communities depend mostly on the tangible benefits of the forest like fuel wood, timber and non timber forest products, apart from all kinds of the intangible benefits they accrue from the forest without knowing about it. Forest and forest products are linked to household livelihood system in a variety of different ways to these people (Rawat, 2008). The role of non-timber forest products (NTFP) in the economic development of local communities and sustainable forest management has

been documented by many researchers (Shylajan and Mythili, 2003) (Panayotou, 1992) (Das, 2005) (Gunatilake, 1993) (Quang, 2006) (Arnold and Perez, 2001).

At the global level, five major categories accounted for 90 percent of the total value of NWFP removals: food (51 percent), other plant products (17 percent), honey (11 percent), ornamental plants (6 percent) and exudates (4 percent). The value of the NWFP removals in the year 2005 was US $ 16,839 mn for the world, though mostly the value of it remains underestimated for most of the countries and region. State of the Forest Report 2010 states that around 10 mn people are employed in forest management and conservation, but many more are directly dependent on forests for their livelihoods (FAO, 2010). Rawat (2008) says that for most of the world's households, NTFPs provide essential food and nutrition, medicine, fodder, fuel, thatch, and construction materials, mulch and non-farm income. Some of them are outlined below:

Two major products for which the people depend overwhelmingly on forests are fire wood and fodder. The working group on an energy policy by the Planning Commission in 1979, as mentioned in the India State of Forest Report 1999, stated that fuel wood consumption in the year 1975-76 was 133.1 mn tones. As against this the recorded production of fire wood from forests was of the order of only about 19 mn tones. NSSO estimated the production of 30 mn tones from TOF (the private lands and gardens). How the gap between the demand and supply then got fulfilled – is a big question. Panta (2009), in an article, stated that since firewood is the only accessible source of households' energy at rural areas for poor and as they can't afford other resources they are dependent hugely on the forest for collection of firewood. It is accepted that most of the fire wood which is in the form of dead and dry wood, is extracted from forests on head-load by the villagers living adjoining the forests. The poor and destitute having no alternative source of livelihood are compelled to resort to such kind of collection. Such extraction goes unrecorded. The country report for the State of the World's Forest estimates the value of removal of fuel wood and NWFPs to be US$7,095 and US$ 133 respectively (FAO, 2010).

Grazing is another vital activity of the people of the peripheral area of forests across the country which put massive pressure on the existing forest resources. Most of the people don't practice stall feeding rather set their livestock free into the forest thereby putting huge pressure on to the already scarce forest resource. India with just a fortieth of the total land area of the world supports more than half its buffaloes, 15% of its goats and 4% of its sheep (Trivedi, 2005). It is for sure that it would be needed an enormous amount of fodder or grazing grounds for such a massive animal population.

implications for the welfare of communities, which use these products for subsistence. For most of the world's households, NTFPs provide essential food and nutrition, medicine, fodder, fuel, thatch, and construction materials, mulch and non-farm income. These products are particularly important in relieving the "hunger periods" in the agricultural cycle, and in smoothing out other seasonal fluctuations. The women of the household are primarily the collectors of the NTFPs since in almost everywhere women are responsible for the household activities that involve forest –based foods and medicine, as well as fuel wood (Rawat, 2008). Boot also opines that indigenous and forest dependent people extract a wide range of products for subsistence and trade, such as: edible fruits, nuts, medicines, construction materials, latexes, resins and so on (Boot, 1997). Fish is another important product that the people extract a lot.

Nadkarni (2001) wrote extensively on the poverty, environment and development in India. He states that continued poverty makes people dependent heavily on land and other available natural resources. India, though have improved much on alleviating poverty, he opines, a significant portion of total population still live in abject poverty as per government estimate. Consequently, the pressures of the poor people continue to remain on land, forest and fisheries. It is necessary to understand here the distinction between the pressure on land to raise food and production and pressure to earn a livelihood. Food items have been grown significantly but people have not been provided with the gainful livelihood opportunities. Therefore, the growing population along with the consistent poverty is putting pressure on land and the forests culminating into encroachment for different purposes. Attempt to encroach government forest lands for cultivation had been a regular phenomenon since independence. After independence, in order to foster economic development, government encouraged industrialization and emphasis was shifted from timber to pulpwood. For pulpwood, forest department was to provide raw-materials at a very low price and the industries did not have any interest to regenerate forest, even in lands earmarked for them to meet their needs. When industries exhausted raw material sources allotted earlier, they could get new areas for similar exploitation. Once a forest was exhausted, encroachers were tempted to extend cultivation into the cleared forests.

The World Bank did a study on eight villages of Assam and found out the villagers to be small-holder farmers, shifting cultivators and landless people. Across all the villages, 76% of households reported agriculture as the primary occupation. All the villagers use forest, primarily for subsistence fuel and fodder. Fuel wood supplies an average 79% of energy needs. Fodder from the forests provides about 64% of the feed

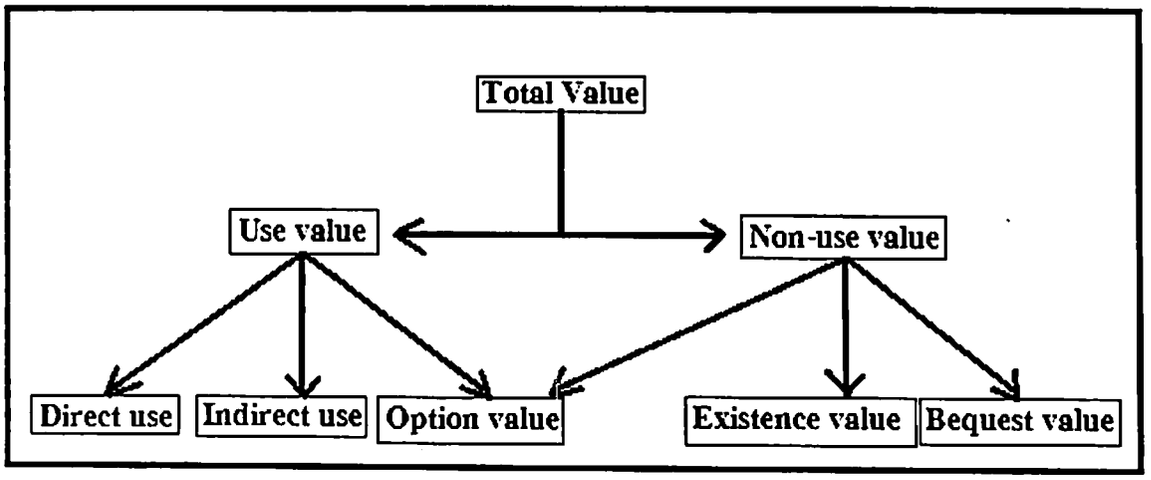
requirements for domestic livestock. Gross values were Rs 2,440 for fuel wood and Rs. 10,992 for fodder per household per year. Poles play a minor role in forest livelihoods since bamboo occupy a significant role in domestic construction. Most communities collect a variety of non-timber forest products, mainly for subsistence use (World Bank, 2006).

2.1.5. Valuation of Ecosystem Services of Forests: Forest ecosystems provide an array of critical but largely undervalued goods and services. In spite of the obvious value of these goods and services in supporting and improving the human condition, many of these values are customarily ignored in the course of development projects. Even when cost-benefit analyses are incorporated into planning and decision-making, many of the less tangible services provided by ecosystems are omitted from the calculus. The result of these omissions is that the economic benefits of development, such as replacing forest with pasture, or draining wetland for agricultural expansion, nearly always appear to outweigh the costs of environmental protection (Voeks, 2004). Further, forest ecosystem valuation provides mechanism for policy instruments, allocation of public spending on forest & environmental conservation, optimize forest goods & ecological services values of forest ecosystem.

Inspite of these environmental services of the forest, their values are not always reflected in conventional market especially in monetary terms. This shortcoming often predisposes forests to wanton destructions (Adekunle et. al. 2012). Valuation increases the available knowledge about the broad range of values associated with the forests, hence providing decision makers with useful information for making choices among alternative uses of the forests. Therefore, there is a paramount need of valuing such ecosystem services in the context of developing countries.

Total economic value (TEV) is a concept in cost benefit analysis that refers to the value derived by people from a natural resource, a man-made heritage resource or an infrastructure system. It appears in environmental economics as an aggregation of the (main function based) values provided by a given ecosystem (Wikipedia, 2013). The components and different values of forest ecosystem can be shown with the help of the following diagrams.

The components of total economic value



The total economic value of environmental resources is built up of use and non use values. Use values are often easier to assess than non use values.

Direct use value: Direct use is most obvious value category, as the economic benefits can be calculated by making use of market information. The outputs of the resource can be directly consumed:

- a forest may yield annually a certain amount of wood that can be sold or used for heating and construction;
- pastures provide space for some livestock;
- a lake provides fish to fisherman;
- enjoying nature (recreation).

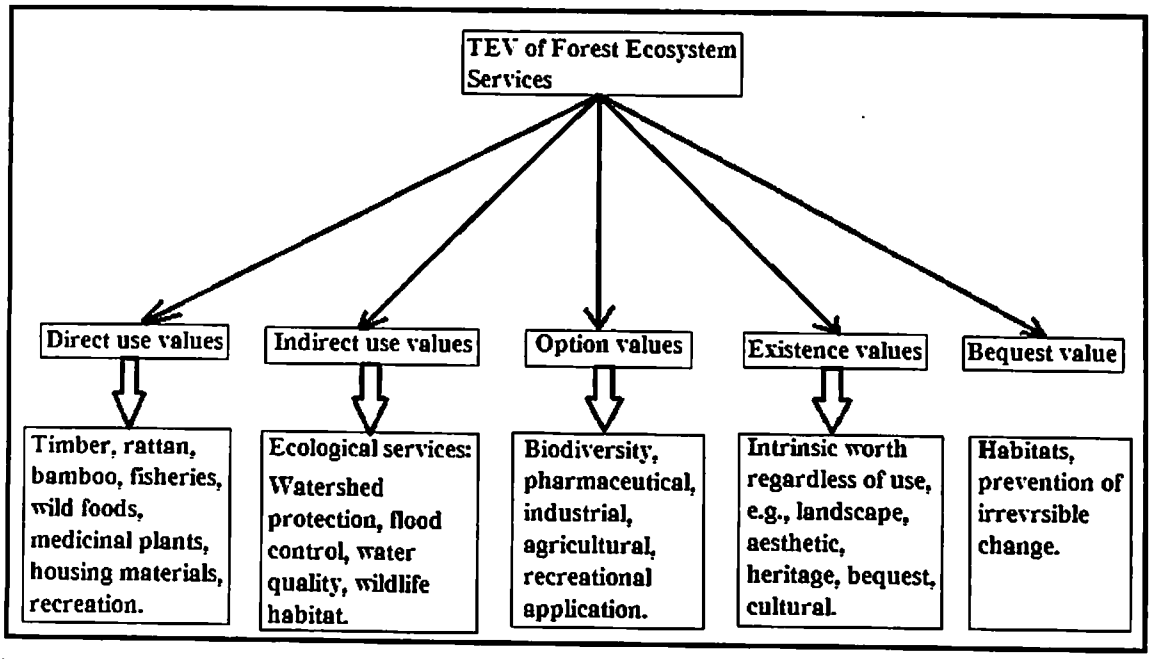
Indirect use value: Indirect use of natural recourses relates to functional benefits, the outputs provide a social benefit from ecosystem functioning (e.g. water purification, erosion protection or carbon sequestration).

Option value: Option value, where individuals are willing to pay for the future use of the resource (e.g. future visits to national parks, clean surface and ground water, avoiding of erosion to enable future use of pastures).

Bequest values: This reflects the publics' willingness to pay to ensure future generations to enjoy the same environmental benefit in the years to come. This relates to the willingness to pay for preserving existing habitats, species and ecosystems. It also includes the willingness to pay to prevent for irreversible changes (for example: extinction of species).

Existence value: This non-use value reflects the "moral" or philosophical reasons for environmental protection, unrelated to any current or future use. It is related to the for example the scientific society and the value from knowledge of continued existence of species, habitats and ecosystems.

Total Economic Value of Forest Ecosystem Services



Source: Jantzen, 2006.

2.2. Forest cover change and the drivers of it: In talking about change we basically talk both about negative and positive change of forest cover. As analysed above though the forest cover is declining for the world as a whole, but the trend of change is not akin everywhere. The State of the World Forest Report represents a picture of regional difference of forest cover change. Developed countries are showing an increasing trend while the developing countries are showing a declining trend as far as forest resource is concerned. Though the loss of forest cover can be attributed to a number of factors but the gain is largely due to afforestation and reforestation programme taken up by the government concerned. The extensive plantation activities in and outside forest, effective protection by the JFM committees and regeneration of shifting cultivation areas, effective protection of forests by Village Forest Protection Committees (VFPC) and plantation activities undertaken by the state are the important factors contributing to increased forest cover in the country.

Every year, about 13 million hectares of forests are converted to other land use leading to biodiversity losses, soil erosion and massive CO_2 emissions. According to the World Bank report 1991, 60% of recent deforestation in the developing world may be for increasing non-forest use such as the agricultural activity, petroleum, etc. and 20% for household use of fuel wood (Hazra, 2008). The investigation of the processes of deforestation provided a wide literature, both at macro and micro levels. The direct and underlying causes of deforestation are agricultural prices and technologies, timber prices, institutions or property rights. Globally, most studies agree upon the fact that

agricultural expansion is the leading direct factor of deforestation: farmers and firms convert forests to agriculture (Damette, 2011).

2.2.1. Population growth and Agricultural expansion: There are various causes of forest cover loss which are size, site and time specific. Some of such causes are: agricultural expansion, increase in population and their ever increasing demands culminating even into encroachment, large infrastructural projects resulting into resettlement and rehabilitation programmes, overexploitation of forest resources, abject poverty, etc. The major causes of change in forest cover in the tropics appear to be expansion of subsistence agriculture in Africa and Asia and large economic development programmes involving resettlement, agriculture and infrastructure in Latin America and Asia (FAO, 1996). This is primarily due to the population increase which leads to deforestation. Deforestation rates remain high and will probably increase in the coming years as the population grows and demand for new settlements, wood for construction, fuelwood, charcoal and food increases as a consequence (Amisah, 2009). Recently released information on the causes of deforestation over 1980-90 decade clearly shows rural population growth coupled with agricultural expansion and economic development programmes as major cause in forest cover change. High population growth and continued dependence on land will raise the pressure on forests, especially in densely populated countries. The demand for food and to feed the world's increasing population will continue to put pressure on forest land (FAO, 1997). There is a continued pressure, particularly in developing countries, to convert forest land to other types of land use, particularly subsistence and commercial agriculture (Field, 2001) (Faham, 2008) which is also a prime factor for forest cover change.

2.2.2. Population and overexploitation: Increase in human population is one of the main reasons of deforestation in our country. Increased population raises the demand for different goods and services and given the natural resources, pressure would be tremendous on it resulting into overexploitation. Ramakrishnan (2004) says that rapid population growth and severe pressure on forested areas for agriculture, livestock grazing, fuel wood and other domestic needs of the rural area put pressures that also contribute to over exploitation of forest resources. In a similar way Kadekodi also talks about high population pressure along with overexploitation and alternative use of the resource as important contributing factors towards forest and other common property resource degradation (Kadekodi, 2004).

2.2.3. Urbanization: Urbanization, which is growing at a rate of 15 to 20 pc a year, is also one of the major factors contributing towards forest degradation or forest

cover loss. Jhum in the NE region is also contributing to forest loss to some extent (FSI, 2011). Increased urbanisation, industrialization and mining have entailed indiscriminate felling of trees resulting denudation of forests. In a study by Jasmin and Chakraborty (2007) at Guwahati city says that the city has spread in the process of its growth towards the periphery. It also says that this process of urbanisation along with its increased population has created many problems for the city along with destruction of natural resources, which is posing a threat to the whole environment of the area. The depleted forest wealth would simply deprive the man of economic and environmental values offered by forest, as discussed earlier (Trivedi, et al, 2005).

2.2.4. Industrialisation: Nadkarni wrote India's post independence scenario to be dominated by massive industrialization culminating into huge deforestation leading to many environmental problems. Apart from the industry demand, hydro-electric projects, transmission lines, rehabilitation of people displaced by developmental projects, roads, mining and above all extension of cultivation by people in search of livelihood also made large demand on areas which were rich in forests (Nadkarni, 2001). Population growth, though, is a major factor, but not the only factor of forest degradation. Demand for wood and wood products will continue to increase in line with the growth in population and income. Increase population demands huge food grains and to produce it huge area of land is needed. It finally leads to encroachment into forests area culminating into forest degradation. Permanent or settled cultivation is more injurious since the farmers don't apply measures for soil and water conservation on encroached land. He further states that the environment degradation is not always due to the pressure of the poor. The deforestation which took place in the nineteenth century and early twentieth century in the form of depletion of timber was mainly due to the pressure to meet the requirement of expanding railway network and wood requirement of urban area.

2.2.5. Poverty and deforestation: Though there is enough food to feed the growing population but the continuing poverty is still a source of pressure on land. This can get reflected in the form of encroachments into forests and other common lands for extending cultivable area and overexploitation of forests and fisheries (Nadkarni, 2001) (Tietenberg, 2004). With poverty more pervasive in forested areas, many people depend in large part on forests for their livelihood. Several studies substantiate that the poverty and unemployment are two of the most important factors leading to forest cover loss across the world (Mukul, 2007; Jodha, 2000; Adhikari, 2002).

Forest cover is decreasing in most of the states of India leading to overall decline of the forest areas of the country. India has the largest number of poor in the world, many of whom depend directly or indirectly on forests for a living. Poverty, as well as large and expanding human and livestock populations, puts unrelenting pressure on the forests of India. The consequence is severe degradation of the country's forest resources (Kumar, 2000).

Different studies reveal that the reasons of such degradation are state specific like management interventions like harvesting of short rotation crops followed by new regeneration/ plantations, forest clearances in some encroached areas, shifting cultivation and biotic pressure, submergence of forest areas in the catchments of the dams, shortening of shifting cultivation cycles and biotic pressure.

Nadkarni (2001) though, blames the poverty and the poor for forest degradation, but, unlike others, also in the view that the poor conserves the environment not by choice, but by chance. It would be interesting to note here, he holds, against the widely held view that the poverty or poor are the main cause of environmental degradation, but the poor people actually protect the environment. The consumption pattern of the poverty ridden people substantiates this argument. If the people of the developing countries reach the standard of living of American and Europeans and adopt their lifestyles, it is doubtful that if the aggregate consumption of resources and the quality of environment could be sustained at all. In a similar line De and Kulirani (2007) says that due to better accessibility, profit motive and government policy the richer cause much damage to the environment. Giving examples of availability of cheap beef in fast food outlets and shrimp farming Samal (2007) says that in some cases, it is not the poverty but richness that led to forest degradation.

2.2.6. Awareness: Extensive forest areas were lost for different non-forest uses, particularly for agriculture, as is discussed earlier. People by and large and especially in the rural India have been ignorant of the benefits from forests, even though their life styles are intimately linked with the forest (Trivedi, et. al., 2005). Environmental awareness and public pressure have continued to have an impact upon all aspects of the forestry sector. De and Kulirani (2007) is of the opinion that due to limited access to education and awareness, tendency of population growth is higher which put more pressure leading to environmental resource degradation. On the other hand, in some instances, local people are acknowledgeable about wildlife, are interested in their sustainable management, and are aware the links between their activities and wildlife conservation. But, the failure on the part of the local forest department officials to

solicit local participation in the management of the sanctuary severely impacted the livelihoods of both the locals and wild animals as well (Ala Uddin et al. 2007).

2.2.7. Market linkage: It is also widely discussed a fact that the human and livestock are much greater than they used to be putting enormous pressure on the carrying capacity of the forest and other natural resources. The demand for forest products is also increasing due to a stronger market linkage (Rawat, 2008; Fox, 2007; Kuri, 2007).

NE India has its own specific causes of forest degradation. Generally, in the developing countries, poverty is the main reason for forest degradation which is not the cause in the NE India. Population growth is the main factor responsible for forest degradation in this part of the country. Growth of population is higher than the country not because of the natural rate of growth but due to migration from the neighboring countries. Increase in the population means increase in the density which necessitated more land and other basic necessities. To meet the daily necessities and habitation more land is needed which is the main cause of encroaching the forest land and forest degradation (Hazra, 2008). The main factors for deforestation in Assam were listed as: i) uncontrolled grazing, ii) indiscriminate jhuming, iii) indiscriminate felling of the trees by the settlers for household requirements and iv) unauthorized squatting. (Sinha, 2012). In discussing the factors of deforestation, Ramakrishnan (2012), concluded that pressures to the external to the region have been primary causative factor for deforestation linked land degradation.

2.3. Conservation of forests and environment: Environmental protection in India was started long back. Kautilya's Artha Sastra enjoined the Kings to protect forests and wildlife, particularly elephants. The cultural values in favour of protection of environment were strong enough to give rise to the institutions of the Sacred Groves and Sacred Space, where exploitation of forest produce including wildlife is severely restricted. Scholars like Madhab Gadgil have contended that there did exist institutionalized patterns of sustainable use of common property land resources like forests at the grass root levels before the British entry into India (Nadkarni, 2001).

Saikia (2011) writes that conservation and wildlife management was a challenge during the colonial period. As the colonial government expanded its agrarian frontier it was obvious that vermin eradication became the official policy in regard to wildlife management. Large scale opening of agricultural land in the 1930s and 1940s had depleted the numbers of wild animals to the worst-ever level. Thus an increasing population and expanding land settlement must inevitably lead to the extinction of the

wildlife: such is the process which civilized progress demands. A forest officer from Goalpara found the expanding agrarian frontier to be sole reason for the continued poaching and trespasses into the reserved areas. He further states that the colonial interest in the protection of wildlife is a much later phenomenon. For conservation not only the foresters but also the large flocks of colonial and non-colonial personnel took active interest. In Assam the earliest attempt came in the form of the establishment of game reserve as early as 1905. Since then it was a long journey and there grew a number of wildlife parks, sanctuaries, and so on in the post independence period.

There are a number of policies and acts for conserving the wildlife and wildlife habitat in India for which the different categories of PAs were declared under the Wild Life (Protection) Act, 1972. Protected Areas have long been the most effective and widespread measure for conserving forests and biodiversity. This prompted the protection of large number of forested areas from certain destruction by commercial, industrial or biotic forces (Kotahri, 2001).

Forests are conserved for various purposes. In India 25% of forests are conserved for production purposes. 16% of forests are for protection of soil, 29% are to conserve the biodiversity of the country and the remaining 30% are for multiple purposes. 12 pc of the world's forests are designated primarily for the conservation of biological diversity (FAO, 2010). Biological diversity encompasses the variety of existing life forms, the ecological roles they perform and the genetic diversity they contain. National parks, game reserves, wilderness areas and other legally established protected areas cover approximately 12 pc of the world's forest area and more than 10 pc of the total forest area in most countries and regions. The primary function of these forests may be conservation of biological diversity, the protection of soil and water resources or the conservation of cultural heritage.

Illukpitiya (2001) took note of the global deforestation in his study. It says that globally, tropical forests are subject to high rates of degradation and deforestation, with current estimates indicating a loss of some 17 million ha, or more than 1% of the total forest area, per year. Protection is one of the methods of assuring the continuation of tropical forests. A fundamental problem for conservation and development programs is the lack of understanding about factors that govern the use of forest resources. Several studies have shown the diversity of resource use patterns across households living in forest margins.

The conservation of natural resources including forests in North East India has a different approach. As is well known that in this part of the country the natural resources including forests belong to different entity. Apart from the government forest department owning the forests, the community and in some cases private individuals also own the forests. It is interesting to note here that the forest resources under the hands of community and private individuals are in a much better shape than most of the government owned forests. The traditional knowledge of the indigenous people acts positively for conservation of forest resources. It is because of the fact that in this region forests, biodiversity and other natural resources become the foundation of peoples' sustenance. That explains why traditionally the communities that depend on them have protected them (Fenrnandez, 2012). There are a number of success stories of forest conservation among different tribes of the North East region. Sarma and Das (2009) in a study show some of such success stories where the Rabha, Bodo, Garo and Banai communities in Goalpara district have their traditional practices of community forestry. Such forest areas are protected and managed by the community under the leadership of Village Forest Committee (VFC). It is interesting to note that this VFC is basically formed by the villagers for the management of their forest. The Villagers have defined stake on such forest for collection of fuel wood, fodder, timbers etc. which can be collected under the defined norms set by the VFC. The practice of imposition of fine for violation of such norms and rules are prevalent everywhere. These groups of tribal communities also consider such forests as buffer and boundary which helps protecting their cultural and ethnic identity by defending their habitation from the penetration of other non-tribal communities. Perhaps due to a number of positive aspects of community forestry Kothari (2002) was of the opinion that without interference, self initiated process of forest regeneration and protection by communities are to be recognised and facilitated.

2.4. Sustainable management of forest resources: It has been observed from the above discussion that the local or fringe communities of a wilderness area are dependent on that resources in a myriad of ways. The characteristics and degree of dependencies, indeed, is site specific. This dependency has significant bearings on the available forest and other natural resources on the earth. High food and fuel prices, which are the result of increasing population and their ever increasing demand, will favour continued forest clearance for production of agricultural crops and livestock for food, feed and bio-fuel to meet the global demand. At this juncture how the remaining and the scarce resources are to be managed sustainably is a million dollar question. Many governments or individual officers are realizing that the survival needs of communities must be allowed to be met from PAs or acceptable alternatives must be provided in

place. This realization motivated Mr A. K. Banerjee, a government forest official, to carry out the Arabari experiment of West Bengal in the 1970 which culminated into a new management structure for the forest resources in the form of Joint Forest Management (JFM). Notwithstanding, many officials are sharply critical of traditional resource uses of villagers, and do not understand the cultural significance of the event. On the other hand, villagers universally label the forest department as corrupt and inefficient, and are not fully conversant of the pressure under which the department staff has to work. This happens so because the protected areas have maximum restrictions on the use of forests by local people. When the people live in an isolated and self-contained economy, there was no problem. When, however, outside markets forces penetrated these economies and started hiring the forest dwellers as agents for poaching and smuggling, human habitation began to be seen as a nuisance. Even if one or two of the forest dwellers are so used for illegal purposes, the entire groups come under suspicion. Zealous foresters tried to relocate the forest dwellers on the fringes of natural parks, which deprived even the innocent forest dwellers of their rights to traditional sources of livelihood. Concern for conservation here conflicted with local interests of the poor people aggravating their poverty resulting into intolerance and conflicts. This intolerance between the department and the fringe people has its own history and the present form of prejudice is the legacy of this history.

Nadkarni (2001) wrote extensively on how the forest dwellers were in tussle with the department for years and how it culminated into forest degradation and different policy as such. He wrote that the British government went about systematically to establish control over forests and isolate local people from forest and their control over forests as far as possible. The forest department was formally created in 1864 with Dietrich Brandish, a German, as the first IG of forests. The Government Forest Act of 1865 empowered the government to declare any forest as government property. The forest legislation was made more comprehensive and stringent through the Indian Forest Act of 1878, classifying the forests into Reserved, Protected and Village forests. The government held absolute right of ownership in the Reserve Forests. Protected forests were those which were yet to be surveyed, but the local people's access and privilege were permitted for the time being. It was in case of village forests that the rights of locals were conceded in respect of grazing. Though the local people had full access to village forests and limited access to protected forests, the area under both was very limited. The bulk of forests area was placed under the reserved category. This meant extreme pressure on village forests and alienation of local people from forests. The alienation of the locals led to serious discontent and protests movements as it adversely affected the local economy. They did not have any responsibility in the

management of forests, especially the reserve forests. To compensate for the loss of rich forests, the government began to transfer huge areas from revenue department to the forest department. This did not necessarily increase the actual forest, but led to deprivation of locals of their grazing areas and pastures.

This deprivation and alienation are still the factors behind the outbreak of conflict or tension between the fringe community and the department. Nevertheless, it is now well understood a fact that without the cooperation of the fringe community the sustainable management of the forest resource is a distant dream. Eventually, there needs to be a gradual shift towards participatory management institutions, which involves the Forest Department and local communities as equal partners in decision making and implementations.

As such, the interaction between forest and forest dwelling communities received increasing attention from social scientists and policy makers due to its significance from the view point of community welfare and sustainable forest management (Shylajan and Mythili, 2003). Even this has been conceded by the government policy document also. Assam Forest Policy, 2004 says forest conservation programmes shall remain a myth without active support and co-operation of the people. It is therefore, essential to inculcate in the people an awareness of the value of the trees, forests and wild life and their contribution towards not only a healthy environment but also towards their poverty alleviation (Assam Forest Policy, 2004).

Kothari (2001) says a centralized bureaucracy-dominated approach to conservation is doomed to failure in the new circumstances that India finds itself in. firstly, new macro-economic policies responding to the globalization process that is sweeping the world are essentially in contradiction to conservation and sustainable use of natural resources. The same government which declares a PA is now willing to sacrifice it at the altar of 'development' and 'economic growth'. Moreover, the local communities everywhere are no longer willing to take things as lying down they want and rightly so, a voice in making the decisions that affect their lives.

Consequently, the concept of participatory management of forest has been gaining popularity in the last part of twentieth century. The State of the World's Forest 2009, says in the same spirit that as income rise the demand for forest environmental services will rise along with the demand for conservation involving the local communities (FAO, 2009). The essentials of participatory management are that the fringe or local community would not be ignored in decision making along with their essential needs that have been fulfilled from the nearby forest area.

Therefore, Gunatilake categorically said economic needs of a rural community in a developing country would make it difficult to set aside a forest without allowing its resources to be used (Gunatilake, 1993).

Managing these forests is no easy task. An ecological understanding of the area especially the impacts of various human activities on elements of local biodiversity and on the ecosystem as a whole is also weak in most areas especially amongst the managers of PAs. Indeed vast majority of management decisions, including those to curb human use, have been done on the basis of assumptions and generalizations, not solid research or evidence from site specific circumstances. That is perhaps why, research (especially long term) has often shown these decisions to be mistakes and to have caused unintended negative consequence (Kothari, 2001). The manager must decide not only how to maximize yields on a given amount of land, but also when to harvest and replant. A delicate balance must be established among the various possible uses of forests (Tietenberg, 2004). For designing an incentive based mechanism for the conservation of forest which benefits the forest depending community, it is crucial to know the benefits that accrue to the society from the extraction of NWFPs. Forest conservation offers a variety of benefits such as direct use values, indirect use values, option values and existence or non-use values (Krutilla, 1967).

Provision of environmental services will remain the main justification for forestry, especially for arresting land degradation and desertification, protecting watersheds and improving the urban environment. Institution building, particularly at the local level, is needed in order to facilitate an integrated approach to resource management (FAO, 2009).

It is observed that as far as forest management is concerned there is complete lack of coordination and cooperation among the line agencies. Kothari (2001), therefore, says that the crucial need is for institutional structures which could ensure regular coordination within and amongst the various governmental departments which have a bearing on the habitats or species sought to be conserved. In all the PAs and other areas studied so far, we found a sever lack of interaction and joint planning between the Forest department on the one hand and other government agencies on the other. In this juncture, there is a crucial role to be played by the outside agencies. NGOs and other voluntary institutions have been instrumental in mediating between villagers and wildlife officials, gathering data, helping local communities to organize for their rights and keeping a watchdog eye on local activities. Independent experts have also helped to

make scientific assessments, though, as mentioned above, the research done till now is far from adequate.

3. RESEARCH GAP

It is now very much understandable from the discussion of various studies across the world that there are some specific areas where the research could be centered around. In Assam, there are a number of protected areas under the control of the government forest department along with massive fringe population. These villagers residing in the close proximity to the forests collect huge amount of products to sustain daily needs of the households. But, there is hardly any systematic study on the characteristics of forest dependent households, extent of forest dependence and its impact on the status of the forest resources and socio-economic dynamics of villagers relating to NTFPs. Such studies, obviously, might have been done elsewhere, but, since the characteristics are highly site, size and time specific, one has to look into the factors of forest dependence of Assam or for that matter for a particular PA in isolation. This will help in identifying the most intriguing factor(s) which are responsible for dependence and thus design policy to reduce the pressure.

Secondly, most of the researchers have found that the main reason of forest dependency is lack of meaningful source of livelihood. Quite often, therefore, it is concluded by many studies that the dependence on NTFPs may decline with an increase in income from other vocations. Will it be then proper to draw an inference that up-liftment of socio-economic conditions of the fringe people will reduce biotic pressure on the forests and promote conservation of biological diversity? Does the provision of alternative sources of livelihood make the people depend less on the forest resources as has been concluded by many studies across the world? But, there are also studies which contradict such findings. A study by Narain et al., (2005) contradicted, though didn't nullify the more generalized concept that income derived from common pool resources strongly decreases with income. This contradiction leaves scope for further investigation into whether an increase in income reduces the dependency on the forest.

Thirdly, it is obvious from the above discussion that one has to examine how to manage this scarce resource sustainably on the face of its decreasing trend. Most of the managers lack the ecological understanding required for effective management of a specific PA. Indeed vast majority of management decisions, including those to curb human use, have been done on the basis of assumptions and generalizations, not solid research or evidence from site specific circumstances. That is perhaps why, research

(especially long term) has often shown these decisions to be mistakes and to have caused unintended negative consequence (Kothari, 2001). Therefore, there is a need of case specific study of forest dependence of the fringe people and the reasons thereof.

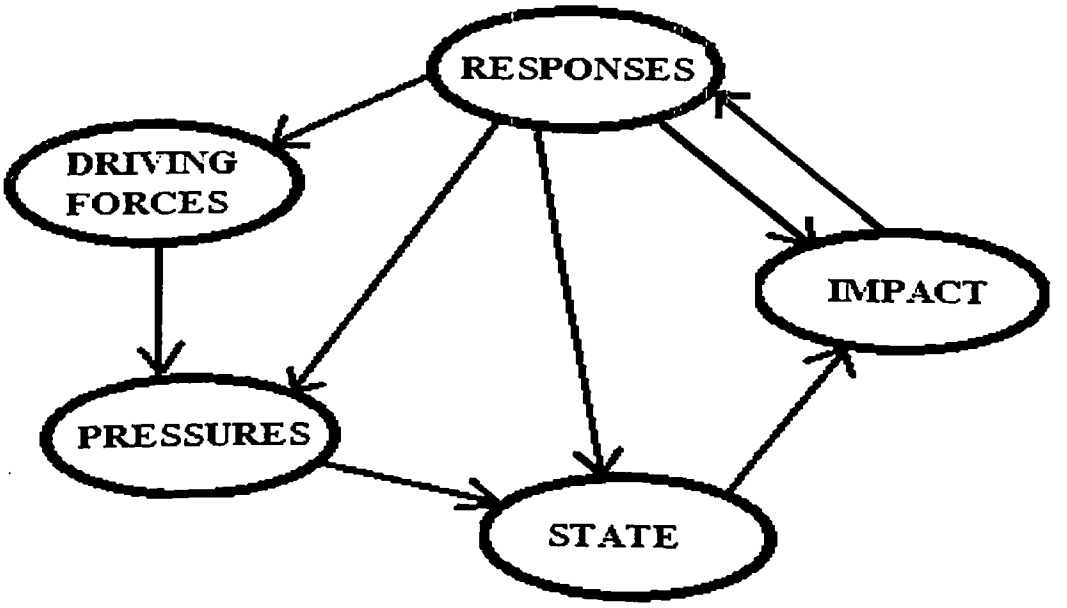
Fourthly, apart from all kinds of tangible benefits, people also enjoy enormous amount of intangible benefits which most of the studies don't take into account nevertheless, has immense values. Therefore, there is a need of calculating the value of such ecosystem services in order to make the people realize the importance of forest ecosystem and its conservation.

It has been found that people residing in and around the forests are very poor. Agriculture is the main occupation, mainly by traditional methods, resulting in only one crop annually. People largely depend on weather for their farms. There is hardly any study about which category of people collect, relative contribution of forest products in annual family income, socio-economic dynamics of forest dependent people, peoples' perception and their awareness about forest and other environmental resources, etc. This study would be planned in a manner to include all these issues.

4. STATEMENT OF THE PROBLEM:

It appears, from the literature review, to be a general consensus that poorer households are dependent more on common property resources like forest and consequently derive higher income from these resources. Their life is intimately connected with the forests, which is their sources of livelihood. Assam is also known for its extensive forest areas and availability of rich floras and faunas besides other valuable forest products. In terms of forest resources it is one of the richest states in India. The recorded forest area of the state is 34.21% of its geographical area. The PA network of the state includes 3 tiger reserves, 5 national parks and 18 wildlife sanctuaries. Having massive fringe population in and around these PAs along with their increased demand, the forests of Assam are being overexploited and encroached upon for both agricultural and settlement purposes. Livestock in the fringe areas are raised and their numbers are increasing over the years since rearing does not involve any cost and it encourages further increasing their number. People don't practice stall feeding and let their livestock free into the forest land in the absence of grazing reserves putting more pressure and affecting the carrying capacity of the forests.

The loss of forest cover results into soil erosion, floods, droughts, climatic change, the elimination of many species of animals, plants, etc. leading to loss of biodiversity, and ecological balance culminating finally to environmental crisis (Sengupta & Paul, 2007).



The DPSIR framework is an effective and simple framework for illustrating ecosystem based management. It relates large-scale drivers of change (e. g. increase in population or human activity) to the pressures they exert (e. g. domestic grazing, deforestation) which cause changes in the state of the park environment (e. g. habitat degradation) resulting in impacts on biodiversity, human well being and socio-economics (e. g. wildlife habitat destruction), thereby leading to institutional response, policy, target setting, measures (e. g. reforestation) (Nebyou, 2013).

It will be imperative here to give a brief elaboration of the DPSIR framework. **D** meaning the driving forces which are the underlying social and economic activities that lead to environmental change. Population growth, poverty, agriculture and industrial production are common examples. **P** means pressures on the environment which result from the driving forces, for example pollution of air, water and soil from industrial production, or depletion of fish stocks through human consumption. **S** indicates state which describes the current state of the environment and recent trends in environmental quality. **I** refers to impacts that are the consequences of the pressures on the environment, for example reductions in biodiversity, soil degradation, poor human health, and lack of clean, safe water. R is the responses that describe the human responses to environmental change, including policies and management strategies to

reduce environmental damage, rehabilitate damaged environments and encourage sustainable development (www.environment.gov.za, 2013).

The proposed research aims at analyzing the drivers of forest dependency of the local communities and resultant impact of such dependency on the environment. How much impact could be repaired and what would be the suitable management practices for sustainable management of the forest ecosystem would also be examined under this study. In the course of the study the information extracted would be extremely beneficial for the GOs and NGOs to help benefit the local communities through providing livelihood security and thereby conservation of the scarce resources. The conceptual framework for the study will be based on the consideration of forest restoration as a potential response to environmental degradation caused by various anthropogenic pressures of the fringe people. Such response options are planned to be viewed according to the DPSIR framework which was developed by the European Environmental Agency (EEA) to help analyzing the process of sustainable development (EEA, 1998). The DPSIR framework is based on the fact that different societal activities (drivers) cause a pressure on the environment, which can cause qualitative and quantitative changes in the state of environmental variables, such change can produce a variety of different impacts on natural resources and the services that they provide to human communities.

6. OBJECTIVES OF THE STUDY:

For designing an incentive based mechanism for the conservation of forest which benefits the forest depending community, it is crucial to know the benefits that accrue to the society from the extraction of forest resources. Forest conservation offers a variety of benefits such as direct use values, indirect use values, option values and existence or non-use values. For most of the products there are no proper markets for transaction, and hence economic valuation becomes difficult. They are not properly accounted for in the total value. Keeping this in the background, the present study attempts:

1. To examine the nature and extent of dependence on forest by various local communities and the drivers of their dependency.
2. To examine the consequences of such dependency on the overall environment.
3. To value some of the important Ecosystem Services.
4. To identify and design alternative livelihood opportunities for the fringe people so as to reduce their dependency on the forest.

7. **RESEARCH QUESTIONS:** The following questions are to be addressed by the proposed research:
   a. What are the household characteristics of the fringe villages of a PA?
   b. What are the tangible goods or benefits extracted by the fringe people and their value?
   c. Are people aware about the intangible services of forest ecosystem?
   d. What are the attitudes of the fringe people towards natural resource conservation?
   e. What roles do the forest ecosystems play in the wellbeing of the fringe people?
   f. What are the resources available in the fringe area for designing alternative livelihood opportunities?
   g. What are the management alternatives which can overcome the identified threats of the park?

8. **DATA SOURCE AND METHODOLOGY:**

The study will be based on both the primary and the secondary data.

Secondary data collection: Secondary data for the study will be collected from various sources like books, journals, survey reports of various governmental and non-governmental organizations, census reports, statistical handbooks, management plan of the sanctuaries, relevant web sites, etc. To assess the forest cover change information from the forest department will be taken. GIS and GPS technology may be used for different aspects of research.

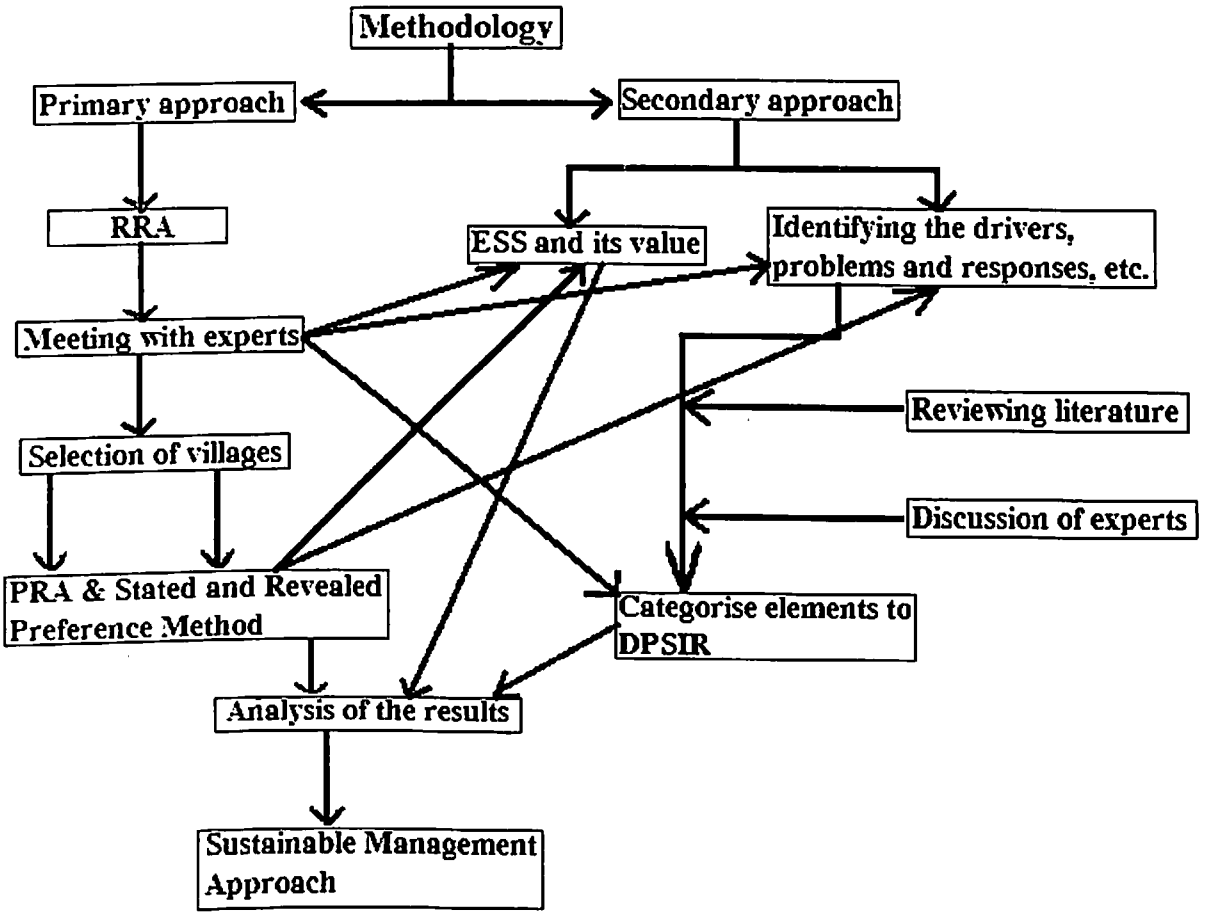
Primary data collection: Since the secondary data may not be sufficient the study would give emphasis to the primary data for a proper analysis of the situation. The primary data will be collected in the following manner:

PHASE I: Reconnaissance visit to the study area

PHASE II: Selection of key informant/s

PHASE III: Participatory Rural Appraisal for primary data collection regarding the household characteristics and the dependency of the people on the natural resources. Using the focused group/participatory discussion as tools for extracting data of their dependency on the forest.

Methodological Framework: The methodological framework has been shown with the following flowchart.



All the fringe villages will be taken into consideration for assessing various kind of dependency of the villagers on the WLSs, but, the villages will be prioritised on the basis of the degree of pressures they put. Population pressure, close vicinity to the forest, socio-economic condition of the people (literacy rate, women literate), etc. would be the parameters for selection of the villages. This would be done in consultation with the key informant. 20% of the fringe villages situated within one kilometer from the forest boundary and 10% of the households of the villages would be considered for the study.

The data would be collected through household survey. For the purpose systematically designed structured questionnaire and question schedule will be used along with the audio-visual aids and field notes and micro observation of the study area. The questionnaire would be prepared covering various ecological, social and economic

parameters. Enough care would be taken to distribute the questionnaire across different age groups to collect more reliable information. Seasonality analysis of their dependence would be done, i.e., the data would be collected in two seasons, namely, monsoon and winter to know about variations of items collected by the people in each season. Moreover, forest officials would be consulted to have some insight in to the policy matters on the approach to natural resource management in the forest as well as in the fringe areas. The Participatory Rural Appraisal (PRA) techniques like, key informants, focused group discussion, seasonality analysis, etc. will be applied for extraction of primary data.

Information about collection and sale of forest products would be obtained from households. In addition, a list of all non-timer forest products (NTFP) is to be prepared with key informants and the Forestry Staff and this document will be used as a checklist to remind respondents about product they might forget. Products such as thatching grass, fuel-wood, fish, etc. may be traded commercially to generate cash while subsistence products such as medicinal plants, wild fruits, leafy vegetables, fish and fuel wood are used for household consumption. Income from the products shall be calculated by multiplying the quantities with market prices. For valuation of the intangible services of the forest, markets for which is absent, contingent method could be utilized.

For the valuation of intangible and non-market benefits of forest ecosystem Contingent Valuation Method (CVM) would be used. Although no single method or technique can be adopted for all the goods and services and although each of the methods have been widely criticized for their inherent weaknesses, nevertheless, techniques such as CVM provide a strong conceptual basis to elicit from individuals the values they place on such goods and services. Spash (2005) has given a good notion of the CVM method on the ground that it has great flexibility, allowing valuation of a wider variety of non-market goods and services than is possible with any other non-market valuation technique. It can be used to estimate both use and non-use values, and it is the most widely used method for estimating non-use values. The CVM has become the most widely conducted valuation tool. The main advantage of this tool is its ability to estimate what are termed as option, existence and bequest values in addition to direct use values. The popularity of the CVM is also based upon the apparent simplicity of asking members of the general public the maximum they are willing to pay (WTP) for an environmental improvement or, less commonly, the least they would be willing to accept (WTA) in compensation for environment degradation.

In practice collecting sound and accurate data on forest use from the interview may turn out to be difficult. Interviewees may often reserve and hesitate to answer detailed questions, as they do generally aware of the regulations of the government/ forest department. Those who invade and clear forests or collect forest products risk severe punishment. Hence, in this situation, additional information is to be collected by direct observation in the village, forest boundary and in major markets located around the sanctuaries. For collection of such data photographic evidences will help to a great extent. Moreover, informal conversation with villagers will help a lot. These informal talks would have to be recorded in a concealed way.

DPSIR framework: It is, indeed, important here to state that the whole analysis would be done according to the DPSIR framework. In recommendation to the European Environment Agency (EEA) on how they should proceed with the development of a strategy for Integrated Environmental Assessment, RIVM proposed the use of a framework, which distinguishes driving forces, pressures, states, impacts and responses, which became known as DPSIR framework (Kristensen, 2004). The framework is seen as giving a structure within which to present the indicators needed to enable feedback to policy makers on environmental quality and the resulting impact of the political choices made, or to be made in the future. According to this framework there is a chain of causal links starting with 'driving forces' through 'pressures' to 'states' and 'impacts' on ecosystems, human health and functions, eventually leading to political 'responses'.

Key variables describing the state of forest resources include forest area, the size distribution and connectivity among forest patches and the composition and structure of forest stands. The way that human activities influence these pattern will determine their impact on key ecological processes such as dispersal, growth, survival, competition, succession and gene flow, which affects biodiversity and the provision of the environmental services on which human communities depend. The severity and the extent of environmental degradation and its impact on biodiversity and the provision of environmental services will determine both the need and scope for forest restoration as a response option (MFE, 2007).

DPSIR framework: The process of creating a DPSIR allows decision-makers or scientists to characterize major stressors, interactions, and tradeoffs related to a decision, and to brainstorm alternative decision options. The use of the DPSIR framework will make it possible to gauge the effectiveness of responses. As a first step, data and information will be collected on different aspects. The data will then be

analysed and will fit into the DPSIR framework. The possible connections between these different aspects will then be analyzed.

9. TENTATIVE CHAPTER OUTLINE:

Chapter I: Introduction
Chapter II: Review of literature
Chapter III: Consumption pattern of resources and its impact on environment.
Chapter IV: Nature and extent of dependency by the fringe communities.
Chapter V: Valuation of intangible benefits of the forest ecosystem.
Chapter VI: Provision of alternative livelihood for sustainable management of ecosystem services.
Chapter VII: Findings, conclusions and recommendations.

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