Management of Forest Resources and Biodiversity Conservation: Some Evidence from India

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Abstract

Forest management is an important alternative strategy for conserving the biodiversity, and for allowing both forest dwellers and larger stakeholders to benefit from the forest. In many Southeast Asian countries, most of the forests belong to the state, and forest management is extremely centralized, even though, national policies do not favour forest management. In this paper, an endeavor has been made to analyze the inter-linkage between the management and fortification of forest resources and protection of endogenous right of people in India with special reference to Nambor reserve forest of Assam.

*Keywords:*Resource management/ Forest right/Sustainable development

1.Introduction

Political-history and economic formation are the transforming components that outline human settlement and assorted human conflicts with the environment. The socio-economic structure of human development and frontiers of human survival enforces inconsistent policies that combat the man-environment relationship. The institutional process of development and the nature of the political economy also underline devastating effects on the environmental landscape. The increasing human population and pressure inflict the loss of environmental sustainability, which raise questions on all these issues. Notably, there is an assorted propinquity between man and the environment in terms of geographical location and level of development. In the modules of economic development of North Eastern Region (NER) of India, environmental geography and eye catching gorgeousness of the region makes it unique among the other areas of India. Historically, economic stagnation, deranged politics and society and the, isolated nature of the region from the mainland of India etc. makes the region divergent and potholed with communal curiosities. However, the novelty of civil society structure and the process of westernization connect the region with the rest of the South Asian countries even though the process is at the opening (Erik and Wan, 2004). Biodiversity loss and human poverty due to chronic natural catastrophes is another consequence which has busted the economy and peasant life for a long time, especially since 1947.

Assam falls under one of the mega biodiversity zones of the world[1] (Department of Environment & Forest, Government of Assam, 2012). Despite having priceless treasures of flora and fauna together with the most suitable natural conditions for sustainable growth of forestry, Assam has been progressively losing its biodiversity as well as a vast expanse of forest due to various reasons including excessive biotic pressures (Government of Assam, 2004). There is large scale unabated encroachment in the reserved forests of Assam by the new settlers which are people who has been displaced by floods, ethnic clashes, immigration. The excessive dependence of the people in the rural areas on the

[1] It covers biodiversity zones of the world Himalaya part of India.

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forests has lead to deforestation. The most damaging factor for the steady depletion of Assam's forest cover has been the unabated encroachment in the reserved forests over the last few decades (Borah et al., 2012). The actual forest cover of the total geographical area of the state has decreased from 26.50 percent in 1969-70 to 24.58 percent in 2003. The forest survey data reveals that loss of forest cover in the State has been increasing over the years. The decrease in total forest cover during the period 2001-03 which was 41 sq. km., increased to 90 sq. km. during the period 2003-05. In this parlance, the encroachment in reserved forests is a major concern to the management and conservation of forests. Approximately 12.77 percent of the total forest area in Assam was under encroachment with 70,149 encroacher households as on 2003. The loss of forest cover in the state is attributed to illicit felling of trees in insurgency affected areas of Sonitpur, Darrang and Karbi Anglong while shifting cultivation has been mainly responsible for loss of forest cover in the districts of North Cachar Hills Karbi Anglong, Karimganj and Hailakandi. However the agrarian mobilization in Assam has been driven by a desire on the part of poor peasants in Assam for security of tenure on forest land that they have occupied and cultivated in the course of successive waves of migration. In this paper an endeavor has been made to study the problem of deforestation formed mainly by the encroachment of forestland by people of Assam with special reference to Golaghat district. The main objectives of the paper are: (a) To analyze the nature and extent of deforestation in Assam; (b) to find out the present status forest encroachment in Assam; (c) to find out the forest dependence of people in Assam; (d) to find out the possible way of solving the problem of deforestation.

2. Methodology

The primary data is collected by undertaking a field study for investigating the forest encroachment and deforestation. For the present study, the sample survey was conducted following a multi stage sampling method. There are 7 reserve forests in the Golaghat District of Assam. In the first stage, one reserve forest in the Golaghat is selected out of 7 and in the 2nd stage four Gram Panchayat (GP) are selected which are situated around the reserve forests which have are occupied these lands for 15 years at least. In the third stage two villages are selected from each of the GPs and in the last stage 20 households are selected from these villages. It leads to total sample size of 160.

2.1 Calculation of household income from non-wood forest product (NWFP)

One of the commonly used techniques for valuing the gross annual value of non-wood forest products has been the incomes approach or products and services approach, whereby the physical production of goods and services is valued using actual or surrogate market prices of the resource. The share of products consumed by the household are measured and of that sold in the market. Products consumed at home are valued at their retail purchasing price in the village town. Wherever the market price was not available, the price of substitutes is used. Both gross and net returns from non-wood forest products of commercial are used. The major part of the cost is labour time involved in extraction. Cost of transporting the products to market is also included. The wage rate at the time of survey was used as opportunity wage to compute cost of labour time involved for collection of NWFP.

2.2. Determinants of forest dependency: empirical model

The following relation to examine the factors determining the extent of forest dependence is considered which is measured by total cash income derived from collection of NWFP. The definition of the variables included in the model has been given later. To test the relation between the dependent variable and explanatory variables, the equation is estimated using the Tobit Model.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \delta D_1 + \gamma D_2 + \mu \qquad (1)$$

3. Result and discussion

Assam is a treasure trove of enormous forest wealth and biodiversity, apart from a rich heritage of cultural diversity, traditions and practices that are closely linked to the State's immense natural resources. Assam lies within the Eastern Himalayas, part of the Indo-Burma Biodiversity Hotspot (Myers et al., 2000). As per the forest profile of Assam, the Reserved Forest area and Proposed Forest area is 14206 sq. km. and 19418 sq. km. respectively in 2009-2010 (Government of Assam, 2011). The total forest area excluding un-classed State Forest is 19418 sq. km. and 3436 sq. km. area is under Protected Area as reported by State Forest Department. Thus, the reserved forest area constitutes around 18 percent and total forest area excluding un-classed forest constitutes around 25 percent of the total geographical area of the State. However, the scenario within the notified area depicts a rather gloomy state in terms of degradation during the last 20 years due to various biotic factors and encroachment. As a result, considerable rich bio-diversity has been lost which needs to be re-built again.

The natural forests in this area have suffered severe degradation over the past two centuries. Deforestation has accelerated even faster during the past three decades. Forest cover in Assam has experienced massive destruction but it is still considerably higher than in other states. Forests cover about 36 per cent of the total geographical area of the state which is still a high proportion of forest cover (NEDFI, 2012). Some of the figures of Assam's forest areas are depicted bellow in figure 1

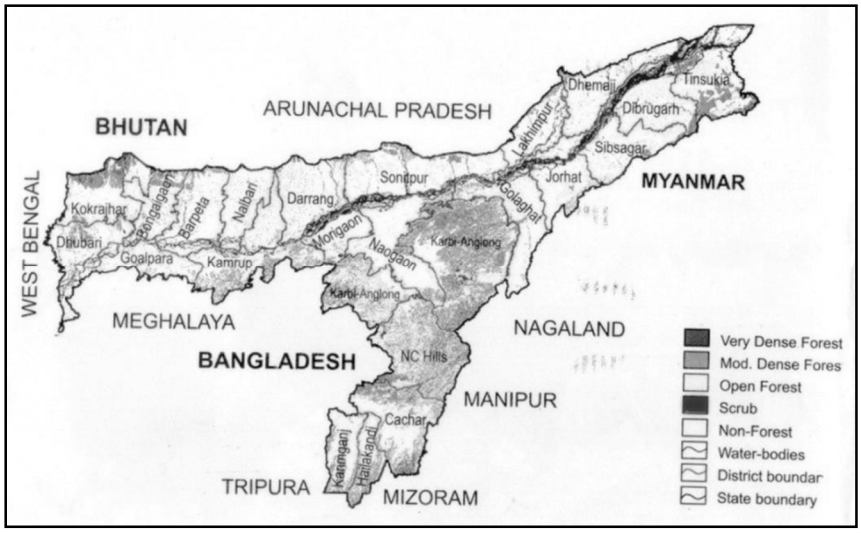

Figure 1 Map of Assam showing forest cover (Forest Department of Assam, 2011)

There are about 312 Reserve Forests in Assam covering 17.68 percent of the State total geographical areas of Assam and there are 25 protected area Networks in Assam covering 5 percent of Assam's total geographical area.

Table 1 Recorded Forest Area in Assam (State Forest Dept. record, as on 31.12.2005)

Type of Forest	Area
Reserved Forest - 312 Nos:	13,870 sq. km. (17.68% of State Geo Area)
Proposed Reserved Forest - 145 Nos:	3,103 sq. km.
Un-classed State Forest :	5,865 sq. km.
Protected Area Network - 25 Nos :	3,925 sq. km. (5% of State's Geo Area)
Total Recorded Forest Area:	26,748 sq. km.

Source: Forest Department of Assam, 2011

The forest & tree cover to total geographical area in Assam is 36.67 percent and forest cover to total geographical area is 24.58 percent. Therefore the forest area is Assam is far below the required level of 33 percent as directed by Forest department of India.

Table 2 Data on Forest & Tree Cover Area

Forest and Tree Cover	Area
Percentage of Forest & Tree Cover to Total Geographical Area	36.67 percent
Percentage of Forest Cover to Total Geographical Area	24.58 percent
Area of Forest Cover	27,826 sq. km. (3.2 % of country's F.C).
Area of Tree Cover	935 sq. km.
Total Area of Forest & Tree Cover	28,761 sq. km.
Percentage of R.F. area to Geographical Area	18.60 percent
Per capita Forest & Tree Cover	0.11 hectare

Source: Forest Department of Assam, 2011

According to the Forest department of Assam, out of a total forest area, 1,684 sq. km. (6.05 percent) are very dense forest followed by 11358 sq. km. (40.81 percent) moderate dense forest area and 14784 sq. km. (53.13 percent) degraded or open forest. Therefore about 53 percent forest areas in Assam are degraded land showing a declining trend of forest areas (Wangda et al., 2009). On the other hand data of forest encroachment shows that out of total estimated area under encroachment (up to 31-03-2003) are 3,555 sq. km. and total estimated encroacher households (as on 31-03-2003) are 70,149 households. There are about 499 forest villages in Assam holding about 538, 35 sq. km. (0.69 percent of Reserve Forest areas) with about a 234,113 population in these villages (Department of Environment & Forests Government of Assam, 2012). It is noted that there are about 3000 Forest Fringe Villages in Assam which is quite high and the data regarding the population and the area covered by these villages are not clear.

Table 3 State-wise Forest Cover in NER, 2009: (area in km^2)

States	Geographical Area	Forest Cover	Change in Forest Cover Over Previous Assessment (2005*)
Arunachal Pradesh	83743	67353	-119
Assam	78438	27692	-66
Manipur	22327	17280	328
Meghalaya	22429	17321	116
Mizoram	21081	19240	640
Nagaland	16579	13464	-201
Sikkim	7096	3357	0
Tripura	10486	8073	-100
India	**3287263**	**690899**	**728**

*The data of 2009 have been compared with that of 2005

Table 3 revealed that among the States of North East India, the highest deforestation is at Nagaland where 201 sq. km. forest area is mislaid followed by Arunachal Pradesh with 119 sq. km., Tripura with 100 sq. km. and Assam with 66 sq. km. However at the same time Mizoram was able to re-forest about 640 sq. km. Therefore as a whole, NER is able to regenerate about 728 sq. km. forest area. The comparison of data of 2005 with 2003 reflects that the highest deforestation is in scrubs followed by open forests. Therefore the awareness or motivation to conserve the forest among the people of Assam is low The hills and plateau of the two districts Karbi Along and N.C. Hills are populated by hill tribes having their own cultural life style intertwined with the forests, wildlife and jhum cultivation[2]. This particular process involves "slashing" and "burning" of forest areas and natural vegetation. Originally hum cultivation had a long jhum cycle of about 20-25 years, which was allowed to elapse before the same plot of land was cultivated. In this process, the forest cover remained intact. But the increase in population demanded more cultivable land, thus shortening the period to about 4-5 years. This greatly affected the vegetation of the area, as well as the total environment. In other parts of Assam also, setting up of saw mills, veneer mills and plywood factories has caused rapid depletion of large forest areas, particularly during the last three decades. The growth of the tea industry has caused depletion of large forest areas. Because of the growth of small tea gardens, many forest covers have had to give way to tea plantations, thus causing further shrinkage in the total forest area. Forests and grasslands have had to be shrunk by the expansion agricultural practice.

The shrinkage of forest cover has affected the climate of Assam adversely. The rainfall has become erratic, the temperatures have risen and in many places, the sign of desertification has set in. The process of deforestation in various geographical regions is destroying this unique environment. Consequently, many animals and plants that live in the rainforests face the specter of extinction.

3.1 Forest encroachment in Assam

Traditionally, Assam was rich in forest resources for which it has gained worldwide attention for its diverse and extensive forest resource. However, about a third of the population of Assam subsists below the poverty line. The percentage of people living below the poverty line in Assam went up to 37.9 percent in 2009-2010 compared with 34.4 percent in 2004-2005 as per the Planning

[2]Jhum cultivation or Slash-and-burn is an agricultural technique which involves cutting and burning of forests or woodlands to create fields.

Commission of India (Government of India, 2012). Traditional and substantial dependence of the people below the poverty line on the resources of the biodiversity for fodder, fuel wood, timber and minor forest produce has been an accepted way of life of the rural population of the State. With the radical demographic changes that have occurred, the land to man ratio and forest to man ratio has rapidly declined and the way of life and the biomass reserve needs have remained unchanged, the forest have come under unremitting pressures of encroachment for farming, and unsustainable resource mining depleting the very resource base they have traditionally relied upon, therefore the forest has become fruitless and depleted of its biodiversity (Naik, 2012). Coupled with these incongruities and anomaly in land use, unsound development strategies have led to increasing threats to biodiversity resources by way of illegal encroachment. The biodiversity losses due to deforestation and encroachment are perhaps the greatest threats to biodiversity of Assam**.** When a piece of land becomes very small, there is competition between trees and crops or cattle production. When the land loses its productive capacity, or the family increases, people encroach onto adjacent land, especially in the case of National Forest areas (Forest Department, 1999). Basically, the landless and flood affected people encroach on the forest areas in Assam where the floods are chronic in nature and occur several times each year. There is large scale unabated encroachment in the reserved forests by new settlers, people displaced by calamities and ethnic clashes in the State, immigrants, plus excessive dependence of the people in the rural areas on the forests leading to deforestation (Forest Department of Assam, 2004).

It has been observed that during the British period some forest villages were set up to tackle the needs of the labour inside the reserved forest. Besides these forest villages many encroached villages were set up due to weak controls and contradicted forest administration. Nambor Forest Reserve is one such forest reserve in Assam where deforestation has taken place due to large numbers of encroachment. According to a report prepared by the deputy commissioner of Golaghat, 10,748 hectares of land out of the total 24,000 hectares are presently under the occupation of encroachers in the Nambor reserve forest in Golaghat district. Eviction drives have been carried out by district forest officials in 1984, 1989 and 1991 at various places including: Raigarh, Khatkhoti, Kacharihola and Champak village that cleared 570 hectares of forest land by demolishing over 280 houses and other structures (Assam Tribune, 2008). However, it has since been learnt that due to political interference, encroachment of land has started again. The total area of the forest has decreased subsequently and biodiversity of the forests have are also been lays.

Nambor Reserved Forest which is situated in Golaghat district was declared as a reserved forest by the British Government in the year of 1878. By the mid nineteen century, the Public Works Department (PWD), the foremost consumer of forest wealth in Assam, required timber both as firewood and for its rapidly growing construction works (Saikia, 2007). In upper Assam, most of the timber was provided by the forest of Nambor which was a matter of serious concern for the British administration and therefore they prepared a plan embodying special instructions for the conservation of Nambor Reserve Forest. At the same time some notable British geologists were concerned about the rich flora and fauna of Nambor such as P. J. Hannay. He had been touring Assam and looking for

mineral resources, and was strongly opposed any move to hand over the land of the Nambor Forest to any company for tea plantations. His exploration made the likelihood of discovering more mineral resources in Nambor brighter (Saikia, 2007). He recommended the administration on the immediate need for the conservation of the forest resources in Nambor and the Nambor forest came under some form of protection and restricted the rights to cut timber. After that, it was declared as a reserved forest in 1878 and during the entire British period Nambor remained as a reserved forest. However, Nambor and its adjoining forests witnessed a major explosion in land reclamation during the post-independence phase. This happened when the province's forest resources came under escalating strain from peasants. The forest department also extended its activities by establishing "Taungyavillages". In 1953 the department established several such villages in Nambor Reserved Forest. Taungya villagers were provided with the free grant of a first class tree. They were required to plant seedlings for which cash payments were made according to the number and condition of the seedlings. Taungya cultivation never occupied large forest areas and these remained confined to a limited area of operation. But after setting up these Taungya villages, several encroached villages were set up in the Nambor Reserved Forest, which lead to deforestation of the area. Peasants came mostly from various villages of Upper Assam (Chaudhuri, 2008). Most of them had lost their land in the river erosion caused by annual floods in "Majuli"[3]. Tea garden laborers also migrated and reclaimed lands in these forests. The forest department failed to accentuate any outline of forest management in the post-independence period. Gradually the forest department ceased to emphasize its absolute right in Nambor and adjoining forest tracts. By 1970, the revenue administration became the authentic authority in these forested areas. The revenue department aggressively rushed the forest department to investigate potentialities of deforestation by peasant cultivation and these encouraged landless peasants to continue migrating and reclaiming land till the 1980s. Most of this migration occurred in times of floods or other such natural calamities. Those who became landless after mortgaging their land to money-lenders also migrated. Few amongst those who migrated to Nambor Reserved Forest were victims of development and displacement.

The peasants who reclaimed land in these forests; however, never got any tenancy right on their lands and their unsecured occupancy soon became a matter of concern. The lands that the peasants had begun to cultivate did not require any irrigation and sustained good cash crops as these were fertile lands. Peasant migration and the gradual retrieval of forest areas in Nambor in the twentieth century caused its impenetrable forest coverage to retreat. As these woodlands were subjected to mounting human infringement, swarming with greater agricultural actions, the conflict between the two frontiers i.e. peasants and forest authorities clashed. At the same time Nambor Reserved Forest became the witness of various development activities such as establishment of schools, community centers, roads, Panchayat, dispensaries, fair price shops, electricity, water supplies and many other development activities. Various government departments also carried out many development schemes. Indirectly these government schemes increased encroachment and deforestation. Unintentionally these development

[3] A River island of Brahmaputra

activities further widened the course of action of encroachment and deforestation.

The Forest Conservation Act 1980 (Ministry of Environment and Forest, 1980) had significantly reinforced the scope of the forest department to effectively supervise forest resources. Eviction by the forest department began to take place after 1981 and between October 1981 and April 1999, according to estimates of the forest department, 13 evictions were carried out in these areas, most of which were illogically carried out in diverse villages without any significant level of reforestation (Antoine et al, 2009). In the mean time, peasants sustained their voices against these evictions and insisted for their rights to land. With the end of the twentieth century, the peasants in Nambor had to face the most decisive phase of eviction in the middle of 2002. It appears that one of the reasons which caused such swift ejections was partially in response to a command of the Supreme Court of India which came in December 1996. This directed the states, including Assam, to stop further encroachment into reserved forests (Kumar, 2002). The implementation of the ruling was followed with repeated intercessions by the Supreme Court, the High Courts' and the Ministry of Environment and Forests. As a prolongation, on February 8, 2002, the Supreme Court directed the chief secretary of Assam, including another nine states, to submit a list of measures taken by them to prevent further encroachment of forest land, particularly in the hilly terrain and national parks and sanctuaries. The notification prompted the Assam government to adopt quick eviction measures in the reserved forests. The most significant contributory factor, however, was the Joint Forest Management (JFM) Project undertaken by the Assam Forest Department (Saikia, 2007). In line with national policy, the Assam Forest Department publicized that in 2002, its primary goal would be the plantation of short rotation crops like cane and bamboo, an objective realized by forestation. In this policy, it was argued, that it would benefit rural families living close to the forests, and among the location chosen were Golaghat district and the deforested areas in Nambor. As peasant refused to move away from villages where they had settled, the Forest Department took initiatives to evict them by force. The eviction drive began on 5th June, 2002, coinciding with the World Environment Day. However due to lack of post-encroachment initiatives, almost all evicted people again occupied their lands. Soon the struggle and contest over forest lands acquired a new dimension with the emergence of collective protests against the eviction. They formed *"Brihattar Tengani Unnayan Sangram Samtti"* (BTUSS) in the year 2002 to protect the rights of peasants and to protest the eviction policy of the government. At present, there are 15410 hectors of forest land and out of this area 8000 hectors are under encroachment. There are 34 villages, among which are six Taungya villages established by the Forest Department. The total population of the area according to the forest department is about 25,655 (Divisional Forest Officer, 2010).

3.2. Present status of encroachment in Nambor reserve forest

The data from the forest office of Golaghat division (Table 4) revealed that out of total 103,795.87 hectare of Reserved Forest areas, about 86,550 (83.38 percent) are under encroachment and out of a total encroached area, about 36.39 percent of the area is intruded by Naga people and the other 63.39 percent is encroached by indigenous people. Therefore, there are two factors of

encroachment: one by Naga people and another by indigenous people in the Reserve Forests of Golaghat District. There are 110 Naga villages and 448 indigenous villages in these Reserve Forests of Golaghat division. In terms of population, the average population of the Naga villages is 2,336 and average population of Non Naga villages is 423. Thus, there is a population pressure of Naga people in the villages of Reserve Forests in Assam along with the local people of Assam.

Table 4 Reserve Forest wise Encroachment Position of Golaghat Division of Assam

Name of Reserve Forest (R.F.***)	Total R.F. area in Ha	Area encroached in Ha*	Area encroached under Naga (Approx.)**	Area encroached under Non-Naga (Approx.)	No. of villages		Population		Total Population
					Naga	Non Naga	Naga	Non Naga	
Diphu R.F.	18363	18050	17500	550	39	3	13088	6608	19696
Nambor South	27240.61	25000	10000	15000	49	115	9083	39670	48753
Rengma R.F.	13921.49	12500	3000	9500	17	136	2727	38087	40814
Doyang R.F.	24637.77	23000	1000	22000	5	154	1008	79405	80413
Nambor North	15410	8000	--	8000	--	43	--	25655	25655
Upper Doigrung	2150	--	--	--	--	--	--	--	--
Lower Doigrung	2073	--	--	--	--	--	--	--	--
Total	103795.87	86550	31500	55050	110	448	25906	189425	215331

*Ha: The hectare (symbol ha) is a metric unit of area defined as 10,000 square meters and primarily used in the measurement of land.
**Approx: Approximate
*** RF: Reserve Forest.
Source: Divisional Forest Office, Golaghat, 2011

3.3 Forest villages

There are 13 forest villages, even though the off record number of forest villages is much more. According to the report from Golaghat divisional forest office, about 1735.4 hectares of land are under these 13 forest villages with a total population of 7,015 in Golaghat division.

Table 5 Forest Villages in Golaghat Division

Name of Forest Villages	Area (in Ha**)	Population
Amguri Forest Village (F.V.)*	35.62	173
Chowdangpathar F.V.	228.87	690
Kachamari F.V.	124.20	236
Merapani F.V.	73.95	456
Tarani F.V.	70.71	1041
Gomariguri Block-I	182.24	--
Block-II	209.60	--
Block-III	196	3656
Block-IV	142	--
Block-V	210	--
Naojan F.V.	100	445
Cungajan MV F.V.	99.60	318
Uriamghat F.V.	62.61	--
Total	1735.4	7015

* Forest Village (F.V.)
**Ha: Hectare
Source: Divisional Forest Office, Golaghat, 2011

Therefore large numbers of areas are encroached by forest villages exacerbating the creating process of deforestation.

3.4 Forest dependence of population

There is so much dependence by the population on the forest resources of the Nambor Reserve forest and Doyang Reserve forest. Out of a sample of 160 households, 110 households depended on the forest for their livelihood. Out of 160 households, the average collection value of firewood from the forest is Rupee (Rs.) 19069.08 which is really high. Only 47 households collect firewood with a value of less than 1000 which is for household needs. On the other hand, 113 households collect firewood with a value of over Rs 5000 or more. So, about 71 percent of the population heavily depends on the forest, thus causing degradation of forest resources.

Table 6 Firewood Collection Value

Gaon Panchayat*	Less than 1000	Rs.** 5000 or more	Total
Jamuguri Gaon Panchayat (G.P.)	12	28	40
Doyang G.P.	17	43	60
Tengani G.P.	7	13	20
Silonijan G.P	11	29	40
Total	47	113	160

* Gaon Panchayat (village administered unit)
**Rs.: Rupee.

In honey collection, only 15 households are engaged this activity. They collect honey with an average value of Rs. 2150. The villagers also collect plants for medicine from the forest which are precious and rare, but have a higher market value. Out of 160 households, 59 collect such plants.

Table 7 Medical Plant Collection (value)

Gaon Panchayat*	Less than Rs.** 1000	Rs. 2000-3000	Rs. 3000-43000	Rs. 4000-5000	Rs. 5000-6000	Greater than Rs. 6000	Total
Jamuguri Gaon Panchayat(G.P.)	19	0	0	0	10	11	40
Doyang G.P.	9	4	8	7	11	21	60
Tengani G.P.	5	0	3	1	0	11	20
Silonijan G.P.	4	2	5	7	6	16	40
Total	37	6	16	15	27	59	160

* Gaon Panchayat (village administered unit)
**Rs.: Rupee.

Regarding timber collection from the forest, 84 households collect timber for commercial purposes. The table shows the value of illegal timber collection from the forest. The average value of timber collection is Rs. 4671. Therefore, 53 percent of households are involved in timber collection as a source of revenue generation.

Table 8 Value of Timber Collection

Gaon Panchayat	Less than Rs 1000	Greater than Rs 5000	Total
Jamuguri Gaon Panchayat (G.P.)	23	17	40
Doyang G.P.	18	42	60
Tengani G.P.	9	11	20
Silonijan G.P.	26	14	40
Total	76	84	160

* Gaon Panchayat (village administered unit)
**Rs.: Rupee.

Regarding animal hunting, the villagers sometimes collect forest animals mainly for their meat and commercial purposes. But it has become rare as then number of animals has been reduced and only a few households are involved in this activity with an average monthly value of Rs1230. They also have to collect other forest resources to some extent.

3.5Forest dependence for non wood forest products

The overall dependence on the forest by the sample households based on their displacement status is given in Table 9. It shows that all the displaced households depend on forest for the collection of NWFP for sale, and the collection of food items for subsistence use.

Table 9 Definitions and terms used in Tobit model and their expected signs

Variable	Definition	Expected Sign
OCCU-INCOME	Annual Household Income from Occupation (INR)	Negative
CULT-INCOME	Annual Household Income from Cultivation (INR)	Negative
ADULTMEN	Number of adult men in the age-group 14-65	Positive
PADDY AREA	Area under cultivation of paddy (Area in cents)	Negative
TOTAL AREA	Total Land Area under Cultivation (Area in cents)	Negative
LOCATION	Location Dummy D = 1 if the household is located interior = 0 otherwise	Positive
DISPLACEMENT	Community Dummy D = 1 for displaced household and = 0 otherwise	Positive
EDU-ADULTS	Number of adults in the age-group 14-65 who can read and write	Negative

Source: Field Survey

The estimated results show that except for two variables, all others have expected signs. There is a significant negative relationship between the Non Wood Forest Products and annual household income from cultivation. The inverse relationship between household income from non-wood forest products and income from cultivation indicate that households with more agricultural income depend less on NWFP. The inverse relationship between the dependent variable and area under paddy cultivation clearly shows that households who have alternative secured source of livelihood may prefer not to depend more on forest for extraction of various NWFP. "Location" is a dummy variable introduced to know whether the settlement or hamlet in the forest area influences the intensity of extraction of various forest products. Our assumption is that if people live nearby the source of forest products, there is more chance of extracting the products more intensively. The coefficient of the dummy variable for location has expected sign but not statistically significant at 5 percent level. "DISPLACEMENT" is also a dummy variable, which is consistent with the observation that both *displaced* and *non-displaced* collect more NWFP. The coefficient is statistically significant.

Table 10 Estimated results of the forest dependency model

Variable:	Coefficient	t	P > t
OCCU-INCOME	-0.0388	-0.54	0.591
CULT-INCOME	-0.5042	-2.19*	0.032
ADULTMEN	-233.97	-0.26	0.793
PADDY AREA	-98.32	-2.08*	0.041
TOTAL AREA	111.07	2.73*	0.008
LOCATION	1464.21	1.01	0.314
DISPLACEMENT	10370.62	3.26*	0.002
EDU-ADULTS	-1345.03	-1.85	0.068
CONSTANT	-4900.13	-1.39	0.168

* Significant at 5% level.

Another important variable that determines the decision of the members of the household to depend or not to depend on NWFP is the level of education of the occupants. Educated adults may prefer other types of employment as opposed to collection of forest products, which is considered to be a low class occupation. The result shows that there is a negative relationship between number of adult men in the household and income from forest products. However, the result is not statistically significant. The reason may be that the women also actively participate in extraction activities. The negative relationship between annual household occupational income and dependent variable is expected.

The conflict between protected area management and the local people residing inside protected areas is an unresolved issue in the protection of forest biodiversity. In this study, we have done an empirical study of forest dependence by indigenous and local communities on a Nambor Reserve Forest in Assam. The analysis on overall dependence on forests shows that people depend heavily on forests for various purposes such as extraction of Non-Wood Forest Products and for subsistence as well as commercial use, fishing, hunting, collection of bamboo, grass etc. The regression analysis shows that income from other sources, such as cultivation is inversely related to extraction of NWFP. Providing alternate sources of income for the livelihood either through employment opportunities or by a secured source of income from cultivation would help reduce the pressure on protected areas.

It has been observed that during the British period some forest villages were set up to tackle the needs of labour required inside the reserved forest. Besides these forest villages, many encroachment villages were set up due to weak forest administration. Nambor Forest Reserve is one such reserved forest in Assam where deforestation took place due to large amount of encroachment. The total area of the forest has decreased and subsequently biodiversity is lost.

4. The forest management policy in India:

India is rich in forest resources and biodiversity. Forests are administrated through the Ministry of Environment and Forests. The Imperial Forest Department was created in 1864 to consolidate the state control on public forests and to put forestry operations on a scientific footing. The first and foremost task in this regard was to forge legal mechanisms to assert and safeguard state control over forests. The first such attempt was made through the Indian Forest Act of 1865, which was replaced by a far more comprehensive piece of legislation in 1878. This Act obliterated the centuries old customary use of forest resources by rural communities all over

India. It provided three classifications of forest: "Reserved forests", "Protected forests", and "Village forests". Reserved forests consisted of compact valuable areas to be brought under full state control. All private rights were extinguished, transferred elsewhere, or in exceptional cases allowed for limited exercise. In Protected forests, rights were recorded but not settled and state control was to be firmly maintained by detailed provisions for the preservation of valuable trees and by demarcation of areas for grazing and firewood collection. Most of the protected forests were gradually converted to the category of reserve forests to bring them under greater state control. The third category of Village forests, which were to be earmarked to meet the needs of local communities, remained on paper only, as this option was never exercised in practice. The same Act, with minor modifications in 1927, is still operational in independent India. In the late 1980s, for the first time in the history of forest management, there was an acceptance of local communities' claims on the forests. This was a revolutionary break from the past. Even independent India's Forest Policy of 1952 had not recognized local peoples' claims. In fact, it stated categorically that "neighboring areas are entitled to a prior claim over a forest and its produce" is destructive to national interest. The first policy, advocating local communities' claims on forests, even though harsh on the encroachment, is the National Forest Policy of 1998. It emphasized safeguarding the customary rights and interests of these people. The Ministry of Environment and Forest carried forward this concept of involving local communities in the regeneration of forests and initiated a policy of Joint Forest Management (JFM) in June 1990. The benefits to the individual members of the forest protection committees under the JFM policy are usufruct rights on grass, lops and tops of branches, minor forest produce and also a stipulated share in the sale of timber.

Recent years have seen a number of changes in the management of forests. There is a major shift towards a more decentralized and people oriented forestry management. Responding to scarcities, villagers have started organizing themselves to reverse degradation and restore productivity. The result has been a renewal of degraded ecosystems. The destruction of natural forests for timber, cropland, fuel wood, pasture, Urbanization has had an impact on many poor rural families who are dependent on forest resources for their livelihood. It is now being recognized that local communities need to be involved in establishing sustainable forest management systems. Governments are opening a number of opportunities for sustainable forest management and biodiversity conservation by decentralizing authority and responsibility for resource management in different parts of the world. In the Asia-Pacific region, the attention is to use community-based forest management programs and the devolution of management responsibilities on some forestry activities to local government units. In the Philippines, land and forest allocation programs have been put in place, in China, Laos, Vietnam, transfer of use rights to forest user groups have been enforced . In India, Joint Forest Management (JFM) has emerged as an important intervention in management of forest resources. In many parts of India, small village groups have started to protect and reclaim degraded forestlands through collective action. The Joint Forest Management Programme seeks to develop partnerships between local community institutions and state forest departments for sustainable management and joint

benefit sharing of public forest lands. The primary objective of JFM is to ensure sustainable use of forests to meet local needs equitably while ensuring environmental sustainability. The central premise is that local women and men who are dependent on forests have the greatest stake in sustainable forest management. The National Forest Policy of 1988 and the JFM resolution of 1990 combined with state level resolutions acknowledged the need to give greater rights and authority to community groups. The policy envisages a process of joint management of forests by the state government and the local people, who would share the responsibility for managing the resource and the benefits accruing from this. Under Joint Forest Management (JFM), village communities are entrusted with the protection and management of nearby forests. These communities are required to organize forest protection committees, village forest committees, village forest conservation and development societies. The guidelines provide for rights to usufruct and non-wood forest products and percentage share of final harvest to organized communities willing to help regenerate depleted forest and wastelands. There are many cases of communities protecting natural forests either on their own initiative or with the encouragement of forest departments. Communities in many parts of rural India are organizing themselves into formal and informal groups for forest protection and management in the states of Orissa and Bihar, Rajasthan, Gujarat, Karnataka, Haryana, Madhya Pradesh and Punjab; while state forest departments promote some, local government or NGOs sponsor some. Forest protection organizations include Groups of Village Elders, Village Forest Protection Committees, Village Councils, Village Youth Clubs, in Orissa, Forest Cooperative Societies in Kangra district of HP, Van Panchayats in UP hills, Forest Protection Committees in West Bengal. When villagers who are dependent on forests, have initiated forest protection on their own, the challenge for forest departments is to facilitate the process, which implies adapting the official JFM frameworks to enable forest departments to participate in the villagers' initiatives. For JFM to represent participatory forest management, emphasis on regenerating timber through community protection needs to be shifted to developing sustainable alternatives for meeting diverse forest produce needs of members of community institutions. Mechanisms need to be evolved for meeting immediate essential needs of the most dependent members through appropriate forest management interventions. In 2006, the Indian Parliament enacted The Scheduled Tribes and Other Traditional Forest Dweller (Recognition of Forest Right) Act-2006. The act provides the right to hold and live in the forestland under the individual and common occupation for habitation and self-cultivation for livelihood by the members of the Scheduled Tribes and Other Traditional Forest dwellers. It also makes the provision of the right of ownership, access to collect, use and dispose of minor forest products, which has been traditionally collected within and outside villages' boundaries. The act is considered as an important step toward proper use of forest resources and biodiversity conservation.

A Joint Forest Management Scheme was tried North Nambor Reserved Forest. The forest department also set up a Joint Forest Management Committee in the area. The local community of the reserved forest opposed this scheme. Because, the, forest department did not allow the forest dwellers to participate in the Joint Forest Management System. They tried to

implement the scheme with the help of the nearby villagers. This created a conflict between the forest department and the local community; the forest department was unable to implement even its entry point activities due to strong opposition from the forest dwellers. Ultimately, the forest department withdrew its conservation agenda. Significantly, the Government of India enacted "The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Right) Act-2006". This act recognized the rights of the tribal people and traditional forest dwellers on the forestland. However, various tribal and other organizations have not supported this act and pointed out that it will not be able to protect the rights of the forest dwellers. At the same time, the act has also been criticized on the grounds that it will not be appropriate to conserve biodiversity in some forest areas like Nambor Reserved Forest. Hence, it has become important to adopt a proper policy for the sustainable use of forest resources. Still the forest villager is dependent on the forest for various goods and services and at the same time the role of forest dwellers is very important to biodiversity conservation. The perception and attitudes of forest villagers and forest dwellers towards biodiversity conservation in general is good and through the Forest Rights Act gave rights to them that should foster proper management of the forest resources.

There is great potential for developing and enhancing forest-based livelihoods in many parts of Assam. However, this requires, in addition to the appropriate management policy, a strong scientific basis for determining harvesting and extraction levels, value addition, marketing and benefit sharing. Specific options need to be studied throughout the life cycle from harvesting to benefit sharing, so that p mechanisms can be developed that enable forest based livelihoods to play a role in economic development as well as encourage incentives for conservation.

5. Conclusion

One of the biggest challenges towards the outlook of forests in the recent times has been concerns about "sustainability of resources". It has emerged as one of the main concerns of recent policy advocacy. The National Forest Commission in its report released in 2006, has recommended creating an enabling environment to facilitate as assessment, monitoring and reporting on national-level criteria and indicators for sustainable forest management. This phenomenon of comprehensive management of forests addressing its ecological, economic and socio-cultural functions has developed throughout the world, resulting in improved understanding of the forest managers and awareness among the people. At the same time the willingness of the local people to help with biodiversity conservation is important. If they accept any rehabilitation package and give up a portion of their land for reforestation it will be helpful to use the forest resources and conserve the biodiversity of the area in a sustainable manner. The Nambor Reserved Forest is rich in biodiversity and hence it should be protected. On the other hand, it is also important to protect the indigenous people's rights. In this situation the government should undertake a proper strategy to fulfill the both objectives. Only such a strategy can be helpful for sustainable use of biodiversity in the area.

The conflict between protected area management and the local people residing inside protected area is an unresolved issue in the protection of forest biodiversity. In this paper, we have done an empirical study of forest

dependence by indigenous and local communities on a North Nambor Reserve Forest in Assam. The analysis on overall dependence on the forest shows that two indigenous communities depend heavily on the forest for various purposes such as extraction of non-wood forest products for subsistence as well as commercial use, fishing, hunting, collection of bamboo, grass etc. The regression analysis shows that income from other sources like cultivation is inversely related to extraction of NWFP. This study corroborated with the other studies that providing alternate sources of income for the livelihood either through employment opportunities or by a secured source of income from cultivation would help reduce the pressure on protected areas.

6. References

Antoine, L. and Ashish, K. 2009. Displacement and Relocation of Protected Areas: A Synthesis and Analysis of Case Studies. **Economic and Political weekly** 125(4):44-56

Anuradha, K. 2002. A controversial eviction drive, Frontline [Online]. Available:http://www.frontlineonnet.com/fl1915/index.htm[Accessed on 8 February 2012].

Assam Tribune. 2008. Encroachment on in Nambor Reserve [Online]. Available: http://www.assamtribune.com/scripts/details.asp?id=oct0208/State [Access on 05 January 2012].

Borah, S.M., Borah, L., and Nath S. C.2012.Ethno medicinal Plants from Disoi Valley Reserve Forest of Jorhat District. **Plant Sciences Feed** 2 (4): 59-63.

Chaudhuri, B.B. 2008. **Peasant Agriculture in Colonial India: establishment of New Links of the Peasant Village with the Wider Polity and Economy.** India: Peasant History of Late Pre-Colonial and Colonial India.

Department of Environment & Forest, Government of Assam. 2012. **Assam State Action Plan on Climate Change, 2012 -2017**. New Delhi. India: Assam State Action Plan on Climate change, Energy and Resources Institute.

Divisional Forest Officer. 2010. **Encroachment Position in Golaghat Division**. India: Forest Department of Assam.

Erik, T. and Henry, W. Jr. 2004. Revisiting East and South East Asia's Development Model (pp. 1-38). Paper presentedat the Cornell Conference"Seventy Five Years of Development". Ithaca, NY: Cornell University Press.

Forest Department. 1999. **Principal causes of forest cover change-general conclusions, in Annotated Bibliography Forest Cover Change.** Guatemala, Rome: FRA Working Paper, FAO.

Forest Department of Assam.2004. **Assam Forest Policy of India.** Assam, India: Government of India.

Forest Department of Assam. 2003. **Forest Survey of India**. Dehradun, India: Government of India.

Government of Assam. 2011. **Forestry: Economic Survey Assam.** India: Government of Assam.

Government of India. 2012. **Press Note on Poverty Estimates, 2009-2010.** India: Planning Commission of India.

Myers, N., Russell A.M., Cristina G.M., Gustavo A.B. da F., and Jennifer K. 2000. Biodiversity hotspots for conservation priorities. **Nature** 403: 853-858

Ministry of Environment and Forest. 1980. Forest Conservation Act 1980 [Online]. Available: http://www.arunachalpwd.org/pdf/Handbook%20on%20Forest%20%28Conservation%29%20Act,%201980%20%28updated%202004%29.pdf. [Accessed on 2 June 2012].

Naik, D.R., Rahiman, S.A., and Hossain, K. 2012. Vulnerable endangered, threatened and rare species theories in the submergence area of Polavaram area. **European Journal of Experimental Biology** 2(1): 288-296.

NEDFI. 2012. Forest. NEDFI Data Bank [Online]. Available: http://db.nedfi.com/content/forest-2 [Accessed on 23 February 2012].

Saikia, A. 2007. **State, Peasants and Peasant Movement. Predicament of Forest Conservation in Assam 1850s-2007.** Bangalore: Centre for Interdisciplinary Studies in Environment and Development.

Wangda, P., Gyaltshen, D., and Pradhan, R. 2009. **Impact of developmental projects in the humid evergreen broad-leaved forest: Wasabi pilot project at Lamperi, Western Bhutan: Case studies on measuring and assessing forest degradation**. Italy: Food and Agriculture Organization of the United Nations (FAO).