

An Analysis of Deforestation in Kokrajhar District of Assam using Remote Sensing Technique

¹ Sanchuma Goyary, ² Bijuta Mushahary

¹ Research Scholar, North-Eastern Hill University

² Assistant Professor, UN Academy, Kokrajhar

E-mail : ¹ goyarysan@gmail.com ² bijutamushahary@gmail.com

Abstract: Deforestation is one of the burning environmental issues in Kokrajhar district of Assam. Deforestation in Kokrajhar district has affected the tribal population who are dependent on forest and forest products to suffice their basic necessities of life. The alarming rate of illegal felling of rare Sal trees in Kokrajhar district and encroachment of forest areas has been of great concern lately. Over utilization of forest resources due to illegal felling coupled with the conversion to agricultural land and encroachment has resulted to its depletion. The changes in forest cover are the matter of concern as it disrupts the environment system, threatens the biodiversity and sustainability of livelihood of the region. The present study attempts to explore the underlying causes of deforestation and its future management. The district witnessed a sharp decline in all the categories of forest from 1977-2017. This paper analyzes the causes of deforestation and its future management. The burgeoning of population, demand of resources, increased agricultural activities; etc. have led to the high incidence of deforestation in the district.

Key Words: Deforestation, Encroachment, Biodiversity, Sustainability, Forest Resources.

1. INTRODUCTION:

Deforestation is one of the most serious and widespread environmental problems which Kokrajhar District is facing. Deforestation is the removable of a forest or stand of trees where the land is thereafter converted to a non forest land. Over utilization of forest resources due to illegal felling and conversion to agricultural land and encroachment has resulted to its depletion in the district. The district also has a number of recognized forest villages which were setup during the British Period of working in forest plantation, tea garden etc. Moreover, today the population in these villages has increased manifold and so as the pressure on forest. The population is dependent on the forests for fire wood, fodder, small-wood, timber; non-wood forests produce (NWFP) and fruits etc. Almost all the requirements of house building, fencing, agricultural implements and energy are met from the forests and this is almost through the unorganized sector with no royalty being paid to the department. Deforestation is the conversion of forest to an alternative permanent non-forested land use such as agriculture, grazing or urban development (Van Kooten and Bulte, 2000). Deforestation is primarily a concern for the developing countries of the tropics as it is shrinking areas of the tropical forests (Barraclough and Ghimire, 2000) causing loss of biodiversity and enhancing the greenhouse effect. Deforestation and forest degradation are the major environmental problems (Goll et al., 2014). Vegetation plays an important role in providing different ecosystem services and goods so as to adapt and mitigate the global climate change. Spectral vegetation index data have been used to investigate the interactions between climate and vegetation at the landscapes level, to assist land management and sustainable utilization of forest and other vegetation resources and also to investigate climate change impacts and carbon sequestration by different vegetation types (Ahmed, 2016). Nath (2014) has also carried out the technique of NDVI by using remote sensing data for monitoring the changing pattern of vegetation of Bandarban Hill Tract of Bangladesh.

2. OBJECTIVES:

- To explore the underlying causes of deforestation.
- To investigate the present status of forest cover and rate of deforestation.
- To suggest some measures to mitigate the problem for sustainable ecological and social setup.

3. DATABASE AND METHODOLOGY:

The secondary sources of data have been collected from Department of Division Forest Office, District Census Handbook, websites (internet), published books, textbooks, articles, journals, newspapers, etc. For the study, a map of Kokrajhar District was acquired from the Cartographic Laboratory, Department of Geography, Gauhati University. The Satellite images of different years were downloaded from USGS Earth Explorer and then stacked in ERDAS Imagine

9.2 to find out the NDVI value. Then, the study area (Area of Interest) extracted from georeference images of Assam map using ArcGIS 10.2. All the data thus obtained are analyzed, tabulated and represented using Microsoft Excel.

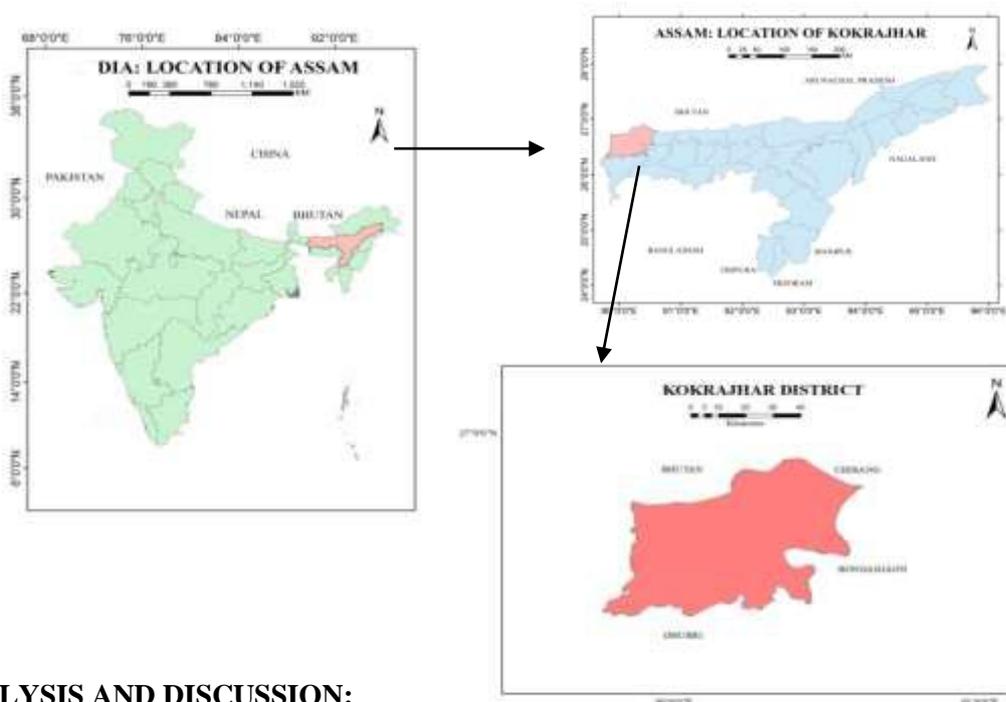
4. LITERATURE REVIEW:

- Dr. L.T.S. Guite and Amritee Bora (2016) studied the forest cover change of East Khasi Hills Meghalaya using Remote Sensing and GIS and found out the changes in forest cover due to rapid rate of urbanization and other anthropogenic factors and calculate the deforestation rate. He also tried to assess the temporal changes in land cover with help of change matrix.
- Shalini Srivastava, T. P. Singh, Harnam Singh, S. P. S. Kushwaha and P. S. Roy (2002) highlight the deforestation and encroachment in the moist deciduous and other forest areas in Sonitpur District of Assam. He also demonstrates unique potential of remote sensing and geographical information system for forest cover.
- Devendra Kumar (2011) studied the monitoring forest cover changes using Remote Sensing and GIS and the study reviewed the potential application of remote sensing worldwide for assessing and monitoring the changes in forest cover during the past decades, an increasing urgent task. However, advances in the spatial and spectral resolutions of sensors are available for ecologist which mainly feasible, to study the certain aspects of biological diversity through direct remote sensing.
- Basudeb Bhatta (2008) published the first edition of Remote Sensing and GIS for understanding the basic concepts and principles of remote sensing, global investigation satellite system (GNSS), and GIS.

5. LOCATION OF THE STUDY AREA:

Kokrajhar district lies in between 26°18' N to 26°54' N latitudes and 89°46' E to 90°58' E longitudes. This district is located on the northern bank of Brahmaputra River. It forms the gateway to the seven sister states. It is bounded in the north by Bhutan, in the east by the district of Chirang and Bongaigaon, in the south by the Dhubri district and in the west by the state of West Bengal. The district extends on the north side of the Brahmaputra River. The total area of the district is 3296.00 sq.kms which accounts for 4.04 percent of the total area of Assam (78.438.00 sq. kms.). Kokrajhar ranks ninth in comparison to other districts in terms of area. There are three Forest Divisions under Kokrajhar District viz. Kachugaon Forest Division, Haltugaon Forest Division and Parbajhora Forest Division

Figure 1: Location map of Kokrajhar District



6. ANALYSIS AND DISCUSSION:

Major Causes of Deforestation

i) Although there is no practice of Jhum cultivation, but lots of encroachments are there in the Reserved Forests and Proposed Reserved Forests in all the Divisions of Kokrajhar District. The encroachments are resulted from the dependents of recognized forest villagers and extended families, who are from Kokrajhar district as well as from other places elsewhere where the communities are heterogeneous. In Kachugaon RFD, due to establishment of number of

forest villages as well as encroachments, forest vegetations were dwindled to a great extent. The NDVI carried out in the study district for forty years reveals the following facts.

Figure 2: NDVI in Kokrajhar District, 1977-2017

Year	NDVI	
1977	0.97 (green colour)	-0.87 (red colour)
2017	-0.07 (green colour)	0.05 (red colour)

NDVI map of 1977

NDVI map of 2017

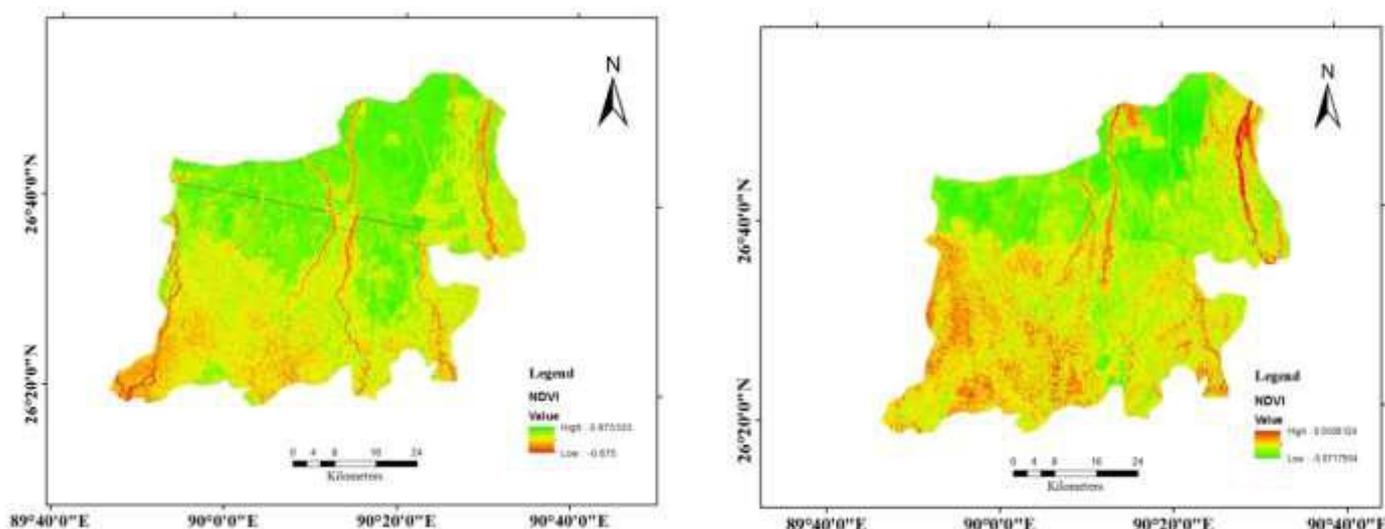


Fig.2: NDVI Map of vegetation cover

The maximum values of the vegetation index were reduced from 0.97 in 1977 to -0.07 in 2017. This shows that the vegetation cover was by far reduced in some parts of the area from 1977 to 2017. It can observe the result as well in the map (Fig 2) as dark green color in both images. The darker the green color in the image the highest NDVI values were recorded and highest vegetation cover and vice versa. In the same way the minimum values are increased from -0.87 in 1977 to 0.05 in 2017. We can observe the result as well in the map (Fig 2) as dark red Color. The darker the red color the lower the NDVI map and the less the vegetation and vice versa. This comparison result shows that highest vegetation cover was observed in 1977 where as average vegetation cover was observed in 2017. Hence the change of vegetation is average in 2017 satellite image than the change of vegetation in 1977. Generally, the result of the NDVI values shows that the vegetation cover in general was reduced and the forests in particular were depleted from time to time even though the change was very insignificant. The trend shows that there was depletion of natural vegetations.

Encroachment under Kachugaon Forest Division

The Kachugaon Forest Division is under the Western Assam Circle Conservancy. The total forest area of the division is 82412.357 hectare. The encroachment is high which about 2,385.14 hectare is. The population is increasing day by day which are about 13,165. There are three Reserve Forests under Kachugaon Forest Division.

Figure 2.1: Encroachment status in the Kachugaon Forest Division, Gossaigaon, 2011

Sl. No.	Name of R.F.	Area under Encroachment (in hectare)
1	Ripu RF	1345.40
2	Kachugaon RF	946.28
3	Flashijhar PRF	93.46
Total encroached area		2,385.14

Source: Department of Division Forest Office, 2018

Encroachment Under Haltugaon Forest Division

The total forest area of the Division is about 67825.12. Due to increasing of population the area under encroachment has been increasing which is about 19926.88 hectare. Among all the reserve forests under Haltugaon Division, Chirang RF has the highest encroachment which is about 18061.68 hectare.

Figure 2.2: Encroachment status in the Haltugaon Forest Division, Gossaigaon-2011

Reserve Land			Encroachment in %
RF & PRF	Total Forest Area (in ha.)	Area under Encroachment (in ha.)	
Chirang RF	59254.12	18061.68	30.48
Manas Pt. RF	2962.00	270.00	9.12
Bengtol Pt. RF	1071.00	46.60	4.35
NadangiriHill RF	1019.00	50.75	4.98
Baxamara RF	136.00	54.40	40.00
Phukagaon RF	161.00	96.60	60.00
Satvendi RF	273.00	218.40	80.00
Nayekgaon PRF Pt-I	774.00	309.60	40.00
Nayekgaon PRF Pt-II	1383.00	414.90	30.00
Amguri PRF Pt-I	82.00	8.20	10.00
Amguri PRF Pt-II	55.00	2.75	5.00
Bangaldova PRF	655.00	393.00	60.00
Total:		67825.12	19926.88

Source: Department of Division Forest Office, 2018

ENCROACHMENT UNDER PARBAJHARA FOREST DIVISION

- The Division at present includes 16 Reserve Forest (R.F.), 8 Proposed Reserve Forest (PRF) with the total area of 45,525.98 Ha. (1,12,375.25 Acres approx.). The Division also has a number of recognized forest villages which were setup during the British Period of working in forest plantation, Tea garden etc. Parbatjhora Division has 14 number of forest villages, with the total area allotted to them being 731.00 ha. As per earlier Working Plan against the land allocated to each village, the villagers has to render 5 days free labor every year to the department, but this practice has long been abandoned.
- Grazing in the forest is a great problem in Chirang RF under Haltugaon Division and in Ripu RF under Kachugaon Division. However, grazing in all other RFs/PRF also by domestic cattle is not only creating pressure but also play a major role in adverse impact of natural regeneration of forestspecies. The villagers living inside the forest areas and the vicinity of the forest areas graze their domestic cattle/buffaloes in the forests. The grazing is in two forms – one is allowing cattle to graze freely from villages and another is by cattle camps – locally known as ‘Khuti’. A number of ‘Khutis’ are there in Chirang RF under Haltugaon Forest Division and in Ripu RF under Kachugaon Forest Division. The grazing of cattle/buffaloes in forest results in damage and destruction of naturally growing seedlings and the undergrowth that is important for forest ecology and having great medicinal values. The grazing cattle also damage the plantation to a large extent.
- Heavy weed and climber infestation particularly in plantations during rainy season and insect attack etc. cause damages to the plantations and forest crops.

- Illegal felling of trees for fire wood, timber and smuggling etc. are also big threat next to encroachment.
- During dry season, widespread fires in the dry forests are also a common feature every year especially during January to March. These are mostly human induced forest fire.

7. CONCLUSION:

It may be concluded that the deforestation is a major problem within forest reserves in Kokrajhar District. Major factors causing deforestation were uncontrolled farming, uncontrolled encroachment for farm lands and fuel-wood and illegal logging. GIS is a very important tool to detect vegetation change. By using this tool, the result of this study showed that there was a reduction of vegetation biomass coverage from 1977 to 2017. Encroachments in the habitat or in its fringes are to be removed and to be discouraged. Local people should avoid going alone and going deep into the forests. The poorer sections have very few alternatives so they depend on forests for fuel wood, fodder, water, fibers, thatch, grasses, etc. Providing effective environmental conservation education and alternative sources of energy would to a large extent minimize the problem. Maintenance of forest cover, creation of awareness among people, policy changes regarding forest, wildlife and community based natural resource management is very important.

8. SUGGESTIONS:

The suggestions for management are given below-

- To conserve and protect the existing forest cover in Forest Divisions for maintaining the ecological balance;
- to protect the areas under sal (shorearobusta) regeneration;
- to recover the heavily degraded area under joint forest management and other community oriented schemes and lastly;
- To promote production and sustainable utilization of NWFP especially medicinal plants and bamboo species.

REFERENCES:

1. Ahmed N.(2016): Application of NDVI in Vegetation Monitoring Using GIS and Remote Sensing in Northern Ethiopian Highlands, *Journal of Science and Technology* 1(1),12-15.
2. Barraclough, S. L., and K. B. Ghimire. (2000). *Agricultural expansion and tropical deforestation: poverty, international trade and land use.* (pp. 5-7). London, Earthscan Publications Ltd.
3. G. Cornelius van Kooten and Erwin H. Bulte, 2000, The Economics of Nature: Managing Biological Assets, *Environmental & Resource Economics*, 23(4), 472-474.
4. Goll II, Nick B., Li Jianhua and McKay Jr and John S. (2014): Analysis on the Causes of Deforestation and Forest Degradation in Liberia: Application of the DPSIR Framework, *Research Journal of Agriculture and Forestry Sciences*, 2(3), 20-30.
5. Nath B. (2014): Quantitative Assessment of Forest Cover Change of a Part of Bandarban Hill Tracts Using NDVI Techniques, *Journal of Geosciences and Geomatics*, 2(1), 21-27.