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Change Detection Analysis of Forest Area of Kenda Village of Kota block, Bilaspur, Chhattisgarh

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Abstract-Chhattisgarh is the tribal dominant state along with rich bio-diversity. Out of the total geographical area of the state, the forest covers more than thirty six percent of the total area. Most of the tribal community of Chhattisgarh are live in the for flung area of the forest region. In the previous decades the tribal communities are depending on the forest product (NTFP) for their livelihood. But in the past three decades the tribal has changed their livelihood pattern and adopting agriculture as an occupation. The present study was conducted in the Kenda (tribal) village of Bilaspur district, Chhattisgarh for analyzing the land use changes in last twelve year span of time. The technique of Remote Sensing and Geographical Information System were used for the analyzing the change trends in land use pattern. Various types of satellite images, toposheet and Remote sensing software are used in this study. It was found ificant changes in land use pattern and result shown the decreasing rate of forest land in the tribal village. The overwhelming message of the present study has shown the urgent need to fulfill the energy and fuelwood demand through the for development of different type of livelihood structure for these tribal area so that they can effectively manage the natural resources and also increase their socio-economic condition.

1. INTRODUCTION

Forests are one of the most important components of the terrestrial ecosystem. They are the storehouse of biological diversity. The human interventions in the natural forest reduce the number of trees per unit area and canopy closure. It effects regeneration, leads to uneven age- class distribution and invasion of alien weeds. The production capacity of the forests could not keep pace with the exponential growth rate of human and livestock populations. Forests provide renewable raw material; and energy, maintain biological diversity, mitigate climate change, protect land and water resources, provide recreation facilities, improve air quality and help alleviate poverty. At the same time forests are affected by fire, grazing, pest and invasive species and are also the primary targets for agricultural and urban expansion. The forest wealth in our country is extremely diverse as a result of the huge variation in the topography of the country.

Due to the impact of biotic pressure on our forests, many forest areas spread across the country has been depleted and degraded which is a serious concern. The role of India's forests in the national economy and in ecology was further emphasized in the 1988 National Forest Policy, which focused on ensuring environmental stability, restoring the ecological balance, and preserving the remaining forests. According to the Forest Resource Assessment 2000, world forest covers 3.9 billon ha and spreads on about 30 percent of the land. The net charge in the forest area was 9.4 M ha per year (rate of deforestation is 14.6 M ha and expansion 5.2 M ha) are tropical but in India tropical forest, dry deciduous forests and moist deciduous forest account for a total of 65 percent (Champion and Seth, 1968).

Land resources form the base for various developmental activities on the earth. Owing to ever increasing pressure of population on land for meeting the growing demand for food, fuel and fiber, a sizeable area of erstwhile barren, fallow and marginal lands and forests in the country have been brought under cultivation (Rao, 1999). For instance, over a span of 40 years (1950-51 to 1990-91), the area under barren and un-culturable lands, culturable wastelands and fallow lands (other than seasonal fallow lands) has decreased from 13.4 to6.4% and 8.1 to 4.9% and 6.1 to 3.1% respectively (Rao, 1999). Out of 329 M. ha, geographical area of our country, an estimated 175 M. ha land is subject to some kind of degradation (National Commission of Agriculture, 1976).

With rapid changes in land-cover occurring over large areas, remote sensing technology is an essential tool in monitoring tropical forest conditions. The remote and inaccessible nature of many tropical forest regions limits the feasibility of ground based inventory and monitoring methods for extensive land areas. Initiatives to monitor land-cover and land-use change are increasingly reliant on information derived from remotely sensed data. Such information provides the data link to other techniques designed to understand the

human processes behind deforestation (Lambin, 1994; Rindfuss and Stern, 1998).

An array of techniques is available to detect land-cover changes from multi-temporal remote sensing data sets (Coppin and Bauer, 1996). The goal of change detection is to discern those areas on digital images that depict change features of interest (e.g., forest clearing or land-covert land-use change) between two or more image dates. One method, image differencing, is simply the subtraction of the pixel digital values of an image recorded at one date from the corresponding pixel values of the second date. The histogram of the resulting image depicts a range of pixel values from negative to positive numbers, where those clustered around zero represent no change and those at either tail represent reflectance changes from one image date to the next (Jensen, 1996). This method has been documented widely in change detection research (Singh, 1986; Muchoney and Haack, 1994; Green et al., 1994; Coppin and Bauer, 1996; Macleod and Congalton, 1998). Some investigators favor this method for its accuracy, simplicity in computation, and ease in interpretation.

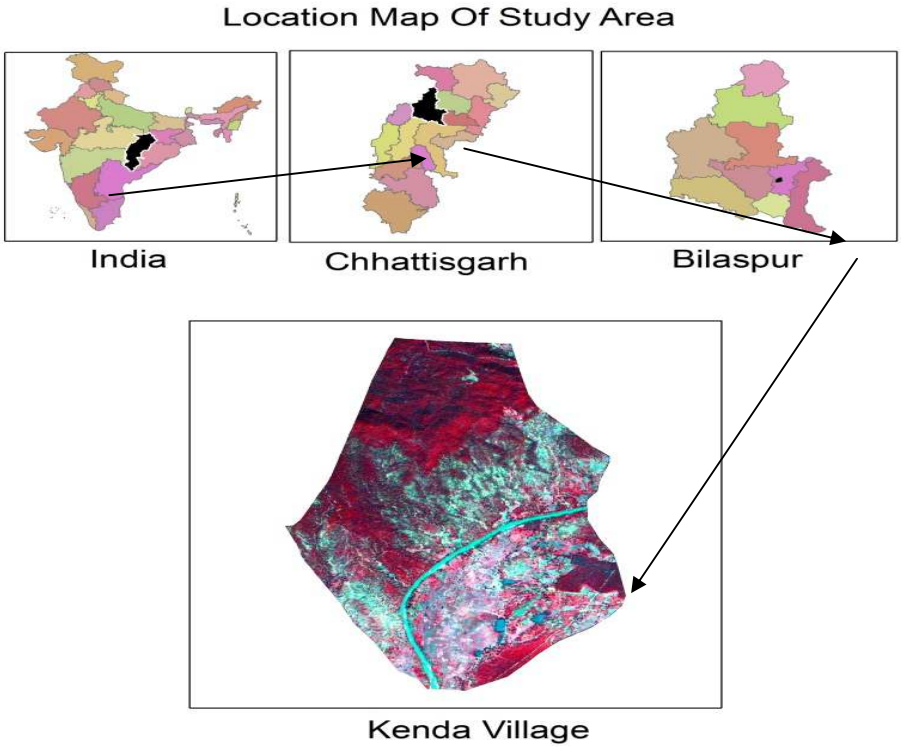
Chhattisgarh is bestowed with vast forest resources and accounts for 44 percent of the total geographical area of state. Sal trees cover 46 percent of the forest area followed by Teak and the timber is mostly used for construction purposes and accounts for 40 percent of the total revenue from forest sector. Tendu leaves found abundantly are used for making bidi and other important viable economic forest produce of the state. There are numerous forest based industrial units in the area of which 306 are registered factories and include furniture, bidi, kosa, tobacco industries and others are cottage industries mostly in the tribal districts of the state. *Eucalyptus citrodora* is important forest species, which is used for oil extraction.

The total tribal population of the state is 7822902 in the year 2011. From 2001 to year 2011 the tribal population is increased 18.2 percent. The major tribal communities of the Chhattisgarh region Gond, Maria, Muria, Pahari Korwa, Baiga etc. Most the tribal population of the state were live in the far flung places of forest area. Most of the tribal population of the state are based on the collection of non timber forest products and agriculture. Kenda village is the Gond dominated tribe village and covered with dense forest. Kenda is a Village in Kota Tehsil in Bilaspur District of Chattisgarh State, India. It is located 32 KM towards North from District head quarters Bilaspur and 10 KM from Kota. Kota is located in $22^{o}21'32.13"N$ to $22^{o}20'17.86"N$ Latitude $81^{o}55'34.9"E$ to $81^{o}56'08.11"E$ Longitude. The village is characterized as forest village. Earlier it was tribal dominated village but in last decades the other caste people was develop their houses in the vicinity of village boundary. As per the census 2011 the whole village population is about 2509 persons, out of which 1286 male and 1223 female. The total household population of village living in around 620 households.

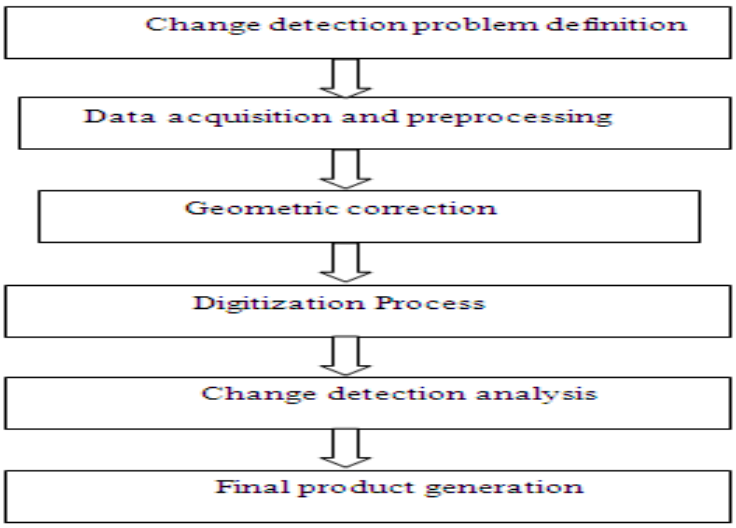
Therefore, attempt will be made in this study to map out the status of land use/Land cover of areas in and around Kenda village between 2001 and 2013 with a view to detecting the land consumption rate and the changes that has taken place in this statues using both Geographic information system and Remote Sensing data.

2. METHODOLOGY

Under this study the Settlement area, Forest area, Water bodies, Roads, Agricultural field area was taken to assess the change over the time. The whole village area was taken for the purpose of study. Firstly the boundaries of village were identified with the help of available documents and GPS survey. Then the area of interest was sorted form the map with the help of ERDAS software. Following applications and tools were used during the study i.e. remote sensing, GIS Software (Arc GIS,ERDAS), GPS.(Global positioning system) and other maps of the study area. The Landsat images had a spatial resolution of 30 by 30 meters, while the GOOGLE EARTH image had a spatial resolution of 10 by 10 meters. The GIS vector data source was also used and other materials including GPS points collected during field verification. The AOI is shorted from maps through the help of ArcGis software and ERDAS Imagine software. For the change detection analysis the geometric correction, mosacing, subset and digitization technique are used during the study. The path and row of the selected image for the study purpose was 144/45 and spatial resolution of the image was 30 meter of the year 2001. The another image reference year was 2013 and path and row of the image was 144/45. The spatial resolution of the Google earth image was 10 meter. The topo-sheet related with the study area, published by Survey of India in the year 1976 was also taken for study purpose. In the present study two different satellite images (Land-sat image & Google Earth image) of Kenda village belonging to 2001 and 2013 is used to carry out change detection analysis. The study area Kenda Village, Kota block of Bilaspur district is located in between 22° 31' 48'' N to 22° 34' 22" N Latitudes and 82° 03' 23" E to 80° 04' 21'' E Longitudes, falling in SOI Top sheets 66J2 with an aerial extent of 15.75 Km^2.Kenda Village is one of the most populated and rapid agricultural developing area in the Kota block of Bilaspur district. The total population doubled with in the last twelve year.



Steps in change detection analysis and research based on remotely sensed data.



3. RESULT AND DISCUSSION

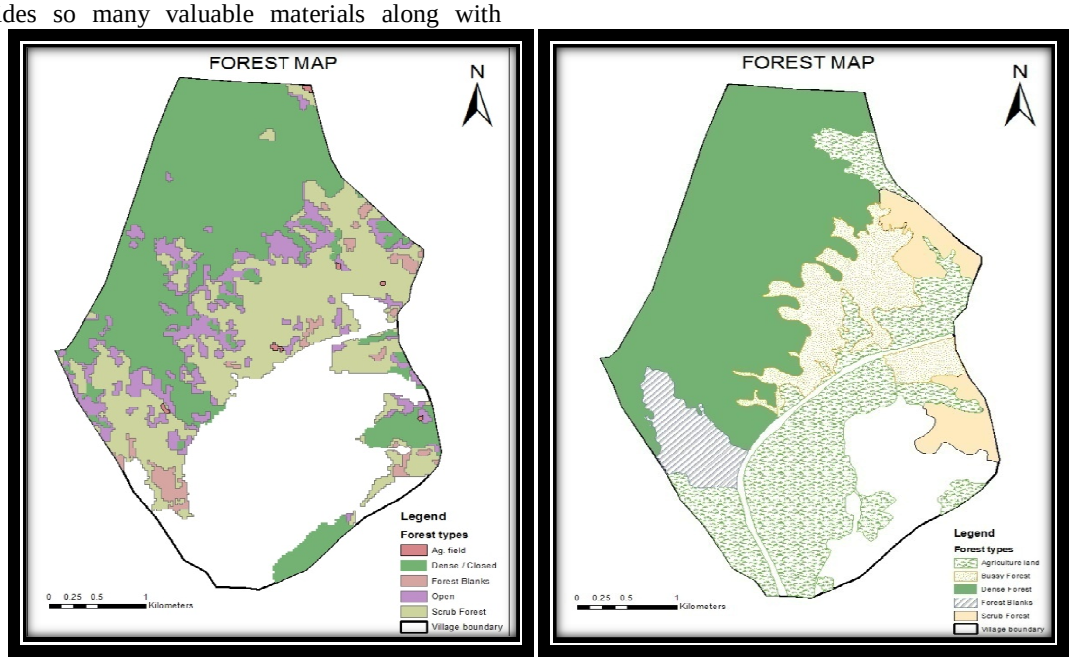
The present investigation was an attempt to deal with the changes occurred with referenced to Water bodies, Roads, Settlements, Forest areas, Agriculture field area and total land use area in Kenda village, Block Kota, District. Bilaspur, Chhattisgarh during 2001- 2013 through the application of remote sensing. Remote sensing and G.I.S tools where

provided by the workstation of Department of Rural Technology, G.G.V. The observation and result which were obtained during the study are given here i.e.

Change in forest area of Kenda village.

Forest is the major natural resource and it provides so many valuable materials along with wood. The wood fulfills the demand of energy as well as other need. The Kenda village is covered with the forest. But in the last decades so many change was seen in village forest belt.

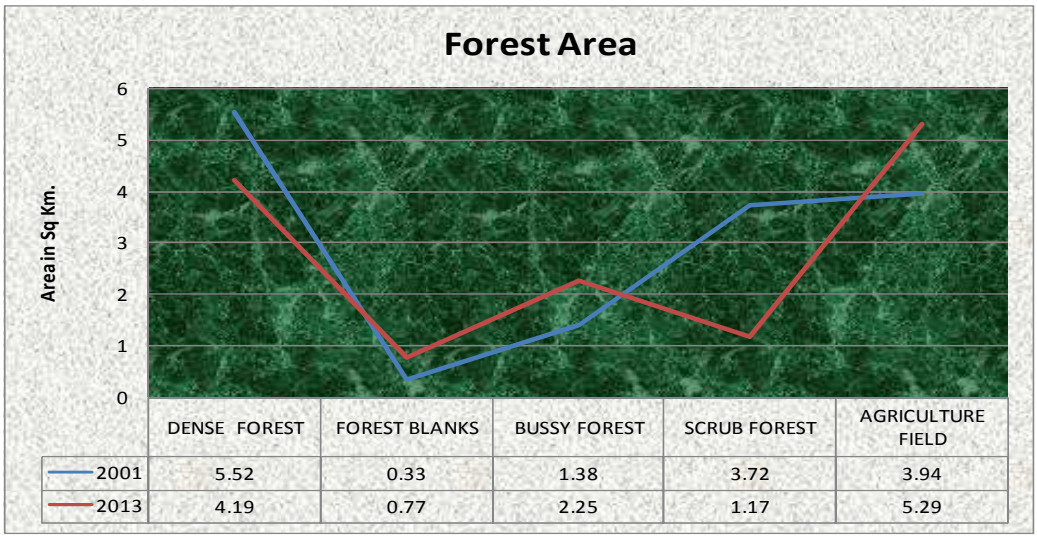
Figure.1:-Image Showing the forest area of Kenda village in years 2001 and 2013.



2001 **2013**

The data in the graph represent, that there is a decline of forest cover of Kenda village. In 2001 the area under dense forest was 5.52sq km and it experienced deforestation and came down to 4.19 sq km in 2013.The area of forest blanks had a rise from 0.33 sq km in 2001 to 0.77 sq km in 2013. The area of bushy forest also increased like forest blank from 1.38 sq km in 2001 to 2.25 sq km in 2013.The same like dense forest happened with the scrub forest it also declined from 3.72 sq km in 2001 to1.17 sq km in 2013. Hence the total area of forest also decreased from 10.95 in 2001 to 8.38 in 2013.

Graph 1: Shows the changes in the situation of Forests of Kenda Village in between the year 2001 to 2013.



The forest area is digitize both of map of the year 2001 and 2013 and compare the whole area in following categories like dense forest, forest blanks, bushy forest, scrub forest and agriculture field.

The data shows a clear downfall in the dense forest area up 8.44 percent decreases in last 12 years. During survey we identify the causes of deforestation. The major causes behind them is fulfillment of energy demand. The area of forest blanks increasing double in last 12 years and bushy forest increases up to 0.87 Sq Km. The scrub forest the area is decreases but agriculture area is increases up to 8.57 percent.

4. CONCLUSION AND SUGGESTION

The total area covered under Kenda village is 15.75 Sq.Km. The Kenda village situated on the district road and well connected with head quarter of Bilaspur district and Gorella block of Bilaspur district. The village having various water bodies, forestland, and agriculture field, as well as some settlement. After the analysis of the image through the use of GIS software calculate the different parameters of changes. For doing this job the specific methodology were adopted. The final results show that the total 10.95 Sq. Km area under forest of Kenda village was in the year 2001. In the year 2013, the images show that only 8.38 sq.km area are fall under category of forest and it cover only 53.25 percent area of whole village. The clear cut difference up to 16.32 per cent area of forest area shown by the image in Fig: 1. It show the population pressure are destroy the forest as well as water bodies for their livelihood and settlement purpose. Mostly decrease in the categories of dense forest is converted into blank forest and bushy forest. The scrub forest area is converted into agriculture land and show the data is this decrease up to 50percent within a twelve year span of time.

The overwhelming message from the study that there is need for the conservation of traditional knowledge regarding the collection of NTFP (non-timber forest product), medicinal plants so that the natural regeneration activities were continue and the growth of forest area is increased. The other programme like energy plantation, social forestry and agroforestry were need to start for the fulfillment of village energy demand.

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