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## RESEARCH ARTICLE

## Satellite image classification of Bangalore Urban and Bangalore Rural areas using Remote sensing and GIS Techniques.

Jagadeesha Menappa Kattimani<sup>1</sup> and T. J. Renuka Prasad<sup>2</sup>.

1. Research Scholar, Department of Geology, Bangalore University, Bangalore, Karnataka, India.
2. Professor, Department of Geology, Bangalore University, Bangalore, Karnataka, India.

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#### \*Corresponding Author

Jagadeesha Menappa  
Kattimani.

### Abstract

GIS Analysis Classification results and topographic information of the study area were subjected to GIS analysis in order to determine the relationship between topographic characteristics of the region. Using spectral signature methodology is very important in dry agro-climatic region of part of these areas (Bangalore Urban and Bangalore Rural) are showing above pie diagram in the part of Central dry Agroclimatic zone (Within the forest region) decreasing forest area by Agricultural purpose 10% and South-Eastern part of the area 17% of Agricultural area covering in the Forest area and Part of areas are also converting forest to Urban Areas and increasing population these vegetations are automatically decreasing continuously.

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### Introduction:-

Remote sensing and geographical information systems (GIS) are important tools for studying land-use patterns and their dynamics. Land-use changes are invariably associated with mining of natural resources. Studying changes in land-use pattern using remotely-sensed data is based on the comparison of time-sequential data. Change detection using satellite data can allow for timely and consistent estimates of changes in land-use trends over large areas, and has the additional advantage of ease of data capture into a GIS (Prakash & Gupta, 1998). The Geographic Information System proposed spatial data management and analysis tools that can assist users in organizing, storing, editing, analyzing, and displaying positional and attribute information about geographical data (Burrough, 1986).

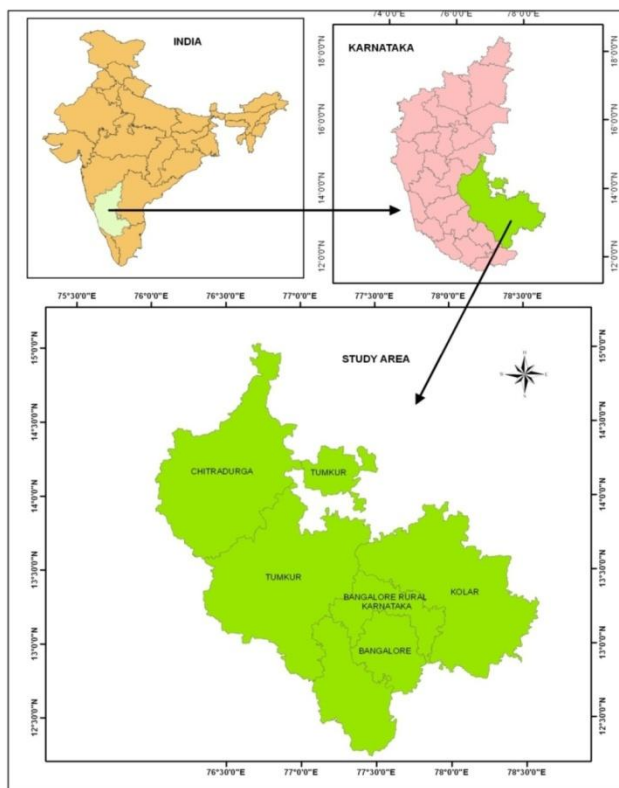
Forest cover data for 1999–2001, were obtained from *Forest Survey of India (FSI) (2001)*, estimated from satellite sensors LISS-III (23.5 m × 23.5 m resolution) and IRS PAN (5.8 m × 5.8 m) on the IRS 1C/1D satellite, and thematic maps for 562 districts of India. FSI reports forest cover in three crown density classes of very dense (70–100%), dense (40–70%) and open (10–40%) forests. The FSI “very dense forests” correspond to the IGBP categories (Loveland *et al.*, 2000) of forest (60–100%) and “open and dense forests” to woodland and shrubland (10–60%). FSI forest cover data is subject to extensive ground-truth comparisons, using methodologies described by FSI (2001), which involve error matrix analysis using 2000 sampling units in each vegetation or land use class. The reported accuracy of the forest cover product is 85.2 to 99.6% in terms of incorrect inclusion and 89.7–98.4% for incorrect exclusion of pixels in each category.

According to United Nations estimates, the population living in urban areas exceeded 50 % of the world total in 2006 and will approach 60 % in 2020. While the world’s urban population is expected to increase by almost 2 billion over the next 30 years, the world’s rural population is actually expected to decline slightly falling from 3.3 billion in 2003 to 3.2 billion in 2030. Thus, all future population growth for the foreseeable future is expected to be absorbed in urban areas. Most, if not virtually all of this growth, is taking place in the developing countries (Shahraki *et al.*, 2011).

Pixel based image classification is a technique aimed to produce clusters and classes in a multi dimensional spectral space, using image pixels of multispectral satellite imagery. In unsupervised classification, results will be spectral clusters that formed according to input parameters and used algorithm. The results were interpreted visually according to ground truth information and clusters combined to form final thematic classes namely Dense Forest, Open Forest, Scrub Forest, Vegetation and Agricultural Land in the forest region.

### Location of the Study area:-

The study area is forest within the Dry Agro Climatic Region of Karnataka and spreads over in 3294 sqkm. It lies between 12°30'0" and 15°0'0" latitude and between 75°30'0" and 78°30'0" longitude and it encompasses seven districts viz., Bangalore Urban, Bangalore Rural, Ramanagara, Tumkur, Kolar, Chikkaballapura and Chitradurga. Total district area is 35214 sqkm and the forest area which is focus of the study is only 9% (Map 1.1).



**Map 1.1:-** Location Map of the study area

### Methodology of Investigations:-

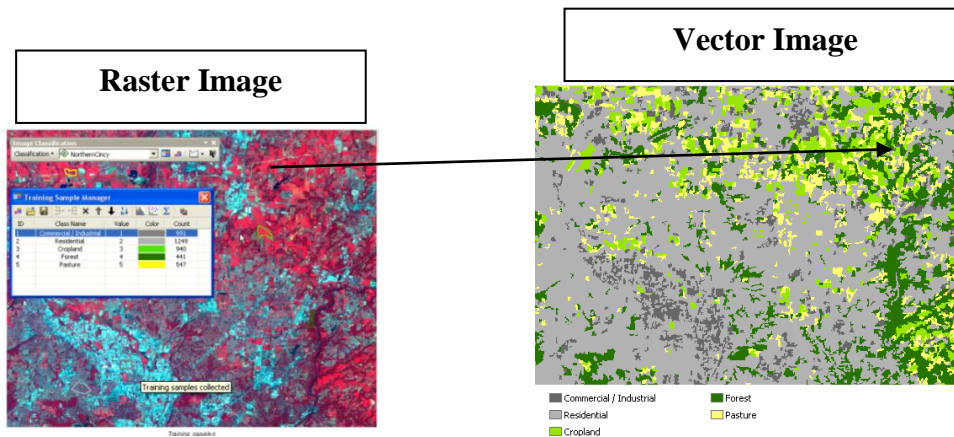
The Remote Sensing (RS) and Geographic Information System (GIS) methods and other statistical data summarization techniques have been used for finding information about the vegetation coverage and within the forest region vegetation cover change in the Bangalore Urban and Bangalore Rural Districts. The function of remotely sensed data in this study is to identify within the forest region vegetation coverage of different study years and generate statistics. The GIS functions are used for combining vector layers into raster layer to overlay the maps for identifying the vegetation cover area.

Erdas imagine is a remote sensing application with raster graphics editor abilities designed by Erdas for geospatial applications. Erdas imagine is aimed primarily at geospatial raster data processing and allows the user to prepare, display and enhance digital images for mapping use in geographic information system (GIS) (George, 2016) .

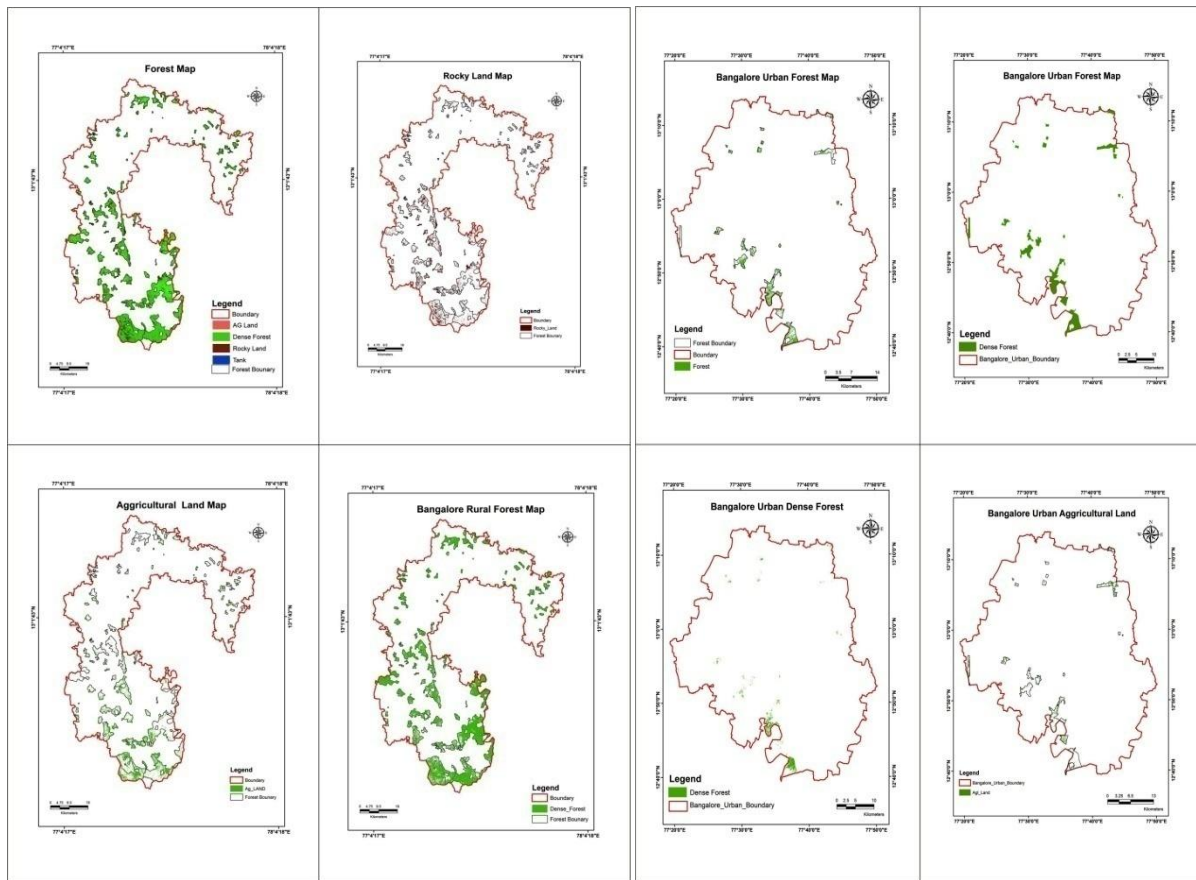
### Supervised Classification procedure:-

1. Open ERDAS IMAGINE 10.2.1 and select the **File Tab**. Click the **Open** folder and select Raster Layer from the menu. Select the image file and then click **OK** in the window.

2. Under the Home tab select **Fit to Frame** and the image will zoom out to its full extent to create an AOI go to the **File** tab > **New** > **2D View** > **AOI Layer**.
3. To open your signature file go to the **Raster** Tab and click on the **Supervised** Icon under the **Classification** section.
4. Go into the AOI tab in the main viewer and click on the **select** button and select one of the aoi's and clicks on the **Create New Signature from AOI** in the Signature Editor window (Fig. 11). Repeat this for all three burn area aoi's.
5. Next, in the menu, select **Merge Selected Signatures** button. A new Class will appear.
6. Double left click on this new Class1 and rename it to something representative of the class. In the **Signature Editor** window click on **file** and **save as**. Navigate to the folder you want to save the signature file to and give it a name. Then click **OK**
7. Under the raster tab click on **Supervised** and select **Supervised Classification**. A Supervised Classification window will open.
8. To view your classification file navigate to this folder through the **File > Open > Raster Layer**. Select file type of .img and select your file. Click **Ok**. It will then add to your menu in the Viewer.
9. to change the colors of the classes to a better representation right click on the classification.img in the contents window and open the Display Attribute Table. This will,bring up the attributes on the bottom of the viewer. Find your classes and right click under the color column and select the colors you want (Map 1.2).



**Map 1.2:-** Satellite Image



Map 1.3: Bangalore Rural Forest Map

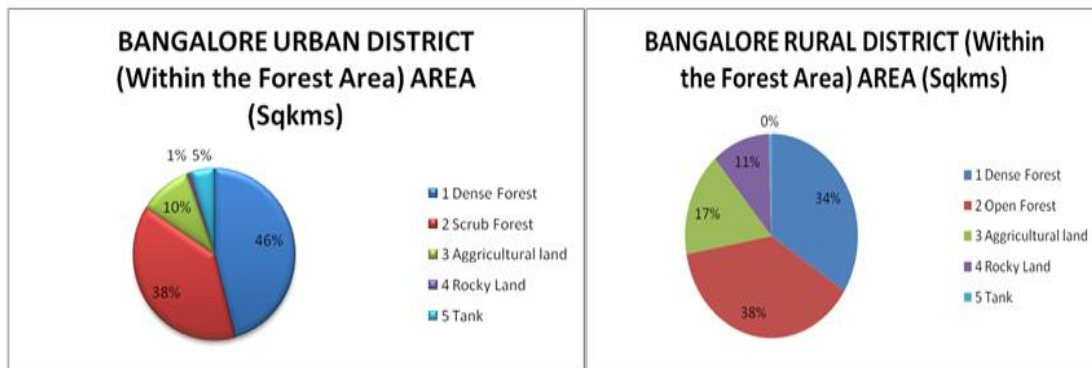
Map1.3: Bangalore Urban Forest Map

**Results:-**

BANGALORE URBAN DISTRICT (Within the Forest Area)		
SI.Nos	CLASSES	AREA (Sqkms)
1	Dense Forest	25.99
2	Scrub Forest	21.7
3	Aggriculatural land	5.81
4	Rocky Land	0.422
5	Tank	2.69
	<b>TOTAL</b>	<b>56.63</b>

BANGALORE RURAL DISTRICT (Within the Forest Area)		
SI.Nos	CLASSES	AREA (Sqkms)
1	Dense Forest	313.33
2	Open Forest	350.3
3	Aggriculatural land	151.82
4	Rocky Land	99.53
5	Tank	4.65
	<b>TOTAL</b>	<b>919.63</b>

Table 1:- Bangalore Urban and Rural Within Forest Area



Graph 1:- Bangalore Urban and Rural Within Forest Area

In the light of massive environmental degradation and need for climate change mitigation and develop management practices in participation with farmers that will maximise complementary interactions and resolve the location-specific constraints to spread the adoption of agro forestry technologies (Kumar, 2005). The detailed forest cover type and density classes are important parameters to assess the natural resource accounting and biodiversity. The phenological developments of the vegetation depend on the type of vegetation, environmental factors, topography and back ground soil and also with forest management practices (Shamsudheen et al., 2005).

Using spectral signature methodology is very important in dry agro-climatic region of part of these areas (Bangalore Urban and Bangalore Rural) (Table 1) (Graph 1) are showing above pie diagram in the part of Central dry Agroclimatic zone (Within the forest region) decreasing forest area by Agricultural purpose 10% and Sotuh-Eastern part of the area 17% of Agricultural area covering in the Forest area and Part of areas are also converting forest to Urban Areas and increasing population these vegetations are automatically decreasing continuously. Dense forests also covering as a Scrub Forest and these scrub forest also converting for future urban managements this is also one of the important concept of deforestation in the study Area. If forests are decreasing means those are infiltration low and Runoff more of part of dry agro-climatic zones (Map 1.3).

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