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Trees Outside Forest (TOF) in Pinjore Block of Panchkula District, Haryana

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Abstract

Trees Outside forest, both major and minor caters to multiple basic needs to the community and contributes more to ecological stability. Their value can be judged by the fact that they are the biggest source of the basic needs of mankind. Thus it is obvious that preservation and protection of this green gold is essential to the national interest. The present study demonstrates the scope, methodology and outcomes of Trees Outside Forest mapping of Pinjore block (Panchkula district) using Cartosat-1 and LISS-IV data. The satellite data was interpreted using hybrid approach for the mapping of various Tree Outside Forests (TOF) categories on 1: 10,000 scale. The overall Trees Outside Forest (TOF) are classified under three major feature types. The analysis of the satellite data also revels that an area of 18.33 sq km (6.36%) of TOF were present in Pinjore block.

Keywords: Trees Outside Forest, GIS, Remote sensing, GPS.

Introduction

Trees are a valuable resource. Their value can be judged by the fact that they are the biggest source of the basic needs of mankind. Trees affect the ambience in a favorable manner. The environmental services provided by trees outside forests, in rural and urban areas, include protection of soil and water resources, the conservation of biological diversity and support to agricultural productivity and sustainability, the buffering of desertification and resource degradation processes in arid and semi-arid zones, amenity and recreation, and maintenance or improvement of livelihoods. In India, trees outside forests (TOF) are an important source of wood, other products and environmental services. Such trees include roadside plantings, woodlots, and scattered trees in the landscape, trees in fields, home gardens and orchards. They not only play a very important role in meeting rural people's needs but are also increasingly significant in supplying the commercial sector with much needed raw material. (Indian Institute of Forest Management, Bhopal, 2001)

Thus it is obvious that preservation and protection of this green gold is essential to the national interest. If it not done simultaneously, soil erodes, flood enhances, agricultural production declines leading to serious ecological imbalance. (J.K. Rawat and Alok Saxena, et al 2002). The present study undertaken with a main objective of mapping of existing Trees Outside Forest in Pinjore block of Panchkula district, Haryana.

Study Area

Panchkula is a planned city in Haryana. There are four towns in the Panchkula district, Pinjore, Barwala, Morni and Raipur Rani. The total geographical area of Pinjore block is 288 sq. km. It lies between north latitudes 30°47′50″N and 76°55′02″ East longitudes.

The average rainfall of Panchkula district is about 1282.7 mm. and 80% of its annual rainfall is received in months of June to September. Tropical dry deciduous forests and sub-tropical forests are found here. Pinjore block has a favorable climate for the growth of rich and abundant vegetation due to reasonably good rainfall and elevation. Shisham (Dalbergia sissoo), Kikar (Acacia nilotica) and Mango (Mangifera indica) are the important tree species grown in this region.

Materials and Methodology

Satellite data

High resolution Cartosat – 1 data (October 2009) and Indian Remote sensing Satellite LISS IV Mx of IRS P_6 (March 2009) data was used to mapping various Trees Outside Forest in the study area. These were acquired from National Remote Sensing Centre (NARC), Department of Space, Govt. of India.

Secondary Data

Secondary (ancillary) and ground data constitute important baseline information in remote sensing, as they improve the interpretation accuracy and reliability of remotely sensed data by enabling

verification of the interpreted details. The following secondary data were used in the study: Survey of India Toposheets on 1:50,000 scale. Topographical No. 53B/14, 53F/01 and 53F/02.

Collateral Data

Available information such as published reports, papers and maps, reports etc were used as the reference, which is collect by Haryana Forest Department (HFD) Panchkula. Surveys of India, topographical maps were taken as the source for creation of base maps.

Interpretation of the Data

The image characteristics such as shape, size, pattern, shadow, tone and texture are used in tree species identification. The parameters of interest in forestry derived from image analysis most often are (1) tree height or stand height, (2) tree-crown diameter, (3) density of stocking, and (4) stand area etc.

Methodology

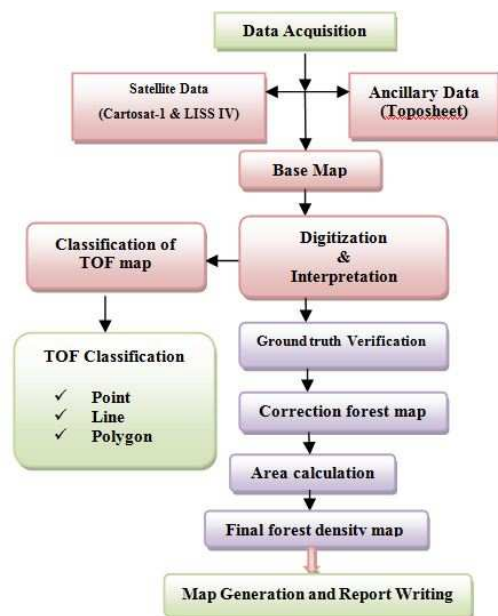The methodology adopted in the study area is shown at Figure 1.

Figure 1 Methodology and flow chart for TOF (Trees Outside Forest).

Ground Truth Verification

Ground Truth is the integral part of any remote sensing studies. It refers to manually visit the concerned area or region and make a ground truthing of the region. In remote sensing, ground truth is important to relate image data to real feature and materials on the ground. Extensive ground truth has

been carried in the study area. For the TOF's an area of Point (1 ha), line 50 x 20 mts and Block (0.1 ha) were selected and intensive ground truth was carried out.

   a. Identification and listing of Trees outside Forest in Pinjor block and accessment of the geographical location on ground.
   b. Preparation of field data set of different Trees Outside Forest cover area and their spatial extent as reference from the Cartosat-1, therefore their actual groung position can be located on Map.

Results and Discussions

The studies depict the application of remote sensing techniques for the mapping of Trees Outside Forest in Pinjore block (Panchkula District). Panchkula district is having the dominancy of forest cover, where Pinjore block is having major portion of forest cover in the district. There is variety of trees found in the block.The area of Trees Outside Forest (TOF) is 18.33 sq. km (6.36 %).

Trees Outside Forest

There is no direct definition of trees outside forests'. The concept is defined by FAO by default in terms of the forest, as follows: "trees growing outside the forest and not belonging to the category of forests, forest lands, or other wooded land". To this definition, Trees outside forests are located on "other land", such as agricultural land, built-up areas such as settlements and infrastructure, and bare land (dunes, former mining areas, etc.).

The TOF were divided into three main categories. They are:-
   1. Point
   2. Line
   3. Polygon (Block)

Table 1 describes about the different classes of Trees Outside Forest, categories, there attribute and area covered under different TOF classes. The analysis of the satellite data revels that an area of 18.33 sq km (6.36%) of TOF were present in Pinjore block.

Classes	Category	Tree Attributes	Area (km^2)
Point	Large		0.21
	Small		0.23
	Cluster		0.83
Line	Road	Well Stocked – Tall	1.19
		Well Stocked – Small	1.79
		Under Stocked – Discrete	0.49
		Under Stocked – Shriveled	0.01
	Farm Bunds	Well Stocked – Tall	0.30
		Well Stocked – Small	0.78
		Under Stocked – Discrete	0.65
	Railway Line	Well Stocked – Tall	0.06
		Well Stocked – Small	0.05
		Under Stocked – Discrete	0.04
Polygon (Block)	State Plantations	Stocked	0.90
		Under stocked	1.50
	Farm Forests	Stocked	0.50
		Under stocked	0.18
	Horticulture Plantation	Stocked Small Crowns	0.64
		Large Crowns	0.75
		Under stocked	0.93
	Scrub	Open	1.78
		Dense	0.17
	Open / Amenity Spaces	Urban	2.72
		Peri-urban	1.19
		Rural	0.28
Total area of TOF			**18.33**
% of TOF			**6.36**

Table 1 Area covered under TOF classes.

Table 1 gives a glace about the total area covered in different categories. These main classes were subdivided into various subcategories. The area computed under point categories was 1.37sq km (0.45% TGA), out of which the large crown categories were calculated to be 0.21 sq km, small crown categories were found to be 0.23 sq km. While the cluster category was calculated to be 0.83 sq km.
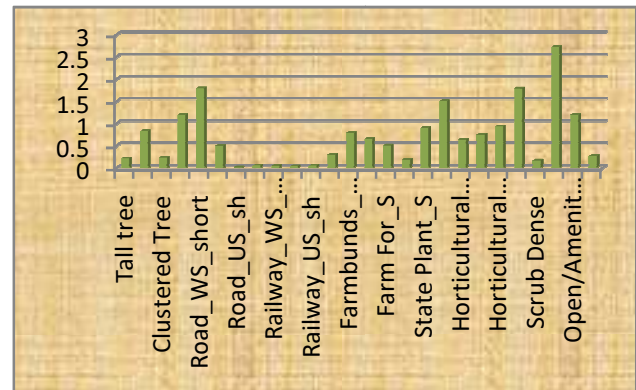

Figure 2 Distributions of Tree Outside Forest Categories.

Description of Trees Outside Forest Maps

This map show point, line and polygon features in Pinjore block. Linear features such as road including well stocked tall, well stocked short, under stocked discrete. The point features include the tall, small and cluster and the polygon features include state plantation, horticulture and open amenities space such as rural and urban areas are identified.
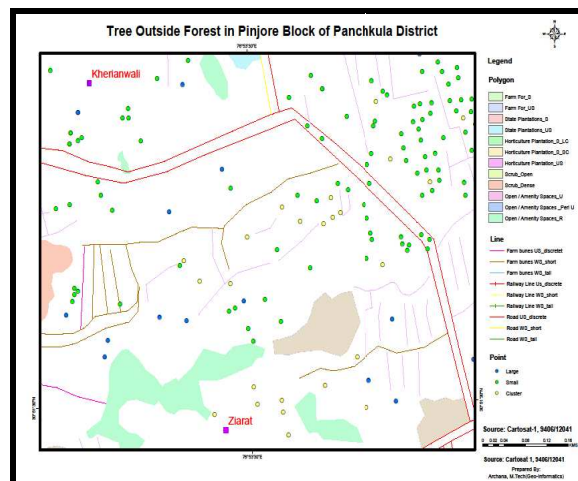
Map 1 Trees outside Forest covers distribution of Pinjore block (Panchkula District).

Ground Control Points

Ground truth data are collected in different area and GPS point are transferred on the image. These points give the exact location of the existing feature in the study area. The GPS point were helped in rectification/modification of the interpreted details, so as to improve the classification accuracy. The GPS point are in form of wave-point and hence they have to be converted into vector format or shape file. The process of conversion is as follows:-

- Extraction of latitude and longitude in Map Source software as .gpx, supporting GPS device.
- Conversion of GCP in excel file and processed in Microsoft Access
- Saving of GCP in .dbf file format.
- Then add data in ArcGIS software with providing datum to GCP file.
- Export of .dbf file into the .shp file.

Conclusions

The study demonstrates the potentiality of satellite remote sensing technique for the generation of base line information on Trees Outside Forest (TOF) in Pinjore (Panchkula district). The interpretation of satellite data (Cartosat-1and LISS IV Mx data of 2009) were merged to interpret the Tree Outside Forest resources in the study area. The interpreted details were checked on the field during the Ground truth verification and the TOF maps were prepared on 1:10,000 scale.

The high resolution Cartosat – 1 data merged with LISS – IV Mx data helped in identification of about The TOF were divided into three main categories in the study area. They are Point, Line and Polygon (Block). During the ground truth collection it was observed that dominant species found to be Shisham followed by Kikar. The analysis of the satellite data revels that an area of 18.33 sq km (6.36%) of TOF were present in Pinjore block. The area computed under point categories was 1.37sq km (0.45% TGA), out of which the large categories were calculated to be 0.21 sq km, small categories were found to be 0.23 sq km. Cluster category was calculated to be 0.83 sq km. The line category were further sub categories into road, railway line and farm bunds.

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