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MAPPING OF TREE OUTSIDE FOREST IN KALESAR BLOCK (YAMUNANAGAR DISTRICT, HARYANA) USING GEO-INFORMATICS TECHNIQUES

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Abstract: Trees outside Forest are located on other lands mostly on farmlands and built-up areas, both in rural and urban areas. A large number of TOF consists of planted or domesticated trees. TOF includes trees in agro forestry systems, orchards and small woodlots. They may grow in meadows, pastoral areas and on farms, or along rivers, canals and roadsides, or in towns, gardens and parks. Trees on the land other than forest or other wooded land includes tree on the land that meets the definitions of forest and of other wooded land except that the area is less than 0.5 ha and width is less than 20 meters, Scattered trees in permanent meadows, tree in parks and gardens, around buildings, in hedge rows and in lines along streets, roads, railway, rivers, streams and canals are included under this categories . The analysis of the satellite data revels that an area of 785.9 ha (10.4%) of TOF were present in Kalesar block. The number computed under point Large tree was 66, Small tree was 148 and cluster tree was 11.The area computed under line categories was 30582.8 meter. The polygon or block plantations were found to be 233.2 ha in area, which occupy major portion of TOF in study area.
Keyword: Satellite data, LISS IV, Cartosat, Geo informatics, Tree outside forest.

Introduction

Trees outside Forest (TOF) are highly heterogeneous natural resources and because of this, no coherent or regional planning is done to manage the TOF. In India, most of the TOF resource is on agricultural lands. Apart from those planted under forestry, horticulture or under social forestry plantations, TOF are not major object of management. Major advantage of TOF area described here

- They make critical contribution to sustainable agriculture, food security and diversification of household economies
- They supply many products (including wood for fuel and construction, fruits, barks and food products) and services (e.g. biodiversity, habitat for wildlife, microclimate stabilization)

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- They protect crops and the soil against water and wind erosion, thus combating drought and desertification and protecting water resources
- from They provide shade and mark property boundaries and rich in significance a cultural and social perspective

However, with increasing realization of significance of TOF, there is need for policy initiative to include trees outside the forest in natural resources planning and consider it as an integral component of landscape inventories.

Study Area

The study area of Kalesar Block of Yamunanagar district (Haryana), India is located between 29^0 50' N to 30^0 30' N latitude and 77 ^{0} 13' E to 77 ^{0} 36' E longitudes. The total geographical area under study is 7525.1 ha. It is bounded by Ambala district on the north-west, by U.P. on the east, Kurukshetra district on the south-west, H.P. on the north, Karnal district on the south and by the river Yamuna on the east. The transitional location of the district between the outer Himalayas and the Yamuna upland plain has enriched it with a topographical variety. The Siwalik Hills, which have a north-west, south-east disposition, flank the northern boundary of the district.

Figure-1

The district has subtropical continental monsoon climate where we find seasonal rhythm, hot summers, cool winter, unreliable rainfalls and great variation in temperature. In winters frost sometime occurs during December and January. This district occasional winter rains from cyclones. There in falls is mostly restricted to rainy seasons. Area experiences extreme climate conditions May & June are the hottest months while December and January are the coldest.

Materials & Methodology

Cartosat-I (Panchromatic) digital data of October 2009 and IRS LISS – IV data were used for the study. The satellite data was procured from National Remote Sensing Centre (NRSC), the details of satellite data were shown in Table -1.

Table -1: Detail of Satellite Data used and its Characteristics

S. No.	Satellite	Sensor	Resolution	Date of acquisition
1.	IRS-P5	Cartosat-1 (PAN)	2.5M	October 2009
2.	IRS-P6	LISS-IV	5.8M	October 2009

Survey of India Topographical Sheets: on 1:50,000 are also used as base data numbered as: 53F/07, 53F/11

Software's used: ERDAS IMAGINE 9.3, ARC/MAP.9.2, Microsoft Office 2007 and handheld Garmin 72 GPS.

The present wastelands change maps was prepared on 1:10,000 scale to monitor the forest for the year 2009. Remote Sensing Satellite data (IRS-P6) LISS-IV & Cartosat-1 acquired during the above years is used.

Ground truth: Doubtful areas are checked by field verification and the location of doubtful area is collected by handheld GPS**.**

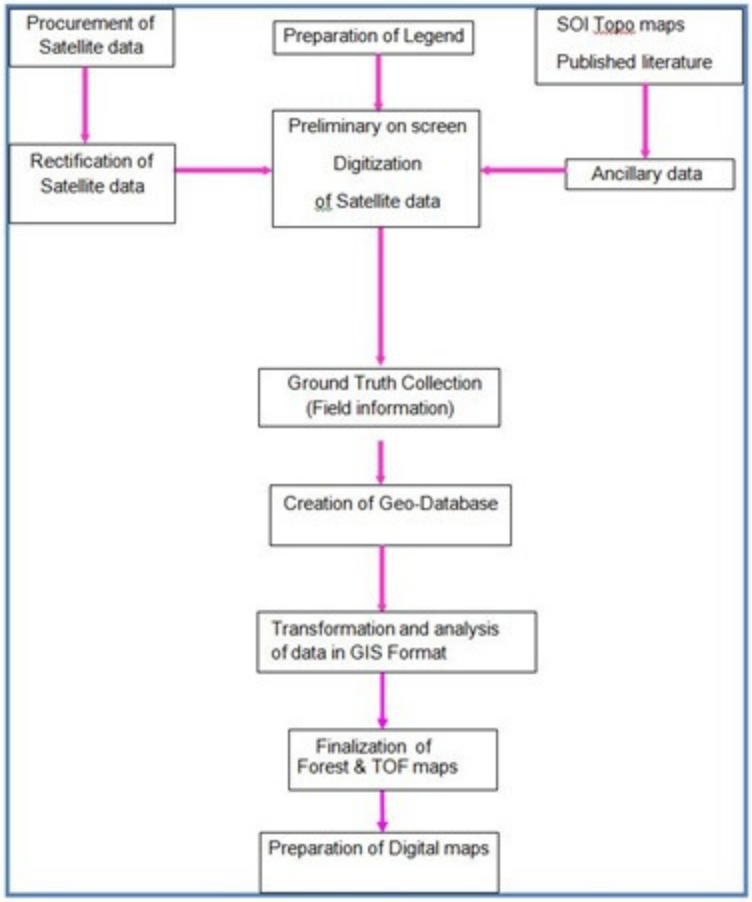

Figure-2 Methodology Flow Chart

Results & Discussion

Area under different classes of Trees outside Forest is divided into the three main categories.

1. Scattered Trees (Point)

There are many trees widely available for smaller gardens, in all shapes and sizes, evergreen and deciduous. Given that many of us have limited space in which to garden, it becomes important that any trees chosen are right for their surroundings, in terms of proportion as well as for their decorative value. In this class of Tree outside forest (TOF), these different categories were identified as Large Tree, Small Tree, and Cluster of trees**.** Number of tree with categories is described in Table-2 and also presented in figure-3.

Table-2: Classification of Trees Outside forest (TOF) point classes

Class	TOF categories	Number
Point (Scattered trees)	Large tree	66
	Small tree	148
	Cluster	11

2. Linear Trees

In the classification of TOF along the roads which are straight in feature. This class is categorized under well stocked trees and further under tall, short, discrete and scattered on the basis of tree attributes. These are planted along the road sides and mapped under different categories on the basis of their attributes. The line class was further sub divide into road, line, canal, river farm bunds. The road categories were further sub divided into, roads Well Stocked (4353.2 m), and road under stocked (750.3m). The farm bunds were sub divided into farm bunds well stocked tall (6068.49m), farm bunds well stocked short (16353.4m) and farm bunds under stocked (1600.8m). The River was well stocked (115.6m). The canal were well stocked (1340.9m).The polygon or block plantations were found to be (233.2ha) in area, which occupy major portion of TOF in study area. Length of linear trees line is described in table-3 and spatial distribution of linear trees is displayed in figure-3.

Table 3: Length of Strip Plantations (Line Feature) in Kalesar block

Classes	TOF Categories (Line)	Length in (m)	%age of TGA*
	Canals-Well Stocked	1340.9	4.4
Strip Plantations	Farm Bunds-well Stocked Tall	6068.5	19.8
(Line Feature)	Farm Bunds-Under Stocked	1600.9	5.2
	Farm Bunds-Well Stocked Short	16353.4	53.5
	River- Well Stocked	115.6	0.4
	Roads-Under Stocked	750.3	2.5
	Roads-Well Stocked	4353.2	14.2
	Total length	**30582.8**	**100**

3. Tree outside Forest in Polygon (Block)

The polygon classes were further subdivided into state plantation, farm forest, horticultural plantation, and scrub land and open. The farm forest further sub divided into farm forest stocked (13.4 ha), farm forest under stocked (0.8 ha). The state plantation state plantation stocked (15.1 ha), the horticulture plantation sub divided into horticulture plantation stocked (75.5 ha), horticulture plantation under stocked (23.4 ha). The scrub land category sub divide into open scrub (88.7 ha), dense scrub (16.5 ha) and account has been open/ amenity. Area under different classes of TOF is described in table-4 and also displayed in figure-3.

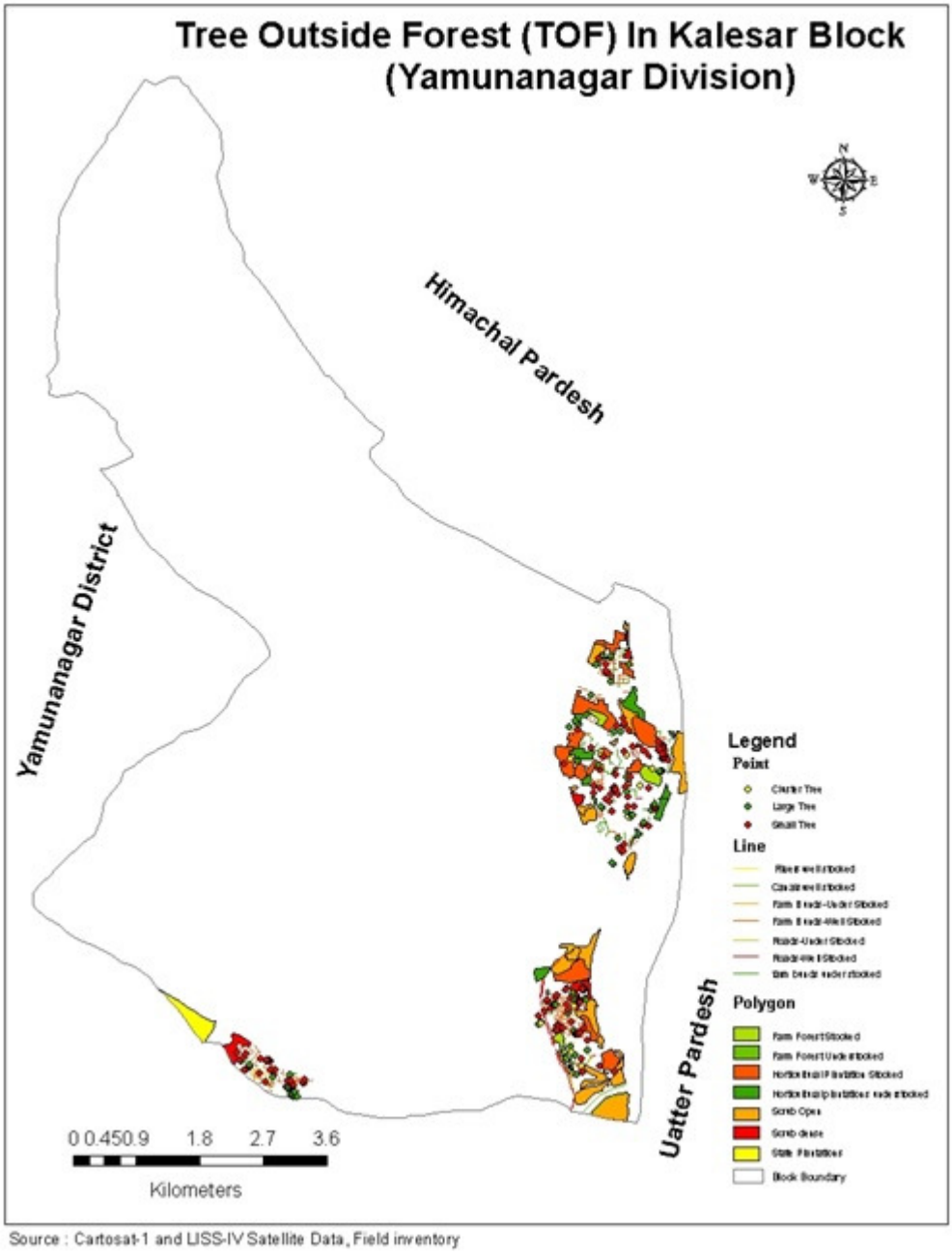

Figure-3

Table 4: Trees outside Forest in Polygon (Block)

Classes	Polygon Categories	Area (ha).	% of TGA
Block Trees (Polygon)	Farm Forest-Stocked	13.4	5.7
	Farm Forest-Under stocked	0.8	0.4
Horticultural Plantation	Horticultural Plantation-Stocked	75.5	32.3
	Horticultural Plantations-Under stocked	23.4	10.1

Scrub	Scrub-Dense	16.5	7.1
	Scrub-Open	88.7	38.0
Plantation	State-Plantations	15.1	6.5
	Total Block Tree	**233.2**	**100**

Conclusions

This study shows the utility of satellite remote sensing technique for preparation of more consistent and accurate information of Tree outside Forest (TOF). Interpretation of Cartosat-1 Panchromatic data supported by LISS-IV ground truth information revealed that there are three categories of Tree outside Forests (TOF) were also identified in the study area. Interpretation of forest cover area is quite easy while using Geo-informatics technology. The visual interpretation technique is subjective and depends on the field knowledge and aptitude of the interpreter but appeared to be more accurate as it avoids the hazards of misclassification during digital analysis. Major highlights are described below:

1. TOF mapping is based on three types classification which are point, line & polygon.
2. Point class have 225 trees from which large tree are 66, small trees are 148 and cluster trees are 11.
3. Linear class covers 30582 metre area from which Farm Bunds-Well Stocked Short & Farm Bunds-well Stocked Tall are major classes.
4. Polygon class covers 233.2 ha area from which scrub open & horticultural plantation Stocked area major dominent classes.

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