Mapping of Strip Plantations using Remote Sensing and GIS in Barwala Block, Panchkula

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Abstract

This strip plantation part of Trees outside forest (TOF) along the roads, canal, river, farm bunds which are appear as linear feature in the image. Strip plantation area could not be computed. The length of the strips was measured. This class is categorized under well stocked, under 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 present study was carried out in Barwala block of Haryana to assess the existing strip plantation. The study was conducted on 1: 10,000 scale using high resolution satellite data of CartoSat-1 for the year 2009. Onscreen digitization technique in Arc GIS was followed to demarcate the existing Trees outside Forest. TOF was 93.02 sq.km which constituted 39.56% of the study area, respectively. It was also assessed that the total length of strip plantation along canal, roads, river was 282.13 km in the block and the *Populus deltoids* and *Eucalyptus hybrid* were found the dominated tree species.
Keywords: Strip Plantations, Tree outside Forest, Remote Sensing, Cartosat-1.

Introduction

Haryana located in north-west India is agriculture dominated state with a total geographical area of 44,212 sq.km out of which 1,553 sq.km is under permanent forest cover which is only 3.61 % of total geographical area (FSI, 2009; Statistical Abstract of Haryana, 2011). Forests are mainly distributed in the Northern and South-Eastern districts of the state. Poplar (Populus deltoids) and Safeda (Eucalyptus tereticornis) tree plantations dominate on farm lands of northern districts whereas Jandy (Prosopis cineraria) Shisham (Delbergia sissoo), Kikar (Acacia nilotica), Jal (Salvadora oleoide) and Shisham (Delbergia sissoo) in central and south Haryana which accounts a major portion of forest cover in the State. The term trees outside forests (TOF), a neologism coined in 1995, is framed in the forest context, defining the concept by default with reference to forested areas. So, trees outside forest refer to trees on land not defined as forest and other wooded land (Pandey et al. 2002). This may include agricultural land, including meadows and pasture, built-on land (including settlements and infrastructure), and barren land (including sand dunes and rocky outcroppings) (Trees outside the forest are a major source of food Lertlum et al. (2000). Livestock fodder produced by TOF can be a matter of life and death in semi-arid or mountainous areas. They supply many products (fuel small timber, fruits, barks and food products) and services (habitat for wildlife, microclimate stabilization) and protect crops and the soil against water and wind erosion, thus combating drought and desertification and protecting water resources (Glen, 2002). Therefore the main objectives of the present study were to demarcate existing strip plantation is the part of TOF.

Objective of the study:

> ➢ Mapping of Strip Plantation in Barwala Block, Panchkula district, Haryana.

Study Area

The study area comprises of Barwala block, district Panchkula, Haryana situated at 29° 23′ N to 75° 55′ E longitude and 29° 38′ N to 75o 92′ E latitude with a total area of 235.37 sq.km. It has an average elevation of 214 meters from Mean Sea Level. The area is covered under topographical sheet No. 53B/13, 53B/14, 53F/01 and 53F/02 of Survey of India on 1: 50,000 scale. 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. The Panchkula district comprises of four physiographic

units, which are: Siwalik Hills, Kandi Belt, Intermontane Valley and Alluvial plain (Arya 2002).
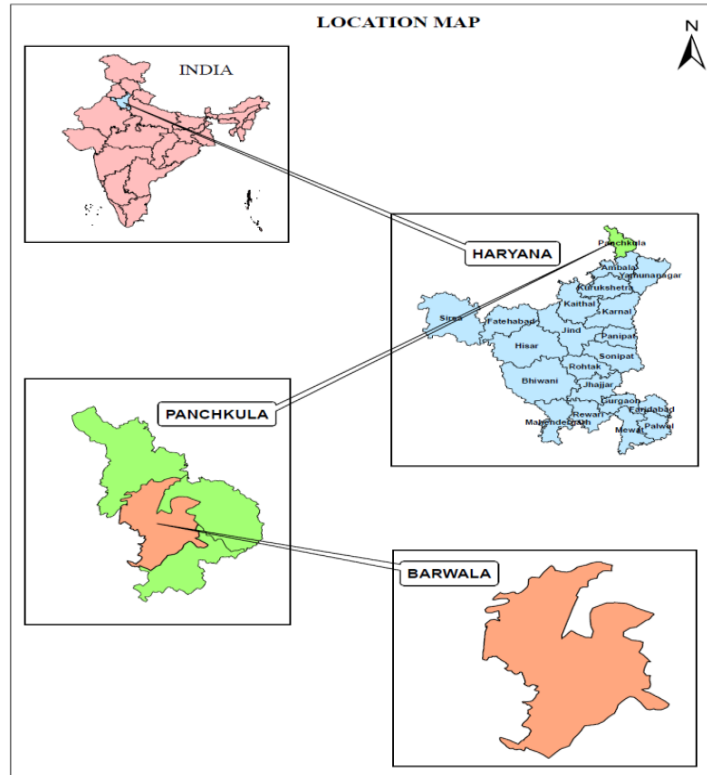

Figure 1: The Location Map of Study Map

Material and Methodology

CartoSat-I (Panchromatic) digital data of October 2009 was used to carry out the study whose specifications are given in **Table 1**. Survey of India toposheets (53B/13, 53F/01 and 53F/02) on 1: 50,000 scale and other ancillary data like district and block boundary maps from Haryana Space Applications Centre were also used in the study. Erdas Imagin 9.1 and ARC MAP 9.3 were the software used to geo-reference of satellite data and for digitization, composition and generation of maps. These were procured from National Remote Sensing Centre (NRSC), Department of Space.

Table 1: Detail of Satellite data used and its characteristics

Satellite	Sensor	Spectral bands (microns)	Spatial Resolution (m)	Swath	Radiometry	Format	Date
Cartosat– 1	Panchromatic (B/W)	0.52-0.85	2.5m	Fore: 29.4Km. Aft. 26.2 Km.	10 bits	Geo-tiff	Oct. 2009

Based on the standard image interpretation characteristics such as tone, texture, pattern, shape, size, location and association etc., onscreen visual interpretation of remotely sensed data was carried out

on 1:10,000 scale. A standard legend prepared to identify and classify different strip plantation categories .Ground truth data were collected in different areas and GPS points were collected and transferred on the map. These points provided the exact locations of the existing features in the study area. These maps were prepared in GIS format and uploaded in the geo- database.

Results and Discussion

Classification of Tree outside Forest (TOF):
This class included Tee outside forest (TOF) along the roads, canal, river, farm bunds which are appear as linear feature in the image. This class is categorized under well stocked, under 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 total area of the Barwala block is 235.37 sq.km. Total area under Tree outside Forest (TOF) is 93.02 sq.km which is 39.56% of total geographical area. Total length of strip plantation along canal, road, river and farm bunds is 282.13 km (Table-2).

Description of various Strip Plantations Classes:

Canal wellstocked tall: Trees which are found on both side of canal having healthy crown density carrying height above 5 meters.

Canal wellstocked short: Trees which are found on both side of canal having healthy crown density but their height is below 5 meters.

Canal understocked discrete: Trees which are found in patches along canal.

Canal understocked shrievelled: Trees which are almost leafless and poor in crown density.

River wellstocked tall: Trees which are found on both side of river having healthy crown density carrying height above 5 meters.

River wellstocked short: Trees which are found on both side of river having healthy crown density but their height is below 5 meters.

River understocked discrete: Trees which are found in patches along river.

River understocked shrievelled: Trees which are almost leafless and poor in crown density.

Road wellstocked tall: Tree which are found on both side of road having healthy crown density and having height above 5 meters.

Road wellstocked short: Trees which are found on both side of road having healthy crown density but their height is below 5 meters.

Road understocked discrete: Trees which are found in patches along canal.

Road understocked shrievelled: Trees which are almost leafless and poor in crown density.

Farm Bunds wellstocked tall: Trees found on field bunds having healthy crown density with height above 5 meters.

Farm Bunds wellstocked short: Trees found on field bunds having healthy crown density with height below 5 meters.

Farm Bunds understocked discrete: Trees which are found in scattered form on field bunds

Table 2: Length of Strip Plantations (Line Feature) in Barwala block

Classes	TOF Category	Length (km)
Strip Plantations (Line Feature)	Canal Wellstocked Tall	0.23
	Canal Wellstocked Short	1.69
	Canal Understocked Discrete	3.17
	Canal Understocked Shrievelled	0.94
	River Wellstocked Tall	4.46
	River Wellstocked Short	8.66
	River Understocked Discrete	11.43
	River Understocked Shrievelled	0.32
	Road Wellstocked Tall	23.95

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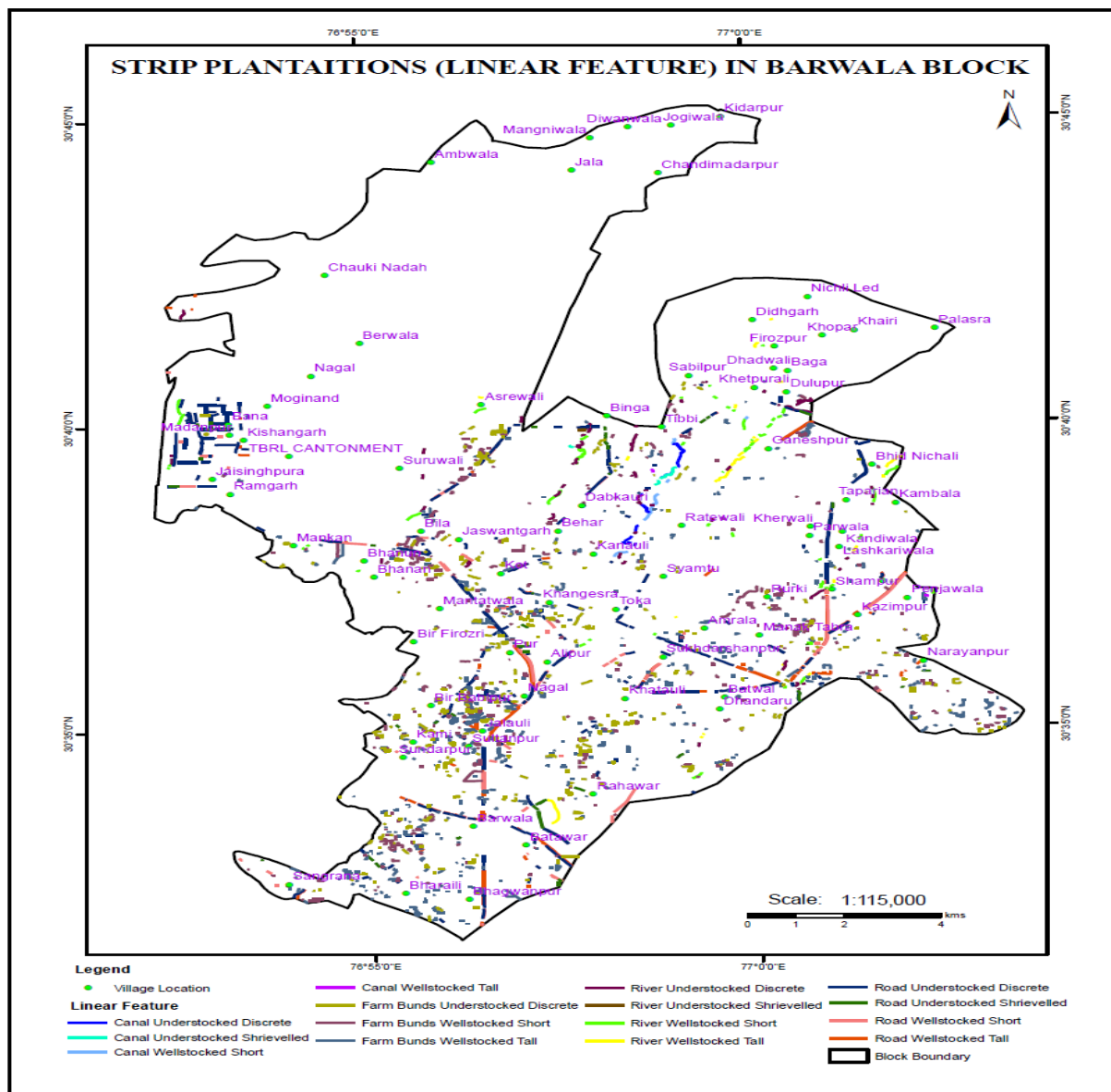|		
Road Wellstocked Short	16.33	
Road Understocked Discrete	65.14	
Road Understocked Shrievelled	7.18	
Farm Bunds Wellstocked Tall	55.83	
Farm Bunds Wellstocked Short	39.10	
Farm Bunds Understocked Discrete	43.61	
Total Length	282.13	

Figure 2: Strip Plantations (Line feature) in Barwala Block (Panchkula)

Conclusions

This study shows the utility of satellite remote sensing technique for preparation of more consistent and accurate information of different forest categories and Tree outside Forest (TOF). It provides a synoptic view of the forest cover area and Tree outside Forest (TOF). Interpretation of Cartosat-1 Panchromatic data supported by ground truth information revealed that there are 282.18 km strip plantations in the study area. Road Understocked Discrete category covered maximum length, which is 65.14 km and minimum length of 0.23 km is covered by the Canal Well stocked Tall category. Interpretation of TOF cover area is 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.

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