



## ASSESSMENT OF TREES OUTSIDE FORESTS BASED ON IRS HIGH RESOLUTION IMAGES- A CASE STUDY

### Environmental Science

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### ABSTRACT

Assessment of Trees outside forests is widely being recognized as a pivotal theme, in sustainable natural resource management, due to their role in offering variety of goods, such as timber, fruits and fodder as well as services like water, carbon, biodiversity. It is for the first time in the study area where the IRS high resolution satellite image is used in stratification of the tree wealth outside the notified forests. The methodology formulated by the Forest Survey of India in assessment of Trees Outside (notified) Forests is followed for ease of comparison, while improving the stratification and increasing the sampling size. The assessment provides necessary inputs for sustainable management of the notified forests by way of reduction of pressure on natural forests. The maps showing the geo-locations where the detailed inventory was to be carried out, were overlaid on topomaps and supplied to field officers for ground verification and the inventory carried out.

### KEYWORDS

Segmentation, Semi-automation, Forestry, Extraction, Irs, High Resolution,

### 1.INTRODUCTION

The increasing forest cover loss and fragmentation of forests on one hand, the need to conserve remnants of representative forest ecosystems and the increasing demand for forest products in developing countries on the other hand; makes the development of innovative sustainable management tools imperative for other less studied tropical forest resources such as Trees Outside Forests. TOF, which comprise all trees outside the notified or recorded forests, are embedded in a landscape matrix composed by different land-uses. Trees outside forest generally include trees on farmlands, in cities and human settlements, orchards, roadsides, pastures, banks of river, streams and canals and shelterbelts which are less than 20 m wide and 0.5 ha area (FAO 1998). The area occupied by TOF, the species composition, the volume, as well as specific characteristics such as the geometry and spatial distribution, can change depending on the biophysical, socioeconomic and political characteristics of a particular landscape.

### 2. OBJECTIVES:

The main objective of the TOF field inventory is to collect qualitative and quantitative information about the trees outside notified forests within precision limits, so as to serve data needs of development planning.

#### These include:

- To estimate the contribution of TOF in tree cover
- To estimate the total number of trees in TOF,
- To estimate the Growing Stock of standing TOF,
- To evaluate the contribution of TOF in fuel wood, fodder & timber production.

### 3.STUDYAREA

Rangareddy & Hyderabad districts are located in Southwest part of Telangana. The total geographical area of the district is 7718.52 km<sup>2</sup>, out of which notified forest area is 758.87 km<sup>2</sup>. The Hyderabad metro district located within this district.

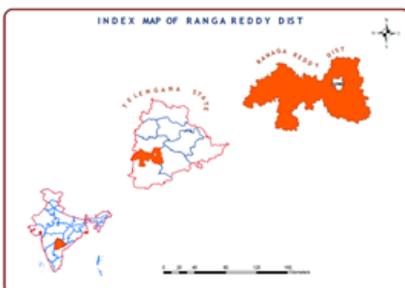


Figure 1: Location Map

### 4. METHODOLOGY

Panchromatic data was ortho-rectified using digital surface model derived from stereo pair of Cartosat-1 data with relative control points. Multispectral data was rectified with reference to the panchromatic data with less than pixel error using ERDAS Imagine 9.1 suite using first order polynomial. Image analysis was carried out using Object based image processing (OBIA), where in concept of pixel is relegated at early stage of processing and group of pixels constituting homogeneity is considered as segment. However, any segmentation up the scale preserves "inheritance" character completely.

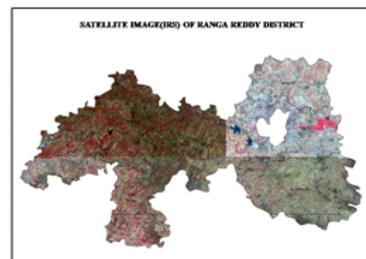


Figure 2: Satellite Image of Study area

### 5. RESULTS AND DISCUSSIONS

#### 5.1 Delineation of TOF and salient aspects

Accuracy assessment of the detection of trees outside forests using OBIA approach was carried out based on the Cartosat-1 high resolution data as well as limited field check as the reference. Categorisation of landscape unit was adopted to understand the behaviour of the approach in cultivated areas adjacent to forest as well as the agriculture clearings prevalent within dominantly forested tract, which can have higher degree of confusion with forest landscape in terms of image elements.

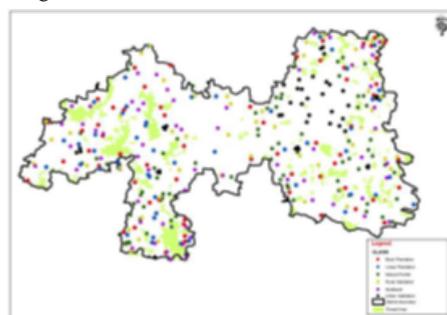


Figure 3: TOF Points in Study area

### 5.2 Object detection in relation to image features

Delineation the total study area is depicted shows quite exhaustive detection of the material of trees for a landscape portion with high contrast. It may be observed that OBIA method has yielded more number of individual trees as compared to other formations in this window. Commission of linear formations as individual tree could also be observed, which may be due to issue of consideration of the size of the patch and due to hard ranges chosen for the class. Commission in to patch or linear formations can also be observed near water body as well as on some farm bunds. Patch formations show distinct detection in this window, which shows the shape based detect ability on the upper side of size distribution of segments.

### 5.3 Detailed evaluation of delineation accuracy

Contingency analysis has been illustrated as two cases. Integrated consideration of the delineation showed that, while all detections were analysed for confirmation to TOF class, 278 entities out of 360 detected entities i.e.,77.2 were found to be accurate. Out of 151 detections of point TOF (individual tree) category, 124 were true positives. In case of linear TOF category 26 out of 31 were found to be true positives. Out of entire set of detections 64 were corresponding to Non Vegetated categories which may be due to objects having similar shape and sizes as that of trees/tree clusters.

Studies involving conifers, riparian zones in temperate forests, woodlands, hence compared well with this study involving dry deciduous remnant vegetation in the given forest edge landscape. Object features involved both spectral and textural traits apart from geometry feature, which were similarly employed in referred approaches as well. It was also interesting to note that results were in line with that of aerial imaging also as in case of analysis in landscape of France. Results clearly demonstrate the utility of high resolution imaging in delineating TOF towards their improved quantification.

## 6. CONCLUSION

In view of the comparative assessment with studies using different imaging sources involving OBIA, current results show encouraging aspects of employing IRS datasets. Current trends in greening urban and rural landscape require rapid approaches for speedy assessment. Strides made in high resolution satellite imaging as well as unmanned aerial platforms do require improved understanding of patterns of trees outside forests, for best geo-information extraction. Emphasis can be especially due to relatively less mechanised as well as sporadic planting initiatives seen in Indian context, since they generate much complex image elements.

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