

**APPLICATION OF REMOTE SENSING FOR VEGETATION MAPPING -  
A CASE STUDY ALONG THE NORTHERN COASTAL DISTRICTS  
OF ANDHRA PRADESH**

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**ABSTRACT**

The study deals with the application of Remote Sensing for delineating various vegetation types along the three coastal districts of Andhra Pradesh. The satellite imagery of the region is divided into three types depending upon tone and texture. Each type is correlated with the ground truth. The species composition has been given and discussed.

**INTRODUCTION**

The Indian peninsula is bestowed with favourable edaphic and climatic conditions conducive for harbouring and development of wide range of vegetation. The floristic pattern comprising variety of plant species within the limited boundaries of an area represents the micro-climatic features of the area which are interrelated with Physiological aspects of the constituent species.

Of late, emphasis has been shifted duly towards the exploitation of renewable and non-conventional source of energy, especially the biotic sources, the forests. Forests provide the essential response, if properly managed, for the multiplicities of demands of the increasing population. Therefore, a systematic and well planned conservation and exploitation of the extensive biomass of forests are the proper measures to tackle the impending energy crisis. But a detailed knowledge of qualitative and quantitative composition of the existing forest area is a necessary antecedent for such attempts. Thus floristic survey is an obligate pre-requisite for creation of new forests in marginal waste lands. All these efforts are essential for preparation and consolidation of a detailed data base on the resources of forests of India, among which dry deciduous and moist deciduous forests of Eastern Ghats occupy a prominent status.

Eastern Ghats is one of the important region in the country with immense potentiality for natural resources but with a comparatively low key development. The floristic heritage of Eastern Ghats, even

though accounted as rich and of considerable economic and ecological importance, has not satisfactorily been documented.

The present paper deals with the application of Remote Sensing for vegetation mapping of Eastern Ghats of the three northern coastal districts of Andhra Pradesh viz., Srikakulam, Vizianagaram and Visakhapatnam.

The Eastern Ghats terrain lying in the three districts constitutes a very important ecosystem housing certain new and hitherto unrecorded species. Many of the constituent species of Eastern Ghats flora of these three districts are of medicinal and also economical importance.

### METHODOLOGY AND RESULTS

The Landsat Imageries scene covering Srikakulam, Vizianagaram and Visakhapatnam districts are 152-047 (B 4,5,7 dated 2.1.73), 152-048 (B 4,5,7 dated 2.1.73), 151-047 (B 4,5,7 dated 24.10.80) and 151-048 (B 4,5,7 dated 19.10.81). Band IV, V and VII imagery for the above scene is interpreted on 1:250,000 scale. Visual interpretation techniques have been adopted to delineate thick forests, sparse forests with partial degradation and areas under total degradation. The satellite imagery of the forest cover of the region could be divided into the three following types depending upon the different tonal and the textural associations.

- I. Very dark tone with fine texture (Semi evergreen to moist deciduous forests)
- II. Dark tone with coarse texture (Dry deciduous forests)
- III. Light tone with coarse texture (Thorny-scrub forests).

These associations are correlated and compared with the data available from field observations on species distribution. Survey was conducted forest-range wise and the type of vegetation and its diagnostic components are worked out. Map I indicating the forest areas based on visual interpretation of the Landsat Imagery is presented and compared with the available ground truth studies of the existing forest cover and a correlation between the two has been drawn.

#### I. Very dark tone with fine texture

This imagery displays thick forest cover with minimum variation in tree crown. There is a possibility that this imagery may be a response to the existence of a relatively thick soil cover and also microclimate. These factors might be responsible for their high degree of absorption resulting in very dark tone. At the same time the dense crown closure

may be responsible for fine texture. Discontinuous pockets of dark tone are clearly visible in the imagery of the districts.

In Srikakulam district, the discontinuous patches manifested in the existing dense forest cover are represented in forest areas of Mandesa of Pathapatnam range and Tekkali and adjoining forest areas of Kasibugga. Interestingly a continuous strip of very dark tone with fine texture is shown at Palakonda range with an altitude of more than 600 m which includes the forest areas of Gara, Barna, Antikonda, Kondaganda, Buchandri, and Sarangi.

In Vizianagaram district thick forests with this tone and texture are represented in Govadi, Digavamanda and Marigadda of Kurapam range. Interestingly, continuous pockets of thick vegetative cover coming under this class are also observed in Narsipuram, Chittavalasa, Peddapuram, in Parvatipuram range and also along the border of Orissa State lying in this range. Vizianagaram range also presents a similar vegetative cover in Boddapadu, Thanuru and Penukalavalsa.

In Visakhapatnam district, forest areas of Gudem valley and Ganda Devi Ghats at an altitude of 900-1070 m develop one of the most dense vegetations. However, a few pockets of highly humid, dark corners, presenting almost semi-evergreen type of vegetation where several Himalayan species like *Lycopodium*, *Glochedia*, *Botrychium*, *Alsophila*, *Peperomia*, *Pygeum*, *Curculigo* and a few other sub-tropical and temperate species have also been recorded (Seshagiri Rao 1958).

The vegetation of the Eastern Ghats of Srikakulam, Vizianagaram and Visakhapatnam districts is mainly dry deciduous type of forests with a few isolated pockets of moist deciduous forests in valleys along perennial streams at fairly high altitude of above 800 m. The frequent components are *Terminalia tomentosa*, *Xylia xylocarpa*, *Adina cardifolia*, *Pterocarpus marsupium* and *Dendrocalamus strictus*, intermingled with evergreen species like *Diospyros sylvatica*, *Syzygium cumini*, *Mangifera indica*, *Schleichera oleasa*, which reach a height of more than 15 to 20 mts. Intermixed with these trees, shrubs or small trees like *Memecylon umbellatum*, *Uvaria hamiltonia*, *Polyalthia suberosa*, *Ardisia solanacea*, etc. are found along with climbers and herbaceous species.

A comparison of the above ground truth and Landsat Imagery of both the districts showed that a fairly good correlation exists between the two. But some degraded forests with unequal tree crown probably due to bushy growth of certain trees and undisturbed growth of other tree species observed during the ground truth studies do not correspond or correlate with Landsat Imagery. It is possible that during the span of nearly decade the dense forest cover as represented in Landsat Imagery

of 1973 might have undergone degradation due to interference of biotic factors resulting in disturbed forest (thorny - scrub forests) as shown in the ground truth of 1983.

Similarly, Beal et al (1964) also obtained large differences between the studies conducted in Honduras (1963-65) but he attributed the degradation of the forests to beetles menace.

## II. Dark tone with coarse texture

The difference of tonal and textural values may be due to uneven canopy of the forest cover, i.e. tall trees associated with shrubs. The other reason attributed to this variation is the frequent clearance of the forests for timber or shifting cultivation (Podu).

This type of tone and texture predominates Landsat Imagery of all the districts under study and it is fully supported by the ground truth.

The dry deciduous vegetation covers nearly 60-70% of the forests in these districts. This is a climatic climax with uneven, rather open canopy formed by a mixture of tall deciduous trees of 15-20 m. height and certain shrubs. The forests might have been earlier subjected to certain disturbances due to biotic, edaphic or climatic factors resulting in more open and uneven canopy. In some areas homogenous association due to predominance of certain species, is found.

The lower canopy is represented by *Trema asiatica*, *Clistanthus collenus*, *Holarrhena antidysentrica*, *Pavetta indica*, while the upper canopy is composed of *Terminalia tomentosa*, *Xylia xylocarpa*, *Adina cordifolia*, *Anogessus latifolia*, *Pterocarpus marsupium*, *Shorea robusta*, *Dendrocalamus strictus*, etc. The existing scanty and sparse association of an important component *Dendrocalamus strictus* (Bamboo) is due to its exploitation for paper industry, residential constructional work. This resulted in extensive areas of cleared forests.

Fire and other biotic factors leading to wide spacing between the trees and shrubs might have resulted in the less dark tone.

## III. Light tone with coarse texture

This class covers hilly area which are devoid of any good vegetative cover. This may be the impact of biotic factors including the shifting cultivation leading to the denudation of certain areas with sparse tree growth.

This tone observed in all the forest ranges of three districts concurs to a very great extent with ground truth. The hilly areas of this type are being extensively cleared and distributed due to podu, fire and for fuel wood. The areas are normally covered by bushy shrubs such as the species of *Randia*, *Carissa*, *Ixora*, *Canthium*, *Woodfordia*, *Acacia*, *Cleistanthus*, *Zizyphus*, *Memecylon*, *Wrightia* Sp. etc. intermingled with various herbs, climbers and grasses.

#### IV. Medium tone with strepped texture

The class is dominated by wet crop areas probably with high content of soil moisture. The ground data reveals that some areas are under cultivation of wet crops like paddy but most of them are dry crops. Formation of this type of tone seems to be due to the presence of more moistures content in the soil substrate due to presence of rivers like Godavari, Vamsandhara, Nagavali and tributaries in the hilly zones. Some of the tree species that usually associated with moist areas of streams are characterisitic, they are *Barringtonia acutangula*, *Ficus hispida*, *Ardisia solanaceae*, *Terminalia arjuna*, *Syzigium cumini*, *Homania riparia*, *Diospyros* sp.

### DISCUSSION

On the basis of the data presented above, it is evident general ecological knowledge gathered by field study and collection and presentation of floristic data for correlating them with Landsat have been found to be of immense help in the classification of vegetation types. Further, a gradual and sometimes sudden clearance of dense vegetation from a particular area creating wide gaps can also be made out by studying concerned Landsat Imageries in temporal sequence and such upto date information forms a great asset for programmes on protection and conservation of natural resources.

It is interesting to observe that the temperate forests are characterised by vast tracts of homogeneous species but tropical forests present a flora which varies frequently from place to place in their species composition. This heterogenous nature of Indian forests poses problems in the application of satellite data to extract detailed information like species composition, density, biomass estimation etc. (Madava Unni 1978 and Gautam & Narayana 1983). Hence an intensive study with reference to vegetation with species composition in India, especially forests of Eastern Ghats is quite essential for proper interpretation of Landsat Imagery and it is possible only by regular field studies.

In the present study an interval of nearly 5 to 10 years between

ground truth and Landsat clearly demonstrates the extense of disturbance caused by various factors. This fact warrants a regularly periodical monitoring of the forests using remote sensing technology to assess the periodical changes in the forests, as ground truth studies cannot be conducted as frequently as Remote Sensing due to tidiousness and consumption of energy and time. As the forests are the perpetual sources of energy the denuded and cleared areas of the forests shown by this sort of study can be reforested through energy plantation. It is very much essential in view of the rural based economy of India where energy's scarcity is rampant.

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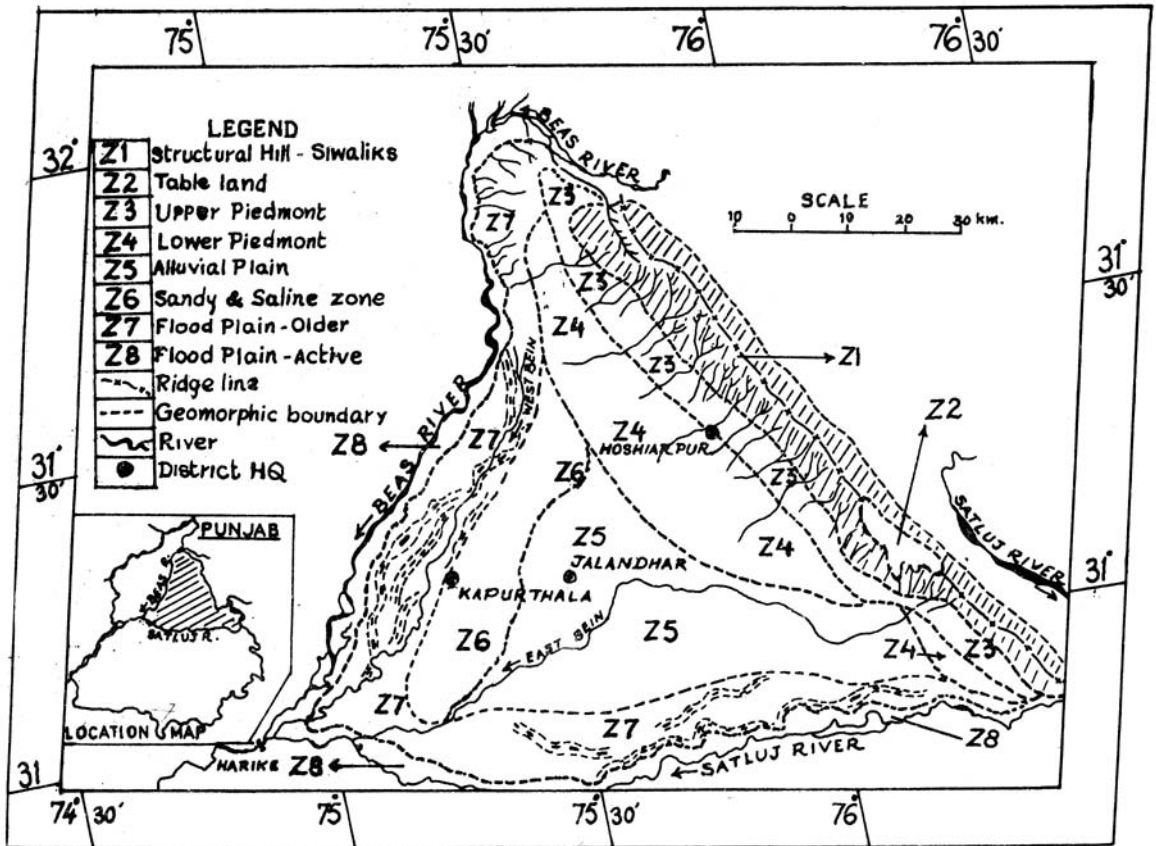


FIG. 1- GEOMORPHOLOGICAL MAP OF BIST DOAB TRACT PUNJAB.

