

## Application of satellite imagery to identify vegetation types -a case study on coconut

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### Abstract

Remote sensing data stored in digital tapes of images can be interpreted by employing computers which can process spectral reflectance properties of objects, every pixel, using fundamental statistical pattern recognition technique. In the present study Satellite imagery of the Kasaragod district of Kerala and Kamrup district of Assam were used to study coconut area. A cropping pattern map has been drawn for coconut and other important crops of the districts. It is noticed that in case of Kasaragod, which has a vast coconut cultivation it is very easy to identify it in the imagery, but in the case of Kamrup where the cultivation is only in homestead, the identification is not easy in 1:50,000 scale. A data with higher resolution can solve the problem.

**Key words:** Remote sensing data, digital tapes of images, coconut cultivation cropping pattern map

### Introduction

Satellite imagery is a mixture of information pertaining to land surface features. Using the imagery, it is easy to extract information as precisely as possible, to suite the interest. Satellite data could be simply described as a spectral imprint of the land surface features. In the present study an attempt has been made to use the imagery to identify coconut plantation of Kerala and Assam. Birkumar *et al.*, (2004) identified cane growing areas of Manipur with the help of satellite image. Coconut can successfully be grown in the subtropical, high humid and highly acidic soils of Assam as commercially as in Kerala. Assam has a typical inland eco-system where coconut grows in an area of 19,600 ha and produces 126.9 million nuts (6442nuts/ha) while Kerala with its coastal ecosystem has an area of 10.1 lakh ha. producing 6672 million nuts (6188 nuts/ha). ( *Source : Department of Economics and Statistics, 2001*). This indicates that coconut productivity in Assam is as good as in Kerala.

Based on this statistics, a study was conducted in both the states with the help of satellite imagery. The aim of using satellite imagery is to critically review the

issue of production versus eco-system of coconut. The objective of the study was to understand the feasibility of using satellite imagery to identify the vegetation types particularly coconut.

### Material and Methods

Kasaragod district of Kerala and Kamrup district of Assam were taken as two representative areas as both the districts are having good productivity to represent the states. Secondary statistical data of the land utilisation of both the districts were collected. Satellite imagery of both the districts collected from NRSA, Hyderabad. With the help of IDRISI-32 and ERDAS software, the images were processed. Necessary surveys were done to confirm the ground truth and two land use maps were prepared with the help of ARC GIS software.

### Results and Discussion

Total geographical area of Kasaragod district is 1,96,133 hectares and the area under forest is 5,625 hectares which is 2.8% of the total land area. The gross cropped area is 1,59,772 hectares which is 81.46% of the total land area. On the other hand total geographical area in Kamrup district is 4,34,500 hectares and area

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under forest is 1.15,694 hectares which is 26.62% of the total land area. The gross cropped area is 1,86,718, which is 42.97% of the total land area. (Source : Department of Economics and Statistics, 2000)

**Major crops of both the districts**

**Major crops of Kasaragod district**

Crops	Area under cultivation (ha)	Production
Paddy	7986	14905 tonnes
Cashew	22992	10 046 tonnes
Rubber	21265	23732 tonnes
Coconut	56183	364 million nuts
Areca nut	12092	22517tonnes

(Source : Department of Economics and Statistics-Thiruvananthapuram,2001)

**Major crops of Kamrup district**

Crops	Area under cultivation (ha)	Production
Paddy	124574	132754 tonnes
Seasonal crops	29340	varies
Coconuts	1852	10.921million nuts.
Tea	3660	772640 kg
Arecanut	5360	1000 tonnes

(Source : Department of Economics and Statistics-Assam,2000)

From the above tables it is clear that in Kasaragod, coconut is a very important crop whereas in Kamrup, paddy is the main crop and importance of coconut is less.

**Satellite imagery**

Keeping in view of the above statistical data, it was tried to understand the position of coconut from the satellite imagery of the two districts. All the images were processed with the help of software to get higher accuracy of the signatures. Vegetation classification was performed using traditional method of image recognition. This hybrid approach of image classification deals with the discrimination among the various vegetation types. The NDVI digital image enhancement was also done which has a direct correlation with the bio-mass of the vegetation.

After processing the images, ground data were collected extensively by establishing the correlation between satellite data and various vegetation types. For land survey, along with satellite imagery, Survey of India map and toposheets were used. In the case of Kasaragod district where the vegetation was mainly perennial with very dense coconut plantations, it was easy to identify the coconut and other plantation crops like cashew and rubber with the help of signature. The survey was very easy and classifications was found accurate.

But in the case of Kamrup where vegetation was mostly seasonal and tree crops or palms were very scattered in homesteads it was very difficult to identify the vegetation types from image. Only in the southern part of the district where dense vegetation of the plantation forest and the natural forests exist it was easy to identify from the imagery. After collecting the ground truth, cropping pattern maps of both the districts were prepared with the help of Arc GIS(fig-1&2). The map gives a very good idea of coconut cultivation of Kasaragod and tallies with the crop statistics.

**Cropping pattern of Kamrup District**

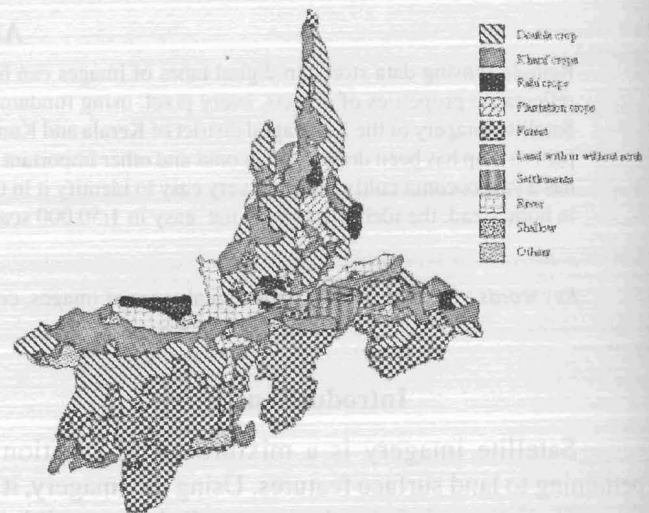


Fig. 1. Cropping pattern of Kamrup district. A map drawn with the help of Satellite imagery and field survey

**Cropping pattern of Kasaragod District**

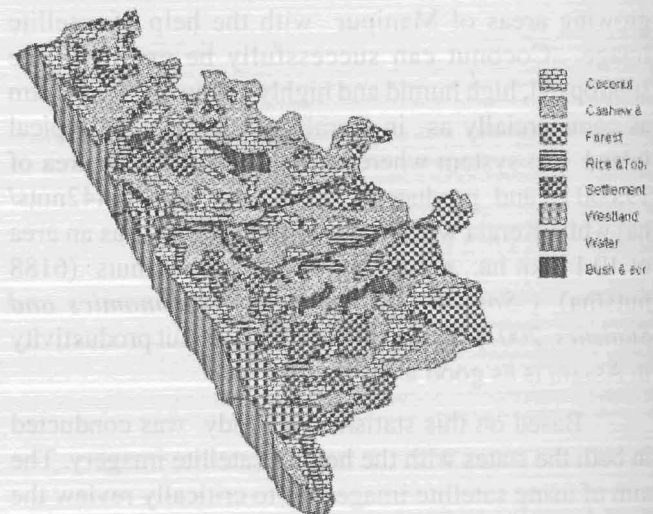


Fig. 2. Cropping pattern of Kasaragod district. A map drawn with the help of Satellite imagery and field survey

## Discussion

Vegetation mapping is a primary requirement for various management and planning activities at the regional and global level. Remote sensing technology can play a role in providing accurate and reliable landscape details with lower cost and lesser time compared to the other methods. Remote sensing of crop is based on physical and physiological interaction of crop variables with the electro magnetic spectrum. The data from satellites could be utilized for assessing the plant cover, crop acreage and production. (Yadav, 1998). The present study confirms the importance of integration of plant resources information with Satellite imagery and GIS for better visualization and interpretability in optimal planning and management of crops. Udaya Lakshmi *et al.* (1998) have used this protocol for decision making and to derive meaningful output for plant resources observation and management.

Hybrid approach of classification has been adopted where modification of spectral classification with the aid of ancillary data set has been found useful. Satellite remote sensing with substantial ground truth has enough potential to classify land cover/use. NDVI, the another digital image processing techniques enables speedy and accurate interpretation if the knowledge of bio-mass of the important vegetation of the experimental zone is

known. Digital technology with the knowledge base is found to enhance mapping capabilities of forest cover type. Jayakumar *et al.*, (2002) mapped the forest resources of the Eastern ghats of Tamil Nadu using a similar approach.

From this study it is very clear that where dense vegetation cover exists 1:50,000 image data is very good for mapping, as in the case of Kasaragod. For seasonal crops, 1:50,000 data cannot give a very good picture as in the case of Kamrup. For preparing the land use map extensive survey is required. This problem may solve with a very high resolution data of 1:25,000 or 1:10,000.

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