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USE OF REMOTE SENSING TECHNIQUES IN DENTIFICATION OF ORANGE ORCHARDS

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ABSTRACT

Remote sensing technique was used to identify and discriminate the orange orchards. False colour composite of IRS LISS-IA date was visually interpreted considering the image characteristics. Field checks were carried out to verify the boundary of orange orchards and other land use categories. Results of this study indicated that remotely sensed data can be effectively used for discrimination of orange plantation from crop land, forest-land and scrub land.

Key words : *Remote sensing techniques, orange orchards, visual analysis*

Remote sensing is broadly defined as collecting information about objects by scientific device called "Sensors" without being in physical contract with the objects. Remote sensing in the wavelength region from the visible to the near-infrared and middle-infrared is based on the measurement of electromagnetic radiations which are reflected/scattered or emitted by objects on the earth surface. The reflection or emission of radiation at different wavelengths by objects depends on the physical structure of the objects and their condition. Thus, they can be identified by their own characteristics pattern or spectral signature remote sensing system provides data in the form which can be easily analysed through visual interpretation or digital processing (digital data) techniques.

The procedures for identifying crops and for estimating yields by utilizing remote sensing procedures are complex. Yet, accuracy of crop identification with Land-set data has been reported as being ninety Per cent or higher in studies of areas where there are large, homogenous, rectilinear fields with few competing crop (Manual of Remote sensing, 1983), Gausman *et al.* (1977e) used Landset – 1 imagery to distinguish between "Redblush" grape fruit (*Citrus paradise* Macl) and orange (*Citrus sinensis* L. Osbeck) varieties and to estimate their hectarage satisfactorily. Computer-aided classification accuracies for the farm, using Lands at MSS data, were 83 per cent for "Redblush" grape fruits, organges and total hectarage, respectively.

In field of agriculture and horticulture upto-date, accurate, timely information on the distribution, growth conditions (vigour, stress and pest and disease) and anticipated productivity are needed for management and planning purpose. Data on these aspects obtained the conventional methods will be incomplete or delayed as it is not possible to monitor constantly the vegetation condition, vigour and stress.

The disparity between the growing demands for timely generation of information on growth conditions, acreage estimation and prediction of yield and limitations inherent in the conventional methods leads to the application of remote sensing techniques. In the present study satellite remote sensing data has been used for identification and acreage estimation of orange orchards in parts of Nagpur district, Maharastra.

MATERIALS AND METHODS

Study Area : The test area covering parts of Katol and savner Tahsils of Nagpur district, Maharastra was selected for this study (Table-1). The district has monsoonic tropical semi-arid climate with mean annual temperature ranging between 25^0 and 45^0C. The average annual rainfall varies from 1,000 to 1,300 mm, which is mostly concentrated during the month of July to September. Physiographically, the test site comprises of three landscape namely (a) Hills, (b) Undulating plateau, (c) Valley. The major geological formation in the area is "Deccan Trap" consisting mostly of basalt. Soils of the study are derived from basalt. In general, the soils are dark coloured, claye, calcareous with varying depths. Based on the depth of the soils, locally they are called as deep black soils, medium black soils and shallow black soils.

Table-1 : Orange plantation and Agriculture at land use statistics of the study area.

Category	Area (Hectares) Visual method
Orange plantation	4800
Crop land	3500
Fallow land	25600
Forest land	13800
Scrub land	42350
Water body	1500
Total	123050

Data used

(i) Remotly sensed data : False colour composite (F.C.C.) of IRS-IA data on 1 : 260,000 scale, dated 9.11.88 and 14.1.89.

(ii) Collateral data : Survey of India Topographical Map 55 K.

Visual interpretation : False colour composite of IRS (LISS-IA) generated by combining three spectral bands 2,3 and 4 on 1 : 250,000 scale was visually interpreted considering the image characteristics like tone or colour, size, shape, pattern, texture, location, association and the image interpretation key developed by NRSA (1989). The interpretation unit (different class) were checked to variety the doubtful areas. Based on the ground verification, boundaries of different classes were finalized. Area under different classes were calculated in hectare using a mitimatre polythene graph street and expressed in hectare and percentage. Ground truth verification.

Ground truth collection is necessary for checking and asserting some of the ground features about which the analyst has doubts for interpretation using imagery as reference. For ground truth collection different sample strips were marked on the S.O.I. topographical maps such that way together represent most of the variations in orange orchards, crops, as well as existing land use categories in the sample stripe were recorded and use3d as reference for visual interpretation of false colour composite pertaining to the study area. Random checks were made after completion of interpretation to verify the validity of orange orchards and other land use categories and boundary delineations.

RESULTS AND DISCUSSION

Visual analysis : The result from visual interpretation of IRS (LISS – I) false colour composite (FCC) on 1 : 2,50,00 scale indicated that orange plantation was identifiable by analyzing image characteristics like tone/colour, texture, shape, pattern etc. the study area was classified into forest, scrub land, crop land, fallow land and water body (Fig.-2). A total of 4,800 hectares of 3.9 per cent of the total land cover was classified as orange orchards within the study area (Table-1). These orange orchards are concentrated mostly around village Katol but scattered throughout the study area. Plate 1 shows the FCC image of the study area. The orange orchards had characteristics of dark red to red colour, small to medium in size and regular shape. These were seen very prominently of FCC. Crop land appeared bright red to red colour varying in size and irregular in shape on FCC. Fallow lands were characterized by a greenish blue colour. Small to large size with regular to irregular shape. Difference in colour image characteristics between orange orchards and crops was released in their canopy light reflectance. Other ground features such as forest occur8ing on hills (light red to red) which is in the lower portion of the scrub land (light yellow to light brown) were also distinguishable on the FCC. The water body appeared as blue colour. The water body appeared as blue. The physiographic features of the hilly area were also well presented in FCC.

CONCLUSION

Analysis of IRS-IA LISS-I data for mapping orange orchards indicated that IRS-IA data can be effectively used for discrimination of orange orchards and agricultural land/land cover using visual techniques in conjunction with collateral and limited field check. This indicates that visual interpretation of FCC should be the first choice for acreage estimations at regional level planning, because of simple technique and minimum time needed for its germination.

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