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Land Use/Land Cover Change of Rabi Season of Rahuri Taluka of Ahmednagar District Maharashtra

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Authors' contributions

This work was carried out in collaboration among all authors. Author PAM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AAA, CP and SDG managed the analyses of the study. Author APK managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Advanced change location procedures by utilizing multi-temporal satellite symbolism helps in understanding landscape dynamics. The present examination shows the spatio- temporal elements of land use of Rahuri Taluka, Ahmednagar District, Maharashtra, India. Sentinel 2A satellite imageries of four different months of *Rabi* season (2019-2020) were acquired by United States Geological Survey (USGS) earth explorer site and quantify the changes in the Rahuri Taluka from October 2019 to January 2020 over a period of 3 months.This study applied supervised classification-maximum likelihood algorithm by using Arc GIS 10.1 Map envision to distinguish land use changes of Rahuri. Land Use/Land Cover (LULC) in the Rahuri has experienced a progression of changes in the course of the last three months. Four significant LULC classes viz; Water body, Built-up Land, Waste/Fallow land, Agriculture land have been distinguished and demonstrate that significant land use in the Rahuri Taluka. Results appears, water bodies was highest in month of October 15.68% (166.48 km^2), Agriculture land was highest in month of November 59.77% (634.56 km^2) and Waste/Fallow land was significantly higher in month of October 41.1% (437.47 km^2) and

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December 41.7% (442.77 km^2) than November 30.54% (324.28 km^2). The examination and discoveries of the investigation features significant approach suggestions for the maintainable Land Use/Land Cover the board in the Rahuri.

Keywords: Land use and land cover; Remote Sensing and GIS.

1. INTRODUCTION

Land use/ Land cover is two separate phrasings which are frequently utilized conversely Dimyati et al. [1]. Land cover alludes to the physical attributes of earth's surface, caught in the conveyance of vegetation, water, soil and other physical highlights of the land, including those made exclusively by human exercises e.g., settlements. While land-use alludes to the manner by which land has been utilized by people and their environment, as a rule with complement on the useful job of land for monetary exercises. The land use/cover example of a district is an outcome of characteristic and financial components and their use by man in reality. Data ashore use/cover and conceivable outcomes for their ideal use is basic for the selection, planning and execution of land use plans to satisfy the expanding needs for fundamental human needs and welfare. This data likewise helps with checking the elements of land use coming about out of changing requests of expanding population.

Land use influences land cover and changes in land cover influence land use. Land use/cover change identification is basic for better comprehension of scene dynamic during a known timeframe having maintainable administration. Land use/cover changes is a far reaching and quickening process, fundamentally determined by common marvels and anthropogenic exercises, which thusly drive changes that would affect normal biological system. Turner and Ruscher [2]. Understanding scene examples, changes and connections between human exercises and characteristic wonder are basic for legitimate land the board and choice improvement. Today, earth asset satellites information are entirely appropriate and valuable for land use/cover change location examines Yuan et al. [3], Brondizio et al. [4].

Sentinel-2 is an Earth observation mission from the Copernicus Programme that systematically acquires optical imagery at high spatial resolution (10 m to 60 m) over land and coastal waters. The mission is a constellation with two twin satellites, Sentinel-2A and Sentinel-2B. The Sentinel-2 satellites is mostly used satellites which will each convey a single multi-spectral instrument (MSI) with 13 spectral bands in the visible/near to infrared (VNIR) and short wave infrared spectral range (SWIR).

The capability of satellite based data as a purpose behind delivering noteworthy information for LULC. Over the span of the latest couple of decades various frameworks of LULC mapping and change area have been made and applied wherever all through the globe. Remote-sensing has been broadly utilized in refreshing area use/cover maps and land use/ cover mapping has gotten one of the most significant utilizations of remote detecting. Lo and Choi [5]. An assortment of progress location procedures and calculations have been created and evaluated for their favorable circumstances and detriments. Among these Unsupervised classification or clustering, Supervised classification, PCA, Hybrid classification and Fuzzy classification are the most normally applied procedures utilized in order Zhang et al. [6].

A variety of supervised classification methods have been applied extensively for the land use change analysis throughout the world. This procedure relies upon a mix of foundation information and individual involvement in the examination zone to a more prominent degree than different zones. Along these lines per-pixel marks are taken and put away in signature records by utilizing this information and the crude computerized numbers (DN) of every pixel in the scene are in this way changed over to brilliance esteems Jensen [7], SCGE, 2011 [8].

An attempt is made in this study to map out the status of land use/cover of one of the development Taluka of the Maharashtra state, viz., Rahuri of District Ahmednagar view to detect the landconsumption rate and the changes that has taken place during the last three months of Rabi season using geospatial techniques.

2. MATERIALS AND METHODS

2.1 Study Area

Rahuri taluka, is a taluka in the Shrirampur subdivision of the Ahmednagar district in

Maharashtra, India. It is located between latitude 19.3951 and longitude 74.6521.It lies on 511 m above sea level. The climate of Rahuri is characterized by hot summer and general dryness. The average temperature in Rahuri is 25.9°C. In a year, the rainfall is 511 mm. The area under rahuri is 1061.5 square kilometer. The area of rahuri is shown in Fig. 1.

2.2 Data Collection

Sentinel 2A at a resolution of 10m were used for land use/cover classification. The satellite data covering study area were obtained from earth explorer site (http://earthexplorer.usgs.gov/). These data sets were imported in ArcGIS 10.1 map satellite image processing software to create a false colour composite (FCC) (Fig. 2). The satellite data specification are given in Table 1.

2.3 Image Pre-processing and Classification

To work out the land use/cover classification, supervised classification method with maximum likelihood algorithm classification was applied in the ArcGIS 10.1 Map software. It is one of the most popular supervised classification methods used with remote sensing image data. This method is based on the probability that a pixel belongs to a particular class. The basic theory

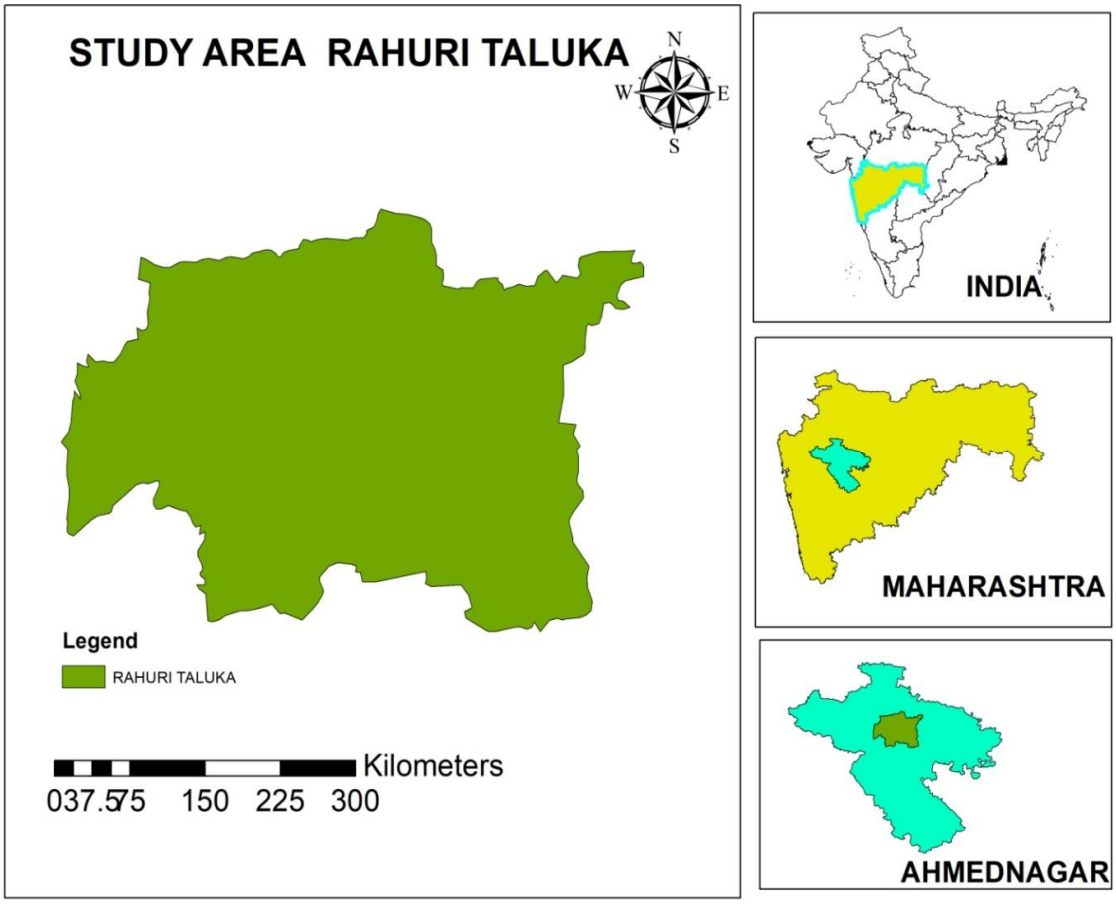

Fig. 1. Location map of the study area

Table 1. Satellite data specifications

Data	Month of acquisition	Bands/color	Resolution (m)	Source
Sentinel 2A	October , November and December	Multis-pectral	10	USGS Earth explorar

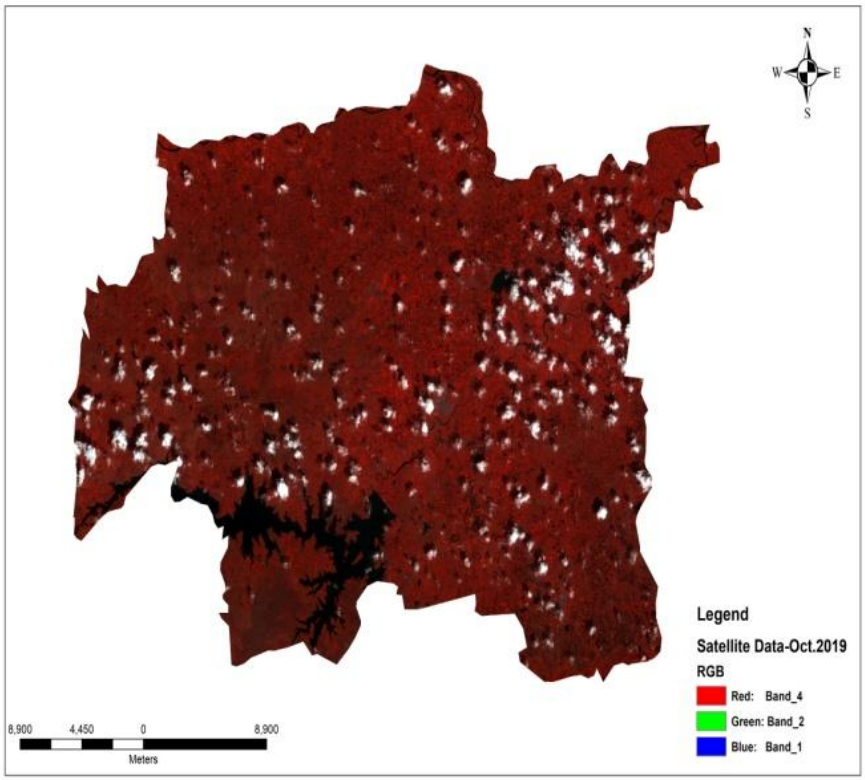

Fig. 2.1. False colour composite of October month

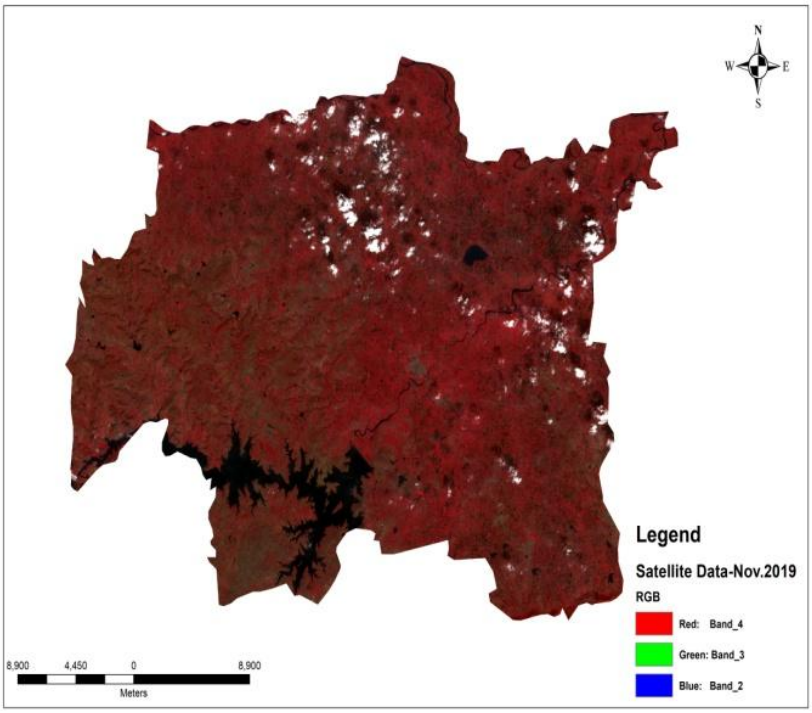

Fig. 2.2. False colour composite of November month

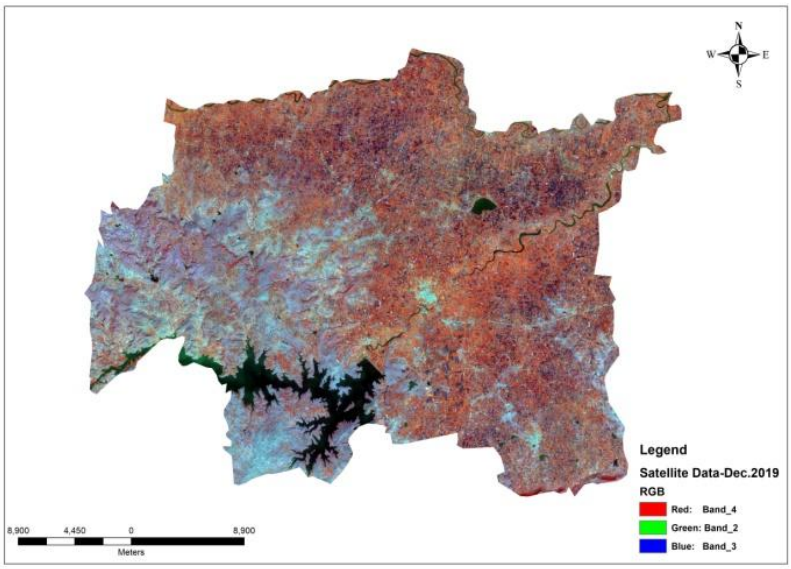

Fig. 2.3. False colour composite of December month

Fig. 2. Satellite images (False colour composite)

assumes that these probabilities are equal for all classes and that the input bands have normal distributions. However, thismethod needs long time of computation, relies heavily on a normal distribution of the data in each input band and tends to over-classify signatures with relatively large values in the covariance matrix. The spectral distance method calculates the spectral distance between the measurement vector forthe candidate pixel and the mean vector for each signature and the equation for classifying by spectral distance is based on the equation for Euclidean distance. It requires the least computational time among other supervised methods, however, the pixels that should not be unclassified become classified, and it does not consider class variability.

Table 2. Classes delineated on the basis of supervised classification

Class name description	Description
1. Water Body	River, open water, lakes, ponds and reservoirs
2.Fallow/Waste/Build up Land	Residential, commercial, industrial, transportation, roads, mixed urban
3. Agriculture Land	Crop fields
4. Cloud cover	Cloud area

Five land use/cover types are identified in the study area viz., (i) Water Body (ii) Waste/Build up Land (iii) Agriculture Land (iv) Cloud cover, described in (Table 2).

3. RESULTS AND DISCUSSION

The results obtained through the analysis of multi-temporal satellite imageries were diagrammatically illustrated in Figs. 3-4 and data are registered in Table 3. Fig. 3 depicts land use/cover status, Fig. 3 portrays land use/cover change in various land use classes and Fig. 4 shows graphical representation of land use/ cover change A brief of these outcomes is talked about in the accompanying sections.

3.1 Land Use/Cover Status

This examination clarifies the essentialness of fusing Remote Sensing and GIS for change recognition investigation of land use/land cover of a region as it offers urgent data about the spatial distribution as well as nature of land cover changes.

Fig. 3.1, 3.2 and 3.3 shows spatial distributional example of land use/cover of the October, November and December month of Rabi 2019 of Rahuri Taluka. These information uncover that in Rabi 2019, about 15.68% (166.48 km2) region of Rahuri Taluka was water body in month of October, 7.33% (77.84 km2) in month of

November and December. This demonstrated diminishing in water bodies territory from October to December because In Maharashtra blustery season period is from June to October which show more region water bodies in October through multispectral satellite pictures.

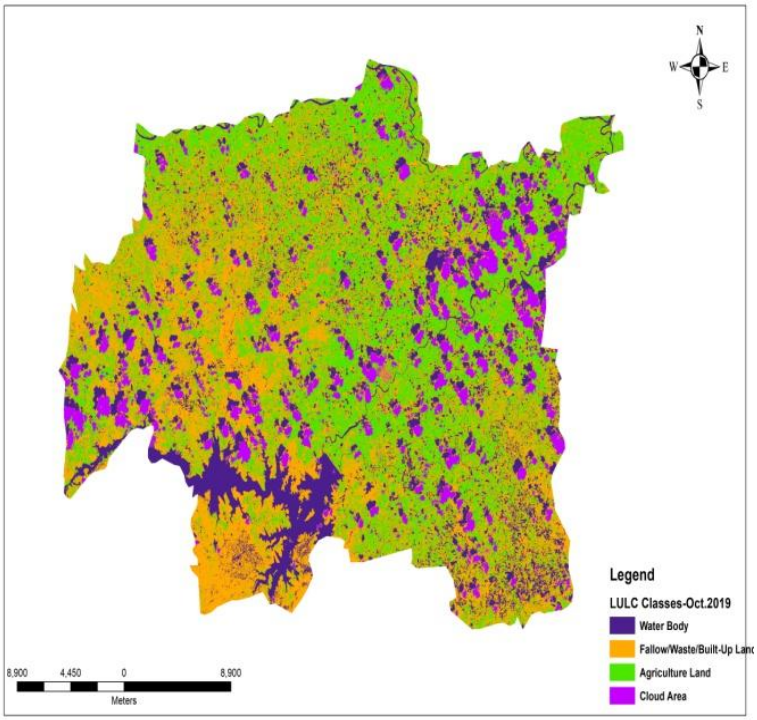

Fig. 3.1. Land use/land cover October

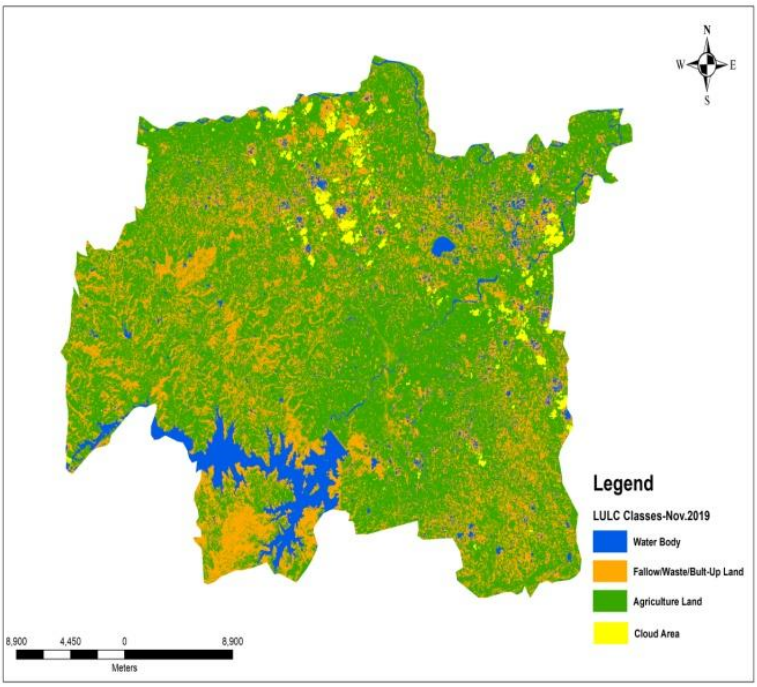

Fig. 3.2. Land use/land cover November

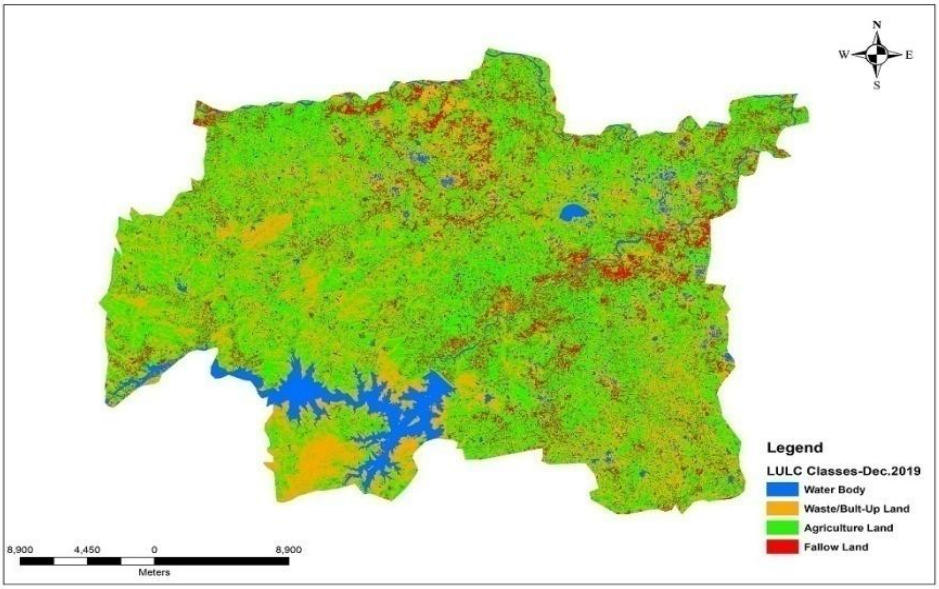

Fig. 3.3. Land use/land cover December

Fig. 3. Land use/cover status of the rahuri taluka in rabi 2019 (based on sentinel 2A satellite imagery)

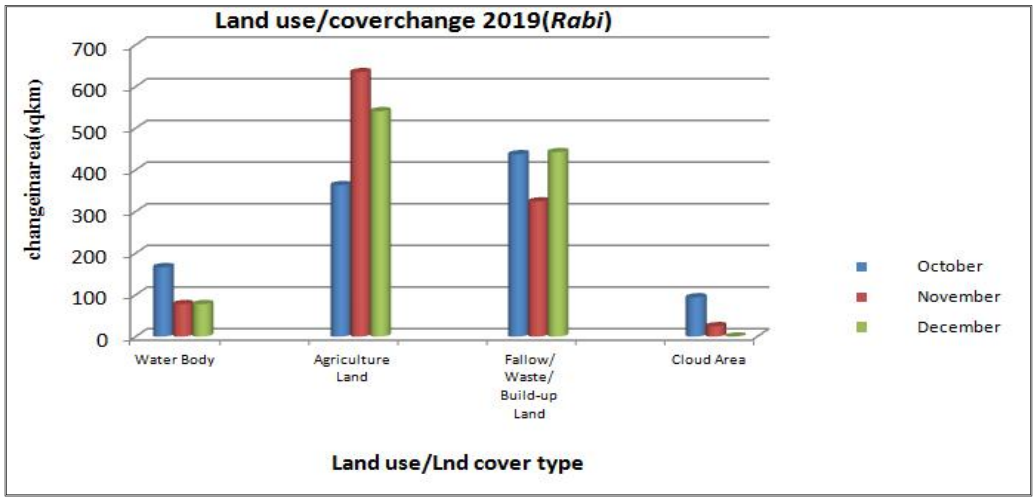

Fig. 4. Diagrammatic illustration of land use/cover change in rabi 2019 of rahuri taluka

Agriculture Land zone was 34.23% (363.45 km^2) in October, 59.77% (634.56 km^2) in November and 50.95% (540.88 km^2) in December of complete region. This territory under agriculture in October was less because of reaping of rabi crop and expanded in November as Rabi crop is gotten noticeable in a region. Again in December territory under Agriculture is diminished because of collecting of sugarcane which is principle harvest of rahuri taluka.

Fallow/Waste/Built-up land territory in October was 41.1% (437.47 km^2), in November was 30.54% (324.28 km^2) and in December was 41.7% (442.77 km^2) of all out region. Fallow/Waste/Built-up land not show the critical changes, changes in zone is because of progress in neglected land which change as per agribusiness crop span.

Cloud cover was more in month of October i.e 8.86% (94.1 km^2) than in November i.e. 2.33% (24.81 km^2) (Table 3).

Table 3. Land cover/land use classes and areas in square kilometer

Land use/cover categories	October		November		December	
	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Area (km^2)	Area (%)
Water Body	166.48	15.68	77.84	7.33	77.84	7.33
Agriculture Land	363.45	34.23	634.56	59.77	540.88	50.95
Fallow/ Waste/ Build-up Land	437.47	41.21	324.28	30.54	442.77	41.7
Cloud Area	94.1	8.86	24.81	2.33	0	0

4. CONCLUSION

The study conducted in Rahuri Taluka of Ahmednagar district in Maharashtra state (India) advocates that multi spectral satellite imagery plays a vital role in quantifying spatial and temporal phenomenon which is otherwise not possible to attempt through conventional mapping.The result obtained The estimation of land use/cover classes and their coverage of study area is easy to calculate with Remote sensing. The study has shown that Supervised classification of algorithms produces best result for area estimation of crops.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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