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Change Detection and NDVI Using RS and GIS In Parts of Parbhani District

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Abstract — *Identification of Land use Land cover (LULC) changes alongside vegetation spread is presently gaining central significance in verity of applications. Remote Sensing (RS) and Geographical Information System (GIS) has been ended up being a potential tool for researching and getting exact information of LULC. The primary objective of this study is to analyze LULC and vegetation changes for two arrangements of satellite information IRS-P6-LISS-III 2008 and IRS-P6-LISS-III 2011 respectively. The arrangement of images is obtained for the year 2008 and 2011 for the same season in order to lessen the impact of regular varieties of vegetation. Supervised classification technique is utilized to screen LULC changes, whereas the Normalized Difference Vegetation Index (NDVI) method is utilized to gauge vegetation scope over a study zone. The results reveal that LULC of cropland increased by 1094.453 ha and depletion of water body by 24.162 ha whereas depletion of medium vegetation by 581.52 ha inside a brief time frame, which may bring about the serious impacts to various aspects of the environment.*

Keywords- *Watershed, RS, GIS, Supervised Classification, LULC, NDVI*

I. INTRODUCTION

Land use land cover change (LULC) has been postulated a fundamental part in the hydrology of a watershed and change in LULC is a noteworthy issue of worldwide natural change and thusly land use/land cover mapping is vital part wherein different parameters are coordinated on the prerequisite premise to drive different formative file for area asset administration. The land cover mirrors the biophysical condition of the earth's surface and subsurface, in this way embracing the soil material, vegetation, and water [1]. Land use is a more convoluted term; it has been characterized as far as disorders of human exercises, for example, farming, ranger service what's more, building development that modifies land surface forms including biogeochemistry, hydrology what's more, biodiversity [2]. The satellite image processing and information with their monotonous nature have ended up being entirely valuable in mapping land use/land change [3]–[5]. Evaluation of such changes is conceivable through RS and GIS methods regardless of the possibility that the resultant spatial datasets are of various scales/resolutions[6].The aim of this study is to screen andbreak down the dynamic change of LULC and vegetation in the Charthana territory of Parbhani region in light of the remotely detected satellite images, factual and review information for quite a short time 2008 and 2011. And after that, the real main thrusts that impact the change were talked about. This examination may give a judicious usage of area assets.

II. STUDY AREA AND DATA

A. Study area

The study area territory is situated in the Marathwada region of Maharashtra which comes under frontier of Penganga stream with an extent of 160.93 km. (100 miles) in the north-east, and of the Godavari river with 64.37 km. (40 miles) in the southwest. Study zone is Charthana, topographically situated under 76° 30′, 76° 40′ E longitudes, and 19°30′, 19°45′ N latitudes and covers an area of 95 Km^2. It shapes a portion of 56 A/10 with 1:50000 scale, In the India Survey toposheet. The upper and lower parts of the Parbhani region being uneven territory are dry seasons inclined and confronts the issue of intense water shortage.

B. Data collection and processing

Cloud Free IRS-P6-LISS-III satellite images of two unique years have been downloaded from Bhuvan website. Every one of the information is pre-processed and anticipated to the Universal Transverse Mercator (UTM) projection framework. The satellite information gathered is appeared in Table.1.

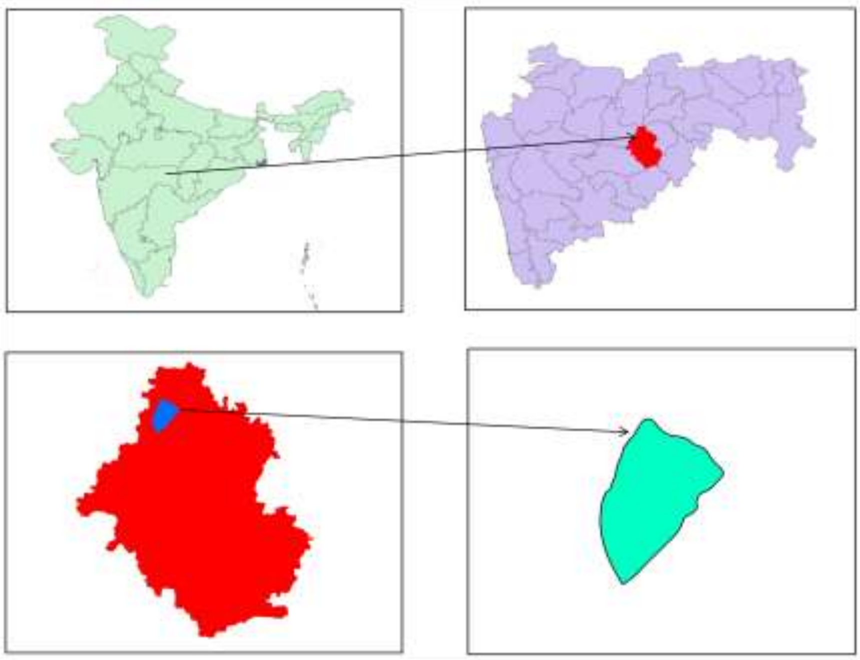

Fig.1. study area territory

TABLE 1. DATA COLLECTION AND SOURCE

Satellite	Sensor	Spatial resolution	Spectral resolution	Acquisition year
IRS P6	LISS III	23.5m	Band-4	March 2008
IRS P6	LISS III	23.5m	Band-4	March 2011

III. Methodology

A. Image processing

All the downloaded images contain distinctive sorts of bands and stacking is performed to get the composite image. Other image upgrade procedures like histogram adjustment are likewise performed on every image for enhancing the nature of the picture [7]. The strategy includes accumulation of two IRS P6 LISS III images for examination of land use change. Subsets of satellite images and aerial photos are amended first for their innate geometric blunders utilizing computerized topographic maps as a part of altered all inclusive transverse mercator coordinate framework.

B. Change detection with supervised classification

In this stage, supervised classification approach is the basis for framing classes that are comparative in spectral reflectance. In this methodology, pixels are allotted for class (i.e., instructional courses) confirmed on the ground in selected territories. Since these preparation sets speak to a little rate of whole satellite imagery and in light of the fact that the choice made by the field observes, inspecting is regularly not irregular and is one-sided by the determination strategy [8]–[10]. The Maximum Likelihood Classifier is an effective paradigm that depends on from the prior probabilities. Change location investigation is completed with the assistance of Changes saw in a pair of images. At long last grouping images important properties like class names and range section were added to raster attribute table utilizing raster characteristic proof-reader. Utilizing statistics tools area of each class is tabulated. The technique utilized is condensed in the stream graph in (Fig.2).

C. NDVI Generation

The Normalized Difference Vegetation Index (NDVI) demonstrates examples of vegetative development from green-up to senescence by showing the amount of effectively photosynthesizing biomass on a landscape [11]. Such images take into consideration the creation of maps, which show observable greenness and can be to a great degree important to land administrators and specialists in deciding changes in vegetation after some duration. The NDVI is the distinction of near-infrared and visible red reflectance count standardized over reflectance [12]. In particular,

$$NDVI = (NIR - RED)/ (NIR + RED) \qquad \textbf{(1)}$$

Spectral improvement tools with ERDAS programming is utilized for working indices. In the wake of completing this procedure, the framework distributes 255 classes with an extensive variety of pixels. NDVI values lie between - 1 and +1. A higher NDVI value indicates vegetation in great condition. This is utilized to eliminate the seasonal sun edge distinction and minimize atmospheric impacts.

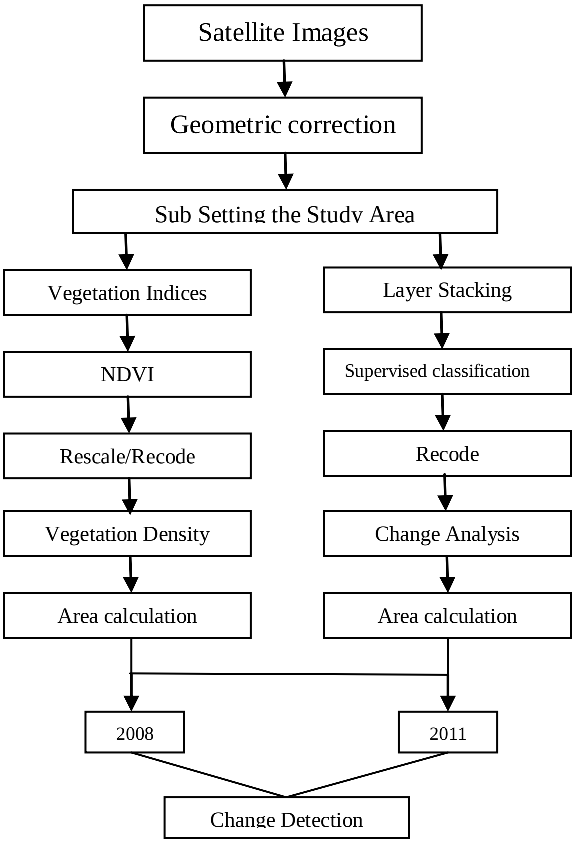

Fig.2. Flow chart of change detection

IV. Result and discussions

A.Land use/land cover-2008

LULC of the watershed has been assessed for 2008 LISS III image (Fig.3). Supervised classification of watershed area shows that a considerable area in land use is cropland covered area 3160.517 ha. barren land covered area 1984.580 ha., fallow land covered area 1581.636 ha., scrub land covered area 2205.855 ha., water body covered area 78.072 ha., and settlement covering area 356.927 ha.

B. Land use/land cover-2011

LULC of the watershed for 2011 LISS III image (Fig.4) shows that considerable area in land use is cropland covered area 4254.97 ha, barren land covered area 1206.76ha., fallow land covered area 1583.05ha., scrub land covered area 1612.22ha., water body covered area 53.91ha., and settlement covered area 654.41ha.

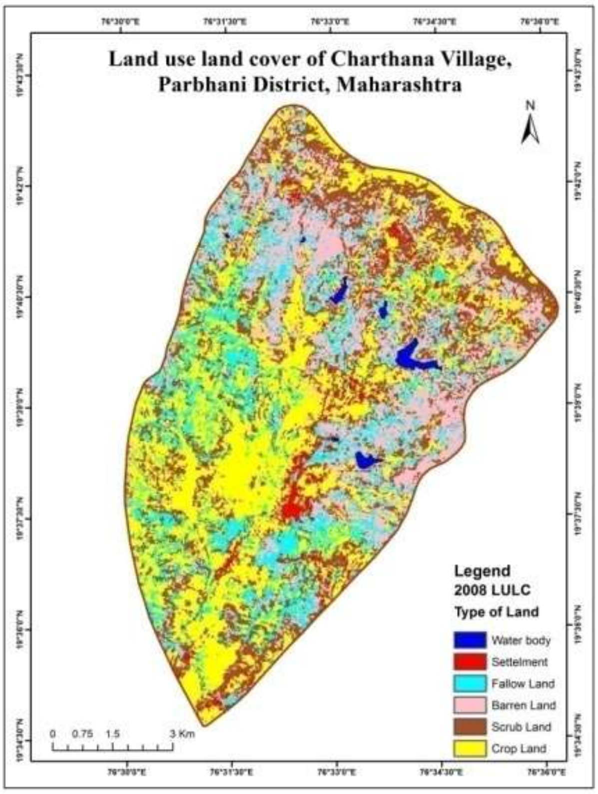

Fig.3. LULC pattern for the year 2008

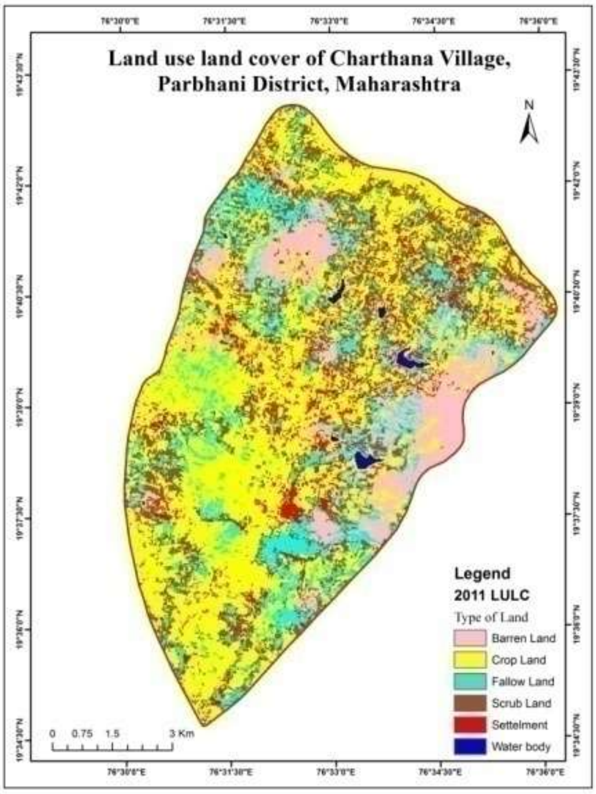

Fig.4. LULC pattern for the year 2011

The significant changes in the area use/land cover amid the study time frame between the years 2008 and 2011 recorded some fascinating perceptions. The study reveals that the real changes happened in cropland and barren land. There are six classes created to be specific cropland, fallow land, Settlement, barren land, scrub land and water bodies. Change detection, investigation demonstrates that crop land has been expanded by 1094.453 ha, the fallow land has been expanded by 1.414ha, and settlement has been expanded by 397.483 ha. Whereas barren land reduced by 777.824ha, scrubland has been diminished by 593.635ha and water body has been diminished by 24.162 ha. So also consequences of NDVI reveal that NDVI in the watershed is in the scope of - 0.74 to 0.15 for year2008 and - 0.05 to 0.56 for the year 2011 separately. Negative estimation of NDVI reflects water body, zero reflects the soil and positive quality reflects vegetation, most extreme positive worth demonstrates great vegetation of the range. Higher estimation of NDVI has been watched for year 2011compared to 2008 because of the expansion in cropland. The vegetation index is demonstrated the seasonal trimming and condition which appeared in Fig.5 and 6.

TABLE.2 RESULT OF CHANGE DETECTION

Type of Land	**2008 (ha)**	**2011(ha)**	**Changes(ha) (+ve and -ve)**
Crop Land	3160.517	4254.97	1094.453
Barren Land	1984.580	1206.76	-777.824
Fallow Land	1581.636	1583.05	1.414
Scrub Land	2205.855	1612.22	-593.635
Settlement	356.927	654.41	397.483
Water body	78.072	53.91	-24.162

TABLE.3 RESULT OF NDVI CLASSIFICATION

NDVI Class	2008 (ha)	2011(ha)	Changes(ha) (+ve and -ve)
No vegetation	85.461	131.03	45.569
Low vegetation	1260.24	1479.32	219.08
Medium Vegetation	2868.20	2286.68	-581.52
High vegetation	3522.93	3691.45	168.52
Very High vegetation	1599.22	1859.82	260.6

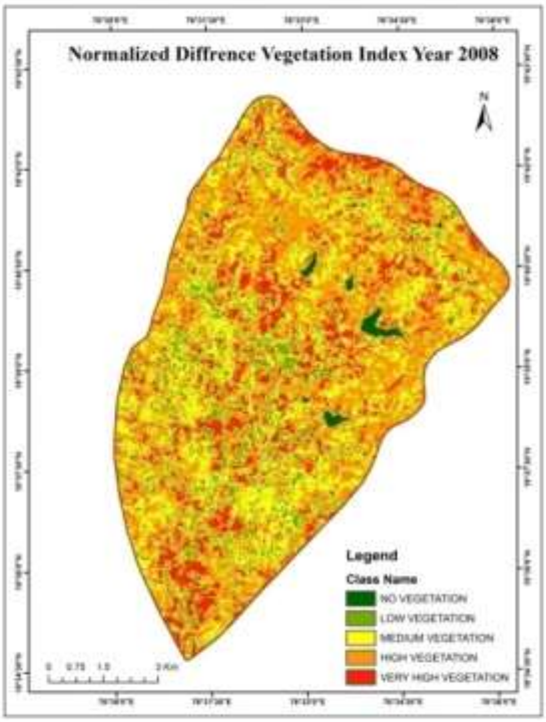

Fig.5. Vegetation cover for the year 2008

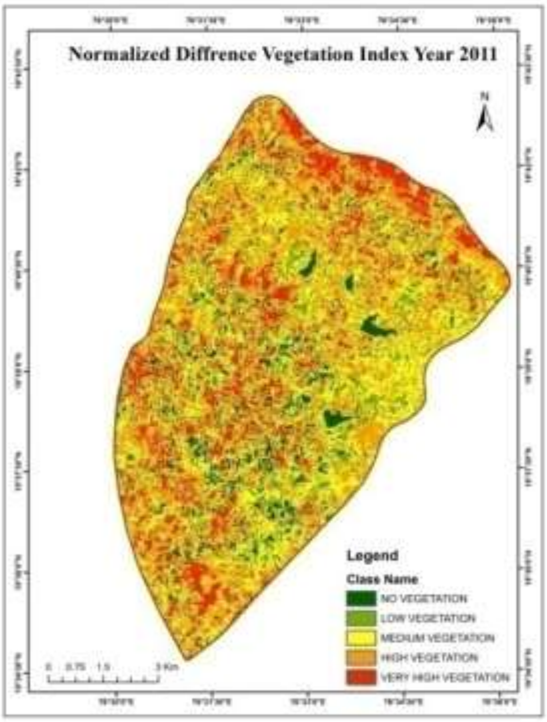

Fig.6. Vegetation cover for the year 2011

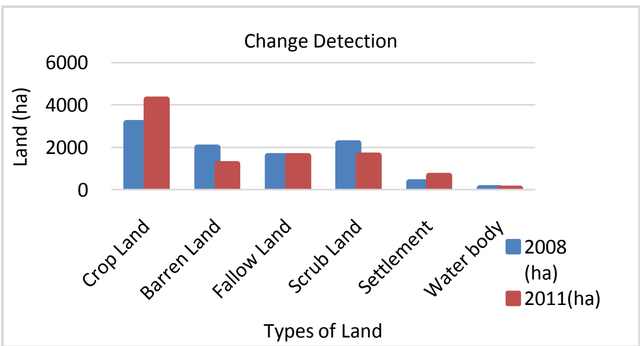

Fig.7. Change in LULC from the year 2008 to 2011

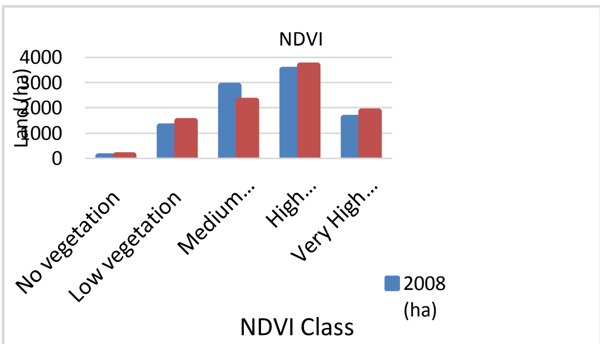

Fig.8. Vegetation cover pattern from the year 2008 to 2011

V. CONCLUSION

Geographical information system and remote sensing has ended up being intense and cost effective method for determining change detection and vegetation cover in the Charthana area of Parbhani district. The study revealed that the drastic increment within a short time span in the cropland from 3160.517 ha to 4254.97 ha and Settlement from 356.927 ha to 654.41ha possibly due to the expansion in the number of inhabitants in the range and expanded population needs. The depletion of water body from 78.072 ha to 53.91 ha indicates that there ought to be earnest need of water protection and water administration framework for long period accessibility of water. NDVI investigation of a watershed infers a general scope of the vegetation has been enhanced during the year 2011 as a contrast to the year 2008. This overall information of vegetation is very useful for measuring crop yield and provides firsthand information for agricultural practices. The best possible rule in regards to ideal land use is required for the watershed region where the management practices are being executed.

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