THINK INDIA JOURNAL

ISSN:0971-1260
Vol-22- Issue-35-December-2019

Land Use/ Land Cover Change Detection Analysis For Vemulawada Mandal Of Rajanna Sircilla District, Telangana State Using Geo-Spatial Technologies

Srinivas Elakurthi and **Praveen Raj Saxena**

Department of Applied Geochemistry, Osmania University, Hyderabad, Telangana

Abstract: Mapping land use/land cover changes at regional scales is essential for a wide range of applications like landslide, erosion, land planning, global warming etc. LU/LC alterations based especially on anthropogenic activities, negatively affect the patterns of climate, the patterns of natural hazard and socio-economic dynamics in global and local scale. Monitoring and analyzing the recent land cover/land use changes through the integration of remote sensing and GIS to detect change in land use and land cover pattern by providing more reliable direct quantitative information could also provide base information for documenting water salinity, soil change and expansion in surface lakes. Therefore, the present study is made to detect the land use/ land cover change between 2013 and 2017 for the Vemulawada mandal of Rajanna Sircilla District, Telangana using geo-spatial technologies. LISS-IV, IRS-2A data for the year 20013 and - 2017 have been used for extraction of thematic information on the land use/ land cover change detection analysis.

Keywords: Land use, Land cover, LISS-IV**,** Vemulawada.

1. Introduction

The word “land use” specifies how a piece of land is utilized, whereas land cover describes the materials present on the surface (Sabins, 1987)“Land cover” denotes the permanent features such as water bodies, rocky knobs and forest lands, etc. These are more or less permanent features. Within the land cover, often land use may take place. For example, agriculture and lumbering in forest area.

The overall objective of the image classification procedure is to automatically categorize the pixels in an image into land use/land cover classes. Normally, multispectral data are used to perform such a classification. The spectral pattern present within data for each pixel is used as the numerical basis for categorization (Lillesand, 1994). In this analysis, both digital and visual interpretations of land use/land cover have been carried out. The land use/land cover categories delineated from the study area are Built-up land, Deciduous Forest, Degraded forest, Water body, Agriculture land, Dry land and other, Plantations.

ISSN:0971-1260
Vol-22- Issue-35-December-2019

A sudden change in land use/land cover may be indicative of change in terrain character. The land use pattern and land management of an area reveal indirectly the conditions of the people of the area, their economic status and resources. The information for land use planning comprises of reliable, up-to-date and comprehensive data on physical, ecological and socio-economic framework of a region. National land use/land cover classification for India, which is fairly compatible with the user's needs, was developed by land use/land cover division under National Remote Sensing Agency (1989). The land use/land cover analysis have been delineated by the standard visual interpretation technique as suggested by NRSC.

2. Study area

The area under investigation lies between the $78^0909'$ to $78^0777'$ East Longitude and $18^0594'$ to 18^0 414' North Latitude. The area is located in in Rajanna Sircilla District (Fig. 1.1), Telangana. The study area Vemulawada Mandal falls in the Toposheet Nos. 56J/14and 56J/15. It is located 15 km towards the North from the district headquarters Rajanna Sircilla.

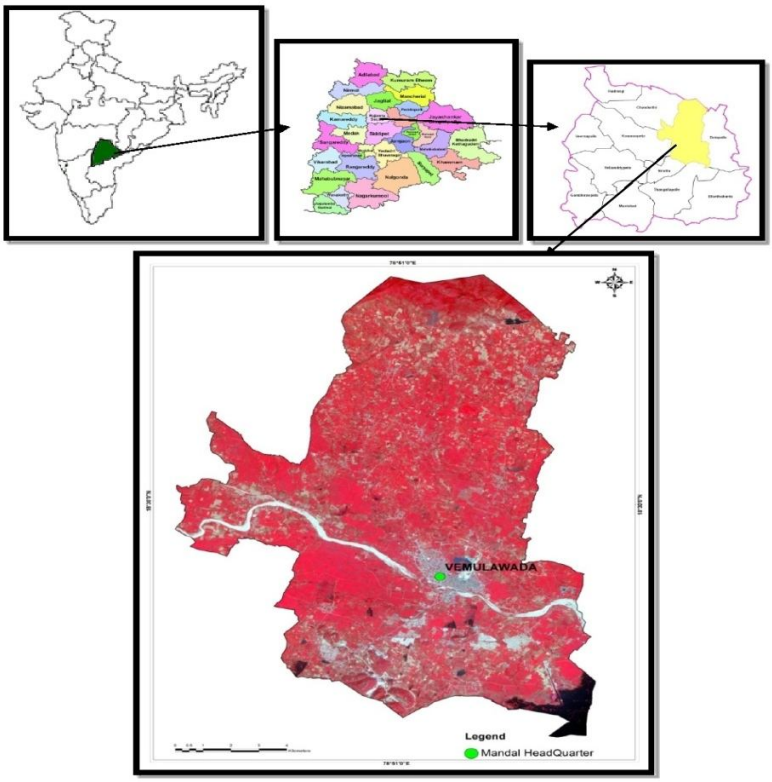


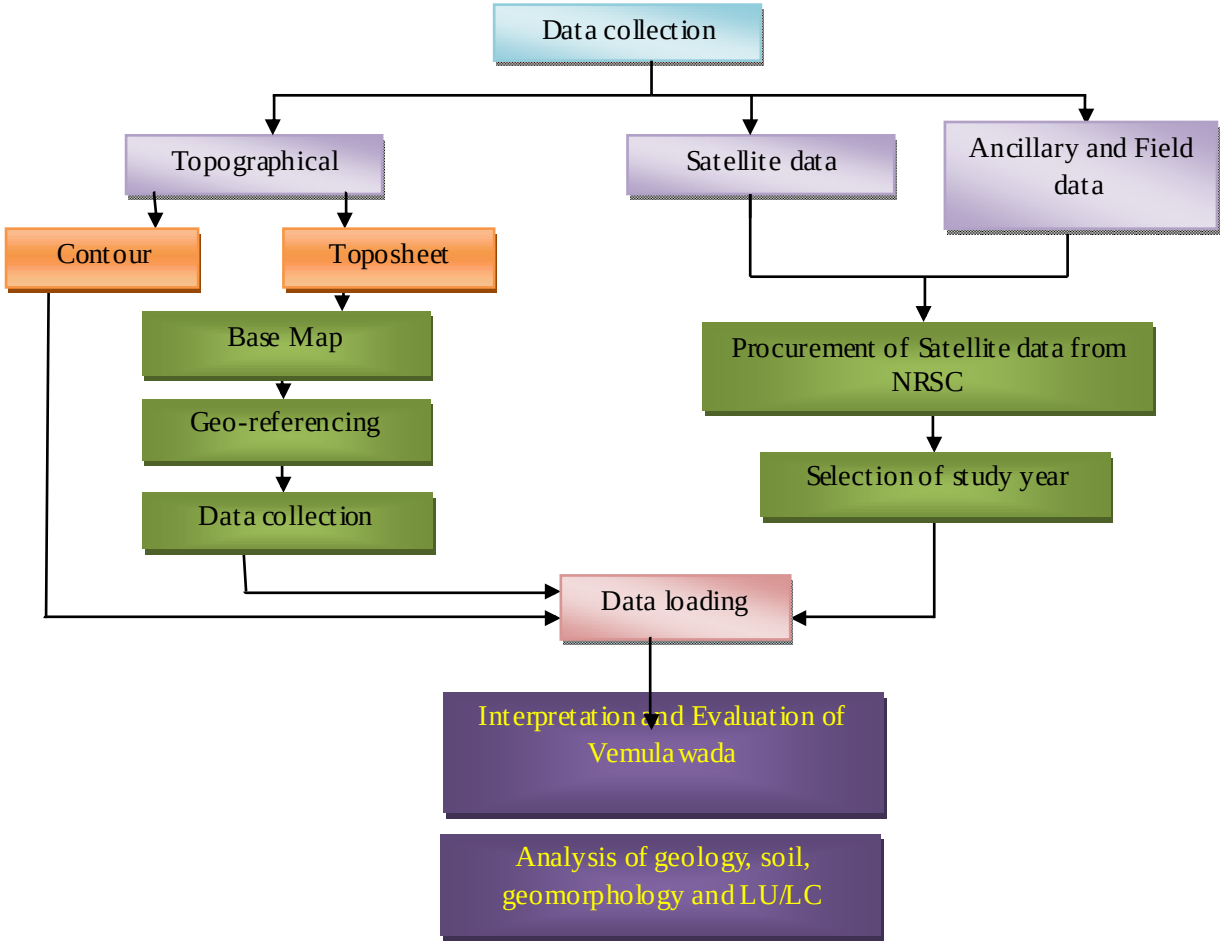
Fig. 1.1: Study area of Location map (as viewed on IR2A, LISS IV, 1st Nov, 2017)

ISSN:0971-1260
Vol-22- Issue-35-December-2019

3. Methodology

The base map of the study area is prepared by the Survey of India (SOI) topographic maps numbered56J/14and 56J/15 on 1:50,000 scale. Land use/ land cover maps were prepared by using LISS-IV data for 2013 year satellite imagery and 2018 year satellite imagery and verified through necessary field check. Two season satellite data were used in the preparation of land use/land cover; SRTM (90m spatial resolution) satellite data was downloaded to generate DEM of the study area. The spatial shifts of thematic maps have been slightly adjusted on the basis of satellite imagery. Different source data have been used to generate thematic layers in Erdas-Imagine-9.1 and ArcGIS-9.2 environment (Figure 2). Various land use/ land cover classes were delineated from both the images by means of visual interpretation methods to finally produce the land use/ land cover datasets and maps for the two references years. In order to properly ascertain the areas and magnitude of land use/ land cover change occurred between 2013 and 2017, a land use/ land cover change map was generated by combining both the land use/ land cover maps of the corresponding years.

Figure 2: Methodology (flow chart)



ISSN:0971-1260
Vol-22- Issue-35-December-2019

4. Results and Discussions

On the basis of the Land use/ land cover classification provided by NRSC, 1989 (Table 1), the change detection analysis is ultimately carried out and following results have turned out that are mentioned below.

Table 1: Land use/land covers classification (NRSC, 1989)

Level – I	**Level – II**
1. Built up land	1.1 Urban 1.2 Rural 1.3 Transport
2. Agricultural land	2.1 Crop land I. Irrigated, II. Un-irrigated 2.2 Fallow 2.3 Plantation 2.4 Shifting cultivation
3. Forest	3.1 Evergreen forest 3.2 Deciduous forest 3.3 Scrub/degraded forest 3.4 Forest plantation
4. Waste land	4.1 Salt affected land 4.2 Gullied or Ravenous land 4.3 Water logged and marshy land 4.4 Upland with or without scrub 4.5 Sandy area 4.6 Barren rocky land/stony waste
5. Water bodies	5.1 Rivers/Streams 5.2 Lakes/Reservoirs/Tanks 5.3 Canals
6. Others	6.1 Snow covered/Glacial area 6.2 Grassland/Grazing land 6.3 Derelict land due to mining and industrial waste

ISSN:0971-1260
Vol-22- Issue-35-December-2019

Supervised Classification:

The computer algorithm/ numerical descriptions of various land cover types present on classification is performed by the image analyst by choosingthe pixel categorization process by specifying signature points (Rao, 2002). Each pixel in the data set is then compared numerically to each category in the interpretation key and labeled with the name of the category it "looks most like" (Lillisand, 1994).The three basic steps involved in a typical supervised classification procedure are 1.Training stage 2.Classification stage and 3.Output stage (Greenways, 1987).

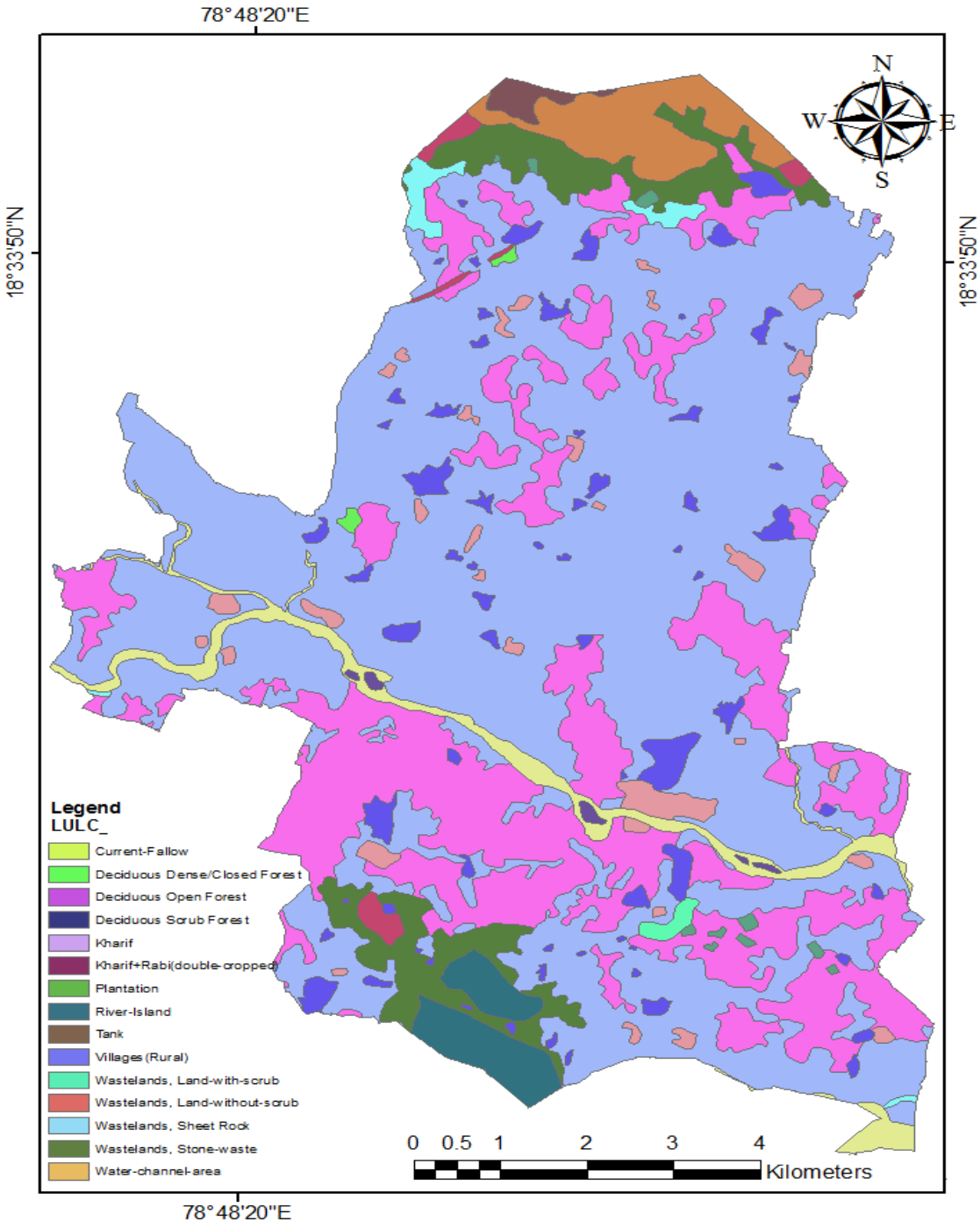
In the training stage the analyst identifies representative training site areas and develops a numerical description of the spectral attributes of each land cover type of interest in the scene.

In the classification stage, each pixel in the image dataset is categorized into the land cover class it most closely resembles. If the pixel is insufficiently similar to any training data set, it is usually labeled "unknown". The category label assigned to each pixel in this process is then recorded in the corresponding cell of an interpreted data set (an "output image"). Thus, the multidimensional image matrix is used to develop a corresponding matrix of interpreting land cover category types (Cambell, 1996).

After the entire data set has been categorized, the results are presented in the output stage. Being digital in character, the results may be used in a number of different ways. Three typical forms of output products are thematic maps, tables of full scene or sub scene area for the various land cover classes, and digital data files amenable to inclusion in a GIS. Supervised classification of land use/ land cover with the homogeneous training sites selected in signature editor and executed in an Erdas-9.2 environment have been assigned to obtain the output (Figure 3&4).

ISSN:0971-1260
Vol-22- Issue-35-December-2019

Land use/ land cover Mapping and Analysis for the year 2013 is as follows:



ISSN:0971-1260
Vol-22- Issue-35-December-2019

Figure 3: Land use/Land cover-2013

Land use/land cover Mapping and Analysis for the year 2017 is as follows:

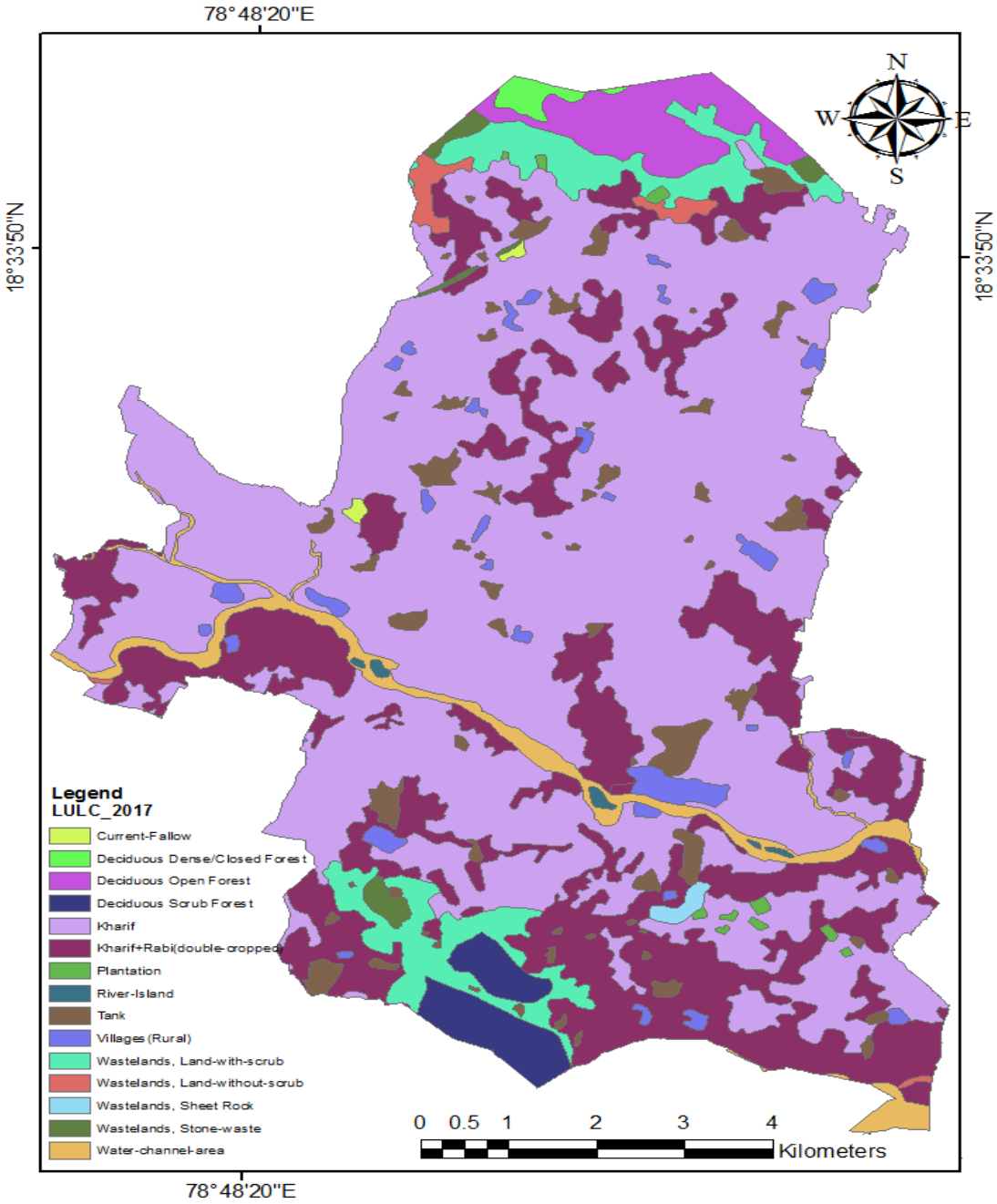


Figure 4: Land use/ Land cover-2017

ISSN:0971-1260
Vol-22- Issue-35-December-2019

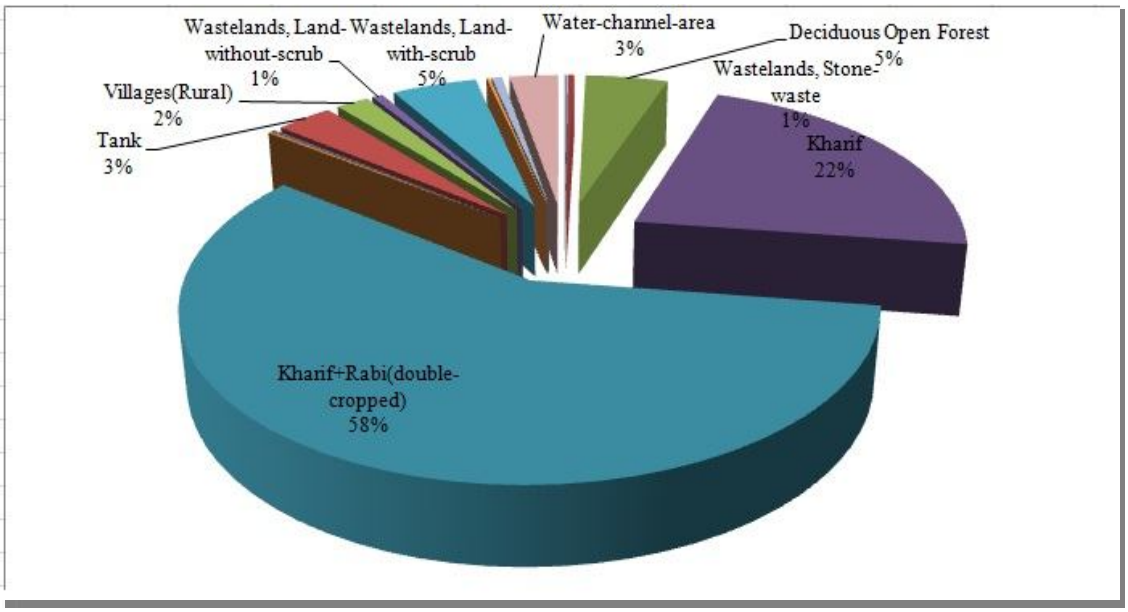


Fig 5: 2013 -Percent area of land use/land covers classes

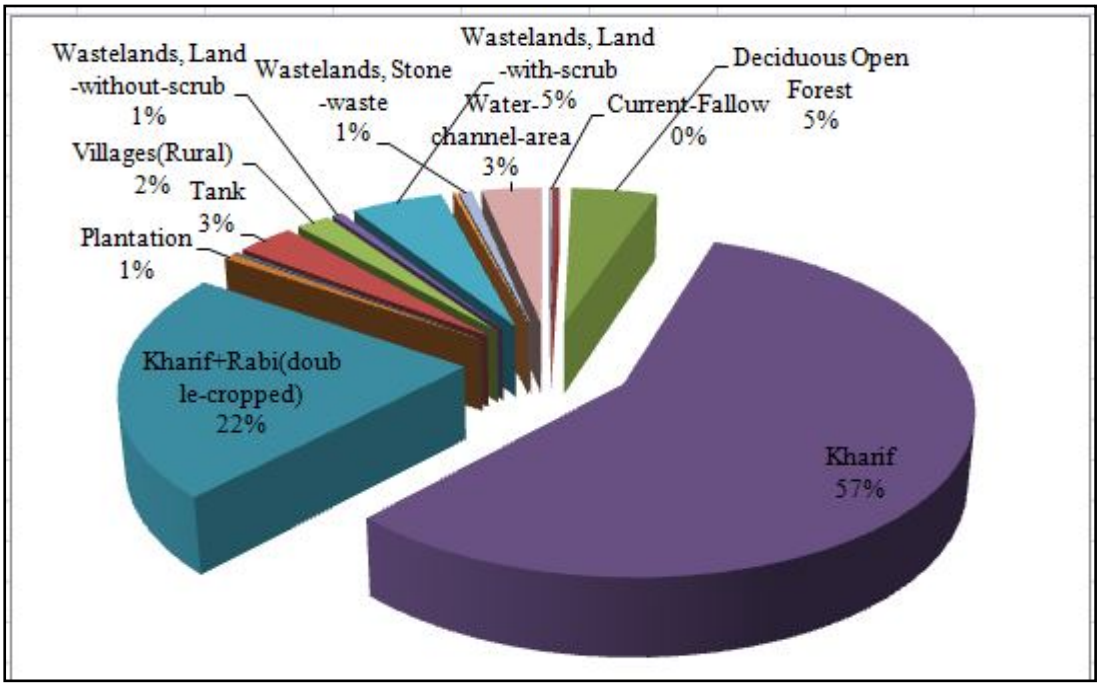


Fig 6: 2017-Percent area of land use/land covers classes

ISSN:0971-1260
Vol-22- Issue-35-December-2019

Land use/ land cover change pattern analysis during 2013 and 2017 years

Table 2: Observed land use/ land cover classes in the study area

Land use/ Land cover type	Area in sq.km 2013	Area in sq.km 2017	% of area 2013	% of area 2017
Current-Fallow	0.21	0.20	0.11	0.11
Deciduous Dense/Closed Forest	0.73	0.71	0.38	0.37
Deciduous Open Forest	8.98	8.96	4.72	4.71
Kharif	42.03	108.26	22.08	56.94
Kharif+Rabi(double-cropped)	110.73	42.21	58.16	22.20
Plantation	0.48	1.25	0.25	0.66
River-Island	0.29	0.29	0.15	0.15
Tank	6.02	6.80	3.24	3.17
Villages(Rural)	3.56	3.56	1.87	1.87
Wastelands, Land-without-scrub	1.19	1.09	0.63	0.57
Wastelands, Land-with-scrub	9.22	9.56	4.84	5.03
Wastelands, Sheet Rock	0.39	0.41	0.20	0.22
Wastelands, Stone-waste	1.13	1.39	0.59	0.73
Water-channel-area	5.29	6.26	2.78	3.29
Total Area	190.39	190.13	100	100

ISSN:0971-1260
Vol-22- Issue-35-December-2019

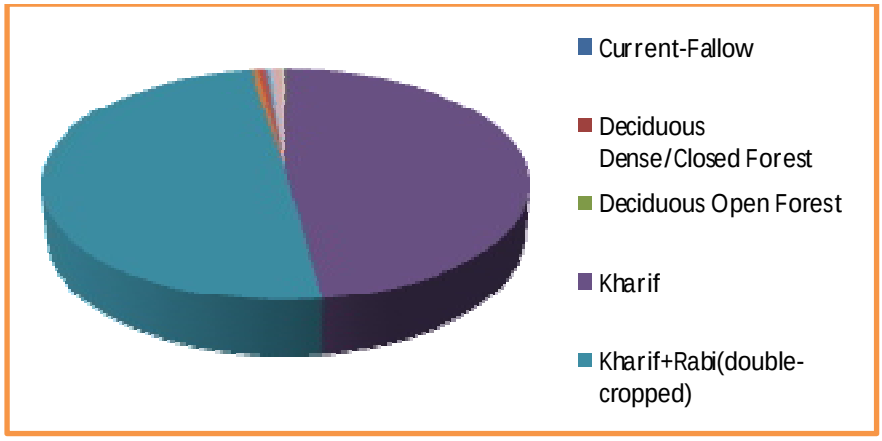


Figure 7: Change of land use/land cover classes from 2013 to 2017

a) **Built -up land:**

It is an area of human habitation developed due to non agricultural use and that has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands. In the study area, about 3.56 sq.km built-up area has been extracted. In this analysis, urban built-up land use includes residential colonies, industries, institutions and commercial areas, temples, etc.

b) **Agriculture:**

The outskirts of the study area are covered by agriculture area is 152 sq.km. Paddy is observed nearVemulawda rural,thettekunta, marupaka, Thimmajipet,mallaram, Marripally, and venkatam palle etc. vegetables are the major crop types near Chekkapally, Vattemla, villages.The crop appeared on the satellite image in light red tone with fine texture and the area is associated with canals/tanks and surface water bodies. It reflects that the area has very good water facility and also covered with nutrient rich soils.

Figure 9: Agriculture paddy at Vattimla

ISSN:0971-1260
Vol-22- Issue-35-December-2019

c**)Forest:**

The forest land includes deciduous forest, degraded forest; evergreen forest and forest plantation areas were identified which covers 1.92 sq.km. Degraded forest land has located in main hill ranges of Nookalamarri Hill

c) **Plantation:**

Plantation is developed along the sea coast in recent years in the study area. Most of the plantation has been identified in the ayyorupalle, sankepally in Easttem Part, Bollaram, lingampadu in South–West part and marupaka, Nookalamarri and Namaligundupalle in North part of the study area. Scrub/ Plantation is identified in some of the areas in the foothills of the kondapur hill range. The total area covered by plantation is nearly 1.25 sq.km. Avenue plantation in Bollaram

Conclusion

Remote Sensing and Geographical Information System (GIS) are well accepted and more dependable advance techniques to detect change in land use and land cover pattern by providing more reliable direct quantitative information. Land use/cover change detection for the years 2013 and 2017 .The study area is divided into ten sub-basins which were selected to evaluate the sediment delivery ratios at the basin. Initial analysis of ancillary spatial data sources gave insight for expected trends of development and land use/cover change, although they were not used for the assessment of change due to discrepancies in classification procedures used. The classification procedure used was able to distinguish eleven land use/cover classes with an overall accuracy of 86.49. Inadequacies in the accuracy results can be attributed to several factors, including, image quality, local climatic conditions, and assessment procedures. Overall changes in the landscape showed an increased trend for crop land (66.23%) in 2017.

References

1. Adinarayana, J. & Rama Krishna, N. (1995) An approach to land use planning in a hilly watershed using GIS. Land Degradation & Rehabilitation. Vol.6, pp.171-178.
2. Abd El hay Aly Farrag, El Sayed Ahmed El Sayed, and Hanaa Ahmed Megahed (2016), Land Use/Land Cover Change Detection and Classification using Remote Sensing and GIS Techniques: A Case Study at Siwa Oasis, Northwestern Desert of Egypt, International Journal of Advanced Remote Sensing and GIS, Volume 5, Issue 3, pp. 1649-1661
3. Bergsma, E. (1986). Aspects of mapping units in the rain erosion hazard catchment survey. Siderius W. ed. Wageningen (Netherlands), No.40. In: International Workshop on Land

ISSN:0971-1260
Vol-22- Issue-35-December-2019

Evaluation for Land-Use Planning and Conservation in Sloping Area. Enschede (Netherlands), Vol.17, No.21, pp: 84-104.

4. Chauhan, H.B., and Shailesh Nayak, (2005). Land use/Land cover changes near Hazira region, Gujrat using Remote Sensing Satellite Data. Jour. of the Indian Society of Remote Sensing, Vol.33, No.3, pp: 413- 420.
5. Dudal, R. (1987)., Agricultural Land Use in Space and Time. In: Land Transformation in Agriculture (ed).
6. Duguma Erasu (2017), Remote Sensing-Based Urban Land Use/Land Cover Change Detection and Monitoring, J Remote Sensing & GIS, Vol.6, No.:2, pp.1-5, DOI: 10.4172/2469-4134.1000196
7. Greenways, D.R., (1987). Vegetation and slope stability. In slope stability, edited by M. F. Anderson and K. S. Richards. Wiley and sons, New York.
8. Jensen, J.R. (1996). "Introductory digital processing": A remote sensing perspective (2n edition). Upper Saddle River, NJ: Prentice-Hall.
9. Joshi, P.K., Rawar, G.S., Padaliya, H. and Roy, P.S, (2005). Land use/land cover identification in an Alpine and arid region (Nubra Valley, Ladakh) using satellite remote sensing, Jour of the Indian Society of Remote Sensing, Vol.33, No.3, pp:371- 380.
10. Lillesand, T.M., and Kuefer, R.W. (1994). Remote Sensing and Image Interpretation. 3rd. ed. John Wiley & Sons, Inc., New York: 750.
11. Naik, D.R, Bosukonda, S. and Mrutyunjayareddy, K, (2011). Reservoir Impact Assessment on Land Use/Land Cover and Infrastructure-A Case Study on Polavaram Project, J. Indian Soc. Remote Sens, DOI 10.1007/s12524-011-0086-2:1-8.
12. Saini, K.M., 1999. Assessment of Degraded Lands of Puruliya District.West Bengal, Using Remotely Sensed Data, Journal of the Indian Society of Remote Sensing, Vol. 27, No.1, pp. 23-30.
13. Sarkar, (2006) Soil Resources Appraisal toward Land Use Planning Using Satellite Remote Sensing & GIS. Journal of the Indian Society of Remote Sensing, Vol.34, No. 3
14. Selçuk Reis (2008), Analyzing Land Use/Land Cover Changes Using Remote Sensing and GIS in Rize, North-East Turkey, Sensors, Vol.8, pp. 6188-6202; DOI: 10.3390/s8106188