Original Research Paper Environmental Science

LAND USE AND LAND COVER MAPPING BY USING GEOSPATIAL TECHNIQUES – A CASE STUDY OF YELDURTHY MANDAL, MEDAK DISTRICT, TELANGANA.

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ABSTRACT The present study analyzes the dynamics of land use / land cover using modern geospatial techniques of Remote Sensing and GIS Yeldurthy Mandal, Medak District, Telangana. The seasonal data of High-resolution satellite data from IRS-P6, LISS-IV –MX Resolution of 5.8m satellite has been used and data collected from field visits were used to analyze the dynamics of land use / land cover of the above area. Erdas and Arc-GIS Softwares were used for classification of land use/land cover. The land use / land cover system is developed based on topomaps and satellite imagery of two seasons (Kharif & Rabi). This classification is of Level-I and Level-II grouped into 6 types based on the classification system. The major land use is Kharif Crop 47.46 Sq.Kms (26.2%), Two Season Crop area 44.83 Sq.Kms (24.7%), Fallow Land 3.31 Sq.Kms (1.8%), Built Up 2.81 Sq.Kms(1.6%), Mine 0.51 Sq.Kms(0.3%), Forest Deciduous 7.41 Sq.Kms(4.1%), Scrub Forest 36.72 Sq.Kms(20.3%), Stony waste 2.29 Sq.Kms(1.3%), Scrub Land Dense 0.88 Sq.Kms (0.5%), Scrub land open 22.06 Sq.Kms(12.2%), Waterbodies 12.96 Sq.Kms(7.1%). The study helps in identifying land use and land cover classes, and the data can be used for future environmental monitoring studies.

KEYWORDS : Remote sensing, GIS, classification, vegetation type, water body, Agriculture.

1. INTRODUCTION

The remote sensing techniques are used to measure the land cover, from which land use can be inferred particularly with ancillary data or priority knowledge. Land use/cover studies are multidisciplinary in nature. In addition, facilitating sustainable management of the land, land cover and use information may be used for planning, monitoring and evaluation of development, industrial activity or reclamation. Detection of long term changes in land cover may reveal an idea for the shift in local or regional climatic conditions and analyzing the basis of terrestrial global monitoring. In order to improve the economic condition of the area without further deteriorating the ecosystem, every bit of the available land has to be used in the most rational way. For this type of mapping it requires the present and the past land use/land cover data of the area. The information on land use / land cover patterns, their spatial distribution and changes over a time scale are perquisite for making development plans. The study focuses on the effectiveness of the satellite data for land use/land cover study and describes the various land use and land cover categories of the study area. It is observed that the multi-temporal images (Seasonal data) play an important role in the classification of land use and land cover.

2. STUDY AREA

Yeldurthy is a large village located in Medak district, Telangana with total 1717 families residing. The Yeldurthy village has population of 7713 of which 3858 are males while 3855 are females as per Population Census 2011. This Mandal lies between 17o 46' 22" and 17o 32' 32" North Latitude, 77o 26' 42" and 77o 42' 36" East Longitude. Yeldurthy village has lower literacy rate compared to Telangana. In 2011, literacy rate of Yeldurthy village was 54.99 % compared to 67.02 % of Telangana. In Yeldurthy Male literacy stands at 66.95 % while female literacy rate was 43.17 %.

3. LOCATION MAP OF THE STUDY AREA:

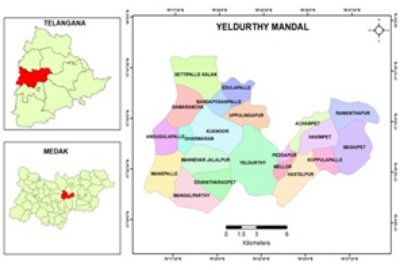

Fig.1: showing the Location map of the study area

4. CRITERIA FOR LAND USE / LAND COVER CLASSIFICATION

In the context of developing a new classification system, it is essential to consider certain criteria and limitations of satellite data and study area particularly to Indian conditions, as the classification system using satellite data should provide a framework to satisfy the needs of the majority of users. **For this certain guidelines and criteria for evaluation must be established.**

- Land use / land cover classification should be comprehensive, scientifically sound, practical and applicable over large areas.
- It should meet the needs of a variety of users.
- The classification should be flexible, which can be used at different scales and at different levels of detail.
- Land use / land cover categories should be described with the minimal set of classifiers (less the classifiers used in the definition, less the errors expected and less time and resources necessary for field validation).
- The classification should be amicable for use of multi-seasonal satellite data
- To decide on an appropriate classification or data level within a classification an arbitrary decision must be made. One must decide on imagery scale or on the scale of representation of data. Satellite data based on scales of 1:250,000; 1:50,000; 1:25,000; 1:10,000 and 1:5,000 will serve to represent Level-I; Level-II, Level-III, Level-IV and Level-V categories respectively.
- The minimum interpretation accuracy and reliability in the identification of land use / land cover categories from satellite data should be at least 85-95 per cent based on the scale of mapping.
- Due to certain limitations of satellite data, some of the similar categories may be generalized, for example forest and wooded land, can be put together under main head "Forest".

5. BASIC CONCEPT OF LAND USE / LAND COVER CLASSIFICA TION

Land use information has given nine "major ideas or concepts about land". These are

1. Location or the relation of a specific parcel of land to the poles, the equator, and the major ocean and land masses. There is also relationship between various tracts of land as well as political location.
2. Activity on the land; for what purpose is this piece of land or tract used.
3. Natural qualities of the land, including its surface and sub

surface characteristics and its vegetative cover.
4. Improvement on land. This is closely related to activity.
5. Intensity of land use or amount of activity per unit of area.
6. Land price, land market activity, and credit as applied to land.
7. Inter-relation in the use between different tracts of land.
8. Interaction between activities on the land and other economic and social activities.

6. METHODOLOGY:

Showing the methodology adopted for land use/land cover mapping. For analysis and interpretation two types of data are needed that is basic data and ground data.

6.1 Basic data includes:

- Satellite data
- Toposheets
- Local knowledge
- Area map on any scale to transfer details
- Reports and other literature of the study area

a. Ground data: Ground data is very much essential to verify and to increase the accuracy of the interpreted classes and also to minimize the field work.

b. Data analysis: For analysis and interpretation of satellite data, the study can be divided into three parts:

i. Preliminary work
ii. Field work
iii. Post field work

Preliminary work includes:

- To see the limitation of satellite data
- To lay down the criteria for land use classification to be adopted
- To fix the size of mapping units, which depends upon the scale
- Interpretation of different land use/land cover classes
- Demarcation of doubtful areas
- Preparation of field land use/land cover map

Field work:

- Type of ground data to be collected
- Selection of sample area for final classification
- Checking doubtful areas
- Change in land use/ land cover due to wrong identification, fresh development, nomenclature.
- General verification

Post field work:

- Reinterpretation and analysis or correction of doubtful areas
- Transfer of details on base map
- Marginal information

Preparation of final land use/land cover map

7. RESULTS

7.1 Base map

Base Map is prepared by using Survey of India topographic maps on 1:25,000 scale. All the settlements, road network, water bodies and forest areas are taken into consideration. By comparing the Survey of India topographic maps with that of the satellite image the size of all the settlements are increased and updated. The aerial extent of the study area is 181.24 sq.kms. Distance from district head quarter is 36 Km.

7.2 Drainage

All the water bodies are divided into dry and wet areas. These wet (water spread) areas changes from time to time and some new tanks are found in the satellite images. For this reason, the drainage map is updated from the satellite. The drainage system existing is Dendritic Drainage pattern.

7.3 Transport map

In the study area all the settlements are connected either by Metalled road or Un-Metalled road and National Highway -5 is passing through this study area. The image shows.

7.4 Landuse/Land cover Map

The land use/land cover categories such as built-up land, agriculture, forest, water body and wastelands have been identified and mapped from the study area. Major part of the study area is covered with single crop and double crop (24%). About (1.6%) of the study area is under built-up land . From the satellite data the agriculture area (26%) could be clearly delineated as, single crop, double crop, vegetation and plantations. Though single crop and double crop has been observed at various parts of the study area and plantations are observed at some places of the study area (8%).Scrub Forest covers (20%), Water bodies occupied (7%). Under this category land with scrub (12%), land without scrub (0.5%) Based on the land use/land cover categories, infiltration rates of water are less at built-up land areas. Consequently groundwater potentials at these places are low, whereas the places where water bodies are present have high potentials and moderate potential at remaining categories (John R Jensen) Present land use/land cover map showing the spatial distribution of various categories and their aerial extent for the present study. The spatial distributions of various land uses are interpreted based IRS-P6, LISS III-MX (Resolution 5.8m) data. (Fig.2&3)

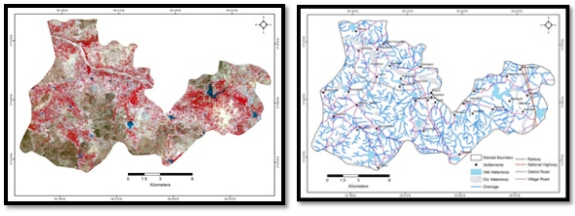

Fig 2: Showing, Satellite Image, Base, LU/LC

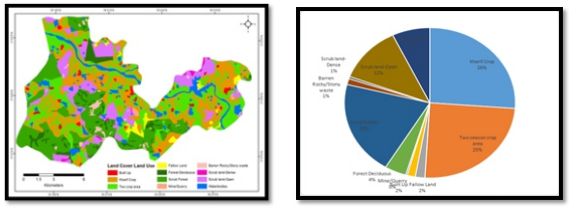

Fig 3: Showing the Pie Chart of LU/LC

Table 1:. Area Estimates of Different Land Use and Land Cover Features

Land Use / Land Cover	Area in sq.km	% area
Kharif Crop	47.46	26.2
Two season crop area	44.83	24.7
Fallow Land	3.31	1.8
Built Up	2.81	1.6
Mine/Quarry	0.51	0.3
Forest Deciduous	7.41	4.1
Scrub Forest	36.72	20.3
Barren Rocky/Stony waste	2.29	1.3
Scrub land-Dense	0.88	0.5
Scrub land-Open	22.06	12.2
Water bodies	12.96	7.1
Total	181.24	100

5. Conclusion

This research paper has demonstrates the ability of GIS and Remote Sensing in capturing spatial-temporal data. Attempt was made to capture as accurate as possible on high scale, Classifying land use land cover, and developed the common legend for land use land cover mapping. The results of the above case study indicate that there has been change in land use/land cover. Spatial information

on the pattern of LU/LC at large scale is great importance for proper planning and management.

Recent advances in satellite sensor spectral, spatial and radiometric capabilities have strengthened the operational scenario of remote sensed based land use / land cover change information at village and mandal level which is important for modelling the environmental changes. Hence high resolution satellite data has been used in this case study for land use land cover mapping at Micro level with pie-charts for better understanding for land use changes.

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