ASSESSMENT OF CHANGES IN AGRICULTURAL AREA IN THE VICINITY OF MVSR ENGINEERING COLLEGE, NADERGUL, HYDERABAD USING GEOMATICS- A CASE STUDY

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Abstract: Industrialization and development activities around the rural areas are leading to drastic changes in the agricultural areas in the villages. Study of these changes and better management of resources is the need of the hour for sustainable development. Landscape dynamics can be easily studied by Digital change detection techniques by using multi-temporal satellite imagery. The present study illustrates the changes occurred in the agricultural sector in Nadergul Village due to establishment of Industries and Educational Institutions using Geospatial techniques. High resolution Satellite imageries of two different time periods, i.e., 2003 and 2019 were acquired and the changes in the Nadergul area over a period of 16 years are found out. Detailed mapping of agricultural fields, settlements, Roads has been performed to and identified the changes between two different time periods. The results indicate that during the period under consideration, there is considerable decrease in the agricultural area and good increase in settlements. The Field study also revealed that though there is increase in settlements, but the area is still not developed with basic amenities such as drinking water facility to public, sewerage systems and lack of proper water recharge facilties.The paper emphasizes how modern geospatial techniques could be effectively used to detect the Land Use Land Cover changes within short span of time and suggest necessary measures.

Index Terms **- Digital Change Detection techniques, Agriculture, Remote Sensing, GIS.**

I. INTRODUCTION

LULC are two different terms which are often used interchangeably [3].Land cover represents the physical characteristics of earth's surface, such as vegetation, water, soil and settlements etc. Land use refers to the way in which land is being used by humans for day to day economic activities. Various Natural and socio-economic factors and their utilization in time and space govern the land use/cover pattern of a given region. Planning and implementation of new land use schemes to meet the increasing societal needs the information on present land use land cover. It also aids in studying the dynamics of land use in todays changing scenarios due to increasing population and urbanization.

Land use and Land cover are interdependent. Change in Land cover affects Land Use and vice versa. Changes in Land Use patterns caused by various social causes affects biodiversity, water and radiation budgets, trace gas emissions and other processes that come together to affect climate and biosphere[13]. Land use/cover change detection is very much required for better understanding of landscape dynamics during a known period of time for having sustainable management. Changes in natural phenomena and anthropogenic activities are causing a wide spread changes in land use/cover, which in turn drive changes that would impact natural ecosystem[14] .Understanding landscape patterns, impact of changes and interactions between human activities and natural phenomenon are very much essential for proper land management and decision making. Today, earth resource satellites data are very applicable and useful for land use/cover change detection studies [16] [1].

With the invent of Remote Sensing and Geographical Information System (GIS) techniques, land use/cover mapping has given a useful and detailed way to improve the selection of areas for various activities such as agricultural, urban and/or industrial areas of a region. Use of remote sensing data along with GIS which helps for data updates, data retrieval and analysis made it possible to study the changes in land use land cover with better accuracy in very less time, and at low cost.[2][7]. High spatial resolution satellite imagery and advanced image processing and GIS techniques, has resulted in a much better monitoring and modeling of land use/land cover patterns. Remote-sensing has been widely used in updating land use/cover maps and land use/cover mapping has become one of the most important applications of remote sensing [8][17][18]

Google Earth images provide valuable and continuous records of the earth's surface during the last few years. The entire Google archive is now available free-of-charge to the scientific public, which provides wealth of information for studying and monitoring changes in manmade and physical environments. The importance of pre-processing (i.e., data selection, co-registration,

radiometric calibration and normalization) in performing accurate and reliable change detection analysis is acknowledged by many studies. [5][9][10][15][4].

An attempt is made in this study to map out the status of agricultural area and settlements of one of the development blocks of the Telangana state, viz., Nadergul region to detect the land consumption rate and the changes that has taken place during the last sixteen years using geospatial techniques.

II. STUDY AREA

Nadergul is a part of Badangpet Nagar Panchayat in Ranga Reddy district of Telangana state, India and Located 20 km away from Hyderabad. It comes under the jurisdiction of Hyderabad Airport Development Authority. This area is majorly composed of waste lands and agricultural lands. Paddy, Cotton, Maize and Groundnuts are majorly grown in this area. The study area is primarily surrounded by Educational Institutions, Multinational Companies and Research Centers. It is located at an elevation of 505m above mean sea level. Nadergul geographically lies between $17^0$15' N to $17^0$20' N latitudes and $78^0$30' E to $78^0$35' E longitudes. The average temperature is 26.7^0 C. It experiences an annual average rainfall of 766mm.The total population of the study area is 24,861.

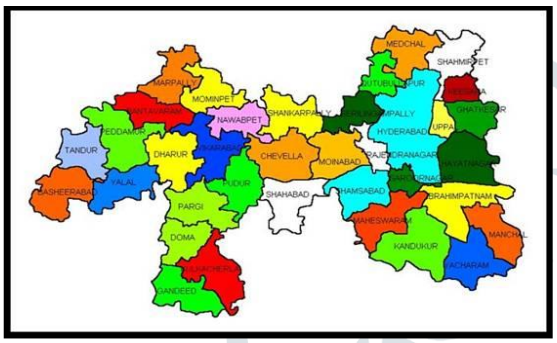

Fig 1. Mandal Boundary of Rangareddy

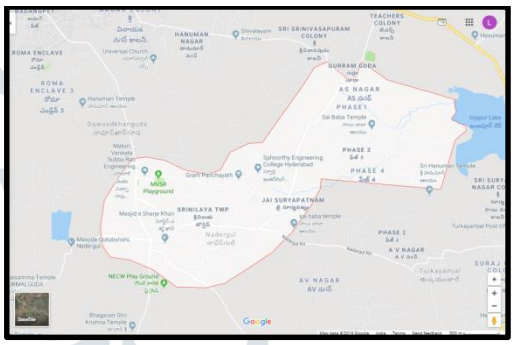

Fig 2. Google Map of Study Area

III. METHODOLOGY

The following Data and methodology has been adopted in executing the work.

1. Data Sources:

Spatial data such as satellite images are taken from Google Earth of 2003 and 2019 years Survey of India topographic map is also used for the cross verification and georeferencing.

Fig 3. Google Earth image of study area in 2003

Fig 4. Google Earth image of study area in 2019

2. Georeferencing Procedure:

The Survey of India map and Google Earth Images are inserted in the ARC MAP 10.0. Four control points are identified and marked them on satellite imagery respectively. After fixing the control points, georeferencing are done using rectify option available in georeferencing toolbar.

3. Digitization of layers:

After georeferencing the image, it is then added to AUTO CAD MAP. The digitization of agricultural lands, roads and settlements is done in different layers. After digitization is done, all the layers were removed of duplicates, dangle errors and topology is created. These are done with the help of different commands available in AUTOCAD.

4. Conversion to Shape file:

The different layers created in AUTOCAD are converted into shape file for further processing using Map Export command available in AUTOCAD.

5. Calculating Areas:

After creation of shape files, with the help of ARCGIS, the areas are calculated by means of

1. Open attribute table.
2. Calculating the Geometry.

With these we are able to calculate the areas of 2003 to 2019.

6.Preparation of layout maps:

After calculating the areas, layout maps are made using Arc Map.

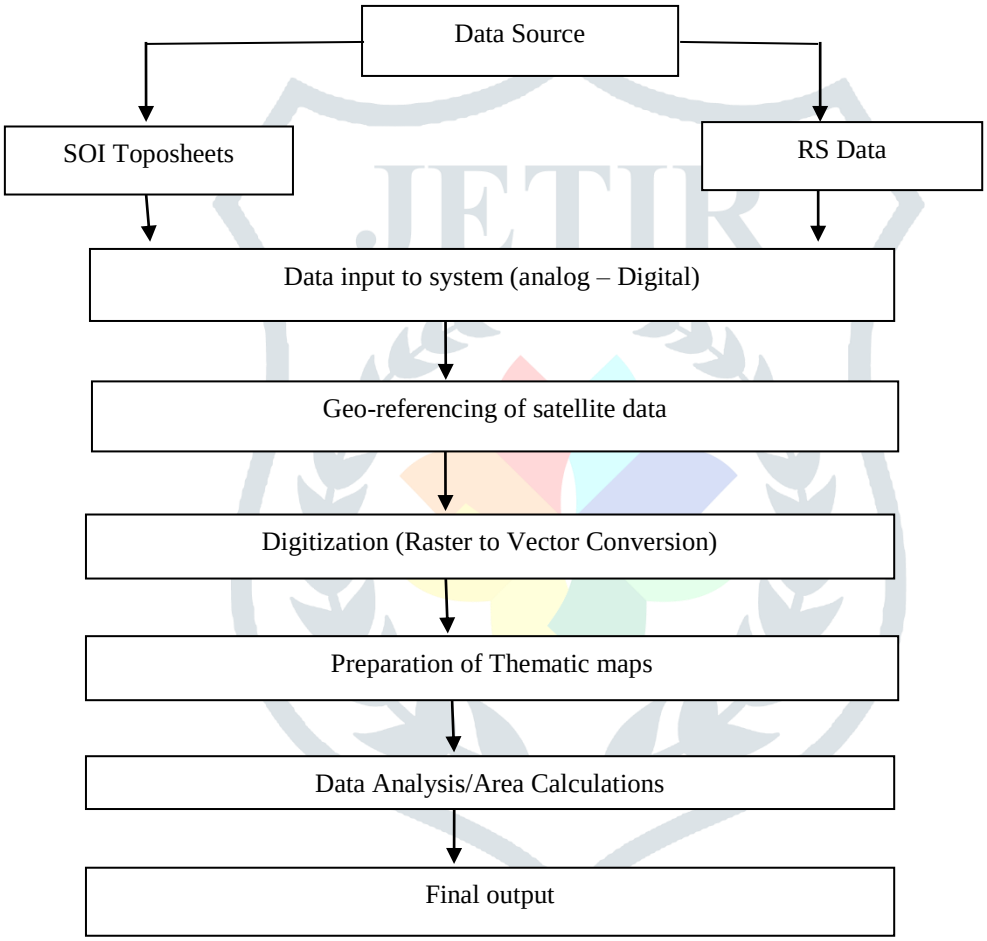

Fig 5. Flow chart showing the Methodology followed for LULC change Detection

IV. RESULTS AND DISCUSSIONS

The area is covered with waste lands and agricultural lands to large extent. But day by day the waste lands and agricultural fields are converted to built up areas like settlements, roads etc. According to SOI District map of the year 1975 most of the land area is agriculture but as time passed, there is a huge decrease in the agricultural area and drastic increase in settlements.

The results are being displayed below:

Agricultural area has decreased to 63 hectares in 2019 from 129 hectares in 2003.
Area occupied by settlements has increased to 131 hectares in 2019 from 64 hectares in 2003.

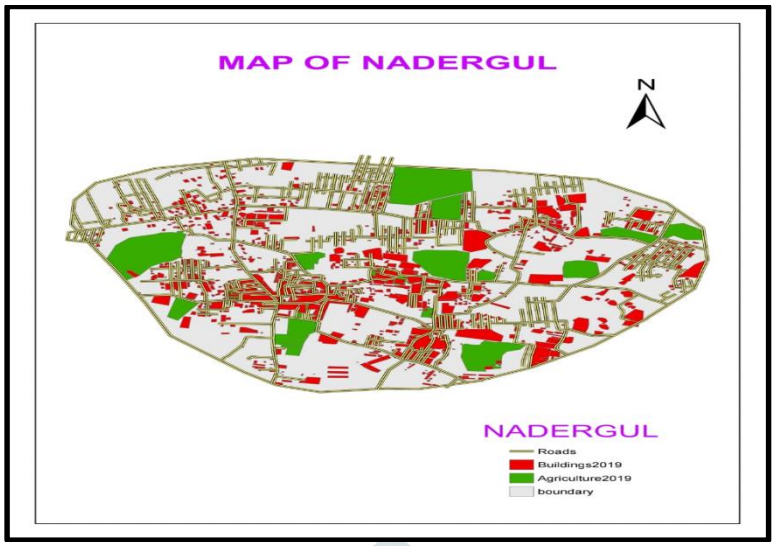

Fig 6: Map of Nadergul

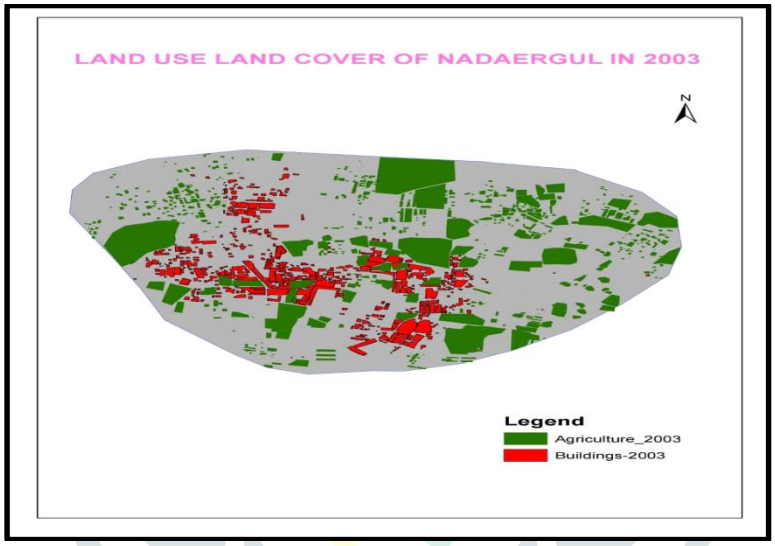

Fig 7: LULC Map of Nadergul in 2003

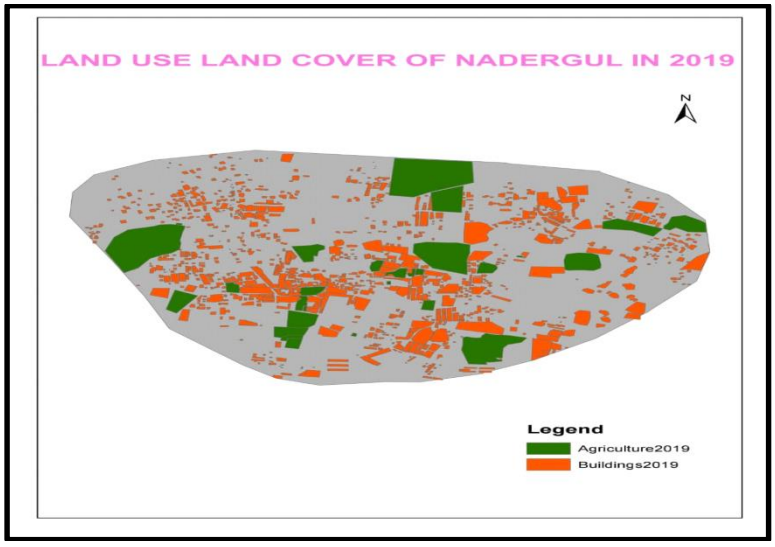

Fig 8: LULC map of Nadergul in 2019

COMPARISON OF AREAS

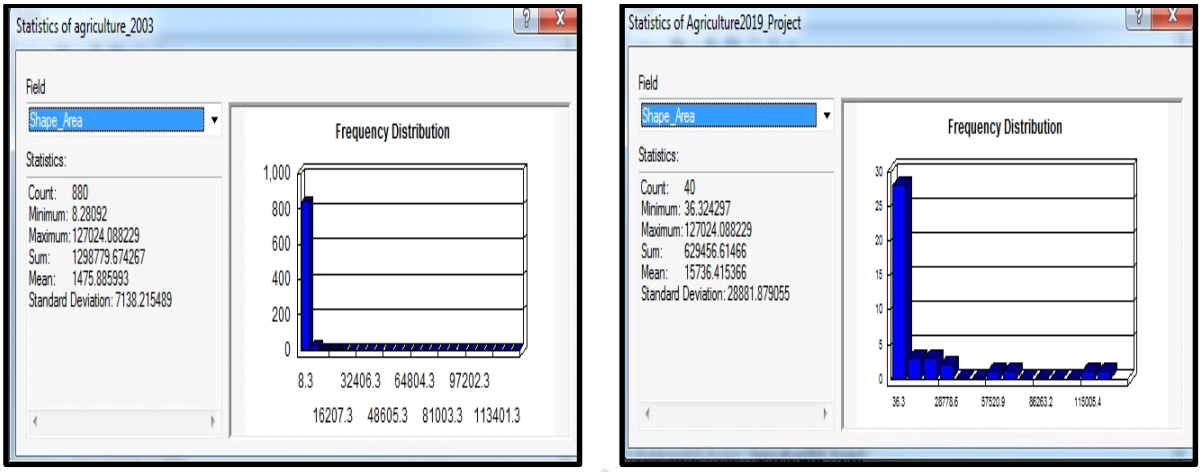

Fig 9: Figure showing statistics of Agricultural Area in 2003 & 2019

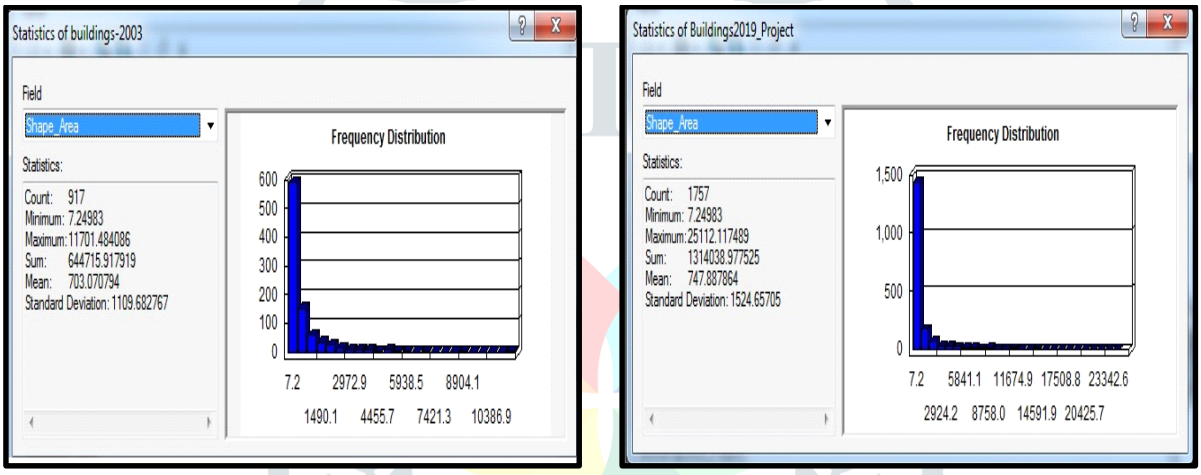

Fig 10: Figure showing statistics of Settlements/Buildings Area in 2003& 2019

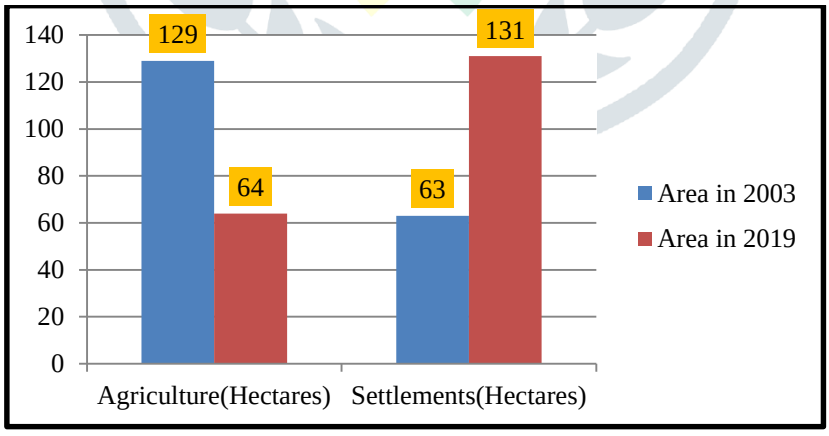

Fig 11: Chart showing the comparison of Areas

V. CONCLUSION

The study conducted in one of the developing regions of Telangana state of India advocates that multi temporal satellite imagery plays a vital role in quantifying spatial and temporal phenomena which is otherwise very tedious through conventional mapping. The study reveals that the major land use was agriculture in 2003 but it is decreasing drastically due to increasing urbanization and development activities. The area under agriculture decreased by 50% whereas Settlements increased by 48% which is highly alarming because Nadergul was contributing to vegetable needs of Hyderabad city. Further decrease in agricultural area will have a big impact on daily needs of Hyderabad. The filed visit taken as part of this exercise clearly shows that most of the remaining agricultural areas are also being converted in to Settlements due to high real estate demand and lowering ground water

table levels.

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