International Journal of Engineering Research
Volume No.7, Issue No.1, pp : 6-9
ISSN:2319-6890 (online),2347-5013(print)
1 Jan. 2018

"DEM Based Topographic Survey of Vaijapur Taluka using RS and GIS"

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Abstract: Vaijapur is one of taluka comes in Auranagabad district in Marathawada region also suffering from the same problem of irrigation and agricultural productivity. Study area is located in Vaijapur taluka, Aurangabad district in Maharashtra, India. State and situated at the latitude of 19°40' to 20°15' north and longitude of 74°35' to 75°00' east covering an area of approximately 1510.5 sq. km and fall in Survey of India Toposheet No. 46 L/16 and having population 311371 as per 2011 Census. Vaijapur is located 514m (1,666 ft) above sea level on the western margin of the Deccan plateau. The objective of the work is to study and to prepare various map like land use land cover, types of soil, contour, aspect, hill shade etc. using GIS and give the suggestions of sustainable development of agriculture in Vaijapur. The software use for the work is ArcGIS 10.3 which is developed by ESRI. The average annual rainfall in that region is approximately 634 mm by this rainfall amount of water collected within the taluka boundary was 974490 million litres From the study of land use land cover map it was found that the ratio of barren land to agricultural land is unity and area contributed by water bodies is negligibly small (0.102% of total area). Barren land is 798.82 km², agricultural/vegetation is 730.50km², water bodies is 1.580 km² and residential 6.131 km². About eight types of soil are found in Vaijapur taluka and type second and seventh have dominant area extent. From study of geology it is showed that only two types of rocks are found in the area. First is basalt and second is alluvial but basalt rock formation is major. Basalt area is 1525.948921 km², alluvial area is 4.100 km².

Keywords: GIS, LULC, Water Bodies, Arc GIS, ESRI

I. INTRODUCTION

Vaijapur is one of taluka comes in Auranagabad district in Marathawada region also suffering from the same problem of irrigation and agricultural productivity. Annual average rainfall in the Vaijapur taluka is approximately 634 mm. Study area is situated in the marathwada region which also faces draught after four to five consecutive years.

Arc GIS is a geographic information system developed by Environmental Systems Research Institute (ESRI), for working with maps and geographic information. It is used for creating and using maps, compiling geographic data analyzing mapped information sharing and discovering geographic information, using maps and geographic information in a range of applications and managing geographic information in a database. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the web.

Anil Z. Chitade[II] explained the use of remote sensing (RS), Global positioning system (GPS), and GIS technology for the detection of LULC changes. In this work LULC changes have been detected using remotely sensed images during the period from 1990 to 2010, using Landsat-TM image of year 1990 and Cartosat-I image of year 2010. The above images were rectified and georeferenced using GPS data collected by point positioning mode observations. Ground truthing for the LULC classification accuracy assessment has been done using GPS instrument. Image analysis operations have been carried out using Erdas Imagine software. Various effects of coal mining activities on the Land use have been highlighted.

S.S. Nalwade and P.A. Hangargekar[XI] carryout study based on water budgeting in a village Golegaon which is situated in Marathwada region (M.S.), India. They had used remote sensing and ArcGIS for the study and finding out water requirement in the village.

Sagar Mali, et at[X] find out the pattern of utilities and which reason is responsible for lack of utilities and with the help of Remote Sensing, GPS and GIS to suggest a solution and how to manage utilities for the increasing population. The satellite data and Survey of India (SOI) toposheets were used to map the utilities of Pune Municipal Corporation (PMC). Ward wise population and data like Ambulance, Blood Bank, Education Sector, Hospital, and road network data were collected and analyzed in order to identify areas high amenities and areas lacking in amenities. Urban growth has transformed most of the agricultural land of PMC into industrial, commercial and residential area.

Objectives: The main objective of study was to prepare Dem based topographic maps as 1) Aspect Map, 4) Contour Map, 2) Hill shade Map 5) Drainage Map, 3) Slope Map, 6) Geological Map using ArcGIS

II. STUDY AREA:

ISSN:2319-6890 (online),2347-5013(print)
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Vaijapur taluka, located in the heart of the drought-prone interior of Maharashtra State and situated at the latitude of 19°40' to 20°15' north and longitude of 74°35' to 75°00' east covering an area of approximately 1510.5 sq. km and fall in Survey of India Toposheet No. 46 L/16 and having population 3,11,371 as per 2011 Census. Also the Sex Ratio of Urban areas in Vaijapur Taluka is 944 while that of rural areas is 935. The total literacy rate of Vaijapur Taluka is 76.36%.

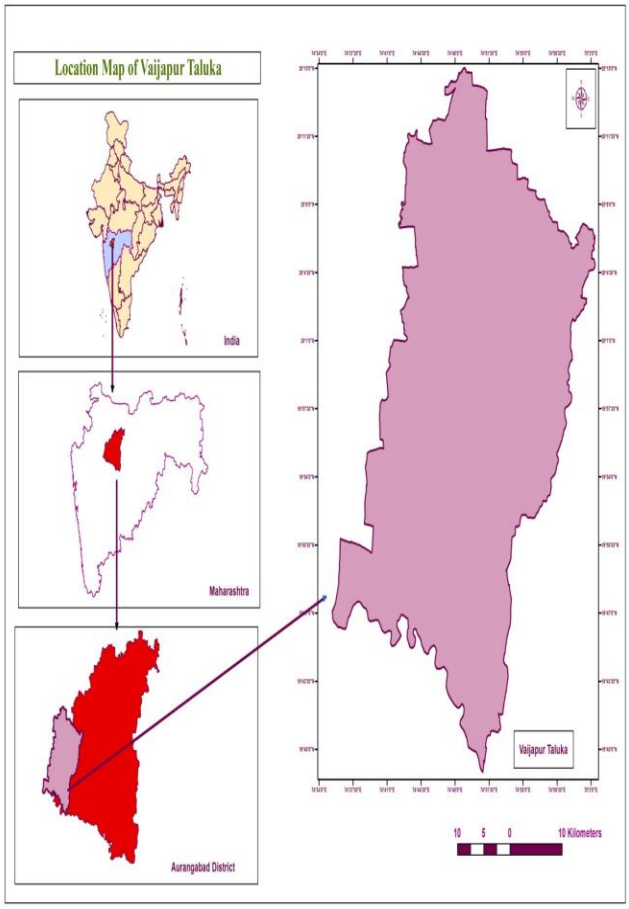

Fig. No.1: Location map of Vaijapur taluka.

III. MATERIALS AND METHODOLOGY:

Data collection:

1. LANDSAT satellite data of 30m spatial resolution of year 2017 has been downloaded from USGS Earth Explorer website : (http://earthexplorer.usgs.gov/)
2. DEM model was downloaded from USGS Earth Explorer official website of NASA operations: (https://gdex.cr.usgs.gov/gdex/)
3. Toposheets of scale 1:50,000 were acquired from: (www.lib.utexas.edu/maps/ams/india)

Methodology: The study was carried out using standard process of Arc GIS. The above listed maps are prepared using slandered process of Arc GIS.

IV. RESULTS AND DISCUSSION

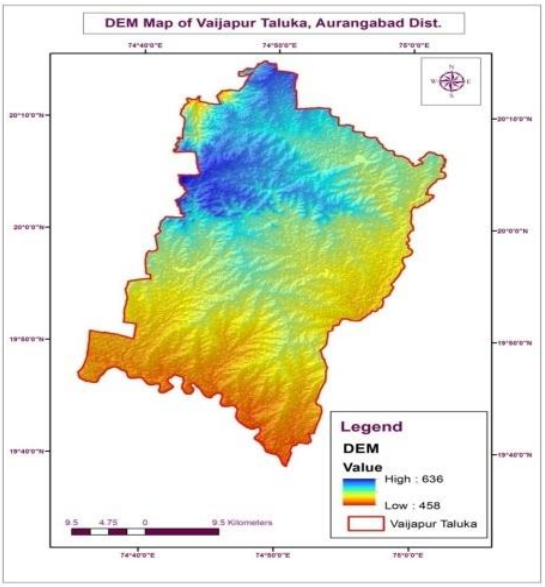

Fig. No. 2: Variation of total annual rainfall year-wise

A digital elevation model (DEM) is a digital model or 3D representation of a terrain's surface. Lowest elevation found – 458 highest elevation found – 636.

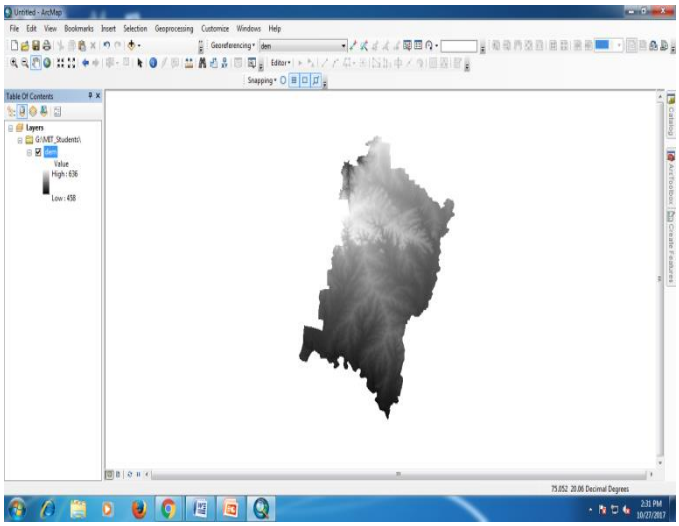

Fig. No. 3: Base map of Vaijapur

From fig. No. 7 it is concluded that the highest contour line is 630 m and lowest contour line is 460 m from the mean sea level. The average contour line which goes through the Vaijapur is 530 m. So from the fig. No. 7 is is concluded that the slope of the Vaijapur is towards south direction so in the south direction of Vaijapur the conservation practices can be done. Highest contour is in the north direction so water flows from the

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north to south direction. As per the fig.No. Outlet point of the Vaijapur may be at South end of the Vaijapur.

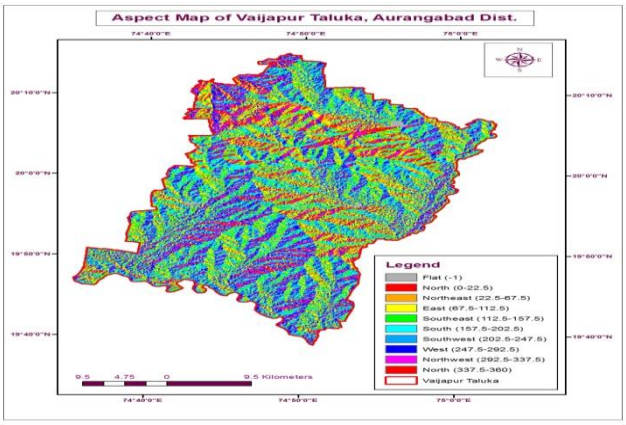

Fig. No. 4: Aspect map of Vaijapur

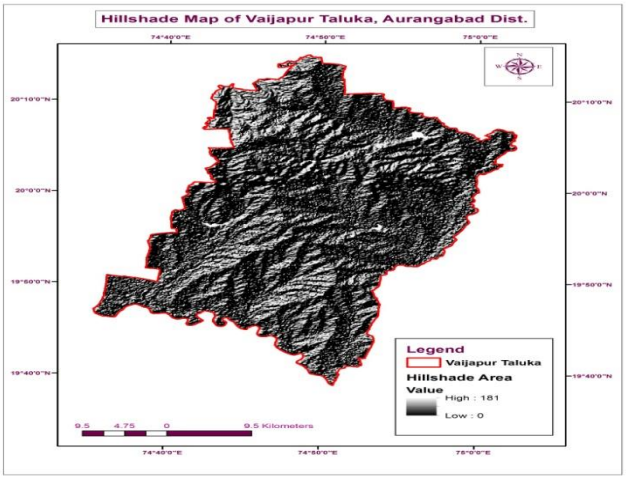

Fig.No. 5: Hillshade map of Vaijapur

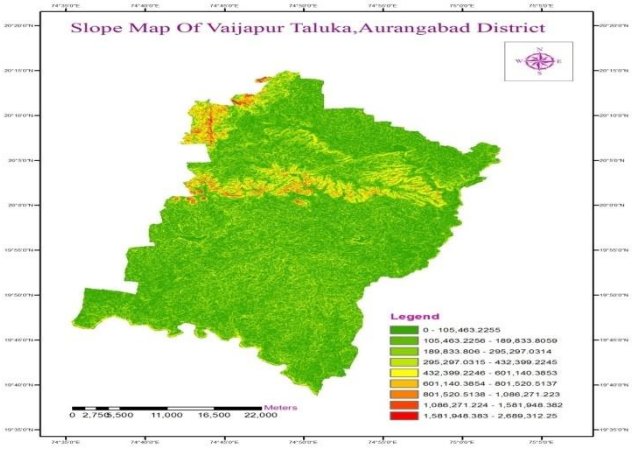

Fig. No. 6: Slop map of Vaijapur

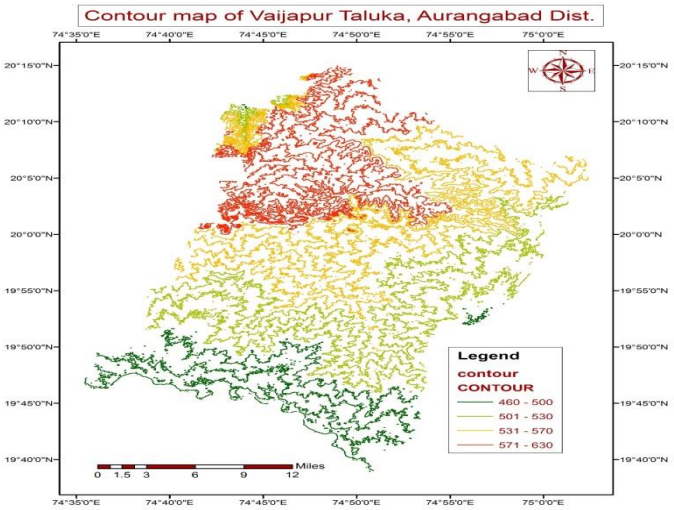

Fig. No. 7: Contour map of Vaijapur

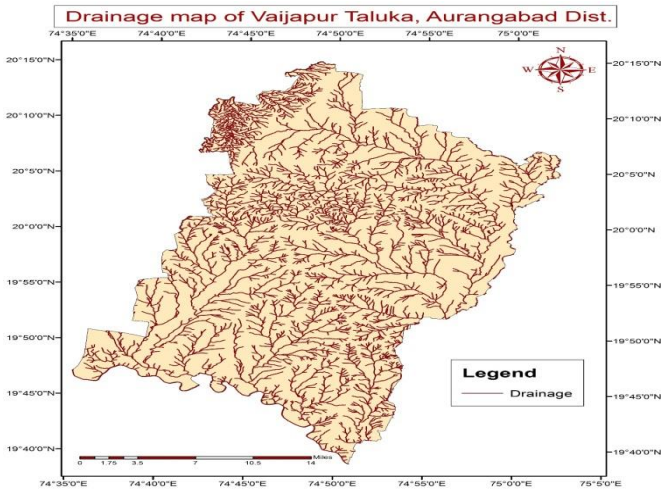

Fig. No. 8: Drainage map of Vaijapur

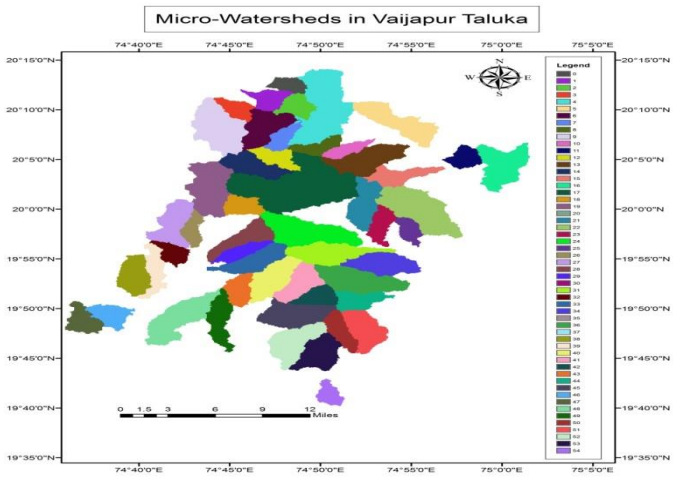

Fig. No. 9: Micro Watershed In Vaijapur.

From fig. No. 8 the total drainage length obsereved in Vaijapur is 2744.8 km, drainage density: 1.78, and from fig. No. 9: the total no. of micro watershed observed is 55 and total area under micro watersheds covered by these micro watersheds is 1041.06 km²

V. SUGGESTIONS:

As we concluded from the results that the water bodies area in the taluka is nearly negligible. Thus, citing the drought conditions the main attention should be to increase the ground water recharge. This can be achieve by construction and maintenance of new and present water conservation structures like bandharas, check dams, gabions, cct, seepage basins etc on the drainage lines in southern part of the taluka which falls under negligible to gentle slopping land.

VI. CONCLUSION:

From the study and the result obtained in the DEM based topographic map it is concluded that the drainage intensity observed was 1.78 and 55 micro WS's having total area of 1051 km. sq. Highest elevation point in Vaijapur is 630 m above MSL and lowest elevation point 460 m above MSL.

The slope is North-South direction so it is beneficial to construct dam or water conservation structure at south of the Vaijapur so that maximum water will be collected.

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