Digital Agriculture Mapping using GIS at Village Level Case Study: Varvandi, Nashik

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Abstract— Role of rural and urban planning &management in Maharashtra is becoming more and more crucial due to the dramatic increase in rural and urban population and allied both areas problems. Ruralization contributes many advantages in terms of economic, butit uncontrolled, would produce negative consequence to the physical, social, & natural environment, with advancement of RS & GIS which considerably influenced the dynamic nature of rural as well as urban regional planning. Remote sensing & GIS becomes imperative for better and improved design making in rural as well as urban regional planning .It offers a solution to the rural problems and decision - making, which is more reliant to the real time spatial modeling. The integration of remote sensing and geographical information system (GIS) has provided a tool, which can contribute to much clear understanding of real planning problems as well as prescriptive planning scenario to enhance the quality of rural planning and management.

Key words: Geographical Information System, Remote Sensing, QGIS, Rural Management and GPS

I. Introduction

Remote Sensing & Geographical Information System (GIS) is the backbone for rural and urban planning and management. Essentially it seeks to integrate a large range of spatial and non-spatial information with respect to topography & other spatial information including-urban services, infrastructure and socio-economic information.Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with object and thus in contrast to on-site observations. Remote sensing is used in numerous fields, including geography, land surveying & most earth science disciplines. (For example. Hydrology, Ecology, Glaciology, and Geology) it also has military, intelligence, commercial, economic, planning humanitarian applications.

A Geographic Information System (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. The acronym GIS is sometimes used for geographic information science (GIScience) to refer to the academic discipline that studies geographic information systems and is a large domain within the broader academic discipline of Geoinfomatics. What goes beyond a GIS is a spatial data infrastructure, a concept that has no such restrictive boundaries.

The major challenges we face in the real world today is overpopulation, pollution, deforestation, natural disasters which have a critical geographic dimensions and also have a geographical component. Geographical decision support system (Geo-DSS) is demanding field, since enormous amount of spatial data have been collected in various applications, ranging from remote sensing to GIS, computer cartography, environmental assessment and planning. Although some efforts were made to combine spatial decision support system but mostly researchers are using a spatial database for popular data mining approach. GIS will give you the power to create maps, integrate information, visualize scenarios, solve complicated problems, present powerful ideas and develop effective solutions like never before so that it supports strategic decision making. With GIS application we can open digital maps on computer, create new spatial information to add a map, create printed maps customized to our needs and perform spatial analysis on it. There is a great deal of geographic data available in formats that cannot be immediately integrated with other GIS data. In order to use these types of data in GIS it is necessary to align it with existing geographically referenced data. This process is also called Georeferencing. Georeferencing is a necessary step in the digitizing process. Digitizing in GIS is the process of "tracing", in a geographically correct way, information from images/maps.

II. Objective

- To collect field survey data of Agriculture.
- To georeference and digitalize cadastral map.
- GIS mapping of field survey data.
- To do Agriculture data and Resources

III. Study area

Fig. 1: Varvandi study area seen from Google Earth Pro

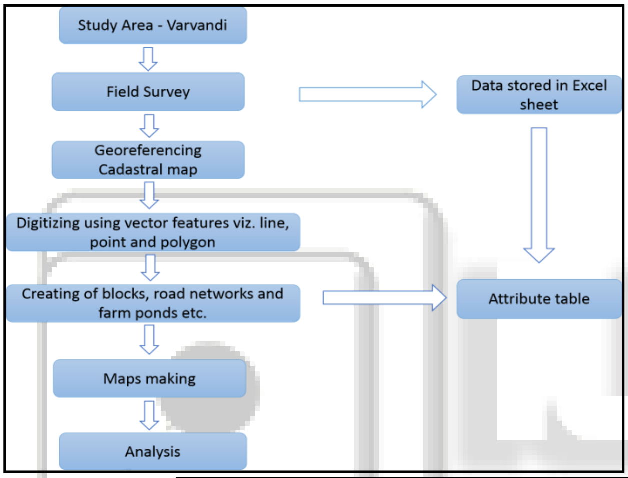
Varvandi village is selected for the present study which is situated in Dindori tehsil of Nasik district of Maharashtra. It is 7 km away from Nasik on the way of Ambegaon. Varvandi village is located between 20° 4'35.37"N latitude and 73°49'54.13"E longitude. Total study area is 102 ha of Varvandi village. Total population of the village is 1248 out of which 648 are males while 600 females. The major crops grown in Varvandi region are Grapes, Wheat, Jowar, Bajara, Groundnut, etc. The major portion of this area is by medium black soil. During field survey in selected study area, there we met 92 farmers of village for getting different information from them. We asked them about their cropping pattern, irrigation sources, crop classification, market, last year crop, soil texture, side business, etc.

A. *Materials & Software used*

For the digitization of study area, the software used was QGIS 2.18.17. And Google Earth Pro. The data was collected in the field survey which is used in map making. Cadastral map of Varvandi village was obtained by Talathi Office Ambegaon.

1) *Software*
   1) QGIS
   2) Google Earth Pro

IV. METHODOLOGY



The methodology implied in this project mainly focuses on the digitization of selected study area using QGIS 2.18.18 software. The methodology also involved Georeferencing of cadastral map of Varvandi village and also making of various maps. Above figure represents the overall flowchart of methodology.

This methodology is divided in following two sections:

1) Field survey work
2) Work on QGIS software.

A. *Field Survey Work*

After getting farmers name, their farm area and block numbers from Talathi Office Ambegaon, we made questionnaire for field survey to ask farmers. We asked them about their farm area, which major crops they produce, their irrigation source to field, previous 2 years crops, their production, market rate, market where they sold, current crop with stage, soil pH, soil texture and side business. We also took latitude and longitude of each and every farm which is present in our study area. During survey we collected all useful information from them and filled it in Google excel sheet. We took 8 GPS points at different locations in our study area for Georeferencing.

B. *Work on QGIS Software*

For the Georeferencing, we scanned the cadastral map and took it into QGIS software. Using Google satellite image, we made Georeferencing using a raster tool named as `Georeferencer`.

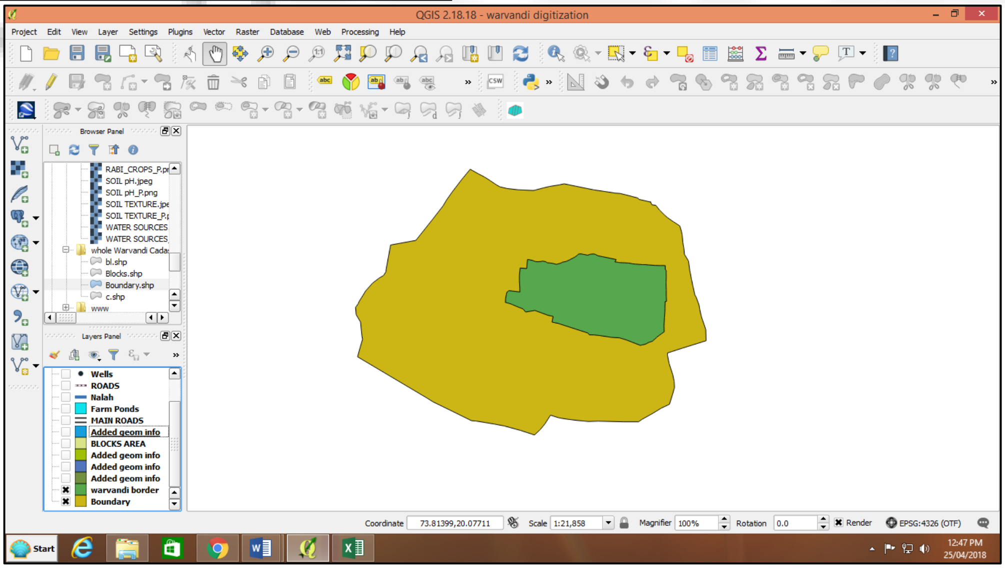


Fig. 1: Study area shape file

V. RESULT & DISCUSSION

After digitizing the study area of Varvandi village on the basis of field survey. Different maps are made on basis of information got in field survey. From the following maps results is analyzed.

- Varvandi - Block wise distribution
- Crop classification with growth stage
- Rabi crops
- Kharif crops
- Soil texture
- Soil pH
- Water sources

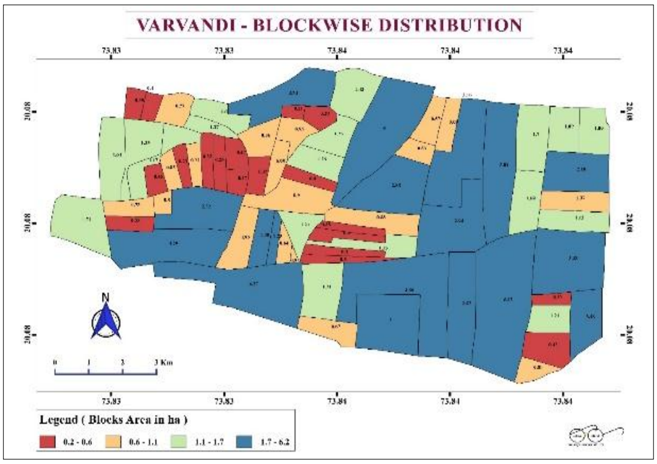


Fig. 4: Blok wise distribution

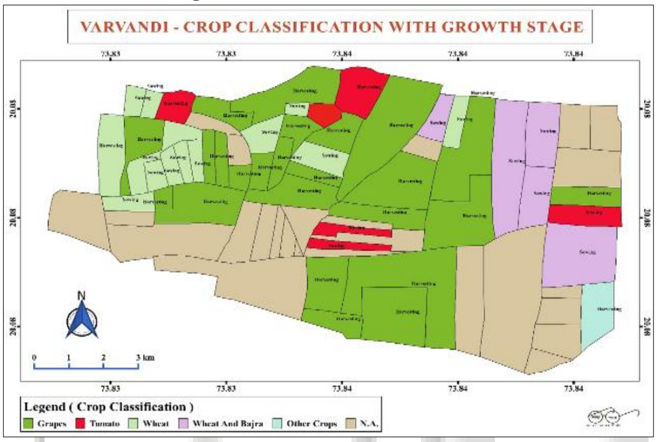


Fig. 5: Crop classifications with growth stage

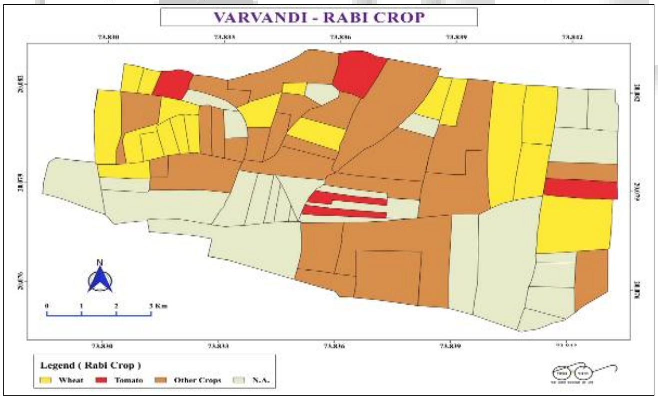


Fig. 6: Rabi crop

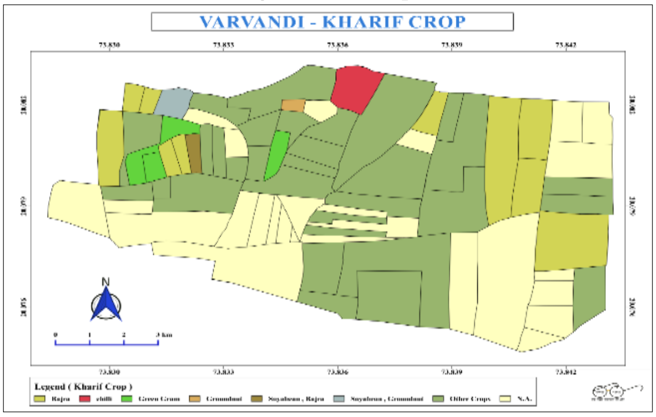


Fig. 7: Kharif crop

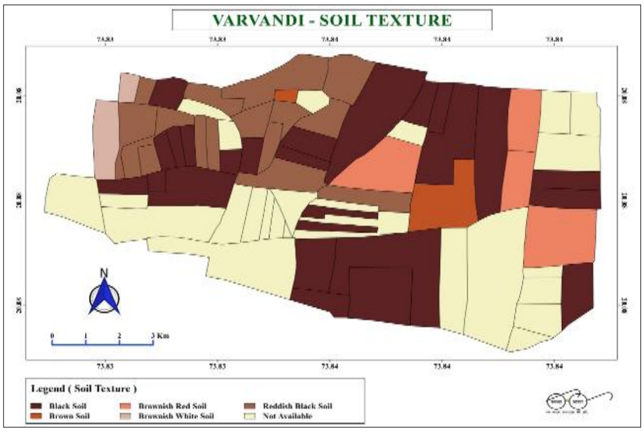


Fig. 8: Soil texture

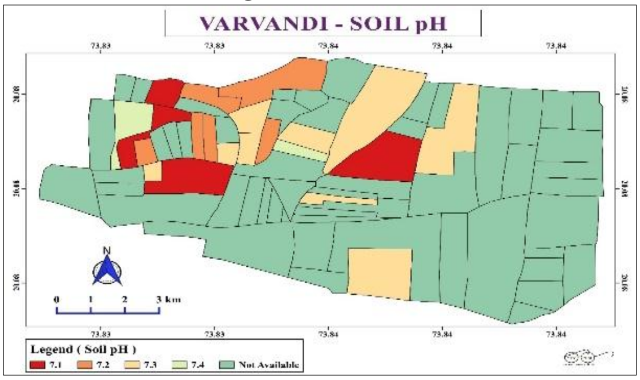


Fig. 9: Soil pH

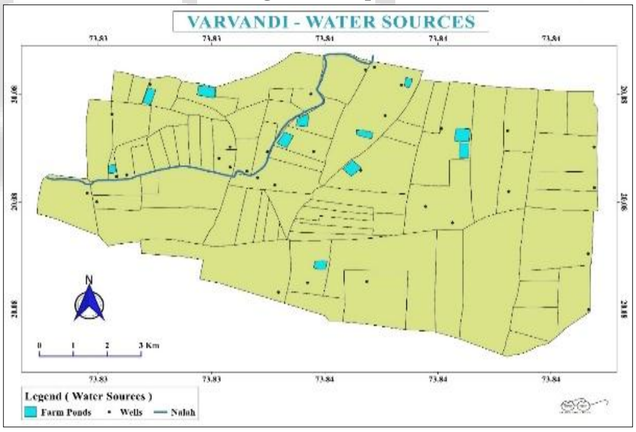


Fig. 10: Water sources

VI. CONCLUSION

Due to availability of maps and digital database, one can easily understand scenario of village or information of the village.

As we have made maps like crop classification, Kharif and Rabi crops map, water sources map, Soil texture and soil pH map etc. With the help of these maps one can easily get information of various crops which were taken in Varvandi village.

One can come know that which water sources are available in the village.

Anyone can easily find the soil texture of Varvandi village using the map.

As we can in future any project establish his proper area will select use of map.

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REFERENCE

[1] M.V.K. Sivakumar and Donald E. Hinsman, *Satellite remote sensing and gis applications in agricultural meteo-rology and wmo satellite activities,* Satellite Remote Sensing and GIS Applications in Agricultural Meteorology, 2000, pp. 1-21
[2] G.V.Padma, P.Venkata Ramireddy, Ch. Tata Babu, *A Geospatial Frame Work For Mapping Of Approximate Cadastral Sub Divisions In Joniganuru Village, Santhipuram Mandal, Chittoor District, Andhra Pradesh - An Initiative* © International Journal of Engineering Sciences & Research Technology [Padma, 4(7): July, 2015]
[3] S.K.Bhan, S.K. Saha, L.M. Pande, *Use of Remote Sensing and GIS Technology in sustainableAgricultural Management and Development*,International conference on Remote Sensing andGIS (ICORG-94), Hyderabad.
[4] PushpakTeredesai, UjwalaZope,*GIS for agricultural land*,International Research Journal of Engineering and Technology (IRJET),Volume: 02 Issue: 07 | Oct-2015
[5] M.G.S.M. ZaffarSadiq , A. Ravindran,*GIS for rural administration*,International Research Journal of Engineering and Technology (IRJET),Volume: 02 Issue: 07 | Nov-2016
[6] Dr. J R Patil, Vihang V. Waghmare,*Application of GIS in Planning of Facilitate Infrastructure*,International Journal of Advance Research in Computer Science and Management Studies,Volume 3, Issue 5, May 2015