International Journal of Future Generation Communication and Networking
Vol. 13, No. 4, (2020), pp. 3137–3144

Agricultural area mapping for Bhuvanahalli Village

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Abstract

Land suitability evaluation is an important step to detect the environmental limit in sustainable land use planning. In this work assessment of land performances for the specific use that is crop production is carried out. In the present study, a land suitability evaluation for a different crops has been carried out through GIS mappings for soil erosion and salinity in the soil, area for different crops and waste land identification. The parameters are selected for this works are soil texture, organic matter content, soil depth, slope and land use/land cover. Area of different crops growth is to be taken and measured areas of various crops like Ginger, Rose and papaya. The extension area which is indentified and shown in the study area mapping also included. Agricultural activities such as various crop classification and, crop condition, crop growth, crop area and estimation of yield, soil characteristics and precision of farming the land. Referred information from remotely sensed images, geographic information system data's are required for mapping.

Keywords: *Land use/land cover change (LULCC), Remote sensing (RS), Geographic information system (GIS), Bhuvanahalli area,*

Introduction

Evaluation of land is an important step in the process of land use planning where resources are limited. Evaluation of area of the land determines whether the requirements of land use areadequately met by the properties of the land. Hence, the objective of land suitability potential evaluation is to predict the inherent capability of land in order to support the specific land use for long periods of time without deterioration. In semi arid and arid dry lands, soil and water conservation practices are followed on a watershed basis, as the watersheds are referred to as basic hydrological units. Integrated management of land and water resources in a watershed requires suitable plans after evaluating the resource potential of the watershed. The land units in the study area of this project demarcated through its properties, position and usage, have their own potentials and limitations. It is possible to grade land units according to their qualities. Few approaches of evaluation of land have been

ISSN: 2233-7857 IJFGCN

reffered, and each has a specific methodological procedure. The qualitative systems are empirical assessment systems and are based on the knowledge and understanding of the area

Literature Review

Bogdan Rosca,et.al presented in the paper “Soil Survey and Mapping using QGIS in the specific methodological context of Romania” The purpose of this paper is to describe the use of QGIS as tool for soil survey and mapping and to analyze the efficiency of Open Source tools in this paper. By integrating data from various sources (GPS points, analog and digital maps, analytical soil data, etc), continuing with editing and spatial analysis and finishing with map production, we have used QGIS mehods in every stage of the soil survey and mapping process following, will be possible to adopt standard procedures specified by methodology.

Shahab Fazal et.al “Urban expansion and loss of agricultural land – a GIS based study of Saharanpur City, India.” This paper uses remote sensing (aerial photographs and satellite images) combined with land checks and field surveys to measure the loss of agricultural land to urban expansion in Saharanpur City between 1988 and 1998. It shows how such techniques allow a detailed mapping of land use changes and includes details of the location of the agricultural land losses, the nature of the land use changes that caused these and the quality of the agricultural land that was lost.

Haris H. Khan et.al.. in this journal paper “GIS-based impact assessment of land-use changes on groundwater quality study from a rapidly urbanizing region of South India is discussed.” In this work attempts to assess the influence of changing land-use patterns on the groundwater quality of the hard rock aquifer system in the Maheshwaram watershed, near Hyderabad, India is shown. The study area in this work is a rapidly urbanizing region with land development progressing at a fast rate. To study the impact of this rapid urbanization and overall land-use patterens was prepared within a geographical information system (GIS) and also a groundwater quality index (GQI).

ALGhaliya Nasser Mohammed Al-Rubkhi , Talal AL-Awadhi , Mohammed ALBarawani - “Land Use Change Analysis and Modeling Using Open Source (QGIS)”.Issues of land use/land cover changes and the direct or indirect relationships of these changes have drawn much attention in recent years. This research work and paper is an attempt to examine the use of QGIS Open source software integrated with GIS techniques to evaluate, and analyze LULC change between the selected periods to project the future of LULC and also detection of the system using QGIS is used.

Objectives

- The prime objective of this study is the preparation of land use (LU) maps.
- GIS mapping and measuring the soil property, and salt present in the soil.
- Assessment of crop production of the area.

Methodology

Total area of land considered for our project is eleven and four tenths hectare out of which three hectares of land is used for the cultivation of the three types of roses, two and nine tenths is used for the cultivation of Ginger and three and two tenth of the land is used for Papaya cultivation. The total area of land being cultivated is nine and one tenth hectares, therefore two and a three tenth hectares of land is available for expansion. The land was originally purchased at Rupees 4000-5000 per acre, a few decades ago. The current value of the total land is 10 crores. There are three bore wells used for the purpose of irrigation. These bore wells are of varying depths. The deepest bore well used in that area is 780 feet deep, the second deepest is 650 feet and the shallowest is 100 feet in depth.
Rose cultivation : Three varieties of roses cultivated in the land are
a. Paneer Rose
b. Merleau Rose
c. Rosa Charisma

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Each rose plant is being cultivated for an area of one hectare, which makes up to the total land of 3 hectares for roses. These roses need to be watered at an interval of 6 days by drip irrigation. The water is being pumped from bore wells. The life cycle of the rose plants are 5- 10 years. Initial crop growth requires 2-3 months.

We planted our own crops. We chose to cultivate Radish as it requires less time to grow. Radishes are a fast-growing, annual, cool-season crop. The seed germinates in three to four days in moist conditions with soil temperatures between 65 and 85 °F (18 and 29 °C). Best quality roots are obtained under moderate day lengths with air temperatures in the range 50 to 65 °F (10 to 18 °C). Under average conditions, the crop matures in 3 to 4 weeks, but in colder weather, 6 to 7 weeks may be required.

All the crops in our selected land are watered by the drip irrigation method. Drip Irrigation is a type of irrigation system that has the ability to save water and nutrients by allowing water slowly to the roots of plants, either from above the soil surface or below the surface of the soil. The goal is to minimize evaporation and place water directly into the root zone. Drip irrigation systems supplies water through a valves, pipes, tubing, and emitters. Depending on how easily designed, maintained, and operated and also installed. A drip irrigation system is more efficient than other types of irrigation systems because it saves water, such as surface irrigation or sprinkler irrigation. Drip irrigation is used in farms, commercial greenhouses, and residential gardens.

Red soil is used for the cultivation of the crops in our selected land. Soil is the mixture of rock fragments and organic materials that spreads over the surface of the earth. Parent material, climate, time, and biodiversity including human activities are important basic factors influencing soil formation. India is a complex country with a range of relief features, landforms, climatic regions, and varieties of vegetation. They also contributed to the growth of the various soil types in India. India is primarily an agrarian region.

Red soil is a very significant soil resource that has major implications for sustainable agricultural development and sound economic growth. Red soil grows under the deciduous forest in a tropical environment and has thin organic-mineral layers that cover a yellowish-brown leached base. Red soils are typically derivative of crystalline material. These are typically poor growing soils, low in nutrients and hard to plant because of their low capacity to retain water. Crystalline and metamorphic rocks such as acid granites, gneisses, and quartzites are the main parent rocks.

Agriculture and important resources are seen of rare interest of technical knowledge creators to implement technology in this field though main stream line in national level growth of India. The solution for providing food security to all people of the world without affecting the agro-ecological balance lies in the adaptation of new research methods and also developed tools, particularly which is conventional to them and as well as frontier technologies like Geographic Information Systems (GIS). The GIS is the blessing of 21st century which helps in achieving the desirable growth rate. GIS technology is being effectively utilized in India in several areas for sustainable agricultural development and management.

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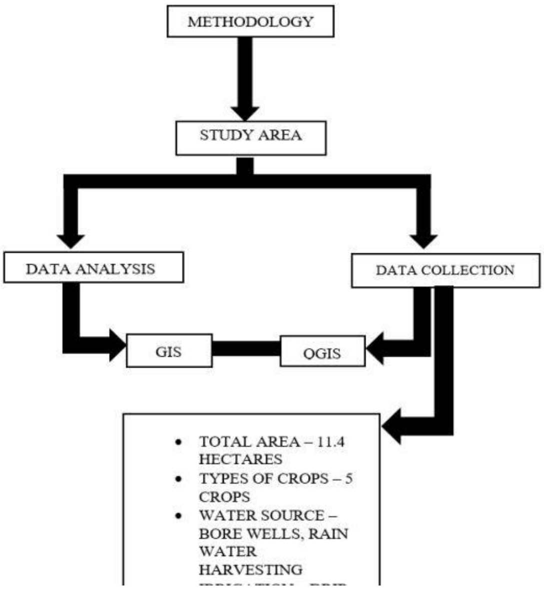

Fig: 1 Methodology for this project

The methodology followed in this work is to select the study area and data will be collected in the study area bhuvanahalli and collecting data can be used for the mapping of area.

The collected data includes total area of the land, types of crops growing on the area and water sources and irrigation types and initial time taken for growing crops and life cycle of the crop.

Table: 1 Data collection chart

S.N.	CROPS OR LAND USE	AREA/ HECTARE	WATER INTERVAL	TYPE OF IRRIGATION	INITIAL CROP GROWTH	LIFE CYCLE
1.a.	Paneer Rose	1	6 days	Drip irrigation	2-3 months	5-10 years
1.b.	Merleau rose	1	5-6 days	Drip irrigation	2-3 months	6-10 years
1.c.	Rosa charisma	1	6 days	Drip irrigation	2-3 months	5-10 years
2.	Ginger	2.9	6-7 days	Drip irrigation	9 months	10 years
5.	Papaya	3.2	6-7 days	Drip irrigation	7-9 months	4-5 years
6.	Expansion land	2.3				
	Total land	11.4				

Boovanahalli is a small village/hamlet in Devanahalli Taluk in Bangalore Rural District of Karnataka State, India. It comes under Boovanahalli Panchayath. It belongs to Bangalore Division. It is located 5km towards South from District Headquarters Bangalore, 5km from Devanahalli, 34km from State Capital Bangalore. The latitude and longitude co-ordinates of this selected land are 13.218181 and 77.680183 respectively.

Neeleri (6km), Rani Cross (Nandi Cross) (7km), Bidaluru (8km), Chennahalli (8km), Vishwanathpura (8km) are the nearby villages to Boovanahalli. Boovanahalli is surrounded by Vijayapura Taluk towards East, Hoskote Taluk towards East, Dotballapur Taluk towards West, Bangalore Taluk towards South. Vijayapura, Chikballapur, Sidlaghatta, Bangalore are the nearby cities to Boovanahalli.This place is in the border of Bangalore Rural District and Chikballapur District. Chikballapur District is north towards this place.

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The total geographical area of village is 612.9 hectares. Boovanahalli has a total population of 4,638 peoples. There are about 1,177 houses in Boovanahalli village. As per 2019 stats, Boovanahalli villages comes under Hassan assembly & parliamentary constituency. Hassan is nearest town to Boovanahalli which is approximately 3km away.

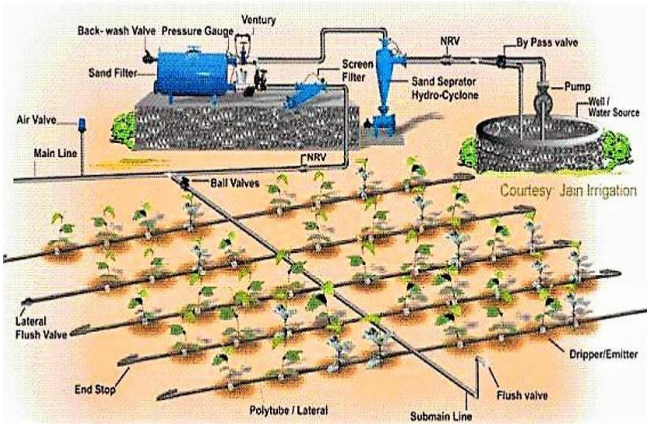

Fig: 2 Commercial Drip Irrigation Systems

A relatively low initial cost a small-scale farmer can set up a drip-irrigation system and also can buy drip irrigation system. If used to grow crops for market, this investment will pay itself within the first season and lead to increased household food production, especially during extended dry periods. water reservoir and bamboo or PVC tubes as distribution pipes, everyone can construct a very efficient irrigation system. If wastewater is used, a filtration unit after the treatment plant is recommended to avoid clogging of the emitters. Read more about simple manual irrigation methods here. Figure 2 Shows the commercial drip irrigation which is used in this work.

Figure 1 represents methodology adopted for this work first in the project study area is important. For this project selected area of the agricultural works and growing different crops in the Bhuvanahalli village. Then data collection sheet is shown in table 1. And which type of the irrigation is adopted also mentioned, water intervals are 6 to 7 days and initial crop growth is 2 to 3 months and life cycle of each crop is shown.

For most of the time agricultural planning has been a system of guesswork or Depend on Prediction.GIS can take the guesswork out of the crop planning management with effective collection of soil data and season ability of topography in line with changing conditions, it allows for precision farming and maximizing the yield and its quality.

The total land covered in this study area is 11.4 hectare is shown in table 1 of data collection chart.

Results

SI. No.	Land Use	Area/sq. meter
1	Rose	29767.168
2	Ginger	29708.186
3	Papaya	32157.03
4	Expansion Land	23283

Table: 2 Land use and crop classification

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Table: 3 Land use and crop classification

SI No.	Crop	Total Area/ha	Annual yield per ha	Annual yield per ha	Annual yield Kgs per ha
1.	Rose	2.976	22	22000	65487.76
2.	Ginger	2.970	25	25000	74270.46
3.	Papaya	3.215	80	80000	257256.22

Fig. 3 Land use and crop classification

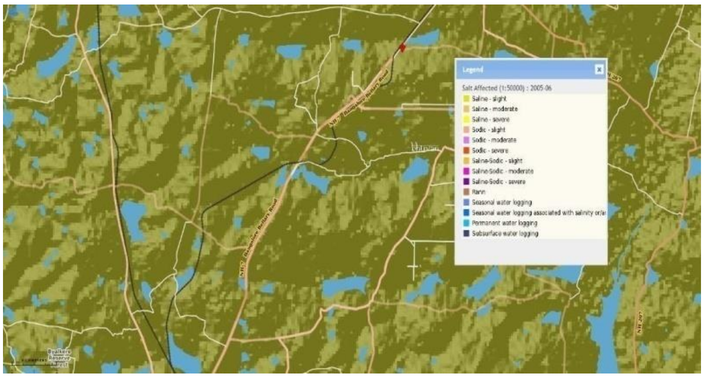

Fig. 4 Salt Affected Soil Mapping

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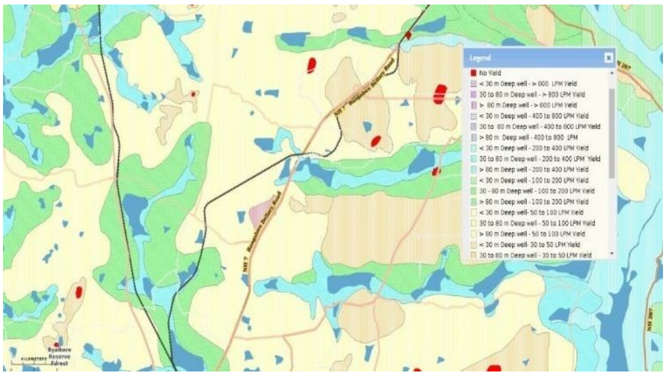

Fig. 5 Ground Water Prospect Mapping

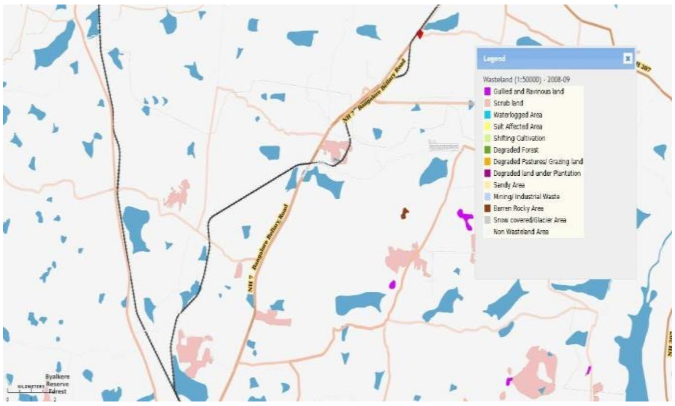

Fig. 6 Wasteland mapping

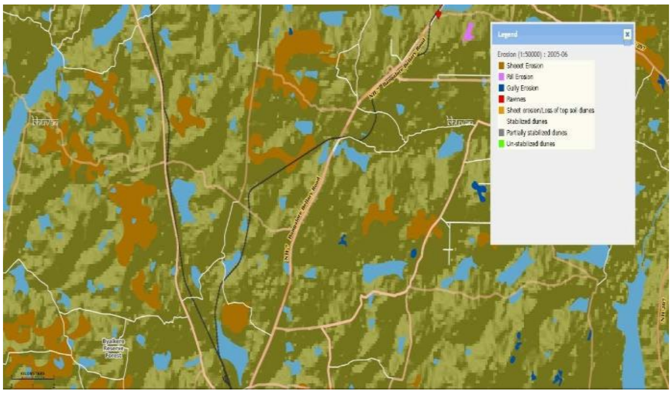

Fig. 7 Soil Erosion Mapping

In table 2 the area for rose crop is 2.976ha and area for ginger is 2.970 ha and area for papaya is 3.215ha and extension land area is also measured 2.328 ha.

In table 3 annual crop yield per ha is given for all the three types of the crops.

In figure 3 land use and crop classification is made using GIS software is shown. Pink color shows ginger crop and yellow color shows papaya crop and green color shows rose crop.

In figure 4 shows salt affected soil mapping and in the same figure blue color shows the areas are affected by soil salinity in the study area (bhuvanahalli village) at four places contained salinity

Figure 5 represents ground water prospect mapping and figure 6 showing waste land mapping, figure 7 shows soil erosion mapping in the study area and also surrounding area of the Bhvanahalli village. In the study area with drip irrigation bore wells also used for growing crops. In figure 6 waste lands are showing but here in the study area it has been considered as extension of the land based on the studies this land is used for different crops in the future. In figure 7 soil erosion mapping is shown the light brown color represents soil erosion in the given figure.

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Conclusion

While natural inputs in farming cannot be controlled, they can be better understood and managed with GIS applications. GIS can substantially help in effective crop yield estimates, soil amendment analyses and erosion identification and remediation. More accurate and reliable crop estimates help reduce uncertainty. GIS in agriculture helps farmers to achieve increased production and reduced costs by enabling better management of land resources. In this study area the different crop growths and different water resources for crop growth is identified and also about soil erosion area mapping. Waste land for future growth of the crop will be suggested and shown. And also areas of soil salinity are shown in different color coding. Agricultural Geographic Information Systems using Geometrics Technology enable the farmers to map and project current and future fluctuations in precipitation, temperature, and crop output etc.

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