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# SOIL SUITABILITY EVALUATION OF SOLLAPURA SUB WATERSHED OF KARNATAKA

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## Abstract

A study was carried out in Sollapura sub watershed of Malenadu region of Karnataka to evaluate the potential and constraints of these soils through land capability classification and soil suitability evaluation. The mapped soils from the study area were matched with criteria for land capability classification and soilsite suitability evaluation. In the land capability map, four classes have been differentiated *viz.*, IIs, IIe, IIes and IIIs. As depicted in the map, majority of the area was classified under good category. According to suitability classification, major crops are ragi, sorghum, bajra, are canut, mango and coconut evaluated for highly, moderately, marginally and not suitable area for higher crop production.

***Key words: Watershed, Land*** capability map, Soil suitability class, GIS

## Introduction

Inappropriate land use leads to destruction of land resource, poverty and other social problems. The land is the ultimate source of wealth and the foundation on which many civilizations are constructed. Society must ensure that land is not degraded and that it issued according to its capacity to satisfy human needs for present and future generations while also maintaining the earth's ecosystems. Part of the solution to the land-use problem is land evaluation in support of rational land-use planning and appropriate and sustainable use of material and human resources. Land evaluation is the process of assessment of a particular tract of land for specific purposes involving the execution and interpretation of data of natural resources, survey of soils, vegetation, climate and other related aspects of land in order to identify and make a comparison of the promising kinds of l and uses. According to van Wambeke and Rossiter (1987) land evaluation is the ranking of soil units on the basis of their capabilities to produce optimum returns per unit area. Several systems of land evaluation are used in soil survey programmes, the most important being land capability classification (Klingebiel and Montgomery 1961) and FAO framework for land evaluation (FAO 1979). The USDA land capability classification is a general purpose land evaluation system useful for farm planning with bias on conservation. The land suitability classification is a specified land assessment system suitable for qualitative and quantitative evaluations.

The soil information so generated is interpreted for various purposes like land capability classification, land irritability assessment, crop suitability studies, management of watersheds, prioritization of watersheds etc. (Ali and Kotb, 2010). GIS is a powerful and sophisticated tool for displaying and analyzing spatial relationships between geographic phenomena in the form of vectors and images. In recent years thematic mapping has undergone a revolution as the result of advances in geographic information system. Vast untapped potential still exists in Indian soils which can accelerate productivity of crops by efficient and sustainable use of soil resources along with water and nutrients. Detailed morphological, physical and chemical characterization of soils as well as land suitability evaluation of the proposed specific study area, Sollapura sub watershed, Chikmagalur district of Karnataka are required for sustainable agriculture and maximization of crop production is required.

## Materials and Methods

The study area Sollapura sub-watershed is located in Chikmagalur district of Karnataka state (fig.1). Chikmagalur district is situated in the Malenadu region of Karnataka in the Deccan Plateau in the foothills of the Western Ghats. It lies in the south central part of Karnataka, between 12° 54'42"- 13° 53'53"N latitudes and 75° 04'46"- 76° 21'50"E longitudes, with a geographical area of 7201 km$^2$. The district comprises of 7 taluks of which Tarikere comes under southern transition zone No.7 and rest of the taluks come under Hilly Zone No.22. Tarikere is located at 13.72°N 75.82°E. It has an average elevation of 698 metres (2290 feet). Tarikere comes under southern transition zone. The mean maximum temperature ranges from 28.6°C to 36°C during summer months of March, April and May. The mean minimum temperature is varied from 16.4°C to 22°C during December, January and February. The south-west monsoon normally sets over the area in the month of June and ends by the September and north-east monsoon from October to December overall annual average rainfall of 765 mm.

Interpretation of satellite data, detailed soil survey, land characteristics, morphological and physicochemical properties based pedons were classified according to Soil Taxonomy (Soil Survey Staff 1999). Fourteen series with 38 mapping units (fig. 2). The classification is based on the inherent soil characteristics, external land features and environmental factors that limit the use of land. Based on the susceptibility of soils to erosion (e), soils (s), topography (t) and drainage (d) limitations the study area was classified into different land capability classes. Arable lands that are fit for agriculture were grouped under I to IV and non-arable lands were grouped class VI to VIII. Criteria for the land capability classification (Klingebiel and Montgomery, 1996). Land suitability was evaluated following FAO (1979) guidelines. It involved formulation of climate and soil requirements of the crop and ratings of these parameters highly suitable (S1), moderately suitable (S2), marginally suitable (S3), and unsuitable (N1). The suitability criteria for given by Naidu *et al*. (2006). The kind and degree of limitations were evaluated. Land capability map and soil site suitability evaluation maps were prepared using Arc GIS software.

## Results and Discussion

Land capability classification is an interpretative grouping of mapping units to indicate the capability of soils to produce crops, raise forestry or yield any other benefits on a sustained basis. One of the earliest and

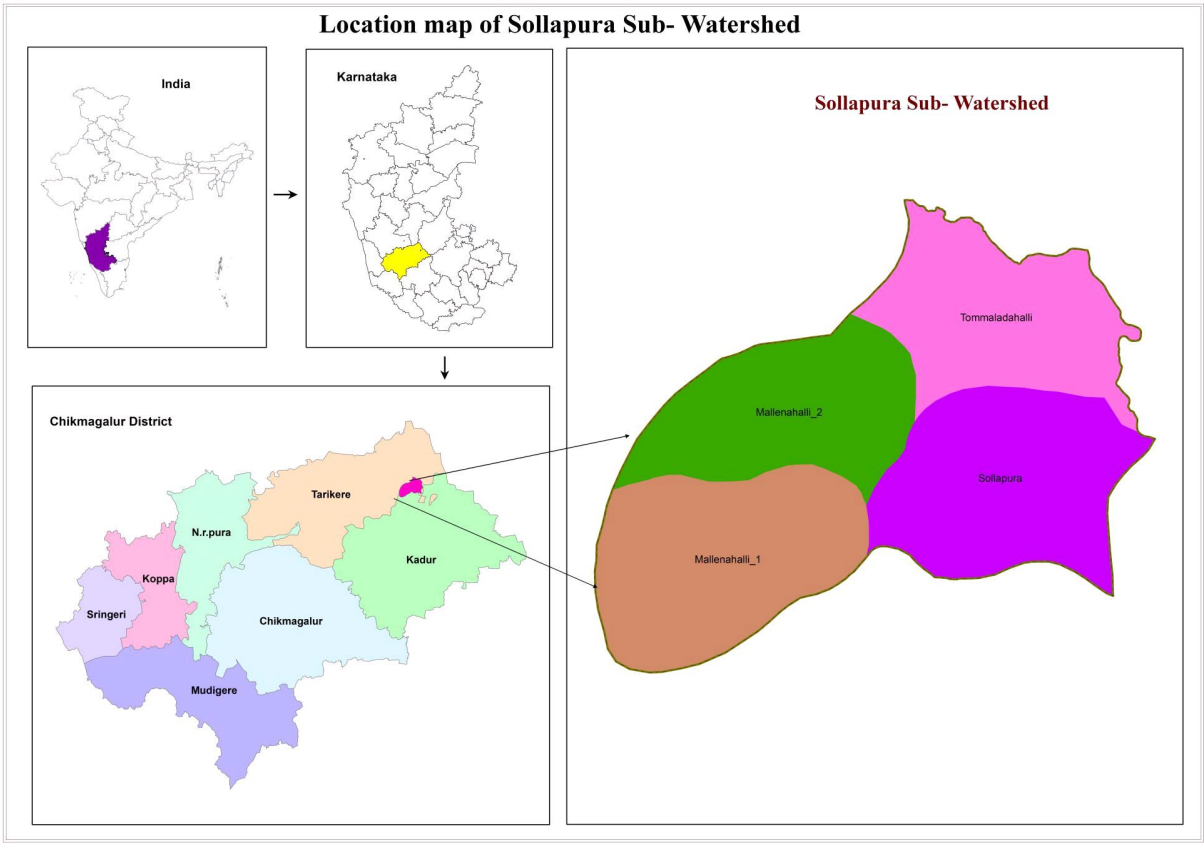


**Fig. 1:** Location of Sollapura sub watershed

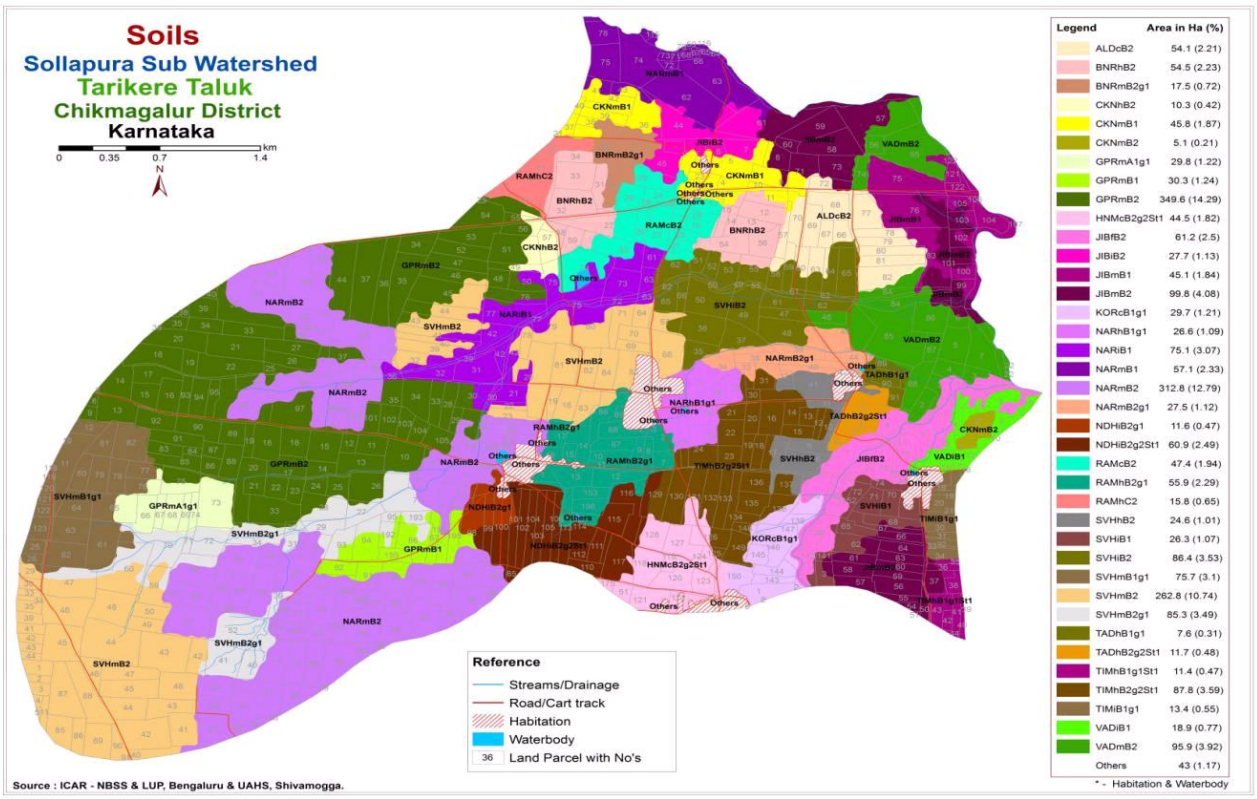


**Fig. 2:** Soil map of the study area

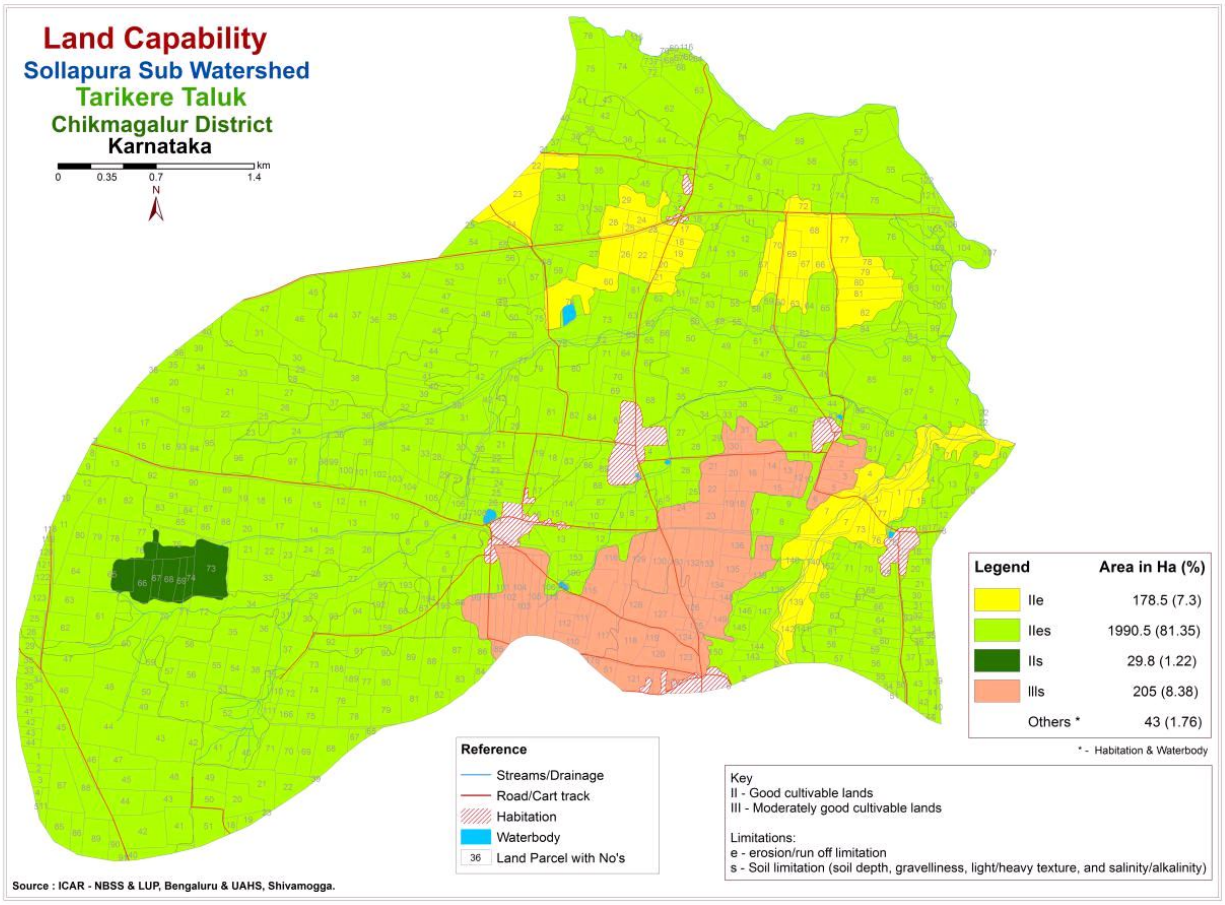


**Fig. 3:** Land capability of Sollapura sub watershed

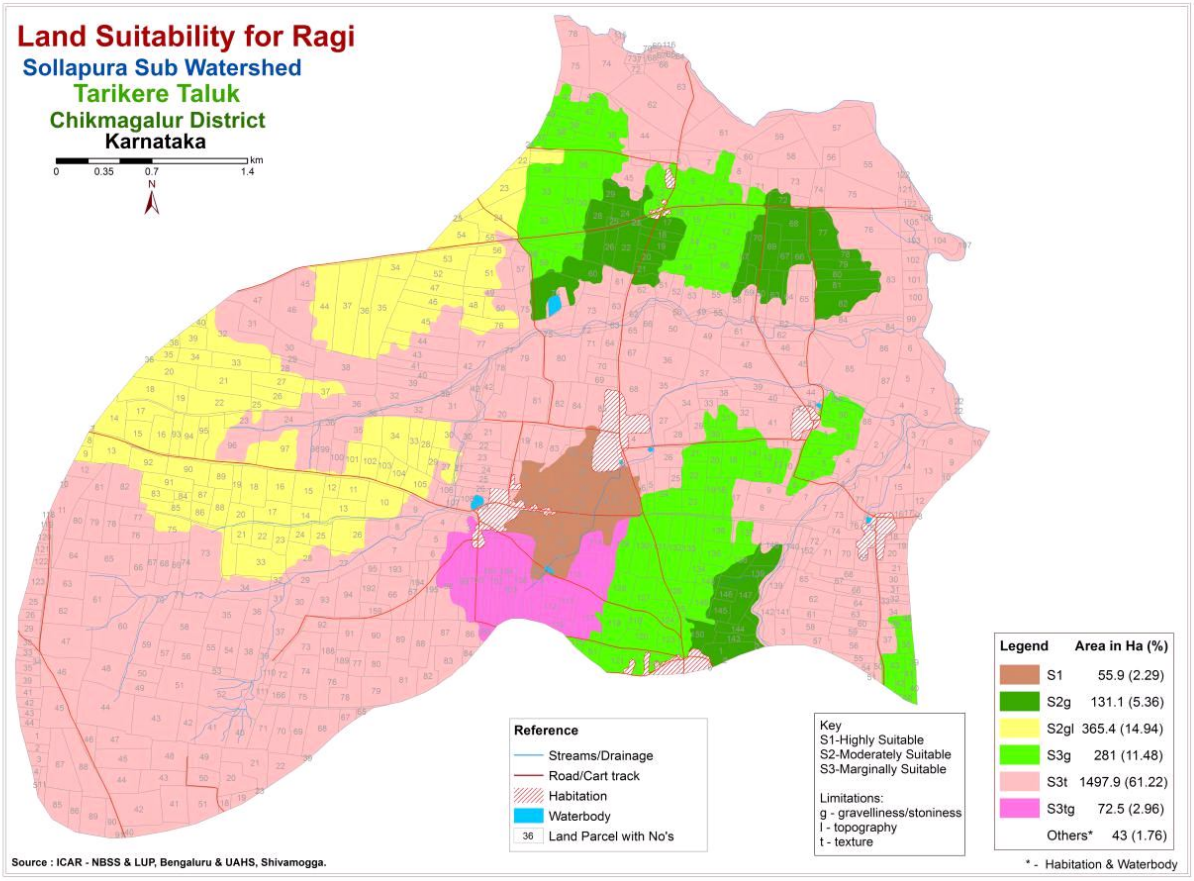


**Fig. 4:** Land suitability for Ragi in Sollapura sub watershed

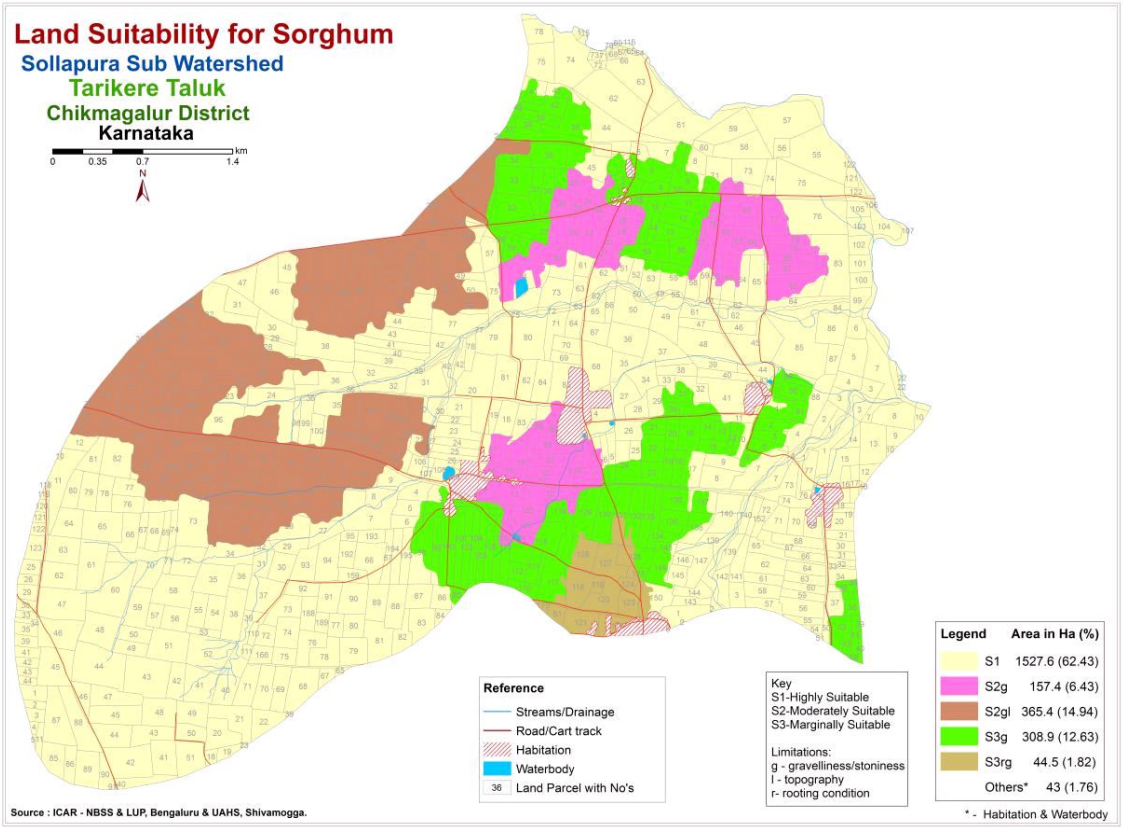


**Fig. 5:** Land suitability for Sorghum in Sollapura sub watershed

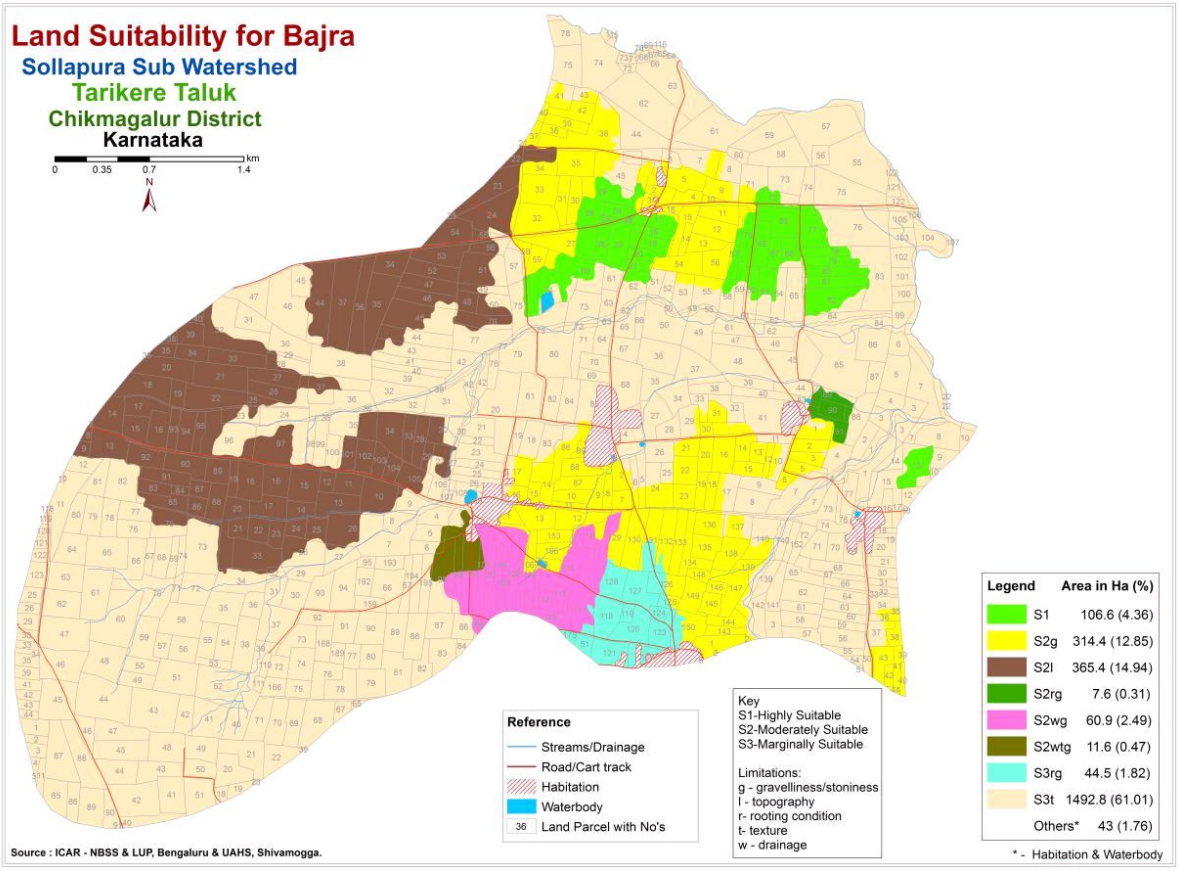


**Fig. 6:** Land suitability for Bajra in Sollapura sub watershed

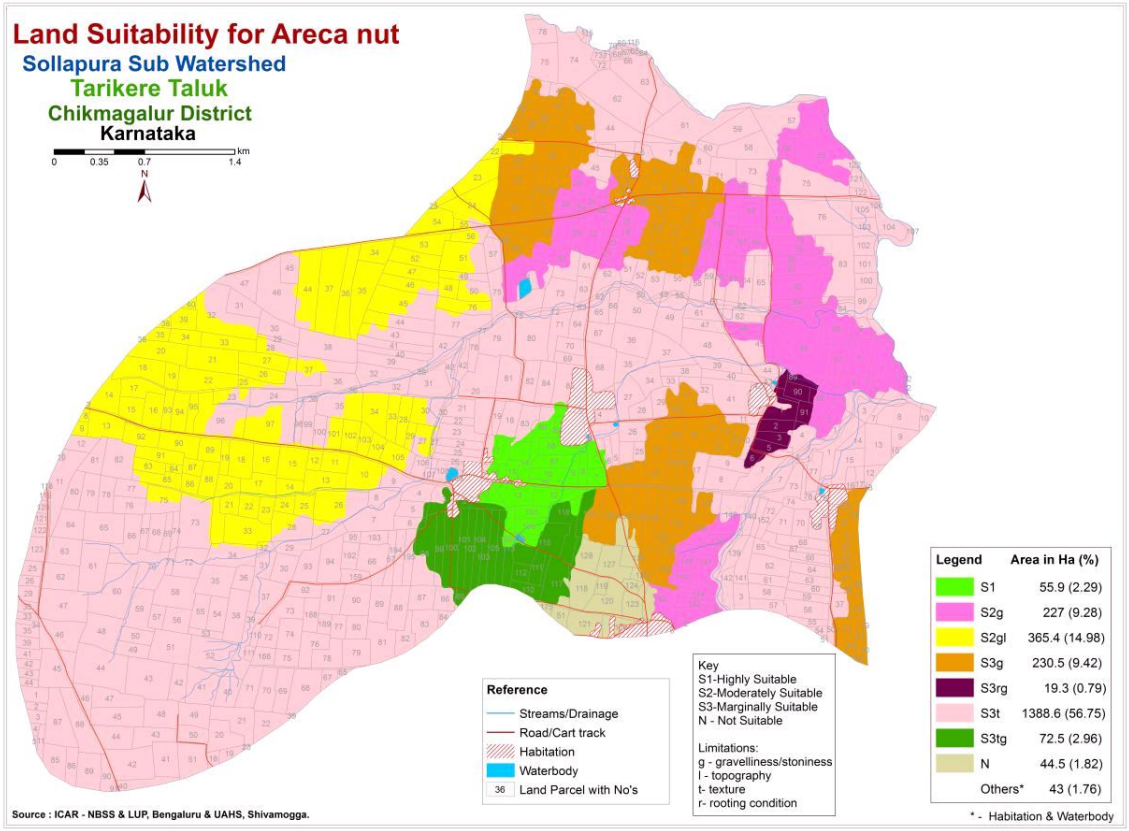


**Fig. 7:** Land suitability for Areca nut in Sollapura sub watershed

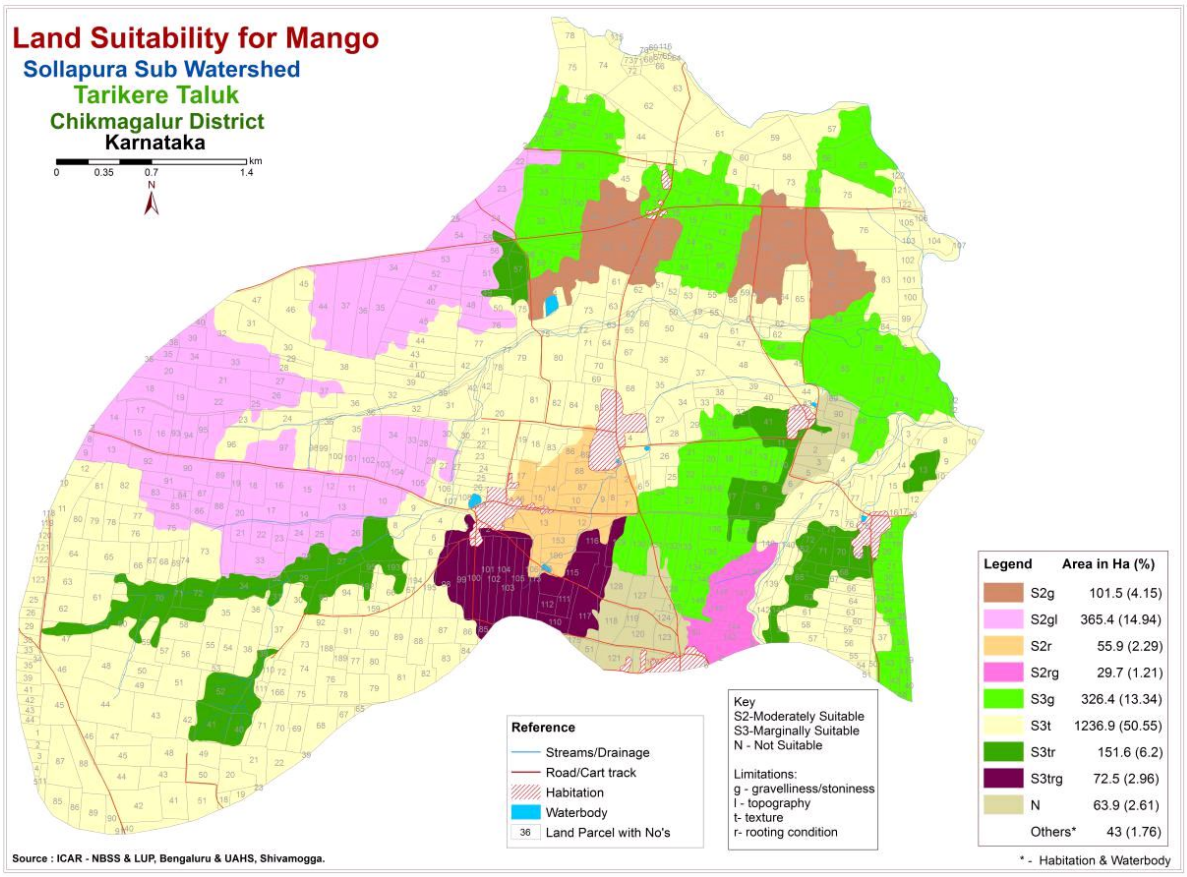


**Fig. 8:** Land suitability for Mango in Sollapura sub watershed

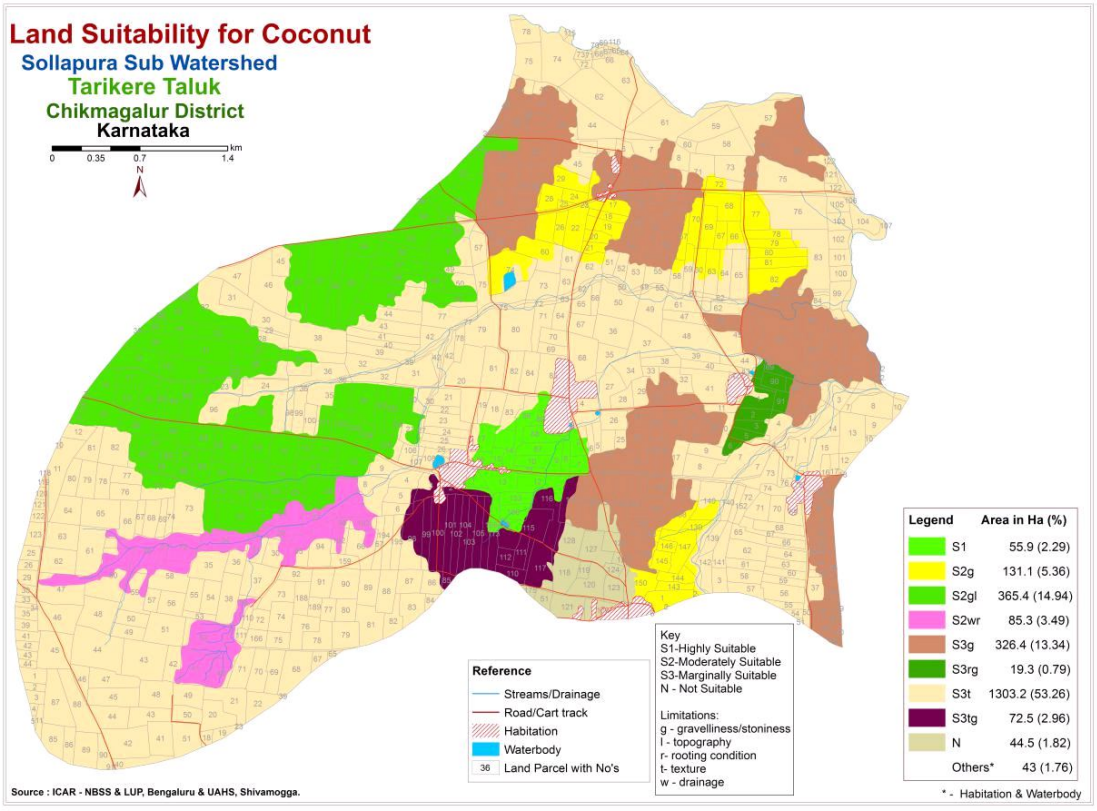


**Fig. 9 :** Land suitability for Coconut in Sollapura sub watershed

certainly the best known soil survey interpretation was land capability classification developed by the soil conservation service of the USDA. The land capability classification of the study area is presented in table. 1 and fig. 3. The study area was classified under land capability classes *viz*., II and III. On the basis of their susceptibility to erosion, soil depth, slope and climate limitation it has been grouped in to different land capability sub classes.

**Table 1:** Land capability classes of Sollapura sub Watershed

| Land capability class | Description | Area (ha) | TGA (%) |
|---|---|---|---|
| IIe | Good cultivable lands having slight erosion | 178.5 | 7.3 |
| IIs | Good cultivable lands having soil limitation | 29.8 | 1.22 |
| IIes | Good cultivable lands having slight erosion and soil limitations | 1990.5 | 81.35 |
| IIIs | Moderately cultivable lands having soil limitations | 205 | 8.38 |

The earlier system of evaluation, grades the land from suitable to unsuitable irrespective of type of land use and management. Such a system cannot provide the necessary information to the land users to make a choice between land use options. In the present study, the FAO framework for land evaluation was used to know the consequences of applying the specified management to a particular parcel of land so that a choice could be made from the alternatives. This method used to assess the suitability of land for major crops such as sorghum, tomato cotton and coconut on the basis of matching exercise between the growth and production requirements of the crops. Sollapura sub watershed of Malenadu region of Karnataka (fig. 4 to fig. 9).

Land capability classification is an interpretative grouping of mapping units to indicate the capability of soils to produce crops, raise forestry or yield any other benefits on a sustained basis. One of the earliest and certainly the best known soil survey interpretation was land capability classification developed by the soil conservation service of the USDA. The similar kind of results were also reported by Mani *et al*. (1999) and Srivastava *et al*. (2001).

Soils of Sollapura sub watershed were classified under class II with sub-classes of 's' (soil limitation) and e (erosion limitation) which occupied the area of 29 ha (1.2%) and 178 ha (7.3%) and major limitation 'es' were occupy 1990 ha (81.35%). These soils are good cultivable lands with slight soil and erosion limitation.

## Conclusions

As depicted in the map, majority of the area was classified under suitable of different crops. According to suitability classification, different class land was found to be suitable for agricultural and horticultural crops, which is ideal for different planner to implementation of different scheme of line department to improve the crop productivity and enhancing the farmers livelihood.

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