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# Land Resource and Hydrological Inventory of Shivapur Sub-watershed for Watershed Planning and Development Yadgir Taluk, Yadgir District, Karnataka (AESR 6.2)

Sujala – III
Karnataka Watershed Development Project- II
Funded by World Bank

ICAR - NBSS & LUP

ICAR - National Bureau of Soil Survey and Land Use Planning, Bangalore
Watershed Development Department, Govt. of Karnataka, Bangalore

# About ICAR - NBSS&LUP

The National Bureau of Soil Survey and Land Use Planning (ICAR-NBSS&LUP), Nagpur, a premier Institute of the Indian Council of Agricultural Research (ICAR), was set up during 1976 with the objective to prepare soil resource maps at national, state and district levels and to provide research inputs in soil resource mapping and its applications, land evaluation, land use planning, land resource management, and database management using GIS for optimizing land use on different kinds of soils in the country.

The Bureau has been engaged in carrying out soil resource survey, agro-ecological and soil degradation mapping at the country, state and district levels for qualitative assessment and monitoring the soil health towards viable land use planning. The research activities have resulted in identifying the soil potentials and problems, and the various applications of the soil surveys with the ultimate objective of sustainable agricultural development. The Bureau has the mandate to correlate and classify soils of the country and maintain a National Register of all the established soil series. The Institute is also imparting in-service training to staff of the soil survey agencies in the area of soil survey, land evaluation and soil survey interpretations for land use planning. The Bureau in collaboration with Panjabrao Krishi Vidyapeeth, Akola is running post-graduate teaching and research programme in land resource management, leading to M.Sc. and Ph.D. degrees.

Citation: Rajendra Hegde, B.A. Dhanorkar, S. Srinivas, K.V. Niranjana, R.S.Reddy and S.K. Singh (2019). "Land Resource and Hydrological Inventory of Shivapur Sub-watershed for Watershed Planning and Development, Yadgir Taluk, Yadgir District, Karnataka", Sujala SWs-LRI Atlas No. 35, ICAR – NBSS & LUP, RC, Bangalore. p.56.

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# PART - A

# Land Resource Inventory of Shivapur Sub-watershed for Watershed Planning and Development

## Yadgir Taluk, Yadgir District, Karnataka (AESR 6.2)

# CONTENTS

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# How to read and use the Atlas

The Land Resource Inventory of Shivapur Sub-watershed (Yadgir Taluk, Yadgir District) for Watershed Planning (AESR 6.2) was undertaken to provide comprehensive site- specific cadastral level information useful for farm level planning and integrated development of the area under Sujala – III, Karnataka Watershed Development Project- II.

This atlas contains the basic information on kinds of soils, their geographic distribution, characteristics and classification. The soil map and soil based thematic maps derived from soils data on soil depth, soil gravelliness, slope, land suitability for various crops and land use management maps are presented on 1:12,500 scale. The maps of fertility status (soil reaction, organic carbon, available phosphorus, available potassium, available sulphur, available calcium, available copper, available manganese, available zinc, available iron, available boron and salinity (EC) on 1:12,500 scale were derived from grid point sampling of the surface soils from the watersheds.

The atlas illustrates maps and tables that depict the soil resources of the watershed and the need for their sustainable management.

The user, depending on his/her requirement, can refer this atlas first by identifying his/her field and survey number on the village soil map and by referring the soil legend which is provided in tabular form after the soil map for details pertaining to his/her area of interest.

The atlas explains in simple terms the different kinds of soils present in the watershed, their potentials and problems through a series of thematic maps that help to develop site-specific plans as well as the need to conserve and manage this increasingly threatened natural resource through sustainable land use management. The Land Resource Atlas contains database collected at land parcel/ survey number level on soils, climate, water, vegetation, crops and cropping patterns, socio-economic conditions, marketing facilities *etc.* helps in identifying soil and water conservation measures required, suitability for crops and other uses and finally for preparing a viable and sustainable land use options for each and every land parcel.

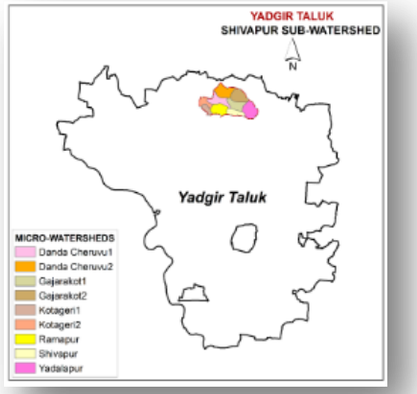
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

# Physical, Cultural and Scientific symbols used in the Atlas

Each map in the atlas sheet is complemented with the physical, cultural and scientific symbols to facilitate easy map reading.

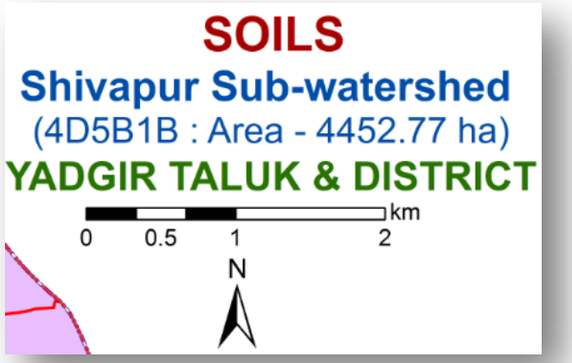
***Inset map***

*Inset provided in each map conveys its strategic location i.e. Taluk, Sub-watershed and Sub-watershed.*



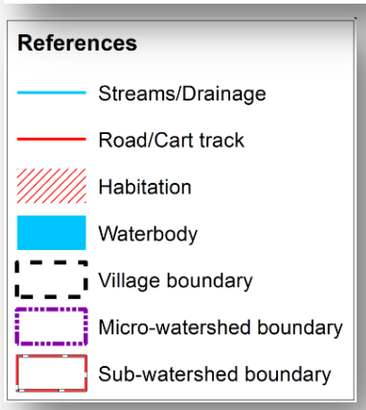

***Map title***

*Map title conveys the relevance of thematic information presented along with a graphical scale, geographical location and watershed details in text form.*



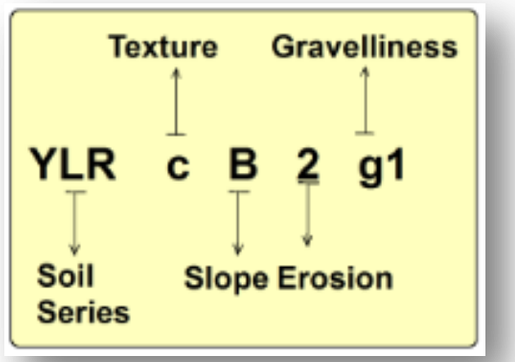

***Legends and symbols***

*Two legends accompany each map, a **map reference**, which depicts geographic features and a **thematic legend** which portrays spatial information. Picking up the symbol and colour of a particular enables one to go to the legends to obtain the required information.*



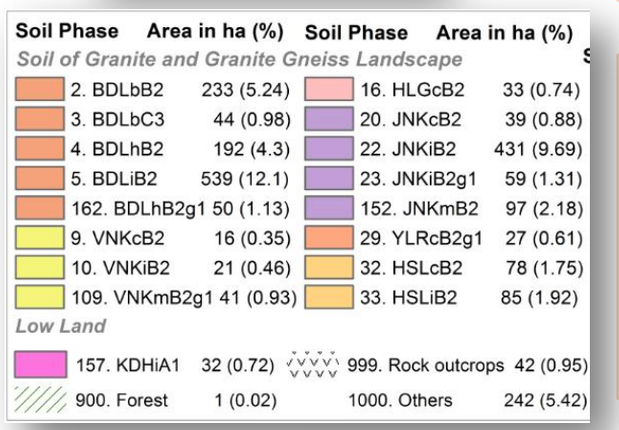

***Soil Units***

*The soil map may be read at different levels. The most detailed level is that of the soil phase. Soil phases are distinguished within soil series mainly based on differences in surface of soil texture, slope, gravelliness , erosion ,etc.*



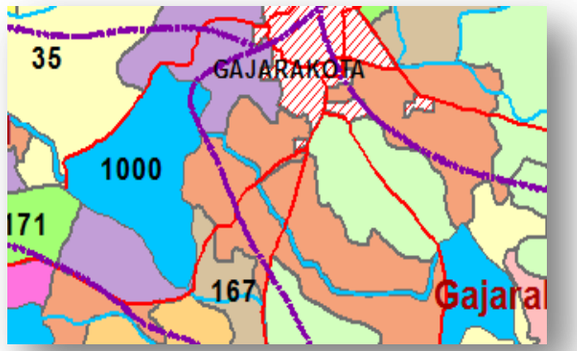

***Map colours***

*Different shades of colours are used as an aid to distinguish the different classes of soils, crop suitability and other maps.*



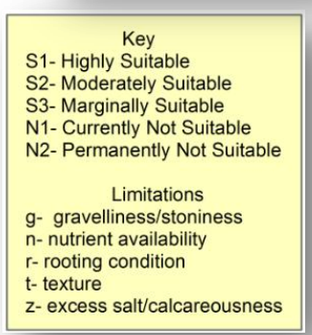

***Soil and plot boundaries***

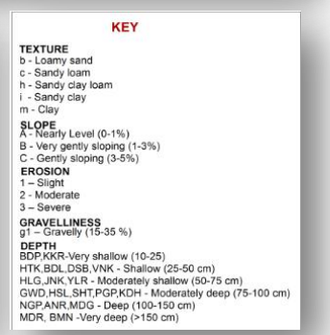
*Soil units shown on the map are represented by both the color and a numeral. The soil boundaries are superimposed on land parcel with revenue survey number boundaries to visualize its spatial extent.*




***Map key***

*There are many thematic types to be differentiated on the map solely based on colour. Therefore soils and suitability types and their limitations are distinguished by colours with a combination of alpha-numeric characters.*



# 1. Introduction

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use land in a rational and judicious manner. But what is happening in many areas of the state is a cause for concern to anyone involved in the management of land resources at the grassroots level. In India the area available for agriculture is about 51 per cent of the total area and more than 60 per cent of the people are still relying on agriculture for their livelihood. The limited land area is under severe stress and strain due to increasing population pressure and competing demands of various land uses. Due to this, every year there is a significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest for farming among the farmers in many areas, large tracts of cultivable lands are turning into fallows and this trend is continuing at an alarming rate.

The watershed management programs are aimed at designing suitable soil and water conservation measures, productivity enhancement of existing crops, crop diversification with horticultural species, greening the wastelands with forestry species of multiple uses and improving the livelihood opportunities for landless people.

The objectives can be met to a great extent when an appropriate Natural Resources Management (NRM) plan is prepared and implemented. It is essential to have site specific Land Resources Inventory (LRI) indicating the potentials and constraints for developing such a site specific plan. LRI can be obtained by carrying out detailed characterization and mapping of all the existing land resources like soils, climate, water, minerals and rocks, vegetation, crops, land use pattern, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed to the farmer and other land users of the area.

The major landforms identified in the Sub-watershed are uplands and low lands. The database was generated by using cadastral map of the village as a base along with high resolution satellite imagery (IRS LISS IV and Cartosat-1). The objectives of the land resource survey, carried out in the Shivapur Sub-watershed covering an area of 4452.77 ha are indicated below.

- Detailed characterization of all the land resources like soil, water, land use, cropping pattern and other resources available at parcel level in the village.
- Delineation of homogenous areas based on soil-site characteristics into management units.
- Collection and interpretation of climatic and agronomical data for crop planning.
- Identification of problems and potentials of the area and strategies for their management.
- Assessment of the suitability of land resources for various crops and other uses.
- Establishment of village level digital land resources database in a GIS framework.
- Enable the watershed and other line departments to prepare an action plan for the integrated development of the watershed.

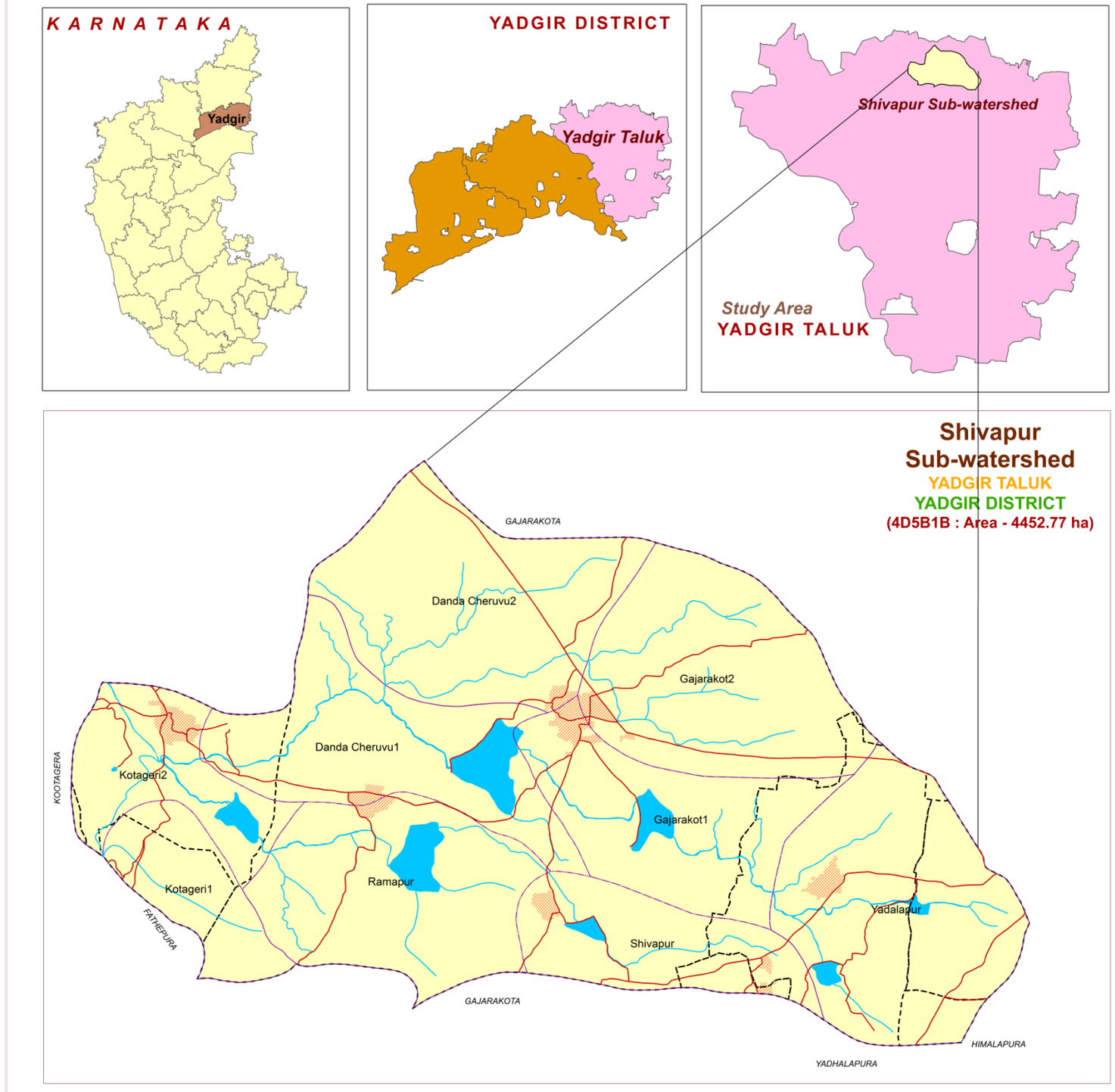
# 2. General Description of Sub-watershed

The Yadgir, popularly called as “Yadavagiri” by the local people, district came to existence on 30th Dec 2009 by carving out of erst-while Kalaburagi district of Karnataka with a geographical area of 5234.4 square kilometers, located in the northern part of the state. It lies between north latitudes’ $16^0$57’ – $16^0$59’ and east longitudes $77^0$ 12’ – $77^0$ 13’. The climate of the district is very hot and dry. The district has an average annual rainfall of 636 mm. Soils are well drained red sandy loam to medium deep black soils. This may be the weathering product of gneissic and granite terrain. Agriculture in Yadgir district is dependent upon rainfall, irrigation tanks, wells, streams etc. The major agricultural crops grown are Jowar, Groundnut, Cotton, Red gram, Bengal gram etc.

As a pilot study, **ICAR-NBSS&LUP, Bangalore** carried out the generation of Sub-watershed (SWs) - LRI for the Shivapur SWs in Yadgir taluk, Yadgir district. It was selected for data base generation under Sujala III project. Shivapur Sub-watershed (code– 4D5B1B ) is covering an area of 4452.77 ha and spread across Gajarakota,Himalapura,Yadhalapura,Gajarakota,Kootagera and Fathepura villages. This sub-watershed encompasses of 9 MWs namely Danda Cheruvu-1 (4D5B1B1e), Danda Cheruvu-2 (4D5B1B1d), Gajarakot-1 (4D5B1B1b), Gajarakot-2 (4D5B1B1c), Kotageri-1 (4D5B1B2c), Kotageri-2 (4D5B1B2d), Ramapur (4D5B1B2b), Shivapur (4D5B1B2a) and Yadalapur (4D5B1B1a). Land Resource Inventory (LRI) was generated for all the nine micro-watersheds.

# 2.1. Location and Extent

## LOCATION MAP OF SHIVAPUR SUB-WATERSHED

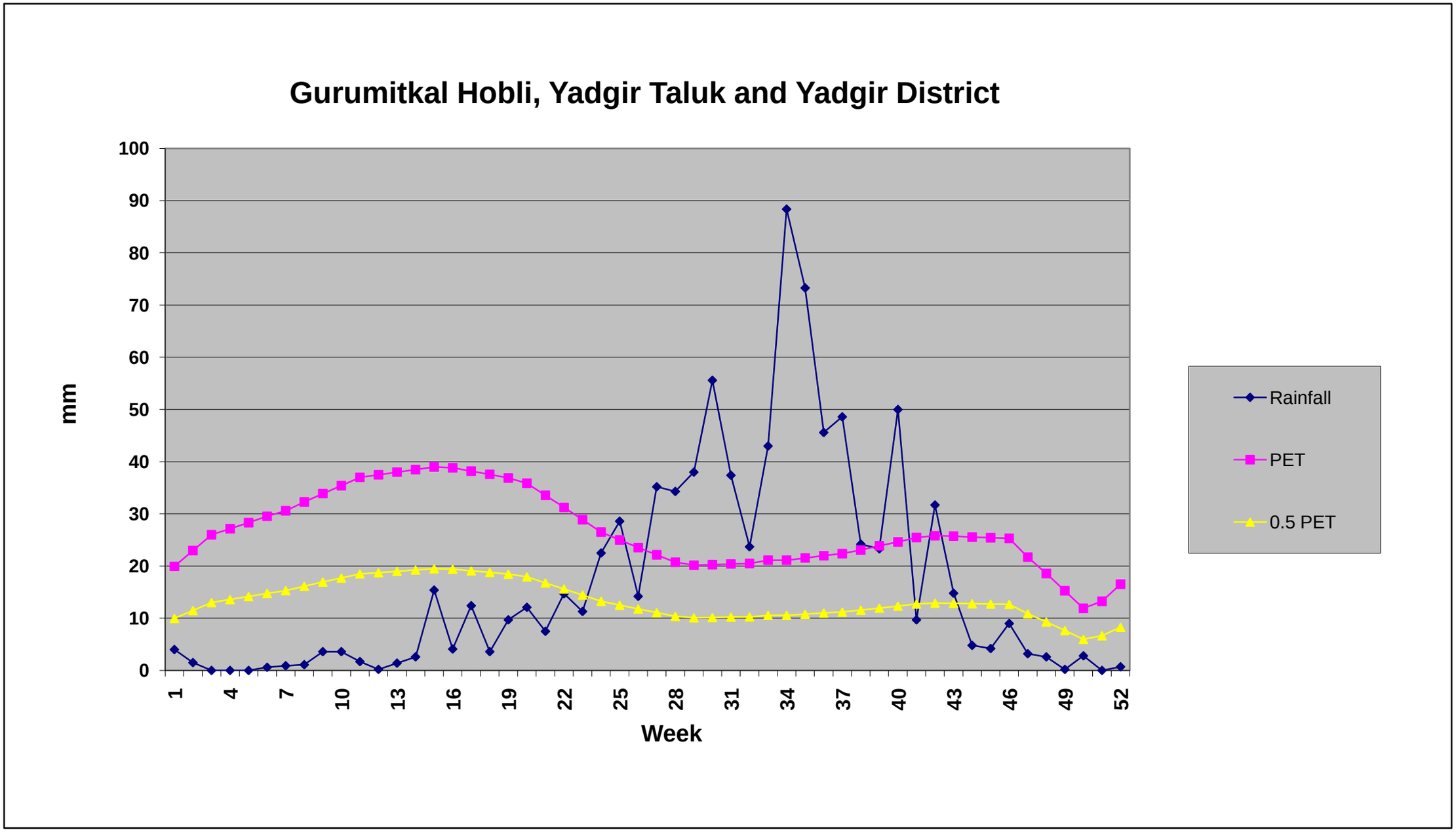



The Shivapur Sub-watershed (Yadgir taluk, Yadgir district) is located in between $16^0$ 51' – $16^0$ 55' North latitudes and $77^0$ 13' – $77^0$ 20' East longitudes, covering an area of about 4452.77 ha, bounded by Gajarakota, Himalapura, Yadhalapura, Gajarakota, Kootagera and Fathepura villages.

**Agro Ecological Sub Region (AESR) 6.2:** Central and Western Maharashtra Plateau and North Karnataka Plateau and North Western Telangana Plateau, hot moist semi-arid ESR with shallow and medium loamy to clayey Black soils (medium and deep clayey Black soils as inclusion), medium to high AWC and LGP 120-150 days.

**Agro-climatic Zone 2: North-eastern Dry Zone:** The total geographic area of this zone is about 1.76 M ha covering 8 taluks of Gulbarga district and 3 taluks of Raichur. Net cultivated area in the zone is about 1.31 M ha of which about 0.09 M ha are irrigated. The mean elevation of the zone is 300-450 m MSL. The main soil type is deep to very deep soils with small pockets of shallow to medium black soils. The zone is cropped predominantly during rabi due to insufficient rainfall (465-785 mm). The principal crops of the zone are jowar, bajra, oilseeds, pulses, cotton and sugarcane.

# Climate

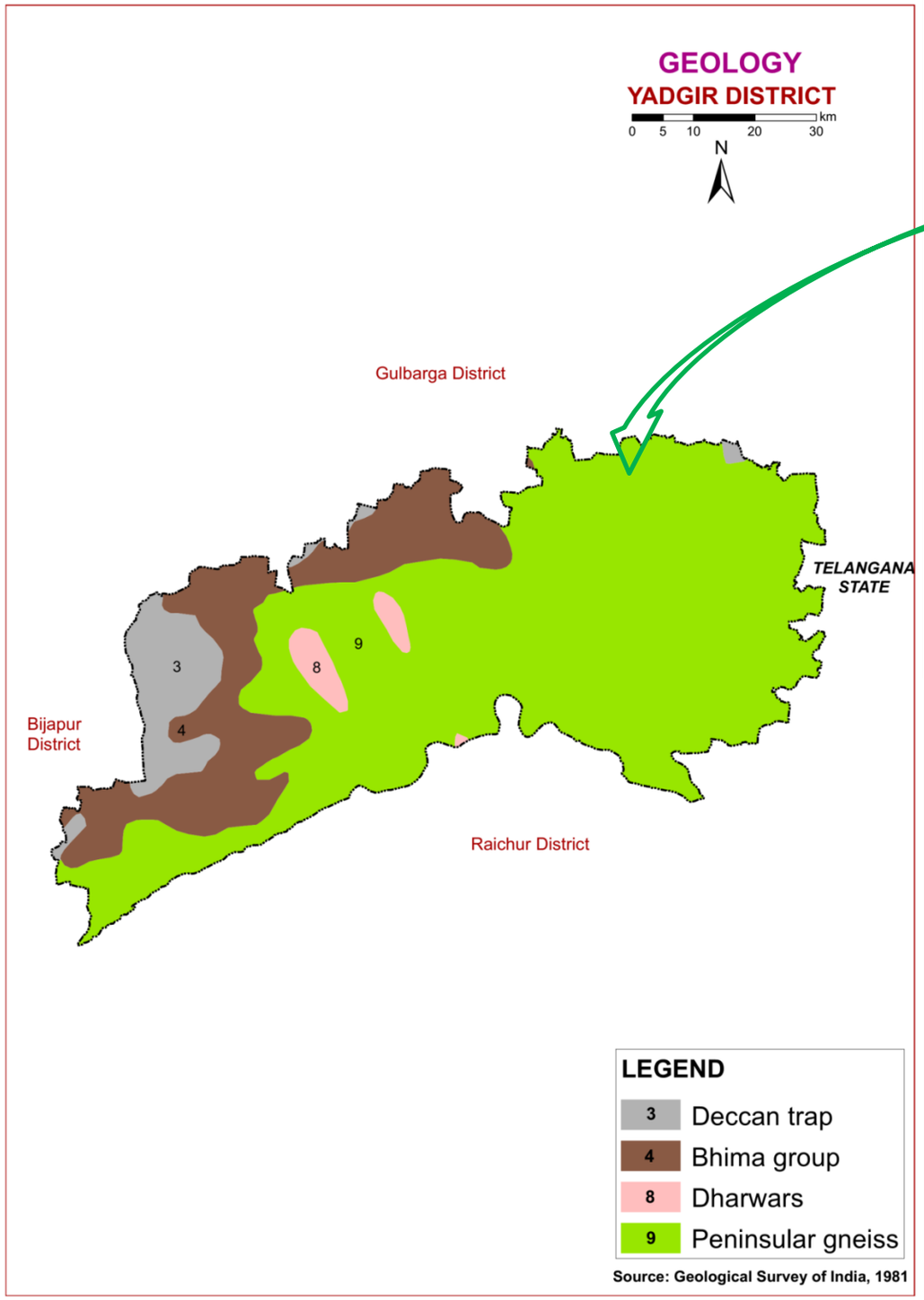


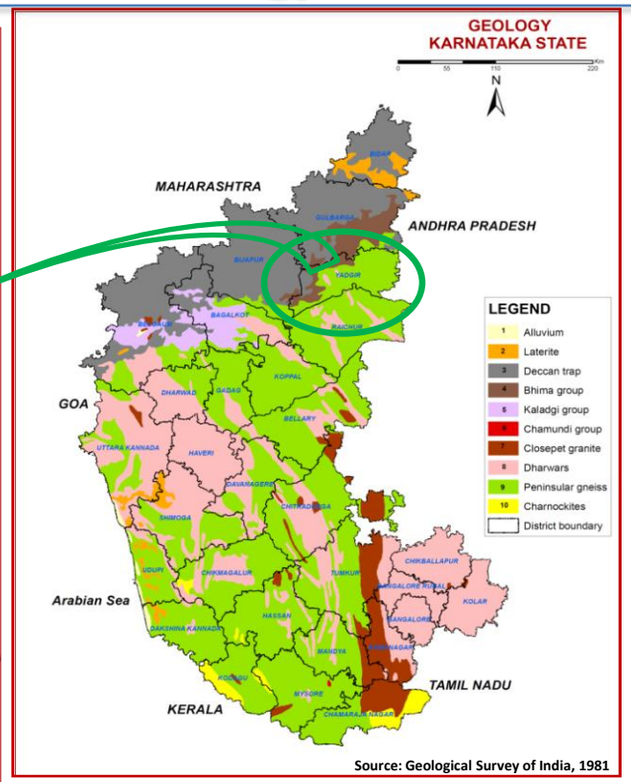

Length of Growing Period (LGP) is varying from June 4th week to 3rd week of October (120 - 150 days)

Annual Rainfall : 882 mm. in the Gurumithkal Hobli, Yadgir Taluk & District

**Source: KSNDMC (1980-2011)**

# 2.3. Geology




**GEOLOGY - KARNATAKA STATE**

Karnataka forms part of the Peninsular Shield, which is an ancient stable block of the earth's crust. The shield is composed of geologically ancient rocks of diverse origin. These rocks have undergone various degrees of metamorphism and crushing. Overlying these ancient rocks are Proterozoic, lete Creteceous to Palaeocene, Palaeocene to Recent, and Recent sediments.

In the stratigraphic succession of rocks in Karnataka the Archaean group is the oldest, followed by Proterozoic, Mesozoic and Cainozoic formations.

**GEOLOGY - YADGIR DISTRICT**

**Mesozoic Group**

Towards the end of the Cretaceous Period there was tremendous volcanic activity in the Peninsular part of India with eruption of a series of lava flows which came out through fissures and cracks. This formation is Known as the Deccan Trap.

***Deccan Trap:*** The Deccan Trap covers an area of 25,000 sq. km. Eight lava flows have been identified in Karnataka, horizontally overlying the older formations. The thickness of the individual flows averages about five metres. The Deccan Trap is relatively uniform in petrographic character. The most common type is augite basalt. Dominant colour is greyish green; texture ranges from cryptocrystalline to glassy. The rock is often visicular and scoriaceous.

**Upper Proterozoic Group**

Formations of the Upper Proterozoic in Karnataka are closepet granites, Chamundi granites, Kaladgi series and Bhima series.

**Bhima series**

This series, equivalent to the Kurnool formations, is named after the Bhima river and occurs in Bijapur and Gulbarga districts. It covers an area of about 4200 sq. km and is overlain by the Deccan trap. The group consists of horizontal, unfossiliferous, unmetamorphosed sedimentary rocks such as sandstones, green, purple and black shales, and cream and bluish limestones. The thickness is about 477 metres.

***Dharwar schists***

The Dharwar schists consist of a complex series of crystalline schists associated with ultrabasic rocks such as amphibolite, peridotites and dunites. These schists are found in long, narrow bands of various dimensions running NW-SE through the Peninsular Gneiss. The Dharwars are divided into Upper and Lower.

Upper Dharwars are equivalent to the Archaean to Lower Proterozoic, and are divided into Bababudan.

Lower Dharwars occur in Mysore district and include amphibolite schist, quartzite, ironstone and marble.

***Peninsular Gneiss***

Exposed over a large area of Karnataka in all the districts except Bidar is the Peninsular Gneiss which is a heterogeneous mixture of several types of granitic rocks such as banded gneisses, granitic gneisses, granites and gneissic granites, granodiorites and diorites. The banded gneisses consist of white bands of quartz-feldspar alternating with dark bands of biotite, hornblende, and minor accessories. The granite group includes granites of all shades with varying composition. Peninsular gneiss seems to have formed by the granitization of the older rocks.

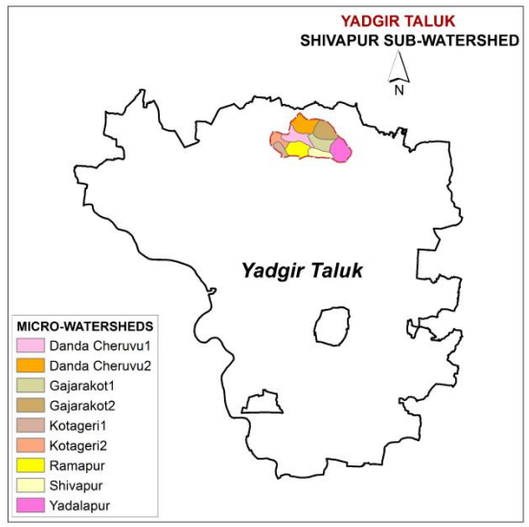
# 3. Survey Methodology

## Sequence of activities in generation of LRI

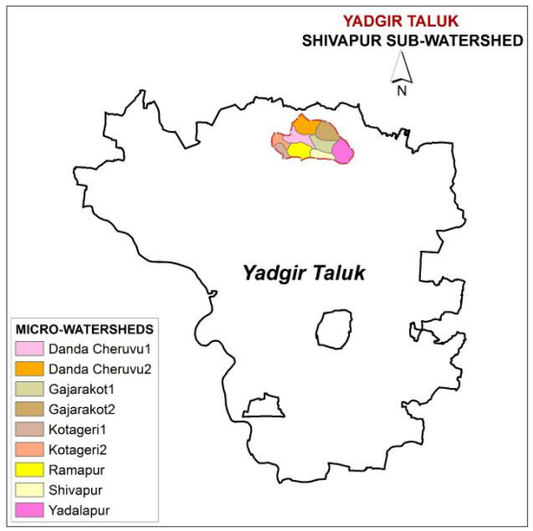
- Traversing the watershed using cadastral maps and imagery as base
- Identifying landforms, geology, land use and other features
- Selecting fields representing land units
- Opening profiles to 2 m depth
- Studying soil and site characteristics
- Grouping similar areas based on their soil-site characteristics into land management units
- Preparation of crop, soil and water conservation plan
- Socio-economic evaluation

The required site and soil characteristics are described and recorded on a standard proforma by following the protocols and guidelines given in the soil survey manual and field guide. Collection of soil samples from representative pedons for laboratory characterization and collection of surface soil samples from selected fields covering most of the management units for macro and micro-nutrient analysis is being carried out (320m grid intervals). Further processing of data at chemical lab and GIS lab are carried out to generate various thematic maps for each of the study area.

# 3.1. Database Used - Cadastral map



# 3.2. Database Used - Satellite Image




## SATELLITE IMAGE

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

Danda Cheruvu2
Gajarakot2
Danda Cheruvu1
Kotageri2
Kotageri1
Ramapur
Gajarakot1
Shivapur
Yadalapur

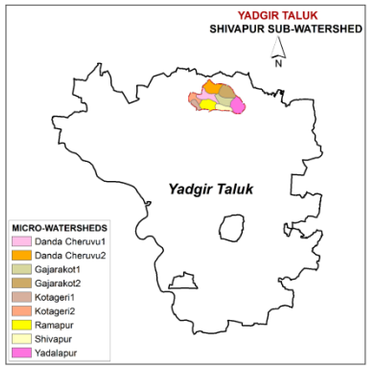
Kootagera
Gajarakota
Mitathapadamapalli
NA
Fathepura
Yadhalapura
Chapetla
Kamalanagara
Himalapura

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Land parcels
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: Cartosat 1 Imagery, 2011**

# 4. The Soils




Texture Gravelliness

YLR c B 2 g1

Soil Series | Slope | Erosion

**KEY**

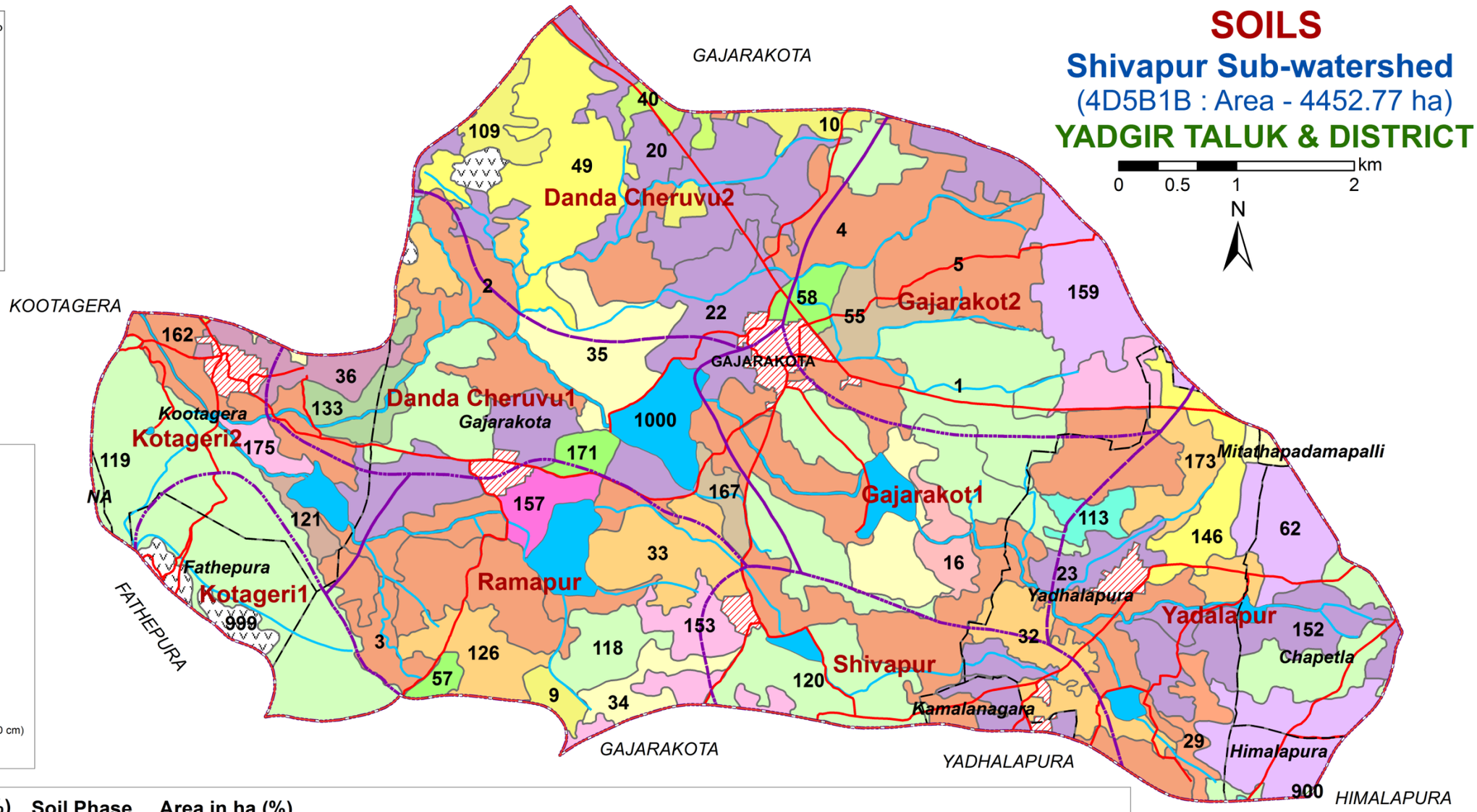
**TEXTURE**
b - Loamy sand
c - Sandy loam
h - Sandy clay loam
i - Sandy clay
m - Clay

**SLOPE**
A - Nearly Level (0-1%)
B - Very gently sloping (1-3%)
C - Gently sloping (3-5%)

**EROSION**
1 – Slight
2 - Moderate
3 – Severe

**GRAVELLINESS**
g1 – Gravelly (15-35 %)

**DEPTH**
BDP,KKR-Very shallow (10-25)
HTK,BDL,DSB,VNK - Shallow (25-50 cm)
HLG,JNK,YLR - Moderately shallow (50-75 cm)
GWD,HSL,SHT,PGP,KDH - Moderately deep (75-100 cm)
NGP,ANR,MDG - Deep (100-150 cm)
MDR, BMN -Very deep (>150 cm)




| Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) |
|---|---|---|---|---|---|---|---|---|---|
| *Soil of Granite and Granite Gneiss Landscape* | | | | | | | | | |
| 2. BDLbB2 | 233 (5.24) | 16. HLGcB2 | 33 (0.74) | 126. HSLhB2 | 54 (1.22) | 55. ANRiB2 | 40 (0.89) | 119. BDPiB3 | 411 (9.23) |
| 3. BDLbC3 | 44 (0.98) | 20. JNKcB2 | 39 (0.88) | 173. HSLiB2g1 | 95 (2.14) | 167. ANRcA1 | 21 (0.46) | 120. BDPhB2 | 97 (2.17) |
| 4. BDLhB2 | 192 (4.3) | 22. JNKiB2 | 431 (9.69) | 34. GWDcB2 | 33 (0.75) | 57. MDGcB2 | 11 (0.24) | 121. DSBcB2 | 15 (0.33) |
| 5. BDLiB2 | 539 (12.1) | 23. JNKiB2g1 | 59 (1.31) | 35. GWDiB2 | 162 (3.64) | 58. MDGiB2 | 24 (0.54) | 133. MDRiB2 | 42 (0.94) |
| 162. BDLhB2g1 | 50 (1.13) | 152. JNKmB2 | 97 (2.18) | 36. SHThB2 | 46 (1.04) | 171. MDGhA1 | 19 (0.42) | 62. BMNmB2 | 163 (3.66) |
| 9. VNKcB2 | 16 (0.35) | 29. YLRcB2g1 | 27 (0.61) | 40. PGPcB2 | 17 (0.39) | 113. HTKcC2g1 | 25 (0.56) | 159. BMNmA1 | 93 (2.1) |
| 10. VNKiB2 | 21 (0.46) | 32. HSLcB2 | 78 (1.75) | 49. NGPmB2 | 163 (3.65) | 1. BDPiB2 | 387 (8.7) | 153. KKRbB2g1 | 99 (2.22) |
| 109. VNKmB2g1 | 41 (0.93) | 33. HSLiB2 | 85 (1.92) | 146. NGPmB2g1 | 62 (1.4) | 118. BDPcB2 | 54 (1.22) | 175. KKRcB2 | 17 (0.39) |
| *Low Land* | | | | | | | | | |
| 157. KDHiA1 | 32 (0.72) | 999. Rock outcrops | 42 (0.95) | | | | | | |
| 900. Forest | 1 (0.02) | 1000. Others | 242 (5.42) | | | | | | |

**References**
- Road/Cart track
- Streams/Drainage
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 4.1 Mapping unit description of Shivapur (4D5B1B) Sub-watershed in Yadgir Taluk, Yadgir district

| Soil map unit No* | Soil Series | Soil Phase Symbol | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite gneiss Landscape** | | | | |
| | BMN | Bhimanahalli soils are very deep (>150 cm), moderately well drained, have very dark gray, calcareous cracking clay black soils occurring on very gently sloping uplands under cultivation | | **256 (5.7)** |
| 159 | | BMNmA1 | Clay surface, slope 0-1%, slight erosion | 93 (2.1) |
| 62 | | BMNmB2 | Clay surface, slope 1-3%, moderate erosion | 163 (3.66) |
| | MDR | Madhwara soils are very deep (>150 cm), well drained, have very dark gray to very dark brown, slightly calcareous sandy clay loam soils occurring on nearly level to very gently sloping uplands under cultivation | | **42 (0.94)** |
| 133 | | MDRiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 42 (0.94) |
| | ANR | Anur soils are deep (100-150 cm), moderately well drained, have dark gray to dark brown, calcareous sodic clay soils occurring on very gently to gently sloping uplands under cultivation | | **61 (1.35)** |
| 167 | | ANRcA1 | Sandy loam surface, slope 0-1%, slight erosion | 21 (0.46) |
| 55 | | ANRiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 40 (0.89) |
| | MDG | Mundargi soils are deep (100-150 cm), well drained, have brown to dark yellowish brown, sandy clay loam soils occurring on very gently sloping uplands under cultivation | | **53 (1.1)** |
| 57 | | MDGcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 11 (0.24) |
| 171 | | MDGhA1 | Sandy clay loam surface, slope 0-1%, slight erosion | 19 (0.42) |
| 58 | | MDGiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 24 (0.54) |
| | NGP | Nagalapur soils are deep (100-150 cm), moderately well drained, have very dark gray to very dark grayish brown, black calcareous cracking clay soils occurring on very gently sloping uplands under cultivation | | **225 (5.0)** |
| 49 | | NGPmB2 | Clay surface, slope 1-3%, moderate erosion | 163 (3.65) |
| 146 | | NGPmB2g1 | Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 62 (1.4) |
| | GWD | Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown, calcareous sodic sandy clay loam soils occurring on very gently sloping uplands under cultivation | | **195 (4.3)** |
| 34 | | GWDcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 33 (0.75) |
| 35 | | GWDiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 162 (3.64) |
| | HSL | Hosalli soils are moderately deep (75-100 cm), moderately well drained, have yellowish brown to dark yellowish brown, slightly calcareous sandy clay soils occurring on very gently sloping uplands under cultivation | | **313 (7.0)** |
| 32 | | HSLcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 78 (1.75) |
| 126 | | HSLhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 54 (1.22) |
| 33 | | HSLiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 85 (1.92) |
| 173 | | HSLiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 95 (2.14) |
| | PGP | Poglapur soils are moderately deep (75-100 cm), well drained, have dark brown, dark reddish brown to yellowish red sandy clay soils occurring on very gently sloping uplands under cultivation | | **17 (0.39)** |
| 40 | | PGPcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 17 (0.39) |

*To be continued….*

| Soil map unit No* | Soil Series | Soil Phase Symbol | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | SHT | Shettalli soils are moderately deep (75-100 cm), well drained, have very dark gray, slightly calcareous gravelly sandy clay soils occurring on very gently sloping uplands under cultivation | | **46 (1.04)** |
| 36 | | SHThB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 46 (1.04) |
| | JNK | Jinkera soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, slightly calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation | | **626 (14.0)** |
| 20 | | JNKcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 39 (0.88) |
| 22 | | JNKiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 431 (9.69) |
| 23 | | JNKiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 59 (1.31) |
| 152 | | JNKmB2 | Clay surface, slope 1-3%, moderate erosion | 97 (2.18) |
| | YLR | Yalleri soils are moderately shallow (50-75 cm), well drained, have brown to reddish brown and dark reddish brown, clay red soils occurring on very gently to gently sloping uplands under cultivation | | **27 (0.61)** |
| 29 | | YLRcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 27 (0.61) |
| | HLG | Halagera soils are moderately shallow (50-75 cm), well drained, have very dark grayish brown to dark yellowish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation. | | **33 (0.74)** |
| 16 | | HLGcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 33 (0.74) |
| | BDL | Badiyala soils are shallow (25-50 cm), well drained, have dark brown to very dark brown and dark yellowish brown, slightly calcareous sandy loam soils occurring on very gently to gently sloping uplands under cultivation | | **1057 (23)** |
| 2 | | BDLbB2 | Loamy sand surface, slope 1-3%, moderate erosion | 233 (5.24) |
| 3 | | BDLbC3 | Loamy sand surface, slope 3-5%, severe erosion | 44 (0.98) |
| 4 | | BDLhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 192 (4.3) |
| 162 | | BDLhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 50 (1.13) |
| 5 | | BDLiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 539 (12.1) |
| | DSB | Dastharabad soils are shallow (25-50 cm), well drained, have dark brown to very dark brown, gravelly clay soils occurring on very gently to gently sloping uplands under cultivation | | **15 (0.33)** |
| 121 | | DSBcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 15 (0.33) |
| | HTK | Hattikuni soils are shallow (25-50 cm), well drained, have dark yellowish brown sandy loam soils occurring on very gently sloping uplands under cultivation | | **25 (0.56)** |
| 113 | | HTKcC2g1 | Sandy loam surface, slope 3-5%, moderate erosion, gravelly (15-35%) | 25 (0.56) |
| | VNK | Vanakanahalli soils are shallow (25-50 cm), well drained, have dark reddish brown, sandy clay red soils occurring on very gently to moderately sloping uplands under cultivation | | **77 (1.7)** |
| 9 | | VNKcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 16 (0.35) |
| 10 | | VNKiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 21 (0.46) |
| 109 | | VNKmB2g1 | Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 41 (0.93) |

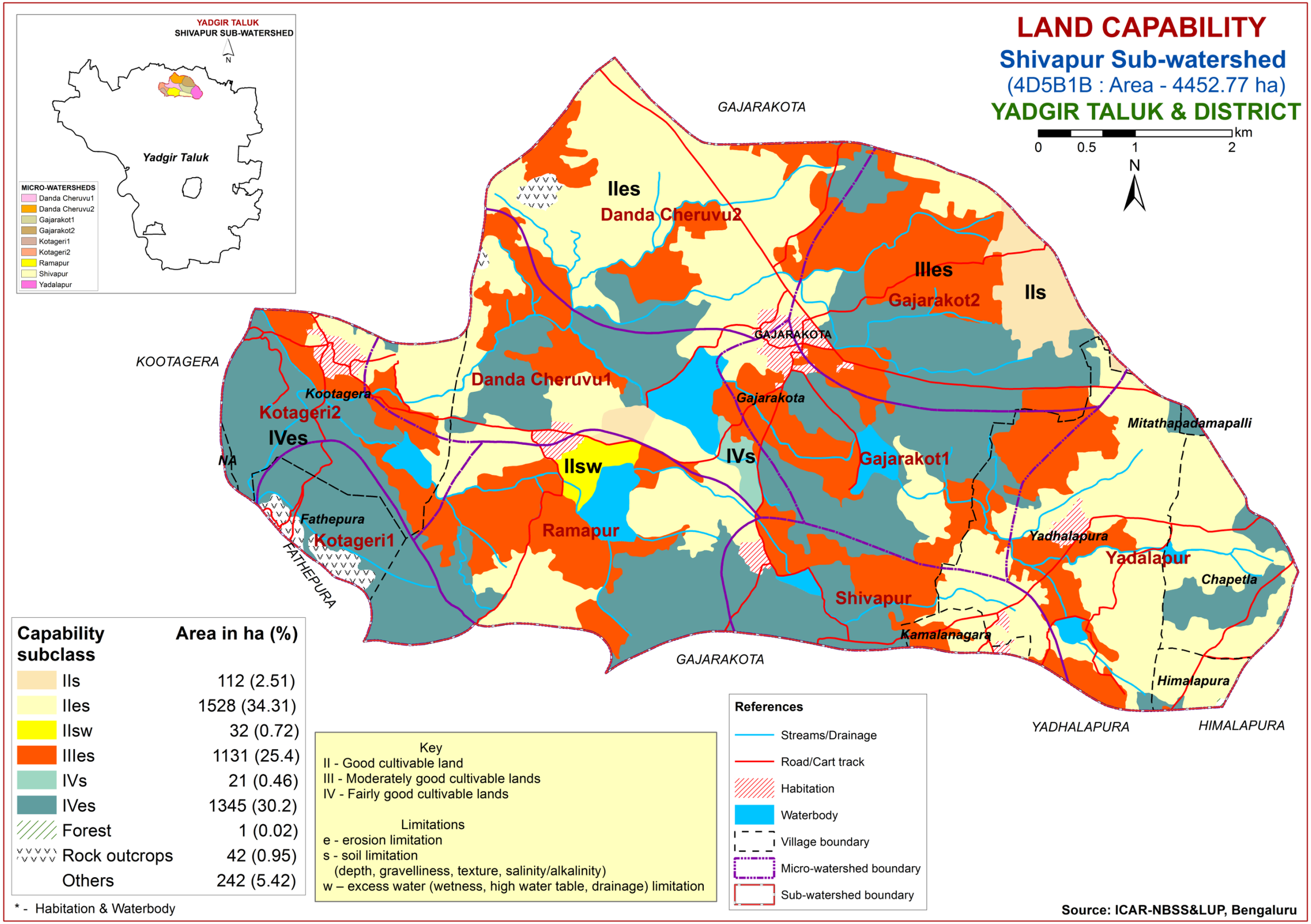
*To be continued….*

| Soil map unit No* | Soil Series | Soil Phase Symbol | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | BDP | Baddeppalli soils are very shallow (<25 cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation | | **950 (21)** |
| 118 | | BDPcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 54 (1.22) |
| 120 | | BDPhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 97 (2.17) |
| 1 | | BDPiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 387 (8.7) |
| 119 | | BDPiB3 | Sandy clay surface, slope 1-3%, severe erosion | 411 (9.23) |
| | KKR | Kakalawar soils are very shallow (<25 cm), well drained, have dark brown sandy loam soils occurring on very gently sloping uplands under cultivation | | **116 (2.6)** |
| 153 | | KKRbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 99 (2.22) |
| 175 | | KKRcB2 | Sandy loam surface, slope 1-3 %, moderate erosion | 17 (0.39) |
| 900 | | Forest | Forest area | 1 (0.02) |
| 999 | | Rock outcrops | Rock lands, both massive and bouldery with little or no soil | **42 (0.95)** |
| 1000 | | Others | Habitation and Water body | **242 (5.42)** |

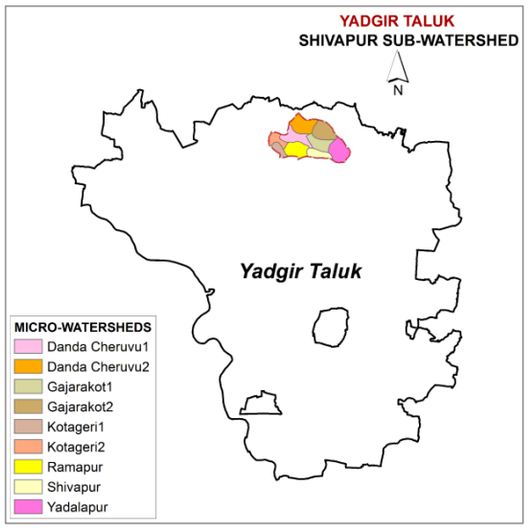
* Soil map unit numbers are continuous for the taluk, not for the sub-watershed

# 5. Soil Survey Interpretations

## 5.1. Land Capability Classification



# 5.2. Soil Depth




## SOIL DEPTH

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA
NA
Danda Cheruvu2
Danda Cheruvu1
Gajarakot2
Gajarakot1
Kotageri2
Kotageri1
Ramapur
Shivapur
Kootagera
Fathepura
Gajarakota
Mitathapadamapalli
Yadhalapura
Yadalapur
Chapetla
Kamalanagara
Himalapura

| Depth Class | Area in ha (%) |
|---|---|
| Very shallow (<25 cm) | 1066 (23.94) |
| Shallow (25-50 cm) | 1175 (26.38) |
| Moderately shallow (50-75 cm) | 686 (15.42) |
| Moderately deep (75-100 cm) | 604 (13.57) |
| Deep (100-150 cm) | 339 (7.6) |
| Very deep (>150 cm) | 298 (6.7) |
| Rock outcrops | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

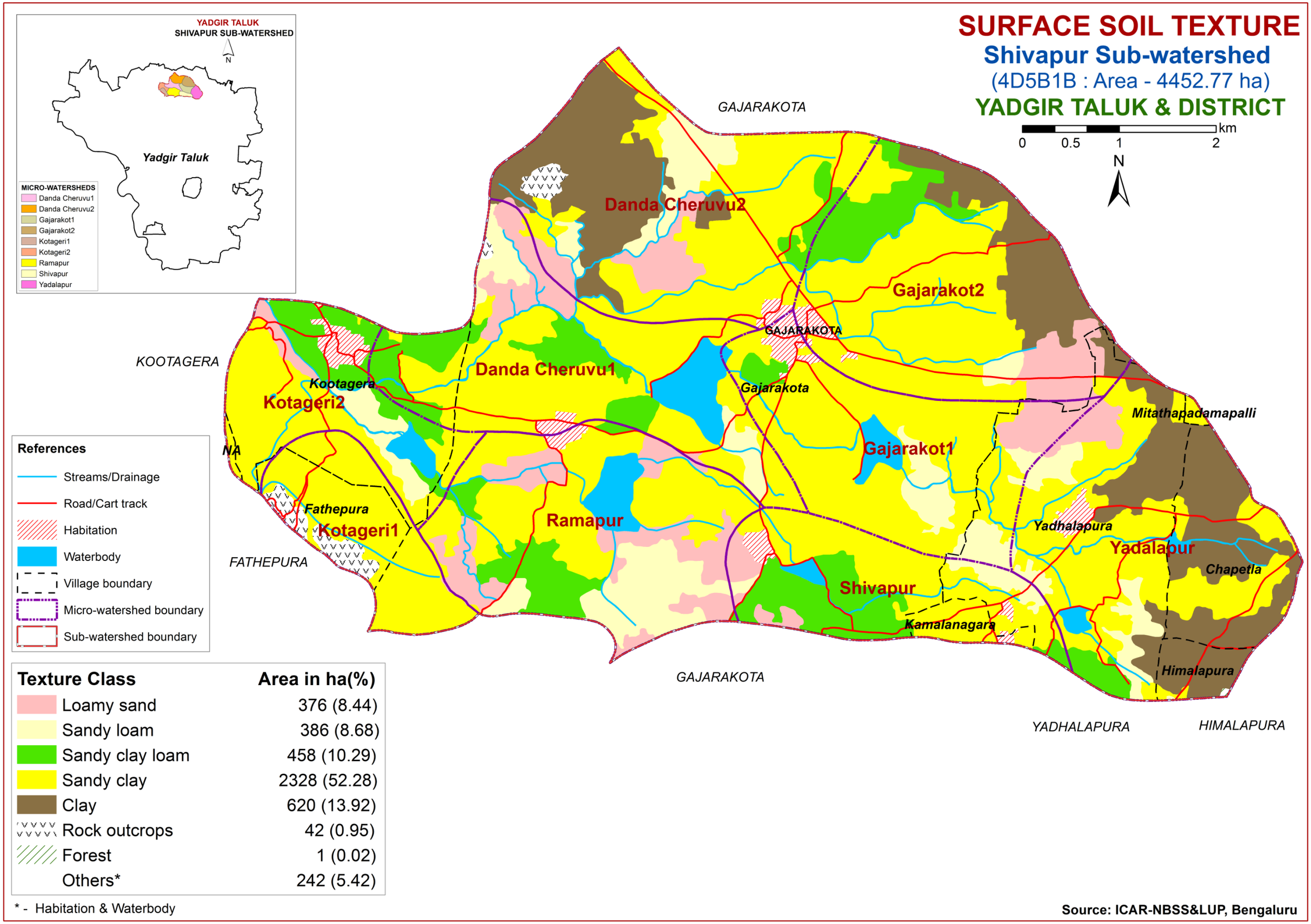
**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

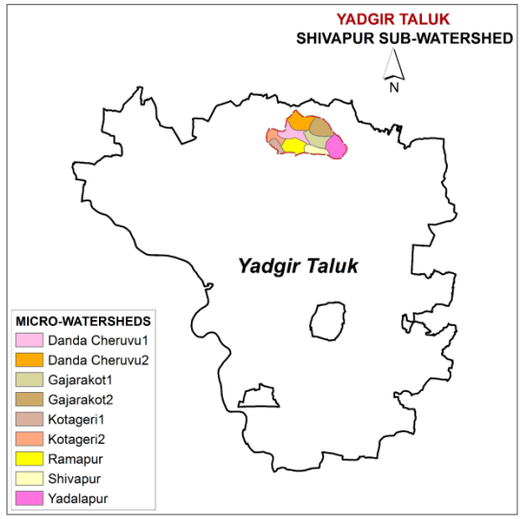
* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.3. Surface Soil Texture



# 5.4. Surface Soil Gravelliness




## SOIL GRAVELLINESS

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

Danda Cheruvu2
Gajarakot2
Danda Cheruvu1
Kotageri2
Kootagera
Gajarakota
Mitathapadamapalli
Gajarakot1
NA
Fathepura
Kotageri1
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Gravelly Class | Area in ha (%) |
|---|---|
| Non gravelly (<15%) | 3709 (83.29) |
| Gravelly (15-35%) | 459 (10.31) |
| Rock outcrops | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

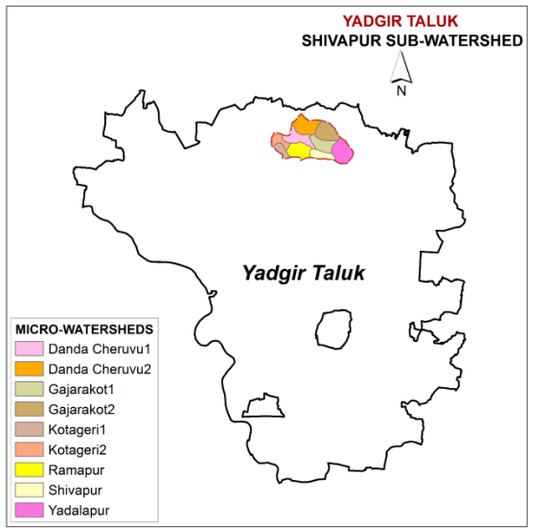
## 5.5. Available Water Capacity

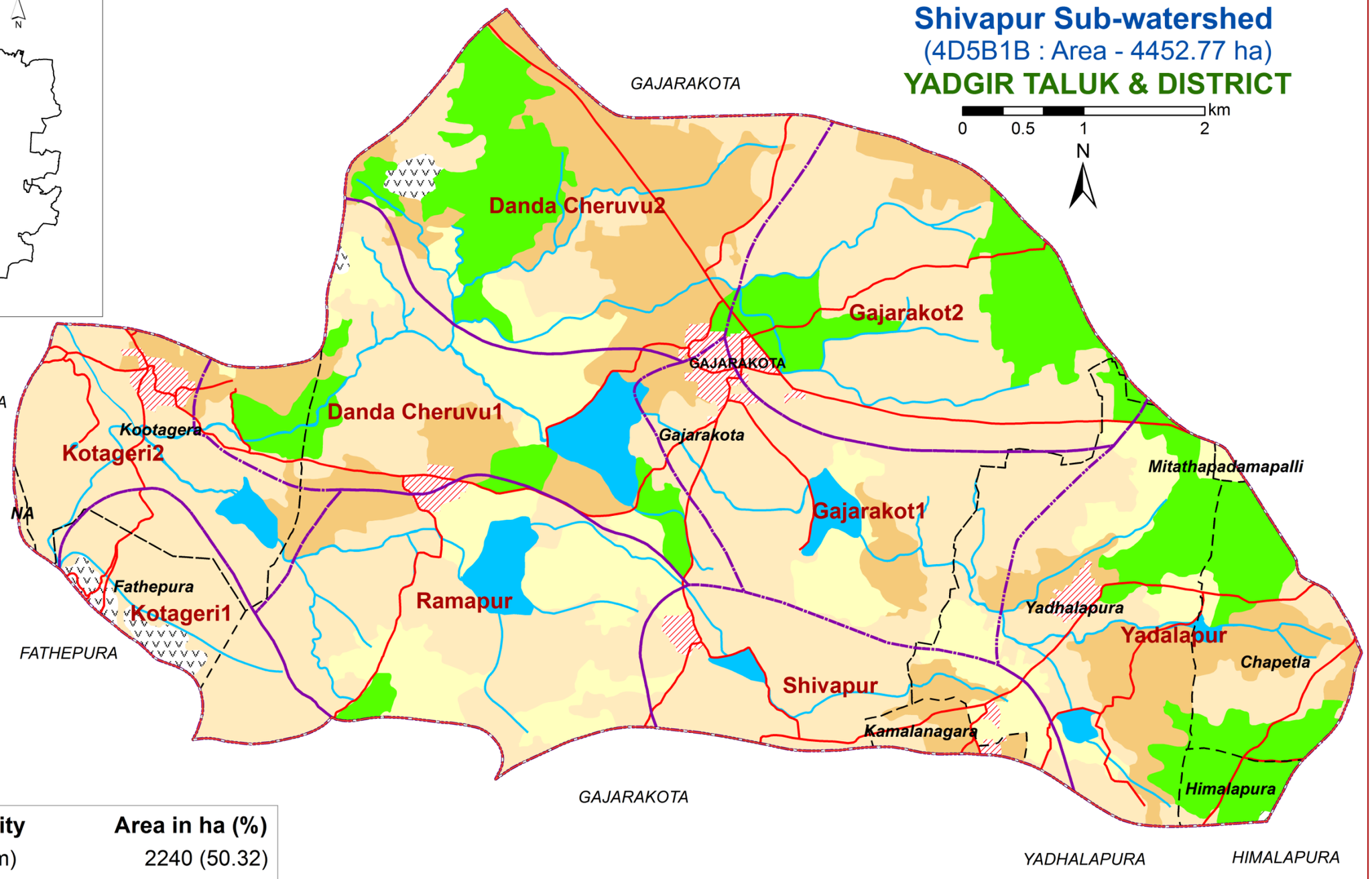
# AVAILABLE WATER CAPACITY

## Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

## YADGIR TALUK & DISTRICT




**References**

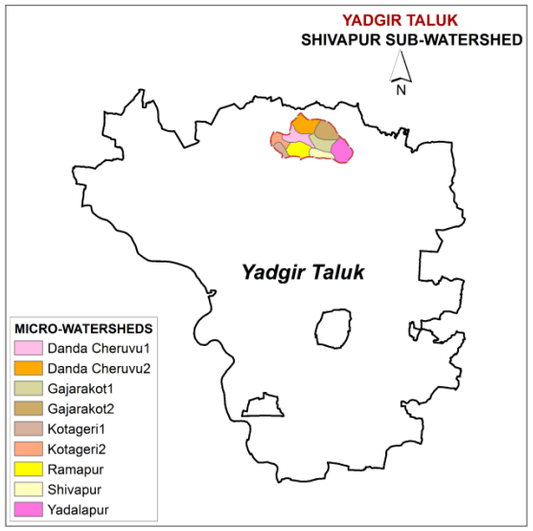
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Available Water Capacity | Area in ha (%) |
|---|---|
| Very low (<50 mm/m) | 2240 (50.32) |
| Low (51-100 mm/m) | 750 (16.85) |
| Medium (101-150 mm/m) | 540 (12.14) |
| Very high (>200 mm/m) | 637 (14.3) |
| Rock outcrops | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.6.Slope







**References**

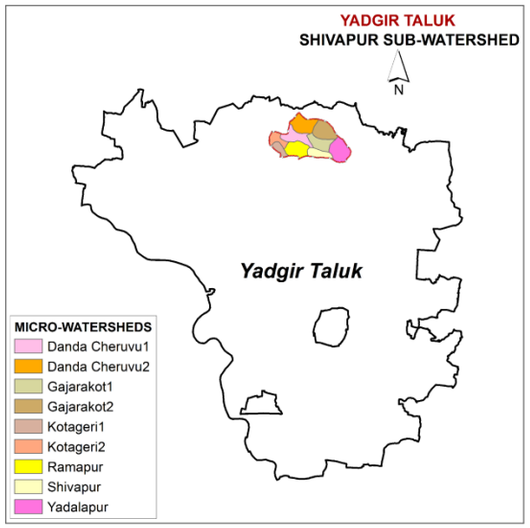
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Slope Class | Area in ha (%) |
|---|---|
| Nearly level (0-1%) | 165 (3.7) |
| Very gently sloping (1-3%) | 3935 (88.37) |
| Gently sloping (3-5%) | 69 (1.54) |
| Rock outcrops | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.7.Soil Erosion




## SOIL EROSION

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km 0 0.5 1 2

N

GAJARAKOTA

Danda Cheruvu2

Gajarakot2

GAJARAKOTA

KOOTAGERA

Danda Cheruvu1

Kootagera

Kotageri2

Gajarakota

Mitathapadamapalli

NA

Gajarakot1

Fathepura

Kotageri1

Ramapur

Yadhalapura

Yadalapur

Chapetla

FATHEPURA

Shivapur

Kamalanagara

Himalapura

GAJARAKOTA

YADHALAPURA

HIMALAPURA

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

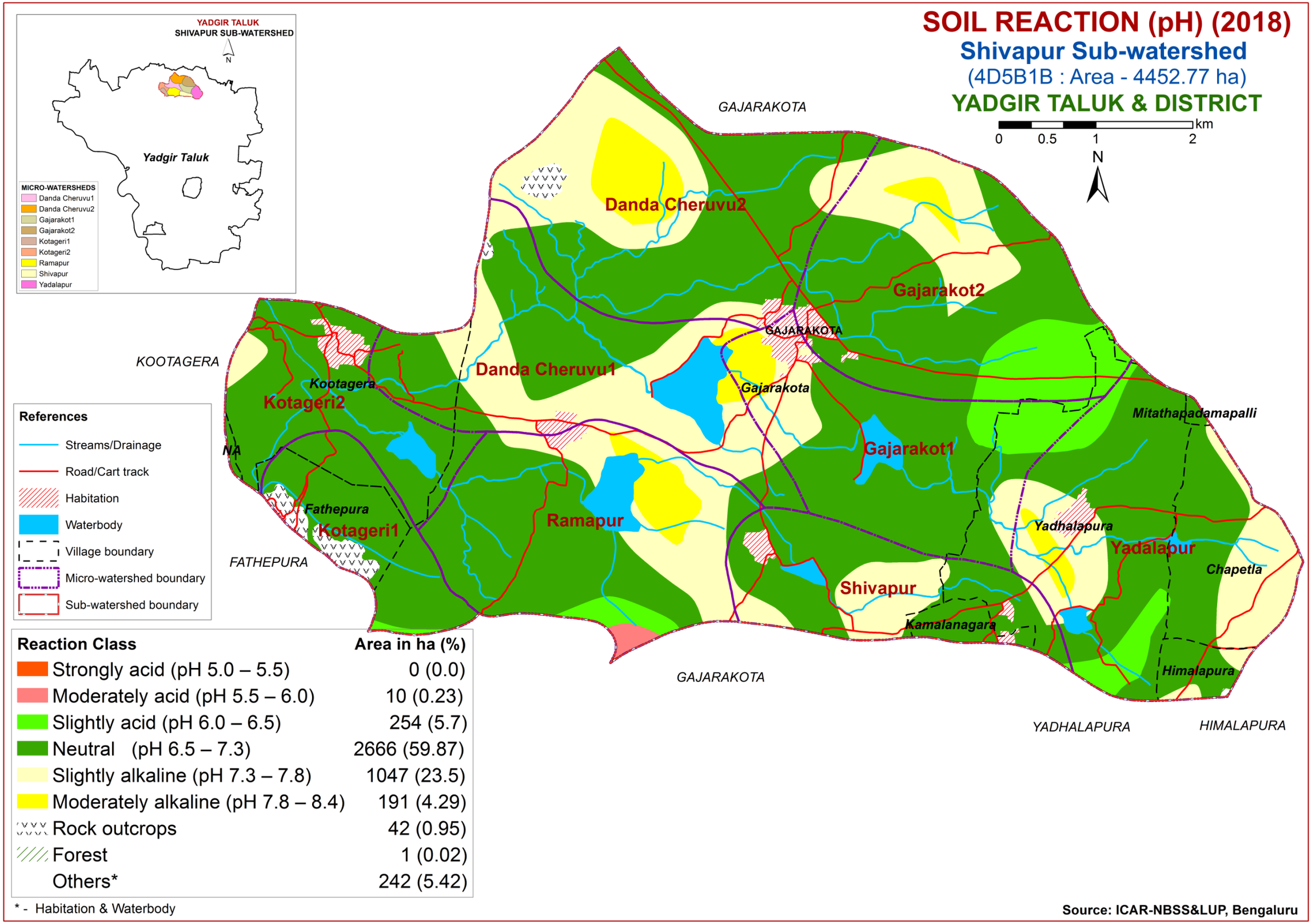
| Erosion Class | Area in ha(%) |
|---|---|
| Slight | 165 (3.7) |
| Moderate | 3549 (79.7) |
| Severe | 455 (10.21) |
| Rock outcrops | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6. Soil Fertility Status

## 6.1. Soil Reaction (pH)

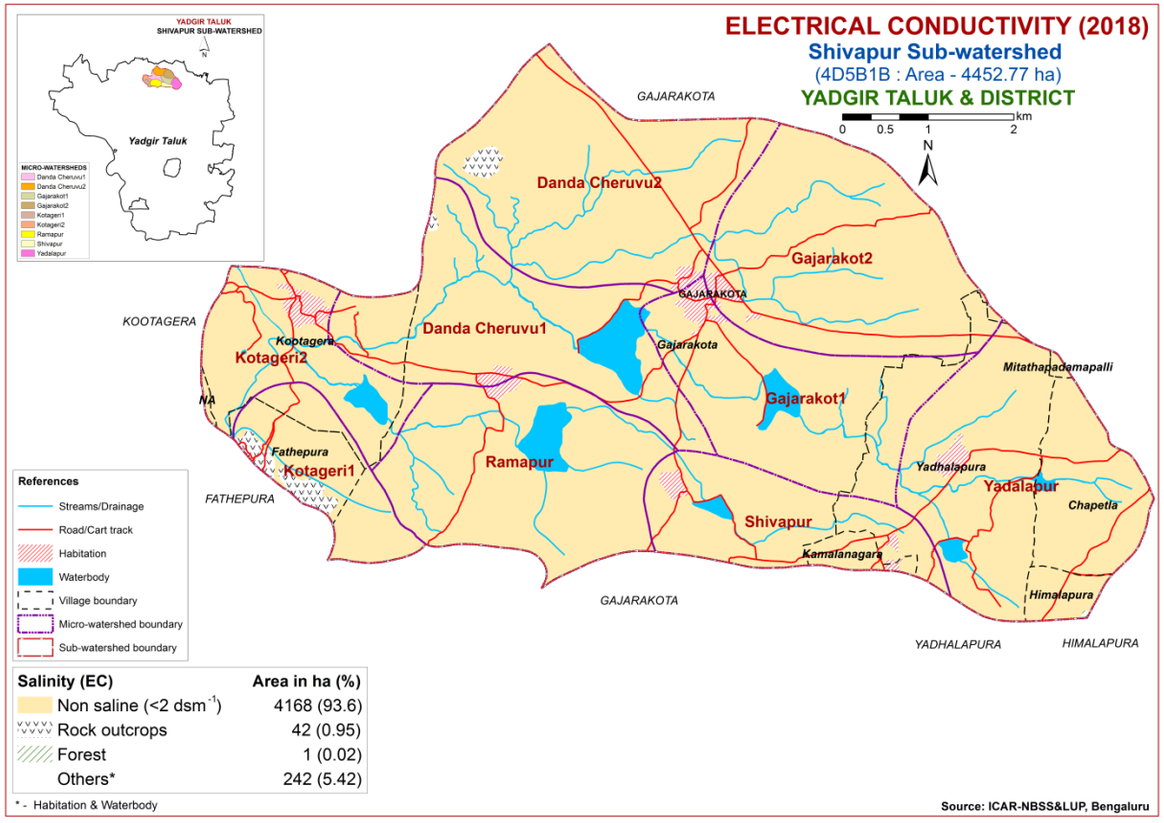



| Reaction Class | Area in ha (%) |
|---|---|
| Strongly acid (pH 5.0 – 5.5) | 0 (0.0) |
| Moderately acid (pH 5.5 – 6.0) | 10 (0.23) |
| Slightly acid (pH 6.0 – 6.5) | 254 (5.7) |
| Neutral (pH 6.5 – 7.3) | 2666 (59.87) |
| Slightly alkaline (pH 7.3 – 7.8) | 1047 (23.5) |
| Moderately alkaline (pH 7.8 – 8.4) | 191 (4.29) |
| Rock outcrops | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

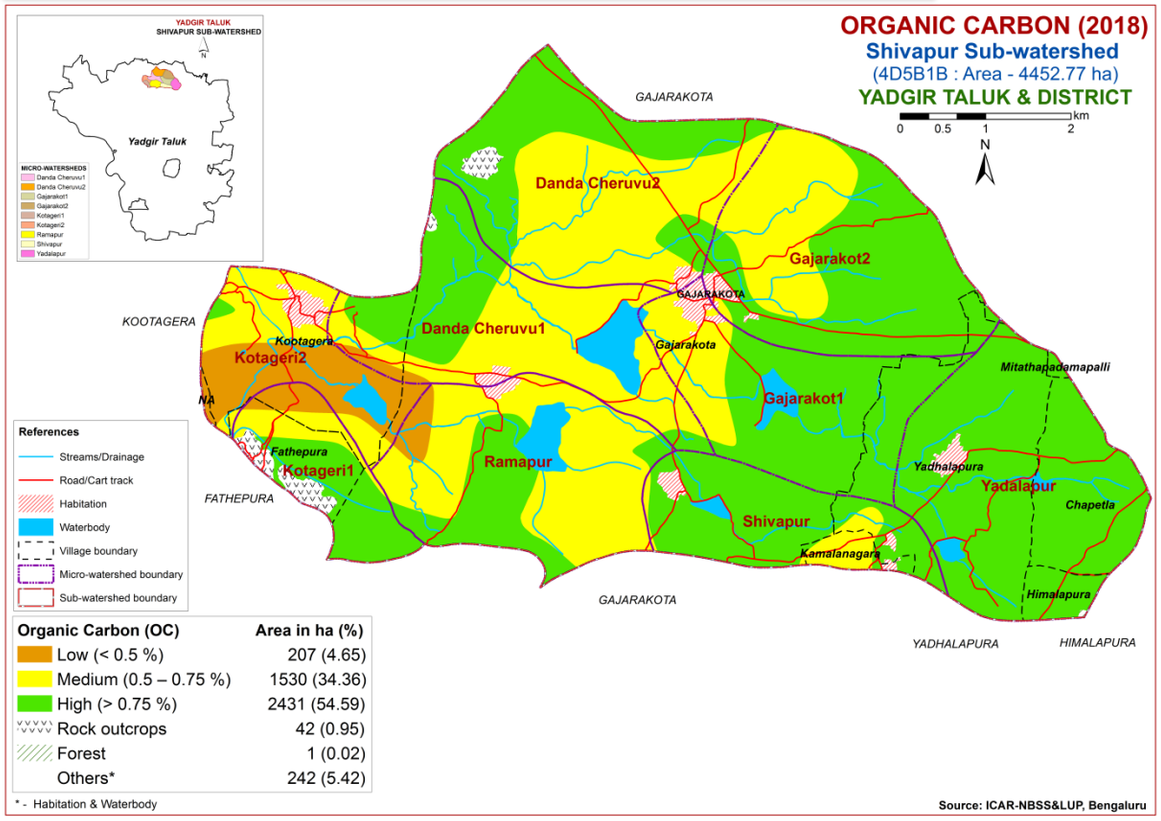
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

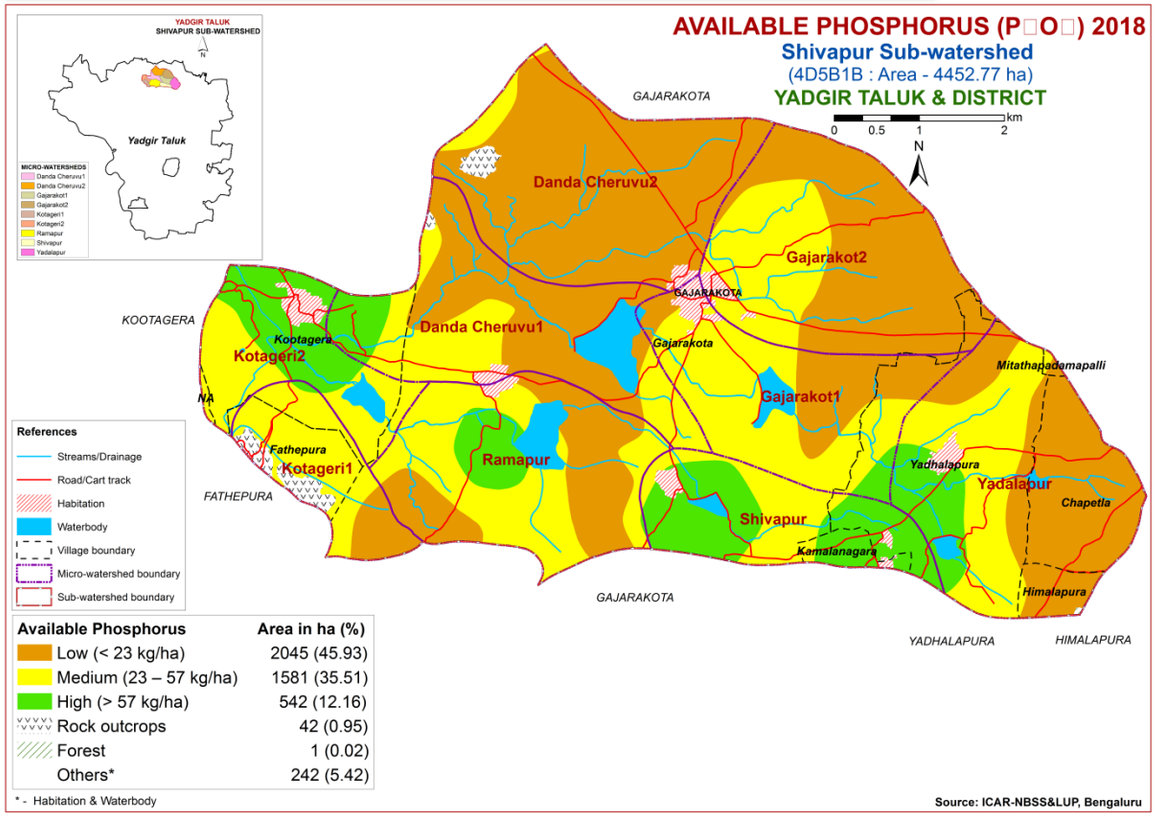
## 6.2. Electrical Conductivity (EC)



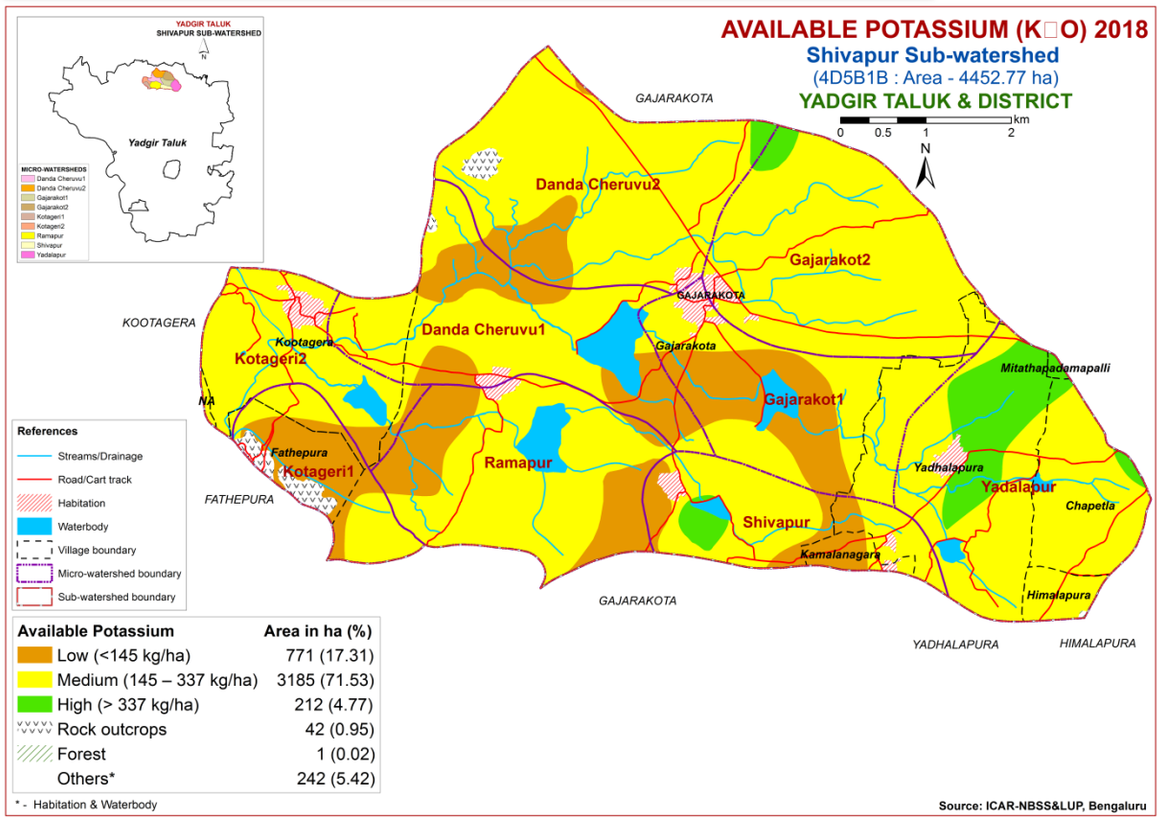

## 6.3. Organic Carbon



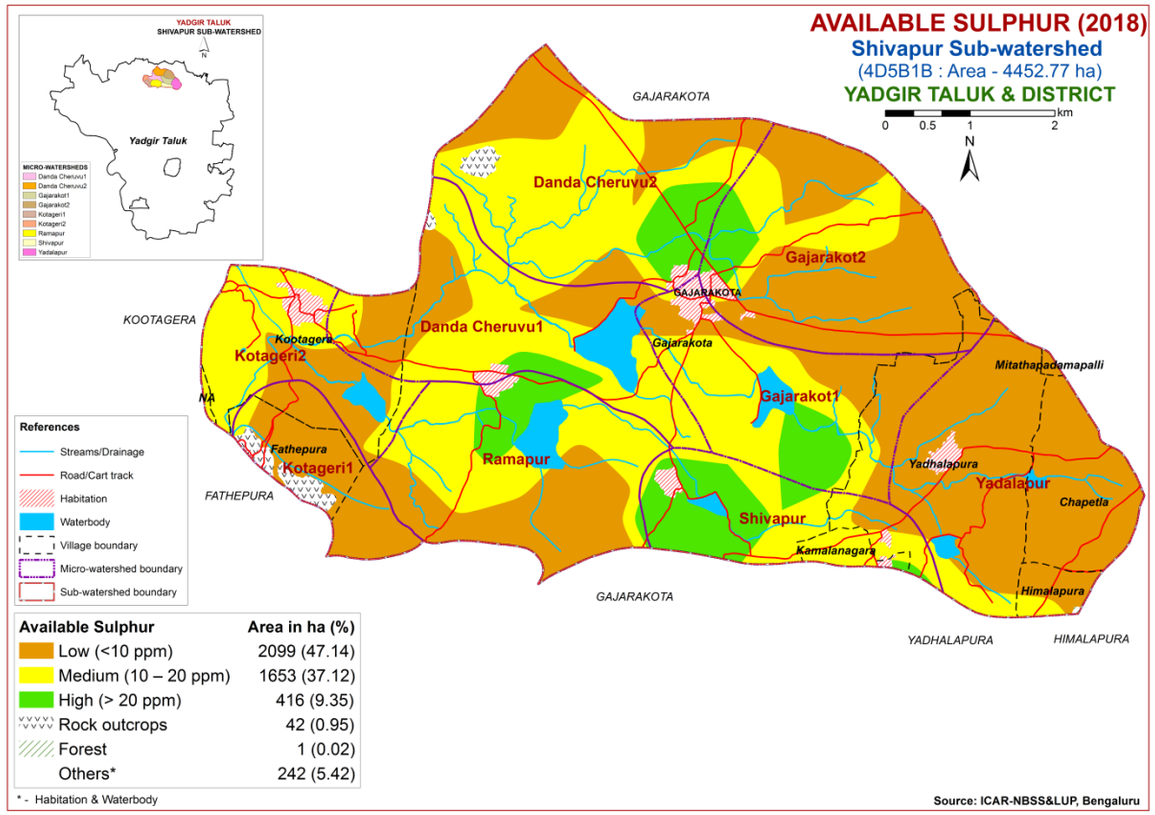

## 6.4. Available Phosphorus ($P_2O_5$)



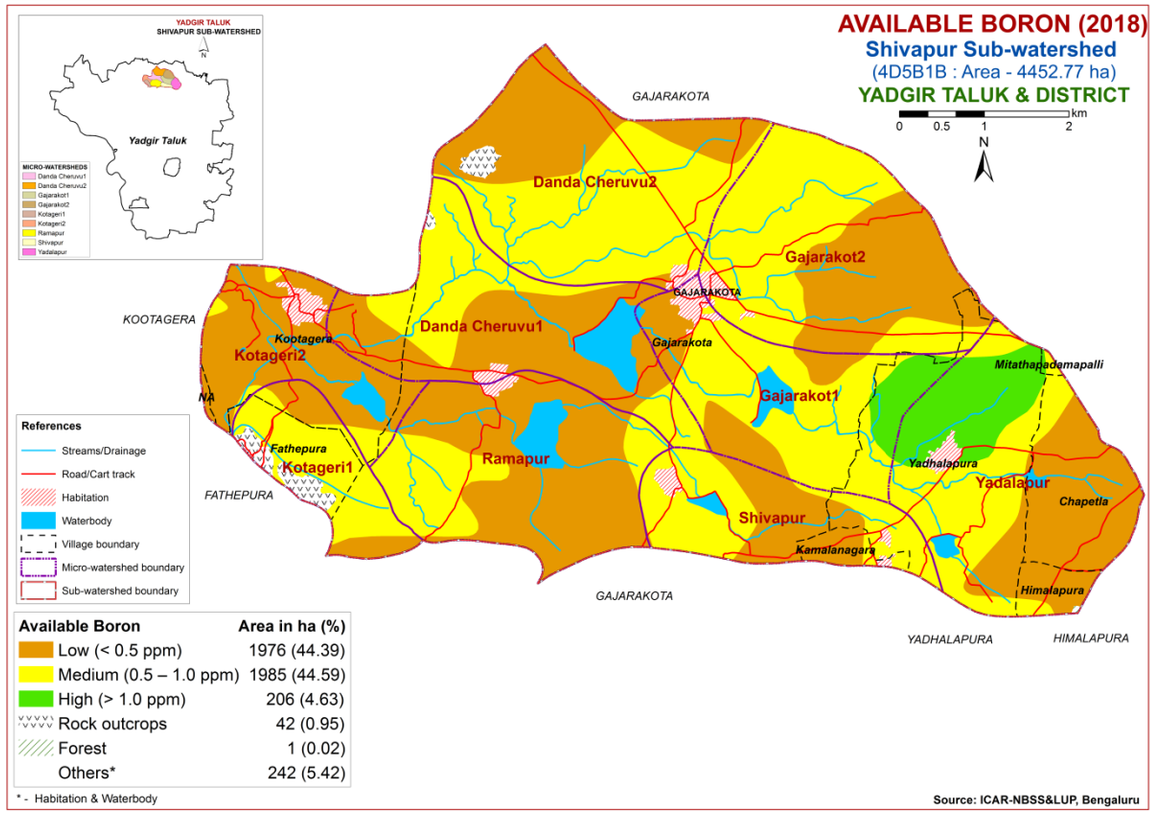

## 6.5. Available Potassium ($K_2O$)



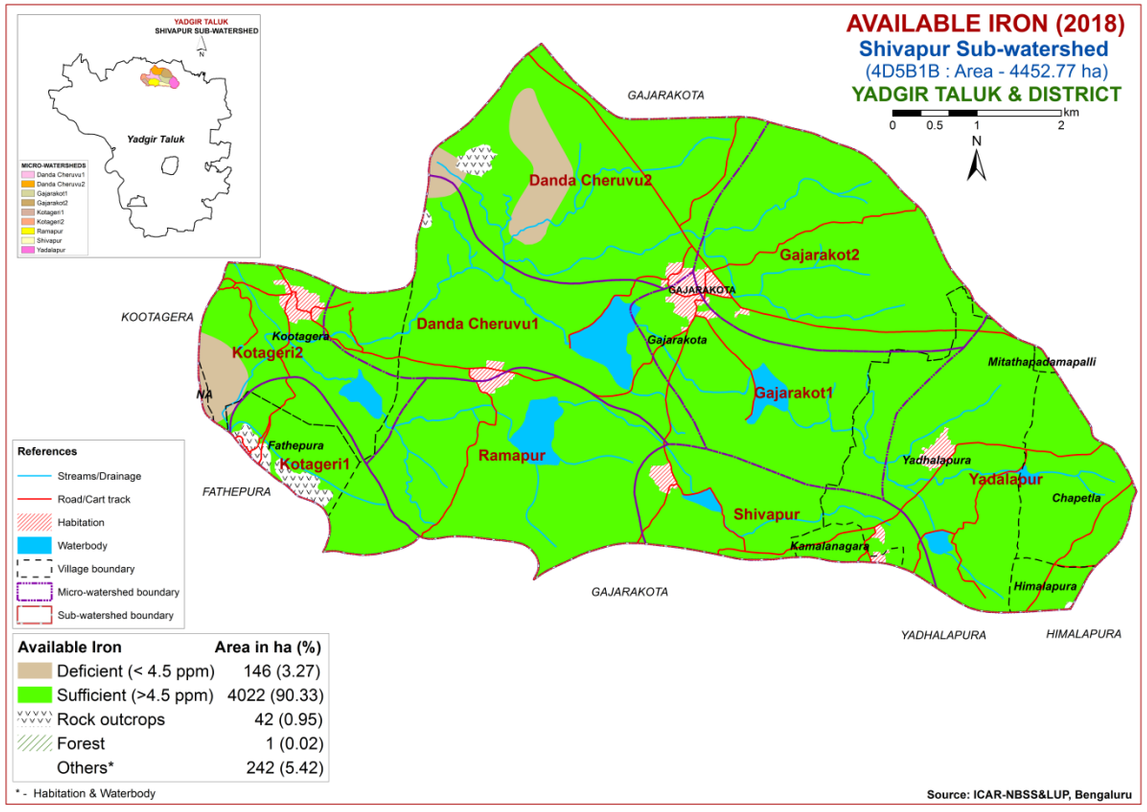
## 6.6. Available Sulphur



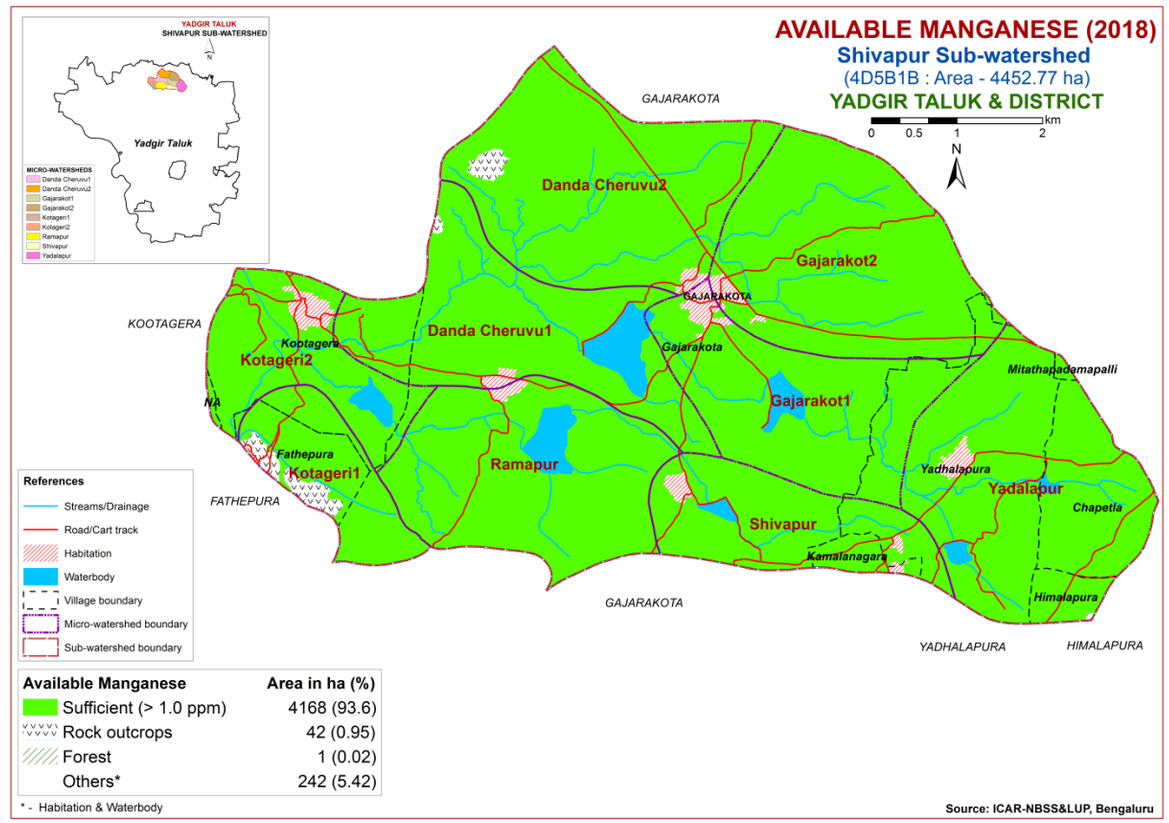

## 6.7. Available Boron



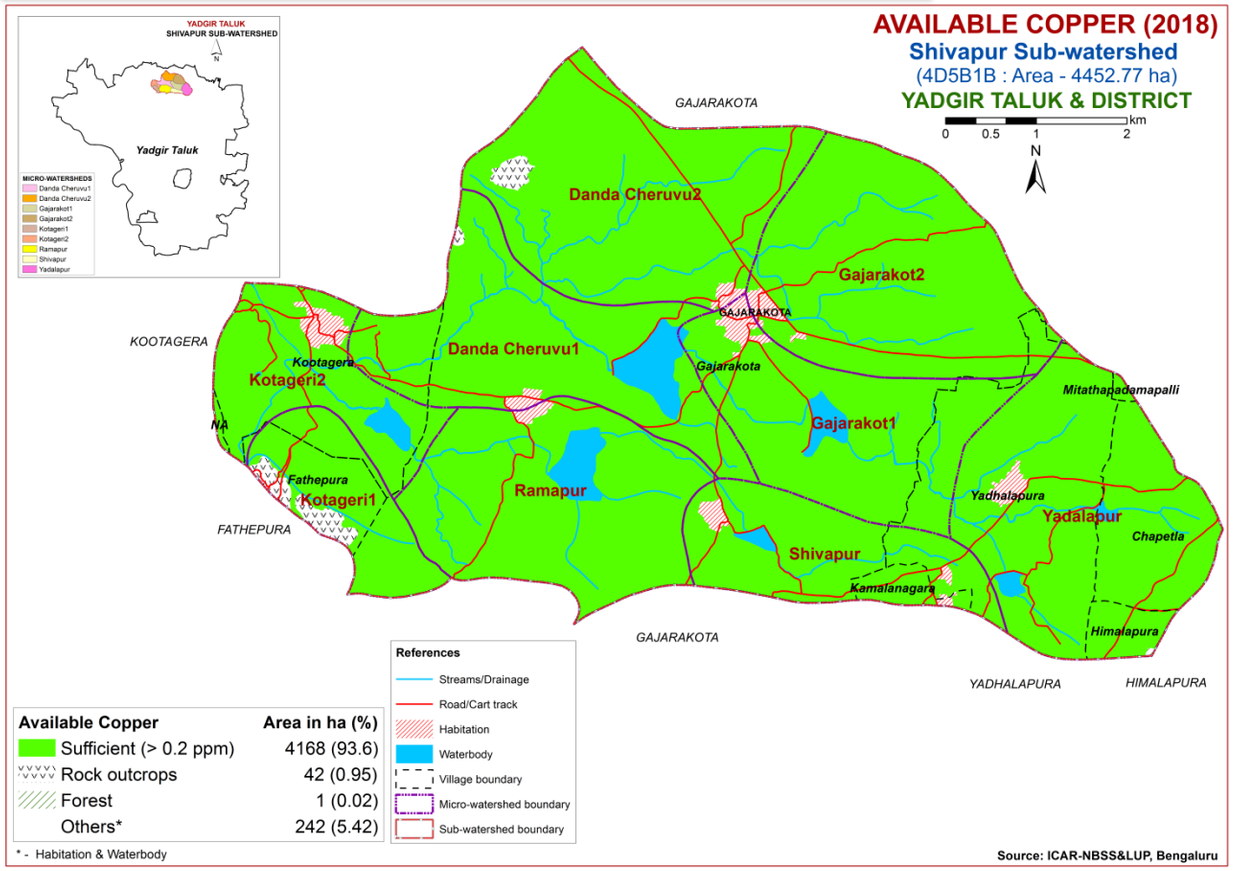

## 6.8. Available Iron



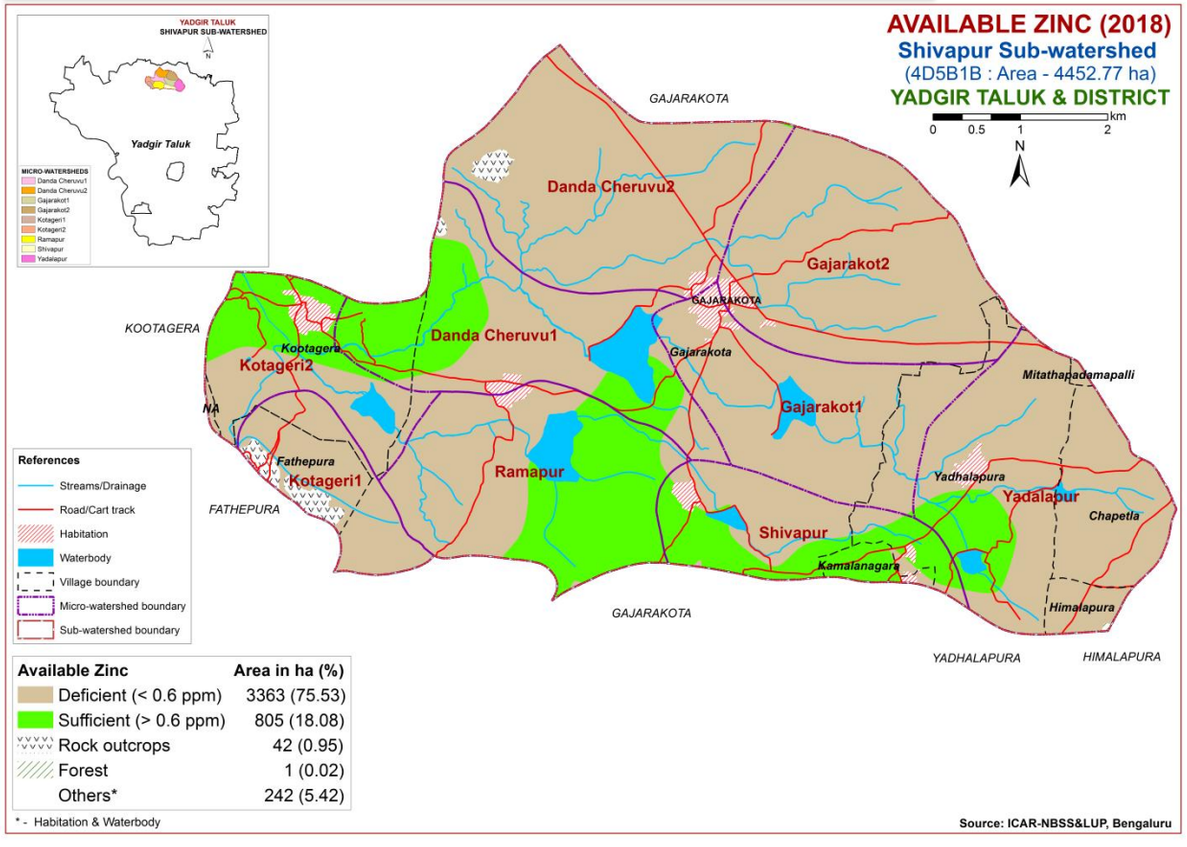

## 6.9. Available Manganese



## 6.10. Available Copper




## 6.11. Available Zinc



## 6.12. Correcting the Soil Nutrient Deficiencies

1. Reclamation of Salt affected soils
   a) When the soil is having neutral pH (6.5-7.5), no need of adding amendments (lime or gypsum)
   b) If the soil pH is <6.5, apply burnt lime to soil as per specifically recommended dosage and again after 2 years proper change has to be made based on soil test results.
   c) If the soil pH is 7.5-8.5 due to excess calcium content, drain out the excess calcium form the soil with good quality irrigation water.
   d) If the soil pH is more than 8.5 due to higher sodium content in soil, apply specifically recommended dose of gypsum & drain out the excess salts with good quality irrigation water.

2. In case of low & high content of major nutrients in the soil, follow the modifications as given bellow:

- N: P: K (N: $P_2O_5$: $K_2O$) **For low N content**, add 25 % extra to the Recommended Dose of Fertilisers (RDF).
  **For high N content**, reduce 25% from the RDF and apply to soil.

  Eg:- if 100kg N, then we have to apply

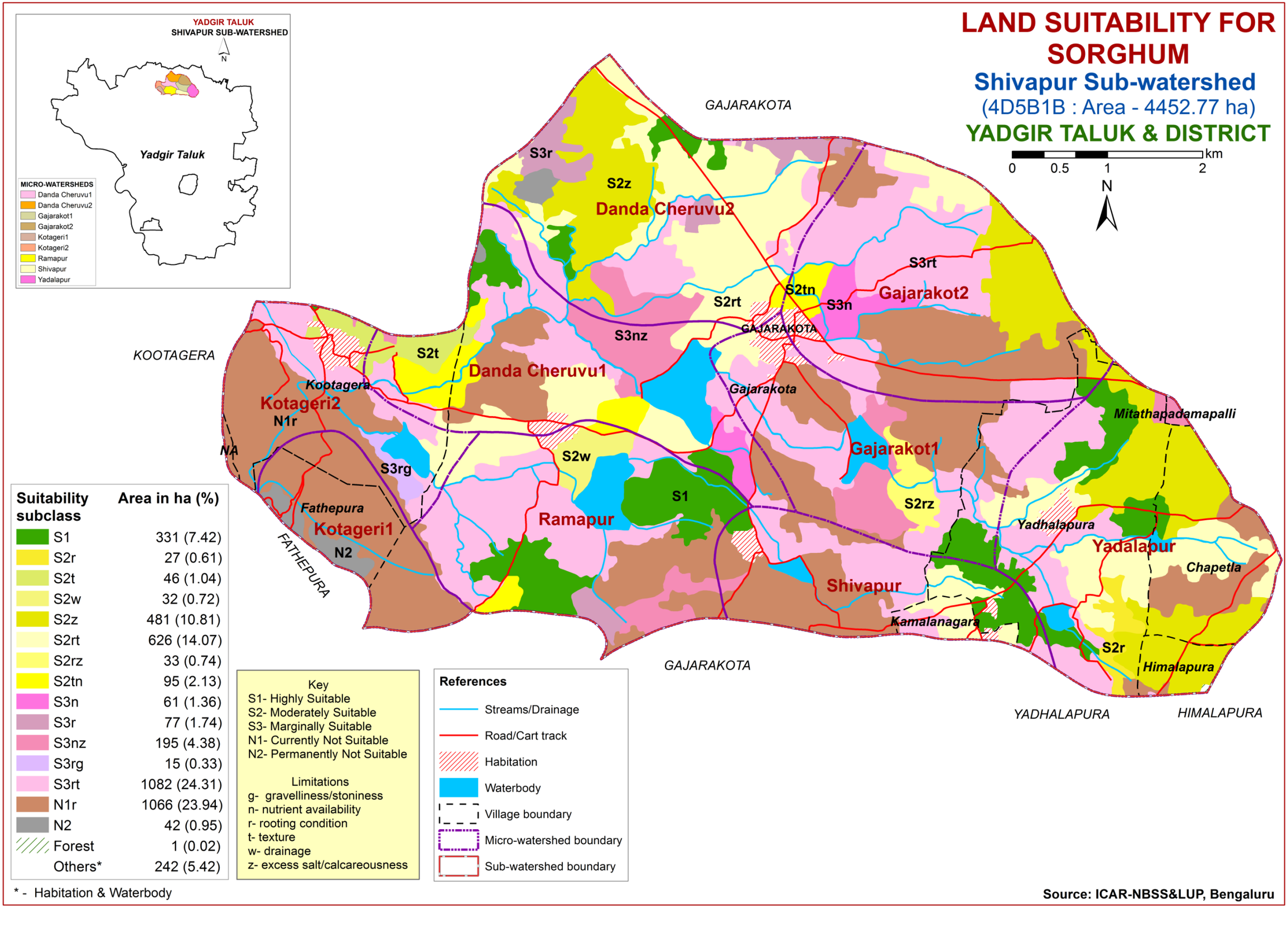
  100+25% for deficient soil.
  100% for medium available N content soil.
  100-25% for higher N content soil.

- Follow the same in case of P & K.

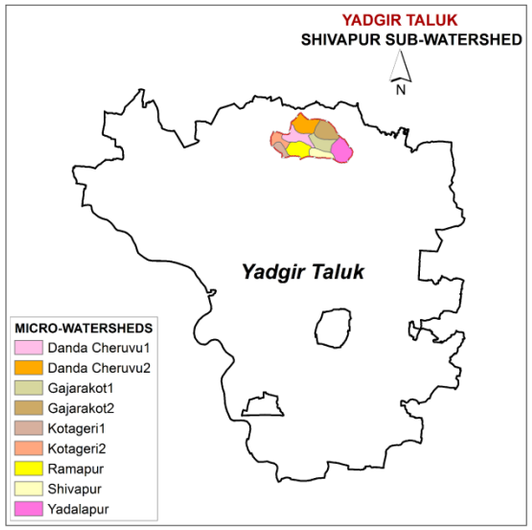
3. Use or Incorporation of biofertilizers like Rhizobium, Azotobacter, Azospirillum, Phosphate Solubilizing Bacteria and mycorrhiza enhances normal available nutrients in soil to the plants and also reduce the input cost of cultivation.
4. For calcium deficient soil, apply N-fertilizers like calcium ammonium nitrate; Gypsum can also supply calcium ($CaSO_4$. $2H_2O$)
5. Apply 405kg $MgSO_4$ per ha to the magnesium deficient soil. In case of perennial horticulture crops apply 150-200g/ plant.
6. In sulphur deficient acid soils (Humid region) apply phosphorus (in the form of) through SSP & use sulphur coated urea to the crops.
7. Apply 30-50kg ferrous sulfate ($FeSO_4$) per ha to the iron deficient soils. In case of perennial Horticulture crops apply 3-5g/ litre $FeSo_4$ /plant as foliar spray.
8. Apply 30-40kg/ha – manganese sulfate ($MnSO_4$) as soil application to the manganese deficient soils. In case of perennial Horticulture crops apply 3-5 g/litre $MnSO_4$ /plant as foilar application.
9. Apply Zinc – 10-25 kg/ha –$ZnSO_4$ – soil application to the Zinc deficient soils. In case of perennial Horticulture crops apply 3-5g/ litre – foliar application.
10. Apply Copper – 5-10 kg /ha – copper sulfate ($CuSO_4$) soil application for the copper deficient soils and for Perennial horticultural crops 3-5g/ litre – $CuSO_4$/plant as foliar application.
11. Apply borax 8-10 kg/ha in boron deficient soils and for Perennial horticultural crops as foliar application – 1g / litre.
12. Apply molybdenum – ammonium molybdate 200-250 gm/ha for Molybdenum deficient soils or dissolve 1g / litre ammonium molybdate for Foliar spray.
13. Soil sampling and testing needs to be done at every 2-3 years interval.

# 7. Land Suitability for Major Crops

## 7.1. Land Suitability for Sorghum



# 7.2. Land Suitability for Maize




## LAND SUITABILITY FOR MAIZE

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

KOOTAGERA

FATHEPURA

GAJARAKOTA

YADHALAPURA

HIMALAPURA

S3r
S2tz
Danda Cheruvu2
S3rt
S2n
S3n
Gajarakot2
S2r
S3nz
GAJARAKOTA
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
S3rg
S2w
Gajarakot1
Gajarakota
Mitathapadamapalli
S1
S2rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
S2rt
Himalapura

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2n | 95 (2.13) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rt | 27 (0.61) |
| S2rz | 33 (0.74) |
| S2tz | 481 (10.81) |
| S3n | 61 (1.36) |
| S3r | 77 (1.74) |
| S3nz | 195 (4.38) |
| S3rg | 15 (0.33) |
| S3rt | 1082 (24.31) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

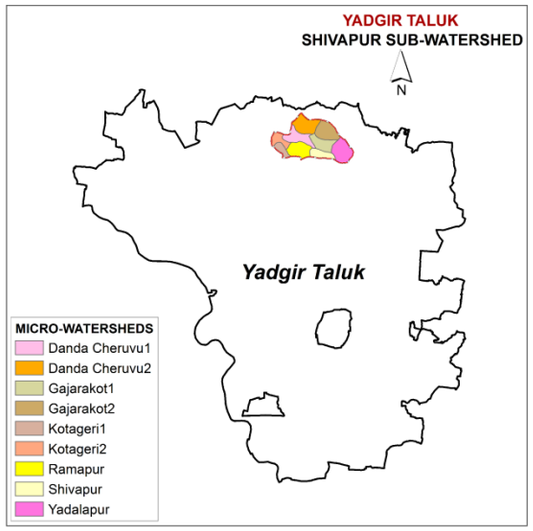
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.3. Land Suitability for Redgram




## LAND SUITABILITY FOR REDGRAM

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km 0 0.5 1 2

N

Key

S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations

n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 331 (7.42) |
| S2rt | 46 (1.04) |
| S2rw | 32 (0.72) |
| S2tn | 95 (2.13) |
| S2tz | 481 (10.81) |
| S3n | 61 (1.36) |
| S3r | 686 (15.42) |
| S3nz | 195 (4.38) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

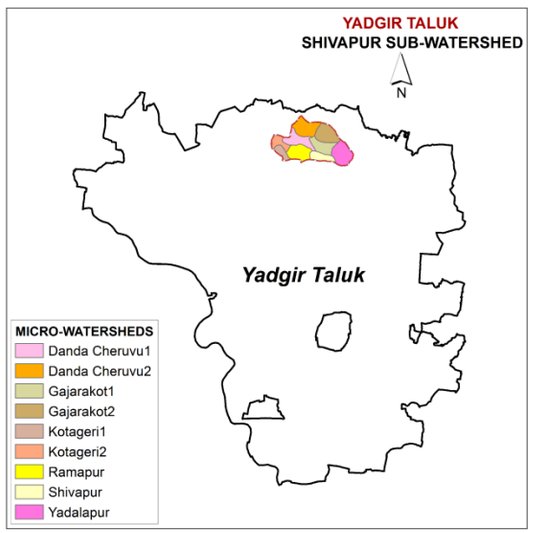
References

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.4. Land Suitability for Bajra




## LAND SUITABILITY FOR BAJRA

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA
Kootagera
Fathepura
Gajarakota
Mitathapadamapalli
Yadhalapura
Chapetla
Kamalanagara
Himalapura

S2tz
Danda Cheruvu2
S3r
S2n
S3n
Gajarakot2
S2r
S3nz
Danda Cheruvu1
Kotageri2
N1r
NA
S2w
Gajarakot1
S3rt
S1
S2rz
Ramapur
Kotageri1
N2
Shivapur
Yadalapur

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2n | 95 (2.13) |
| S2r | 654 (14.68) |
| S2w | 32 (0.72) |
| S2rz | 33 (0.74) |
| S2tz | 481 (10.81) |
| S3n | 61 (1.36) |
| S3r | 1150 (25.82) |
| S3nz | 195 (4.38) |
| S3rt | 25 (0.56) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

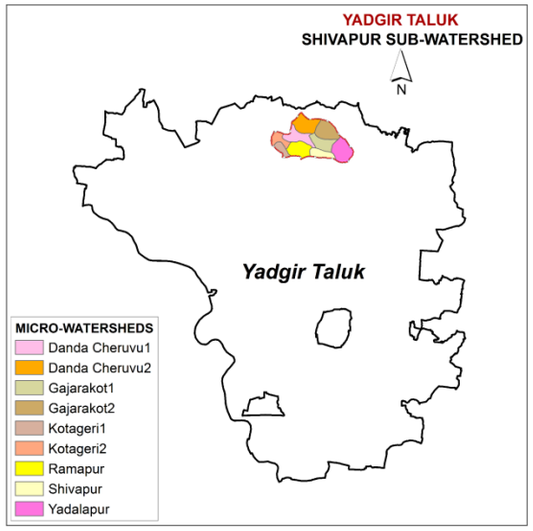
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.5. Land Suitability for Drumstick




## LAND SUITABILITY FOR DRUMSTICK

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S3z
Danda Cheruvu2
S3r
N1n
Gajarakot2
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
Gajarakota
Gajarakot1
Mitathapadamapalli
S2rw
S2r
S3rz
Ramapur
Fathepura
Kotageri1
N2
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 377 (8.47) |
| S2rw | 32 (0.72) |
| S3r | 654 (14.68) |
| S3z | 481 (10.81) |
| S3rz | 33 (0.74) |
| N1n | 351 (7.88) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

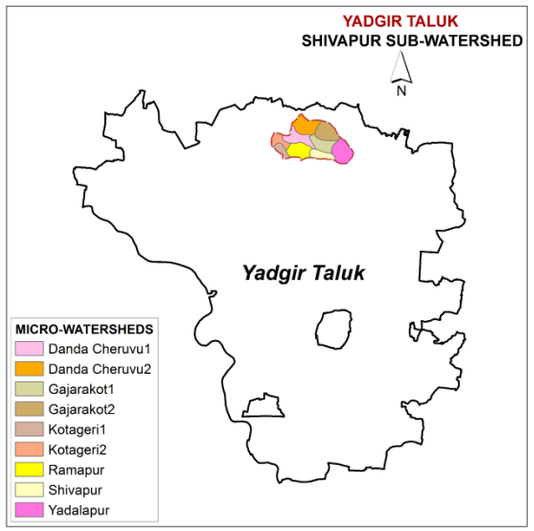
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.6. Land Suitability for Sunflower




## LAND SUITABILITY FOR SUNFLOWER

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km 0 0.5 1 2

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S2z Danda Cheruvu2
S3r
S3n
Gajarakot2
N1n
S2rt
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
Gajarakota
Mitathapadamapalli
Gajarakot1
S2rw
S2r
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

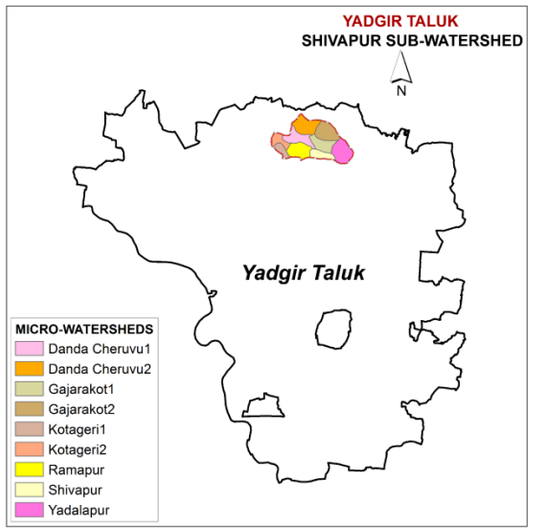
| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 331 (7.42) |
| S2z | 481 (10.81) |
| S2rt | 46 (1.04) |
| S2rw | 32 (0.72) |
| S3n | 95 (2.13) |
| S3r | 686 (15.42) |
| N1n | 256 (5.74) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.7. Land Suitability for Cotton




## LAND SUITABILITY FOR COTTON

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N




| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 390 (8.76) |
| S2z | 481 (10.81) |
| S3n | 61 (1.36) |
| S3r | 77 (1.74) |
| S3t | 706 (15.84) |
| S3nz | 195 (4.38) |
| S3rg | 15 (0.33) |
| S3tn | 95 (2.13) |
| N1r | 1066 (23.94) |
| N1t | 1082 (24.31) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

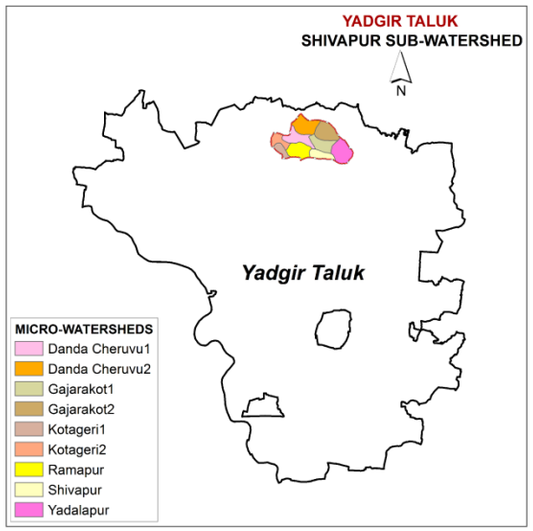
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.8. Land Suitability for Bengalgram




## LAND SUITABILITY FOR BENGALGRAM

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

S3rt

S2z

Danda Cheruvu2

N1t

Gajarakot2

S3t

S3n

S3nz

GAJARAKOTA

KOOTAGERA

Danda Cheruvu1

Kootagera

Kotageri2

N1r

Gajarakota

Mitathapadamapalli

NA

Gajarakot1

Fathepura

Kotageri1

N2

FATHEPURA

Ramapur

Yadhalapura

Yadalapur

Chapetla

Shivapur

Kamalanagara

Himalapura

GAJARAKOTA

YADHALAPURA

HIMALAPURA

| Suitability subclass | Area in ha (%) |
|---|---|
| S2z | 481 (10.81) |
| S3n | 61 (1.36) |
| S3t | 1190 (26.74) |
| S3nz | 195 (4.38) |
| S3rt | 92 (2.07) |
| N1r | 1066 (23.94) |
| N1t | 1082 (24.31) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

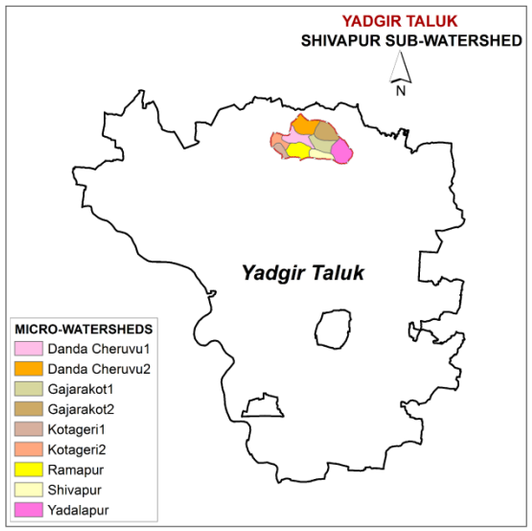
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.9. Land Suitability for Groundnut




## LAND SUITABILITY FOR GROUNDNUT

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

KOOTAGERA

FATHEPURA

GAJARAKOTA

GAJARAKOTA

YADHALAPURA

HIMALAPURA

S3t
Danda Cheruvu2
S3r
S3n
S2r
Gajarakot2
S3tz
N1n
S1
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
Gajarakota
Mitathapadamapalli
S2tw
Gajarakot1
S2t
S2rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 46 (1.04) |
| S2r | 626 (14.07) |
| S2t | 331 (7.42) |
| S2rz | 33 (0.74) |
| S2tw | 32 (0.72) |
| S3n | 95 (2.13) |
| S3r | 1175 (26.38) |
| S3t | 252 (5.67) |
| S3tz | 256 (5.76) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

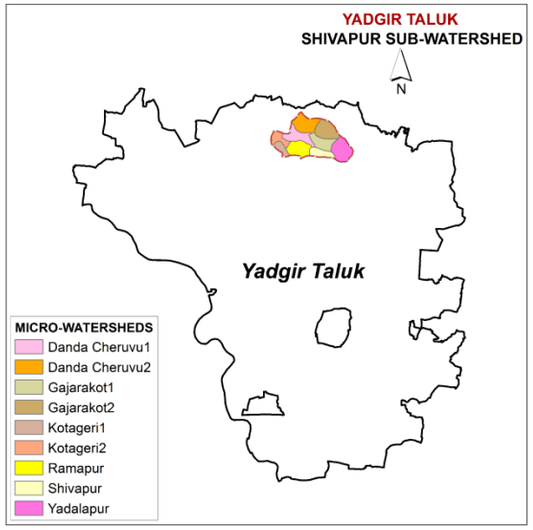
Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.10. Land Suitability for Chilli




## LAND SUITABILITY FOR CHILLI

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S2tz
Danda Cheruvu2
S3r
S3n
S2r
Gajarakot2
N1n
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
S3rg
S2w
Gajarakot1
S1
Ramapur
S2rz
Fathepura
Kotageri1
N2
Shivapur
Yadhalapura
Yadalapur
Chapetla
Kamalanagara
S2rg
Himalapura
Mitathapadamapalli
Gajarakota

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S2tz | 481 (10.81) |
| S3n | 95 (2.13) |
| S3r | 1160 (26.04) |
| S3rg | 15 (0.33) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

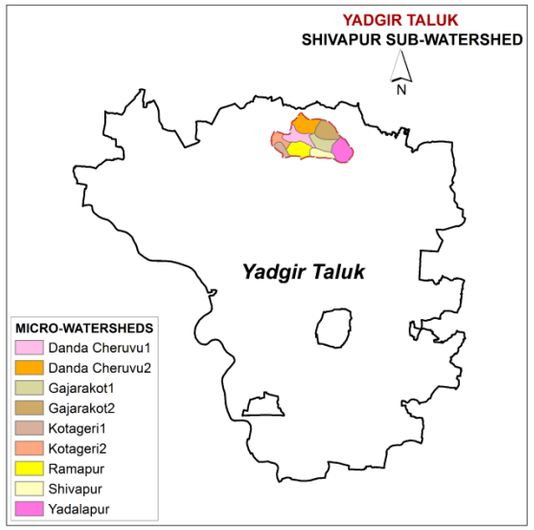
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

References
Streams/Drainage
Road/Cart track
Habitation
Waterbody
Village boundary
Micro-watershed boundary
Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

# 7.11. Land Suitability for Pomegranate




## LAND SUITABILITY FOR POMEGRANATE

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S2tz
Danda Cheruvu2
S3r
S3n
Gajarakot2
N1n
Danda Cheruvu1
Kootagera
Kotageri2
N1r
Gajarakota
Mitathapadamapalli
NA
S2rw
Gajarakot1
S2r
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

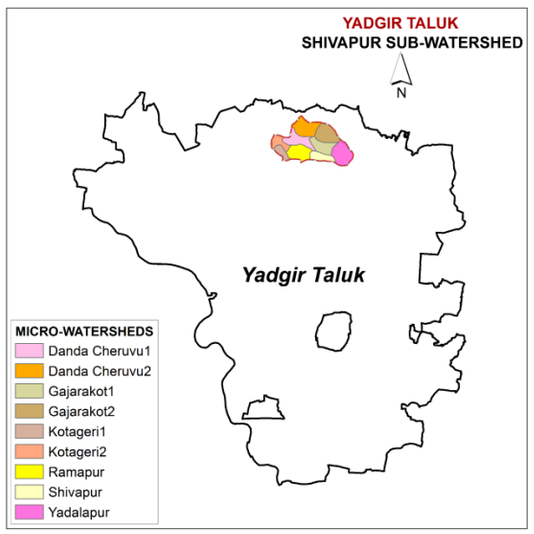
| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 377 (8.47) |
| S2rw | 32 (0.72) |
| S2tz | 481 (10.81) |
| S3n | 95 (2.13) |
| S3r | 686 (15.42) |
| N1n | 256 (5.74) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.12. Land Suitability for Tomato




## LAND SUITABILITY FOR TOMATO

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA
Kootagera
Fathepura
Gajarakota
Mitathapadamapalli
Yadhalapura
Chapetla
Kamalanagara
Himalapura
S3t
Danda Cheruvu2
S3r
S3n
Gajarakot2
S2r
N1n
Danda Cheruvu1
Kotageri2
N1r
NA
S3rg
S2w
Gajarakot1
S1
S2rz
Ramapur
Kotageri1
N2
Shivapur
Yadalapur
S2rg

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S3n | 95 (2.13) |
| S3r | 1160 (26.04) |
| S3t | 481 (10.81) |
| S3rg | 15 (0.33) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

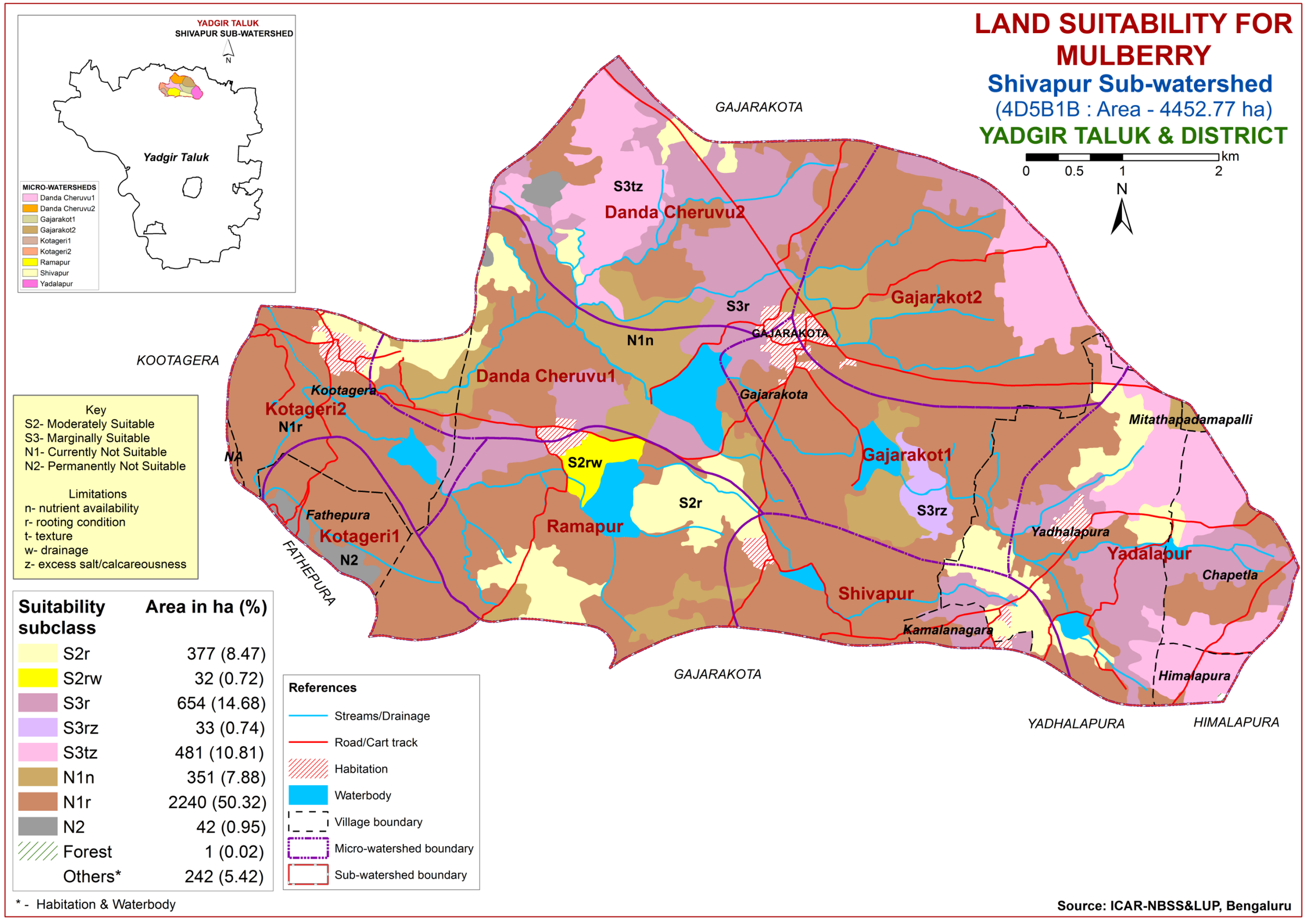
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

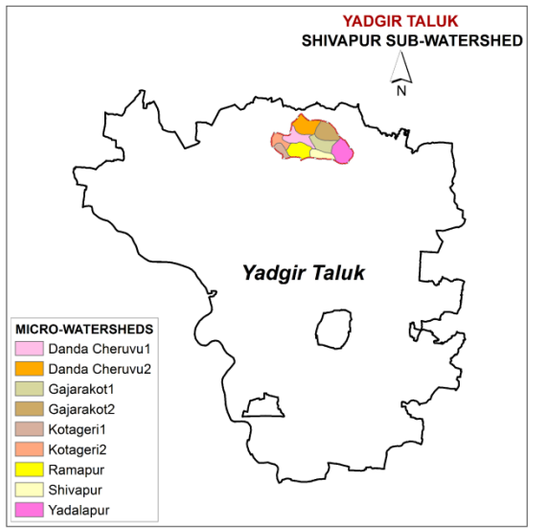
**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.13. Land Suitability for Mulberry




NOTE: Mulberry suitability evaluation only for mulberry leaf, not for silkworm rearing

# 7.14. Land Suitability for Bhendi




## LAND SUITABILITY FOR BHENDI

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S2tz
Danda Cheruvu2
S3r
Gajarakot2
S3n
S2r
N1n
GAJARAKOTA
Danda Cheruvu1
Gajarakota
Mitathapadamapalli
Kotageri2
N1r
NA
S3rg
S2w
Gajarakot1
S1
S2rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
S2rg
Himalapura

| Suitability subclass | Area in ha(%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S2tz | 481 (10.81) |
| S3n | 95 (2.13) |
| S3r | 1160 (26.04) |
| S3rg | 15 (0.33) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

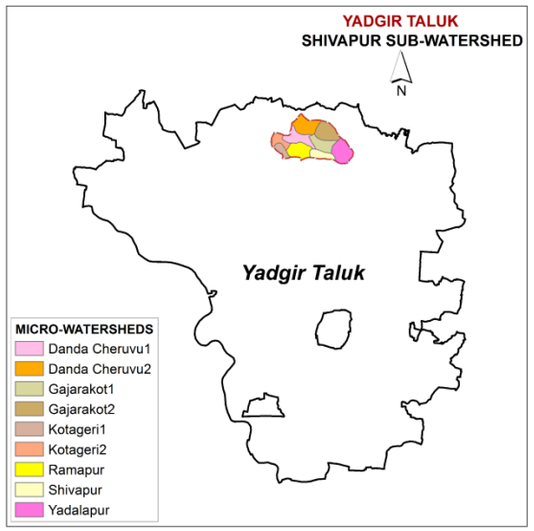
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.15. Land Suitability for Guava




## LAND SUITABILITY FOR GUAVA

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S3tz
Danda Cheruvu2
S3r
N1n
Gajarakot2
GAJARAKOTA
Danda Cheruvu1
Kootagera
Kotageri2
N1r
Gajarakota
Mitathapadamapalli
NA
S2rw
Gajarakot1
S2r
S3rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 377 (8.47) |
| S2rw | 32 (0.72) |
| S3r | 654 (14.68) |
| S3rz | 33 (0.74) |
| S3tz | 481 (10.81) |
| N1n | 351 (7.88) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

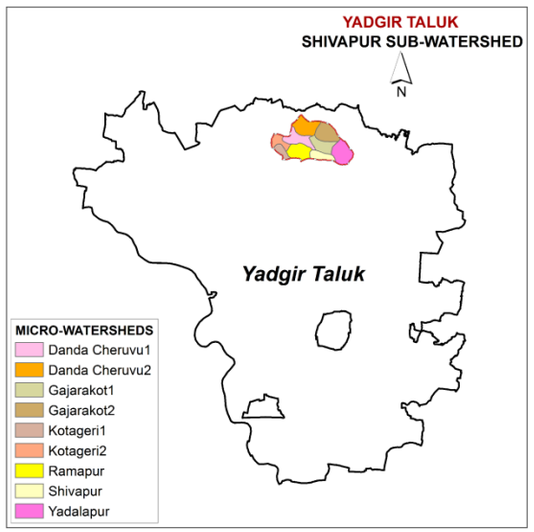
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.16. Land Suitability for Mango




## LAND SUITABILITY FOR MANGO

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

S3t

Danda Cheruvu2

S3n

Gajarakot2

N1n

GAJARAKOTA

KOOTAGERA

Danda Cheruvu1

Kootagera

Kotageri2

N1r

Gajarakota

Mitathapadamapalli

NA

Gajarakot1

S3r

Fathepura

Kotageri1

N2

Ramapur

Yadhalapura

Yadalapur

Chapetla

FATHEPURA

Shivapur

Kamalanagara

Himalapura

GAJARAKOTA

YADHALAPURA

HIMALAPURA

Key
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture

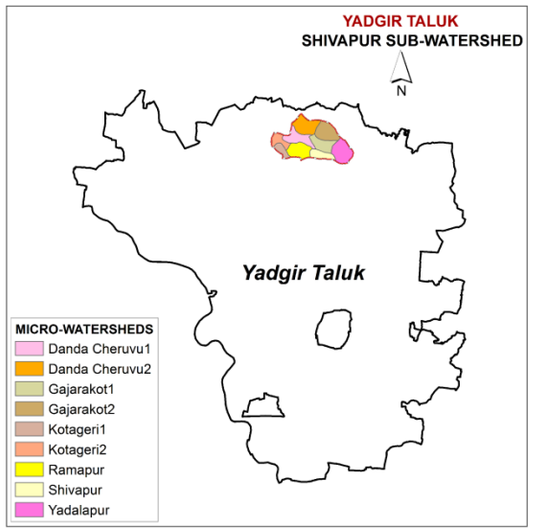
| Suitability subclass | Area in ha (%) |
|---|---|
| S3n | 95 (2.13) |
| S3r | 409 (9.19) |
| S3t | 481 (10.81) |
| N1n | 256 (5.74) |
| N1r | 2927 (65.73) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.17. Land Suitability for Sapota




## LAND SUITABILITY FOR SAPOTA

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S3t
Danda Cheruvu2
S3r
S3n
Gajarakot2
N1n
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
Fathepura
Kotageri1
N2
S2rw
Ramapur
S2r
Gajarakot1
Gajarakota
Mitathapadamapalli
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage

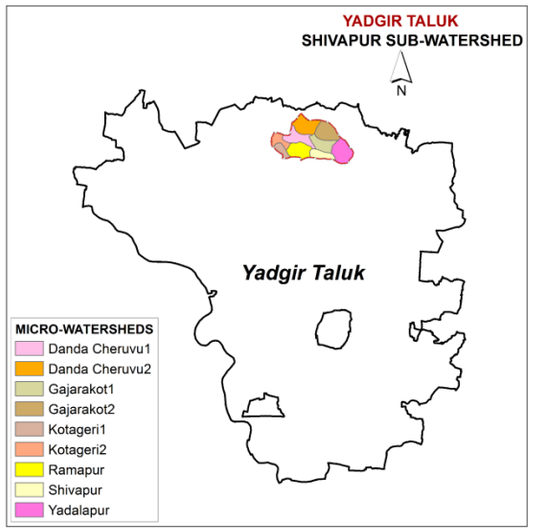
| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 377 (8.47) |
| S2rw | 32 (0.72) |
| S3n | 95 (2.13) |
| S3r | 686 (15.42) |
| S3t | 481 (10.81) |
| N1n | 256 (5.74) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.18. Land Suitability for Jackfruit




## LAND SUITABILITY FOR JACKFRUIT

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km 0 0.5 1 2

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA
Kootagera
Fathepura
Gajarakota
Mitathapadamapalli
Yadhalapura
Chapetla
Kamalanagara
Himalapura
NA
S3tz
Danda Cheruvu2
S3r
N1n
Danda Cheruvu1
Kotageri2
N1r
S2rw
S2r
Ramapur
Gajarakot2
Gajarakot1
S3rz
Shivapur
Yadalapur
Kotageri1
N2

| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 377 (8.47) |
| S2rw | 32 (0.72) |
| S3r | 654 (14.68) |
| S3rz | 33 (0.74) |
| S3tz | 481 (10.81) |
| N1n | 351 (7.88) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

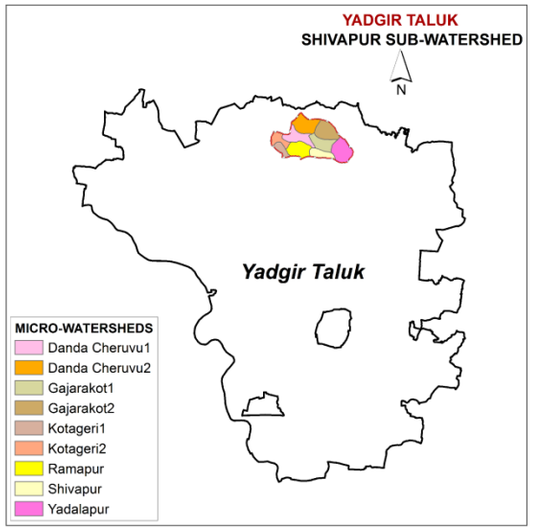
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.19. Land Suitability for Jamun




## LAND SUITABILITY FOR JAMUN

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

S3z

Danda Cheruvu2

S3r

Gajarakot2

GAJARAKOTA

N1n

KOOTAGERA

Danda Cheruvu1

Kootagera

Kotageri2

N1r

Gajarakota

Mitathapadamapalli

NA

Gajarakot1

S3rz

Fathepura

Kotageri1

N2

FATHEPURA

Ramapur

Yadhalapura

Yadalapur

Chapetla

Shivapur

Kamalanagara

Himalapura

GAJARAKOTA

YADHALAPURA

HIMALAPURA

Key
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
z- excess salt/calcareousness

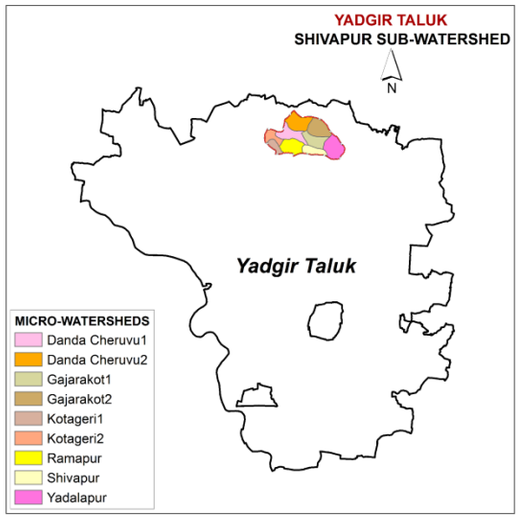
| Suitability subclass | Area in ha (%) |
|---|---|
| S3r | 1063 (23.87) |
| S3z | 481 (10.81) |
| S3rz | 33 (0.74) |
| N1n | 351 (7.88) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.20. Land Suitability for Musambi




## LAND SUITABILITY FOR MUSAMBI

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S2z
Danda Cheruvu2
S3r
S3n
Gajarakot2
N1n
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
S2rw
Gajarakot1
Gajarakota
Mitathapadamapalli
Fathepura
Kotageri1
N2
Ramapur
S2r
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

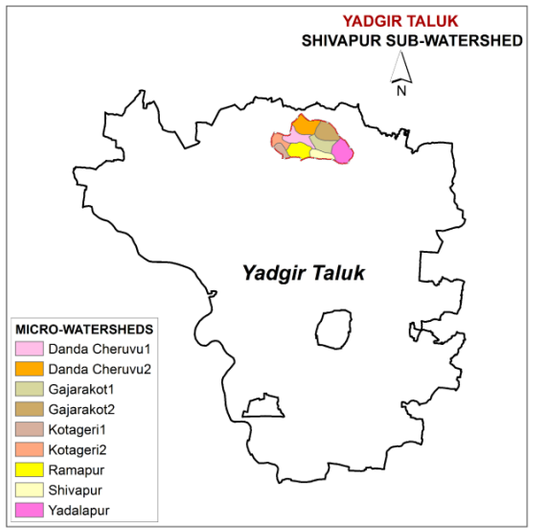
| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 377 (8.47) |
| S2z | 481 (10.81) |
| S2rw | 32 (0.72) |
| S3n | 95 (2.13) |
| S3r | 686 (15.42) |
| N1n | 256 (5.74) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.21. Land Suitability for Lime




## LAND SUITABILITY FOR LIME

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
S2z
Danda Cheruvu2
S3n
S3r
Gajarakot2
N1n
GAJARAKOTA
KOOTAGERA
Danda Cheruvu1
Kootagera
Kotageri2
N1r
Gajarakota
S2rz
Mitathapadamapalli
NA
S2rw
Gajarakot1
S2r
Ramapur
Yadhalapura
Yadalapur
Chapetla
Fathepura
Kotageri1
N2
FATHEPURA
Shivapur
Kamalanagara
GAJARAKOTA
Himalapura
YADHALAPURA
HIMALAPURA

Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
w- drainage
z- excess salt/calcareousness

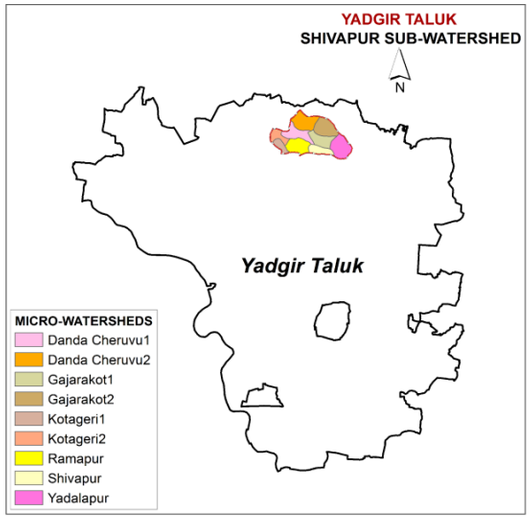
| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 282 (6.33) |
| S2z | 481 (10.81) |
| S2rw | 32 (0.72) |
| S2rz | 95 (2.14) |
| S3n | 95 (2.13) |
| S3r | 686 (15.42) |
| N1n | 256 (5.74) |
| N1r | 2240 (50.32) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.22. Land Suitability for Cashew




## LAND SUITABILITY FOR CASHEW

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
S2r
N1t
Danda Cheruvu2
N1n
Gajarakot2
N1tn
GAJARAKOTA
KOOTAGERA
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
Gajarakota
Mitathapadamapalli
Gajarakot1
N1zn
S3n
Ramapur
Fathepura
Kotageri1
N2
FATHEPURA
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
S3r
Himalapura
GAJARAKOTA
YADHALAPURA
HIMALAPURA

| Suitability subclass | Area in ha (%) |
|---|---|
| S2r | 17 (0.39) |
| S3n | 360 (8.08) |
| S3r | 27 (0.61) |
| N1n | 2006 (45.05) |
| N1r | 1183 (26.57) |
| N1t | 481 (10.81) |
| N1tn | 61 (1.36) |
| N1zn | 33 (0.74) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

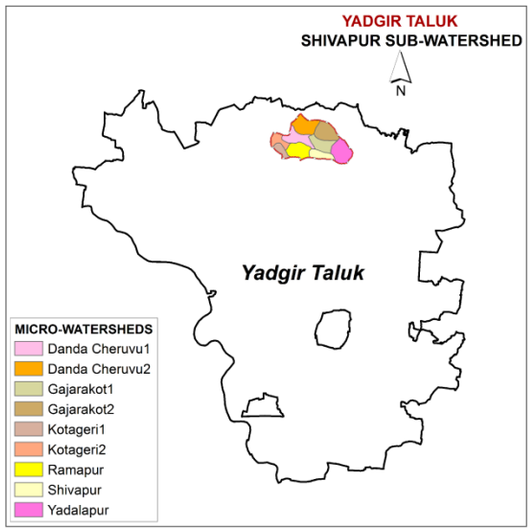
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.23. Land Suitability for Custard Apple




## LAND SUITABILITY FOR CUSTARD APPLE

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
S3r
S2z
Danda Cheruvu2
S3rt
S3n
Gajarakot2
S2r
GAJARAKOTA
N1n
KOOTAGERA
S1
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
Gajarakota
Mitathapadamapalli
S2w
Gajarakot1
S2rz
Fathepura
Kotageri1
N2
FATHEPURA
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura
GAJARAKOTA
YADHALAPURA
HIMALAPURA

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 64 (1.43) |
| S2r | 967 (21.71) |
| S2w | 32 (0.72) |
| S2z | 481 (10.81) |
| S2rz | 33 (0.74) |
| S3n | 95 (2.13) |
| S3r | 92 (2.07) |
| S3rt | 1082 (24.31) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

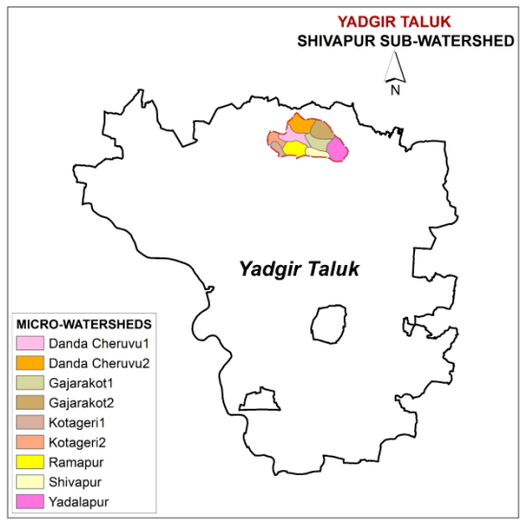
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.24. Land Suitability for Amla




## LAND SUITABILITY FOR AMLA

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S3r
S3z
Danda Cheruvu2
S3rt
Gajarakot2
S2r
N1n
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
S2w
Gajarakot1
S1
S2rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
Himalapura
Mitathapadamapalli
Gajarakota

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 654 (14.68) |
| S2w | 32 (0.72) |
| S2rz | 33 (0.74) |
| S3r | 92 (2.07) |
| S3z | 481 (10.81) |
| S3rt | 1082 (24.31) |
| N1n | 351 (7.88) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

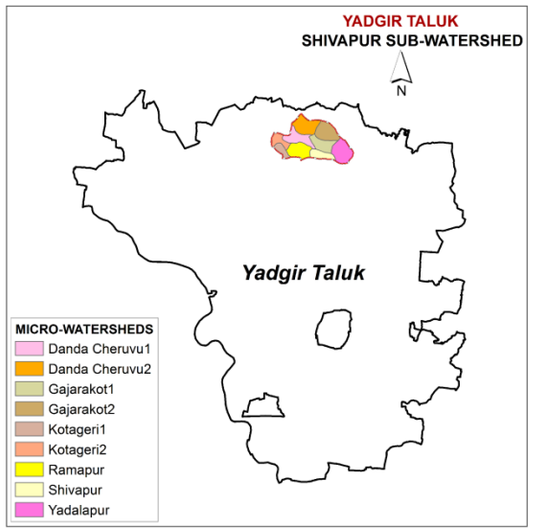
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.25. Land Suitability for Tamarind




## LAND SUITABILITY FOR TAMARIND

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S3z
Danda Cheruvu2
N1n
Danda Cheruvu1
Gajarakot2
Gajarakot1
Kotageri2
N1r
Kotageri1
N2
S3r
Ramapur
Shivapur

Kootagera
Gajarakota
Mitathapadamapalli
NA
Fathepura
Yadhalapura
Yadalapur
Chapetla
Kamalanagara
Himalapura

Key
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
n- nutrient availability
r- rooting condition
z- excess salt/calcareousness

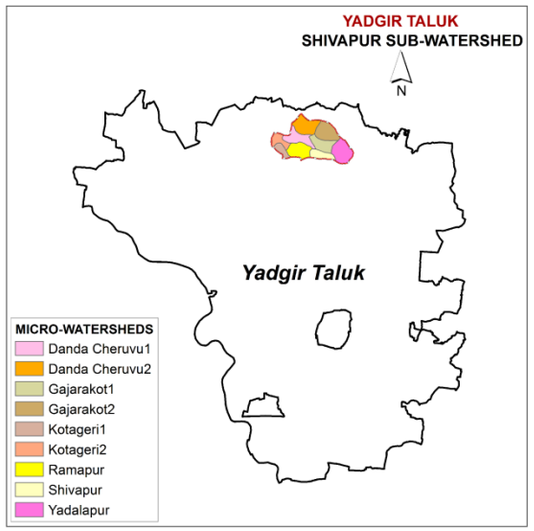
| Suitability subclass | Area in ha (%) |
|---|---|
| S3r | 409 (9.19) |
| S3z | 481 (10.81) |
| N1n | 351 (7.88) |
| N1r | 2927 (65.73) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7.26. Land Suitability for Brinjal




## LAND SUITABILITY FOR BRINJAL

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
GAJARAKOTA
YADHALAPURA
HIMALAPURA
Kootagera
Fathepura
Gajarakota
Mitathapadamapalli
Yadhalapura
Chapetla
Kamalanagara
Himalapura

S3t
Danda Cheruvu2
S3r
S3n
Gajarakot2
S2r
N1n
Danda Cheruvu1
Kotageri2
N1r
NA
S3rg
S2w
Gajarakot1
S3rt
S1
S2rz
Ramapur
Shivapur
Yadalapur
Kotageri1
N2
S2rg

| Suitability subclass | Area in ha(%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S3n | 95 (2.13) |
| S3r | 1135 (25.49) |
| S3t | 481 (10.81) |
| S3rg | 15 (0.33) |
| S3rt | 25 (0.56) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

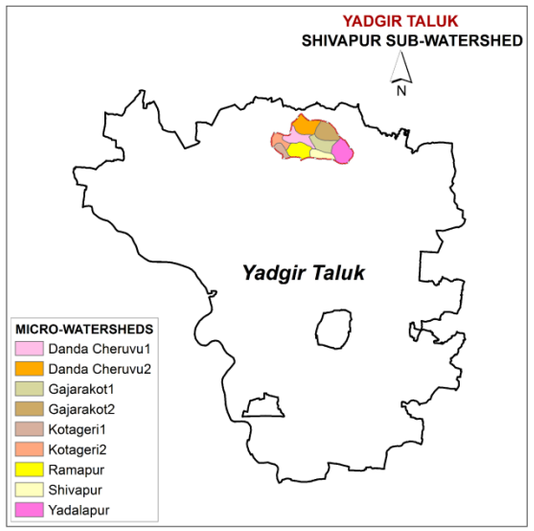
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.27. Land Suitability for Onion




## LAND SUITABILITY FOR ONION

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
S3tz
Danda Cheruvu2
S3r
Gajarakot2
S3t
S2r
N1n
GAJARAKOTA
KOOTAGERA
Danda Cheruvu1
Kootagera
Kotageri2
N1r
Gajarakota
Mitathapadamapalli
NA
S2w
Gajarakot1
S3rg
S1
S2rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
FATHEPURA
Shivapur
Kamalanagara
S2rg
Himalapura
GAJARAKOTA
YADHALAPURA
HIMALAPURA

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S3r | 1160 (26.04) |
| S3t | 256 (5.76) |
| S3rg | 15 (0.33) |
| S3tz | 225 (5.05) |
| N1n | 351 (7.88) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

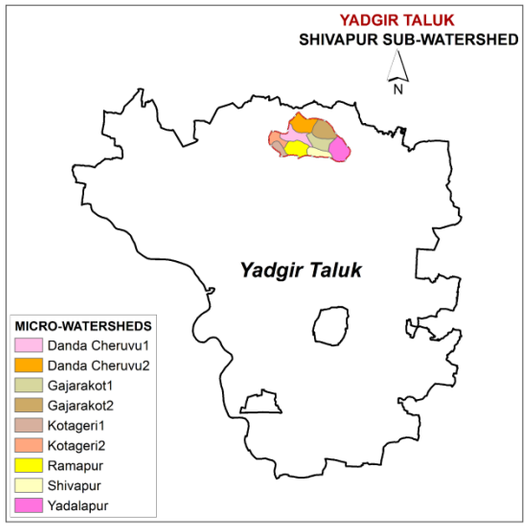
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

# 7.28. Land Suitability for Marigold




## LAND SUITABILITY FOR MARIGOLD

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA
Kootagera
Fathepura
Gajarakota
Mitathapadamapalli
Yadhalapura
Chapetla
Himalapura
Kamalanagara
NA

S2tz
Danda Cheruvu2
S3r
Gajarakot2
S3n
S2r
N1n
Danda Cheruvu1
Kotageri2
N1r
S3rg
S2w
Gajarakot1
S1
S2rz
Ramapur
Shivapur
Yadalapur
Kotageri1
N2
S2rg

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S2tz | 481 (10.81) |
| S3n | 95 (2.13) |
| S3r | 1160 (26.04) |
| S3rg | 15 (0.33) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

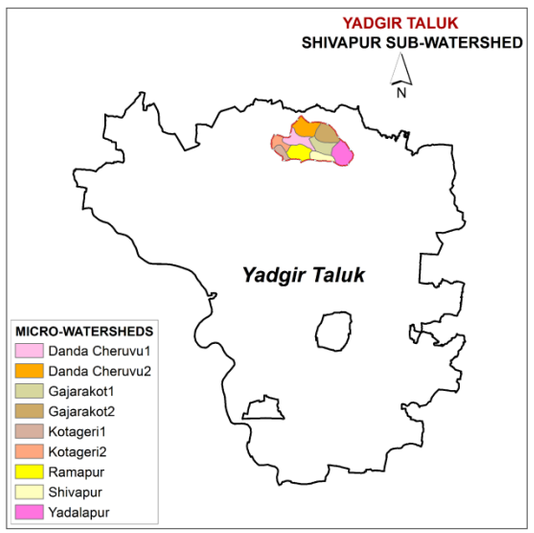
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 7.29. Land Suitability for Chrysanthemum




## LAND SUITABILITY FOR CHRYSANTHEMUM

### Shivapur Sub-watershed

(4D5B1B : Area - 4452.77 ha)

### YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
KOOTAGERA
FATHEPURA
GAJARAKOTA
YADHALAPURA
HIMALAPURA

S2tz
Danda Cheruvu2
S3r
S3n
Gajarakot2
S2r
N1n
GAJARAKOTA
Danda Cheruvu1
Kootagera
Kotageri2
N1r
NA
S3rg
S2w
Gajarakot1
Gajarakota
Mitathapadamapalli
S1
S2rz
Fathepura
Kotageri1
N2
Ramapur
Yadhalapura
Yadalapur
Chapetla
Shivapur
Kamalanagara
S2rg
Himalapura

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 377 (8.47) |
| S2r | 626 (14.07) |
| S2w | 32 (0.72) |
| S2rg | 27 (0.61) |
| S2rz | 33 (0.74) |
| S2tz | 481 (10.81) |
| S3n | 95 (2.13) |
| S3r | 1160 (26.04) |
| S3rg | 15 (0.33) |
| N1n | 256 (5.74) |
| N1r | 1066 (23.94) |
| N2 | 42 (0.95) |
| Forest | 1 (0.02) |
| Others* | 242 (5.42) |

* - Habitation & Waterbody

Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

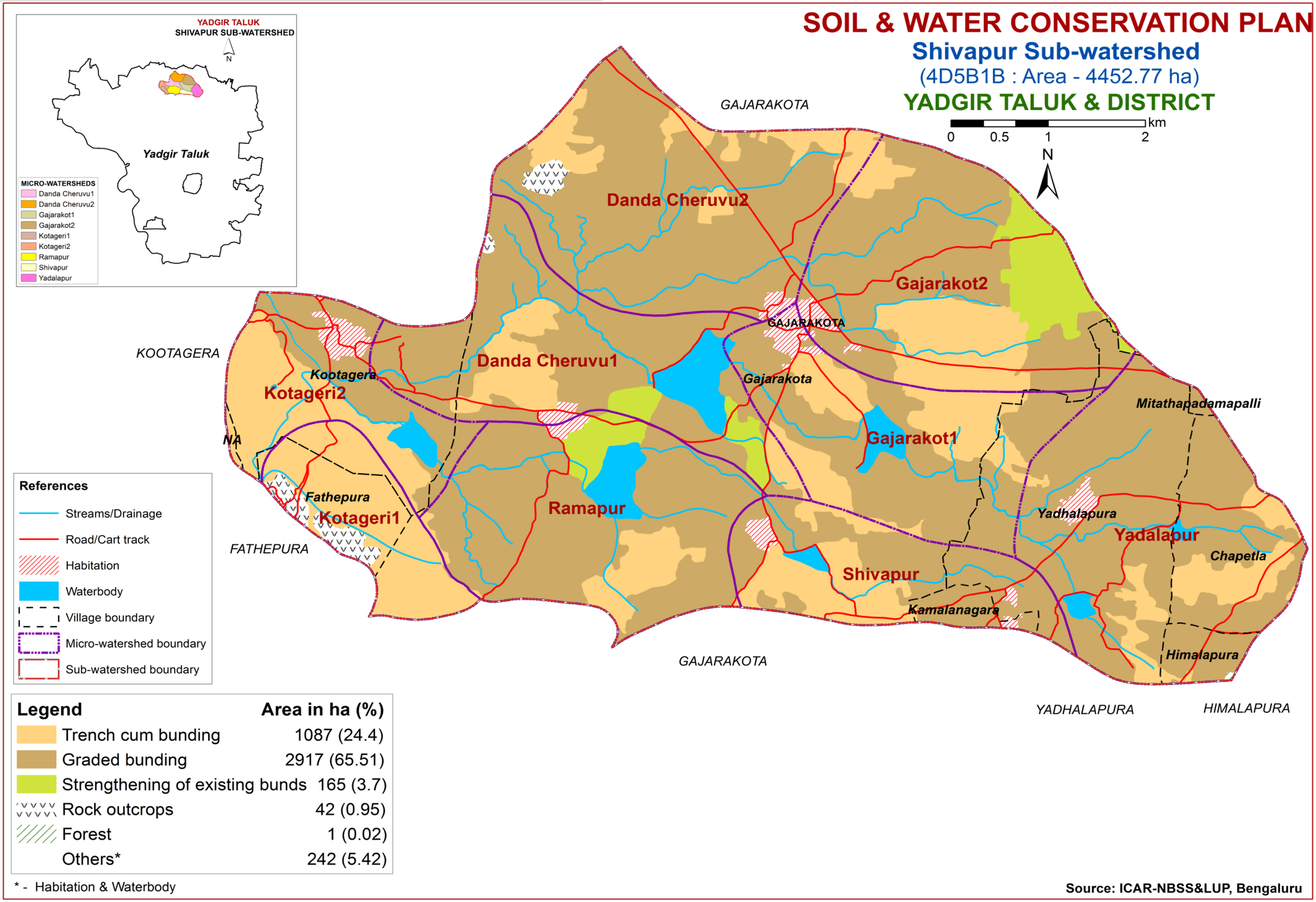
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

**References**
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 8. Soil and Water Conservation Measures

## 8.1. Soil & Water Conservation Plan



## **9. Table.** Proposed Crop Plan for Shivapur Sub-watershed, Gurumatkal Hobli, Yadgir Taluk, Yadgir District based on soil-site–crop suitability Assessment

| LMU. No | Soil Map Units | Field Crops/ Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 1 | 167.ANRcA1<br>55.ANRiB2<br>34.GWDcB2<br>35.GWDiB2<br>(Sodic soils) | - | **Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass | Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage |
| 2 | 159.BMNmA1,62.BMNmB2<br>32.HSLcB2,126.HSLhB2<br>33.HSLiB2,173.HSLiB2g1<br>49.NGPmB2,146.NGPmB2g1<br>36.SHThB2<br>Moderately deep to very deep, black clay soils) | Maize, sorghum, Sunflower, Cotton, Red gram, Bengalgram, Bajra | **Fruit crops:** Lime, Musambi, Custard apple, Pomegranate<br>**Vegetables:** Chilli, Bhendi<br>**Flowers:** Marigold, Chrysanthemum | Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices |
| 3 | 157.KDHiA1<br>(Moderately deep , lowland sandy clay soils) | Maize, Sorghum, Sunflower, Groundnut, Red gram, Bajra | **Fruit crops:** Amla, Tamarind<br>**Vegetables:** Tomato, Onion**,** Bhendi, Chilli, Brinjal, Drumstick,, Coriander<br>**Flowers:** Marigold, Chrysanthemum | Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practises |
| 4 | 57.MDGcB2,171.MDGhA1<br>58.MDGiB2,133.MDRiB2<br>(Deep to very deep, strongly alkaline soils) | Sorghum, Maize, Bajra | **Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass | Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage |
| 5 | 40.PGPcB2<br>(Moderately deep, red sandy clay soils) | Sunflower, Sorghum, Maize, Groundnut, Red gram, Bajra | **Fruit crops:** Mango, Musambi, Sapota, Tamarind, Pomegranate, Amla, Custard apple, Guava, Jackfruit, Jamun, Lime<br>**Vegetables:**Tomato, Onion**,** Bhendi, Chilli, Brinjal, Drumstick, Coriander<br>**Flowers:** Marigold, Chrysanthemum | Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices |

*To be continued….*

| LMU. No | Soil Map Units | Field Crops/ Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 6 | 29.YLRcB2g1 (Moderately shallow, red clay soils) | Maize, sorghum Groundnut, Bajra, Cotton | **Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:** Marigold, Chrysanthemum | Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices |
| 7 | 20.JNKcB2,22.JNKiB2 23.JNKiB2g1,152.JNKmB2 (Moderately shallow, sandy clay loam soils) | Maize, sorghum Groundnut, Bajra | **Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:** Marigold, Chrysanthemum | Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices |
| 8 | 2.BDLbB2,3.BDLbC3 4.BDLhB2,162.BDLhB2g1 5.BDLiB2,121.DSBcB2 113.HTKcC2g1,9.VNKcB2 10.VNKiB2,109.VNKmB2g1 (Shallow soils) | - | **Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra* | Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers |
| 9 | 118.BDPcB2,120.BDPhB2 1.BDPiB2,119.BDPiB3 153.KKRbB2g1,175.KKRcB2 (Very shallow soils) | - | *Styloxanthes hamata*, *Styloxanthes scabra* | Use of short duration varieties, sowing across the slope |

# PART - B

## Hydrological Inventory of Shivapur Sub-watershed, Yadgir Taluk, Yadgir District, Karnataka for Watershed Planning and Development

**Sujala - III**
**Karnataka Watershed Development Project-II**
**Watershed Development Department**
**Government of Karnataka**

THE WORLD BANK

# Hydrological Inventory of Shivapur Sub-watershed, Yadgir Taluk, Yadgir District, Karnataka for Watershed Planning and Development


Prepared by

**ICAR-National Bureau of Soil Survey and Land Use Planning**
**Regional Centre, Hebbal, Bangalore - 560 024**

ICAR - NBSS & LUP

**Phone:080-23412242**

**E-mail: hd_rcb.nbsslup@icar.gov.in**
**nbssrcb@gmail.com**

# Details of Hydrology Team of LRI Partner Responsible for Preparation of Atlas

| Name | Designation |
|---|---|
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| Dr. S. Srinivas | Principal Scientist |
| Dr. K .V. Niranjana | Chief Technical Officer |
| Sh. R.S.Reddy | Consultant |
| Sh. A.G.Devendra Prasad | Consultant |
| Smt. K.Karunya Lakshmi | Research Associate |
| Ms. Seema, K.V. | Senior Research Fellow |
| Dr. Sekhar Muddu<br>(Reviewed and approved) | Professor & Lead Scientist,<br>Dept. of Civil Engineering & ICWaR, IISc, Bangalore |
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# INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Shivapur sub-watershed (4D5B1B) in Yadgir Taluk, Yadgir District, has been undertaken for integrated planning, development and management.

- Shivapur sub-watershed (Yadgir Taluk, Yadgir District) is located between $16^0$51’37’’-$16^0$55’23’’ North latitudes and $77^0$13’52’’- $77^0$20’12’’ East longitudes, covering an area of about 4452.77 ha.

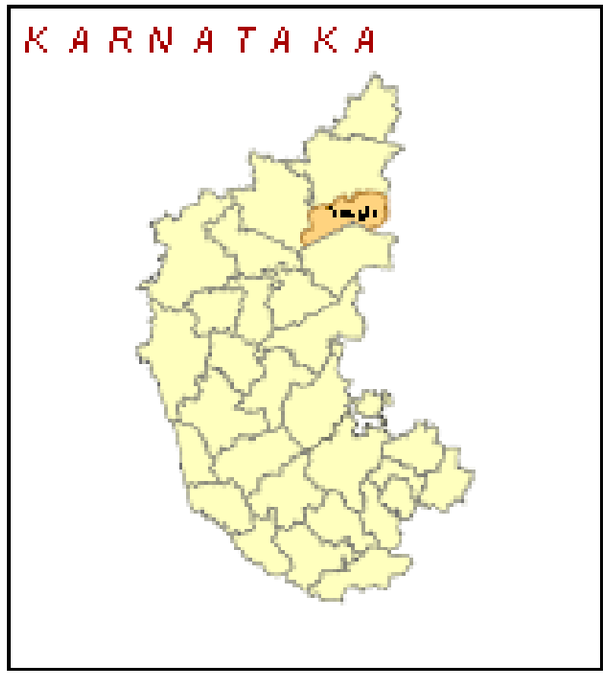
- This sub-watershed encompasses of 9 MWs namely Danda Cheruvu-1 (4D5B1B1e), Danda Cheruvu-2 (4D5B1B1d), Gajarakot-1 (4D5B1B1b), Gajarakot-2 (4D5B1B1c), Kotageri-1 (4D5B1B2c), Kotageri-2 (4D5B1B2d), Ramapur (4D5B1B2b), Shivapur (4D5B1B2a) and Yadalapur (4D5B1B1a). Land Resource Inventory (LRI) was generated for all the nine micro-watersheds.

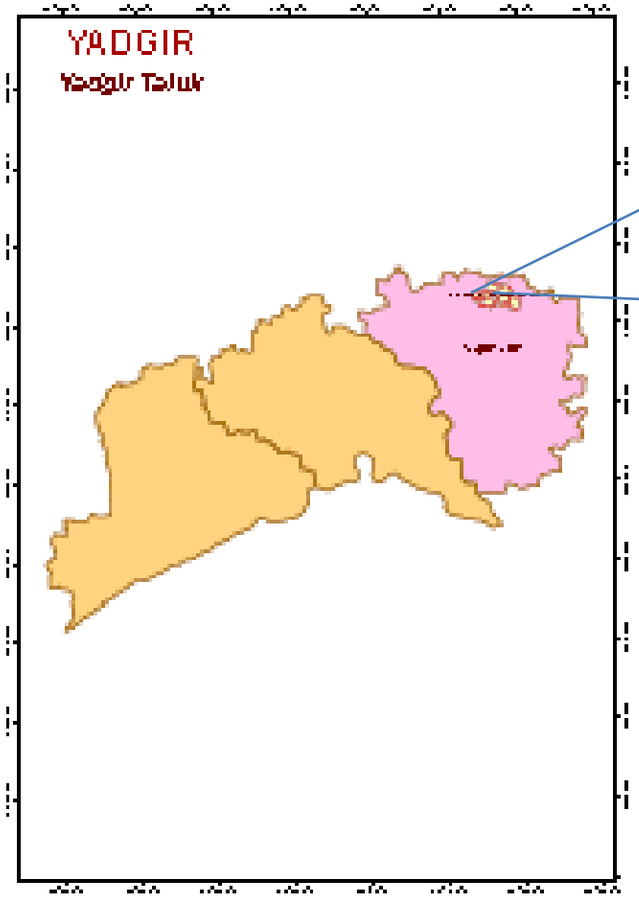
- Average annual rainfall (1960-2014) of the Hobli (Block) pertaining to the sub-watershed is 887 mm.

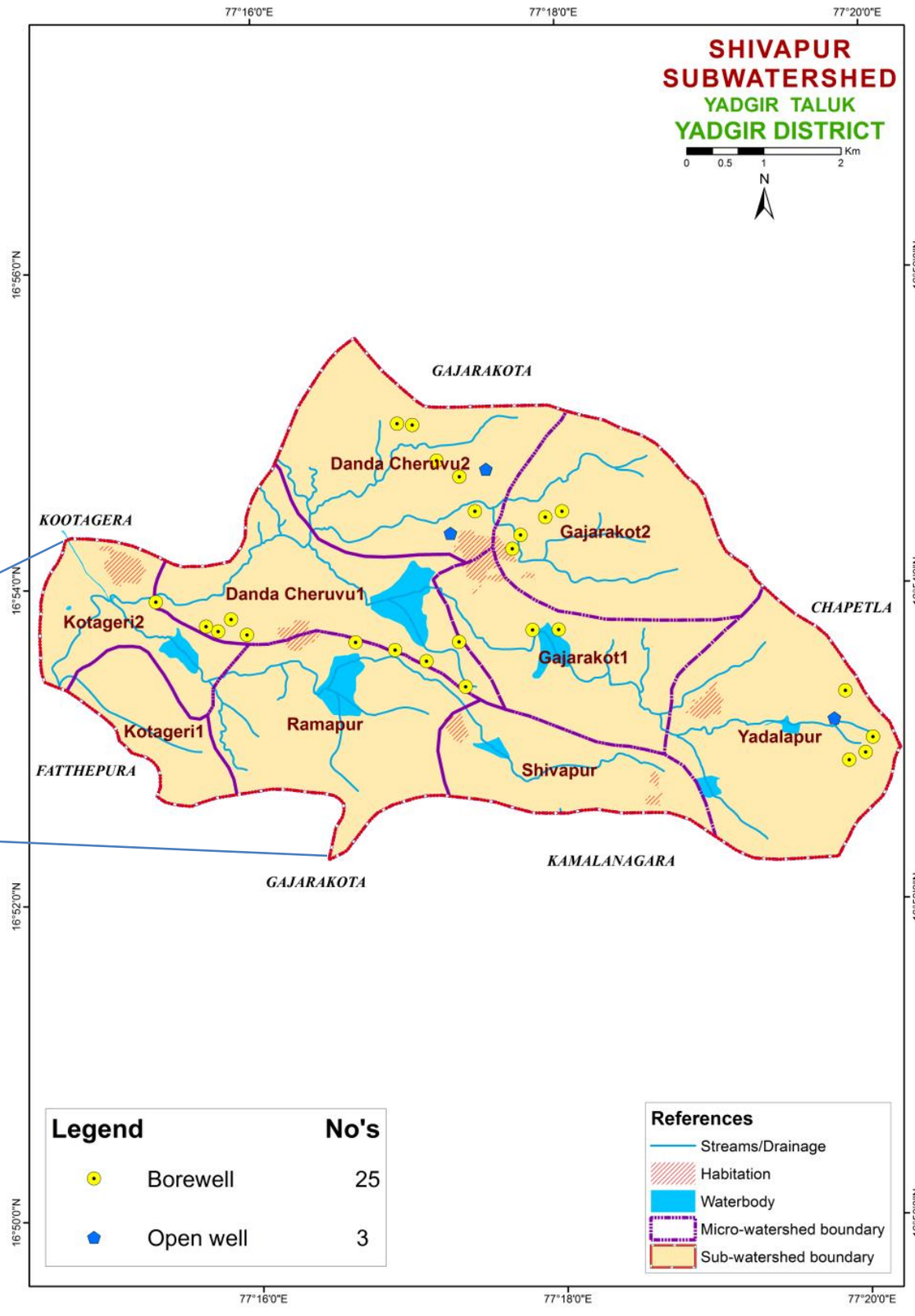
- In this sub-watershed major *kharif* crops grown are Maize, Cotton, Sunflower, Groundnut, Red gram, Chilly, Soybean , Paddy and major *rabi* crops are Sorghum, Bengalgram, Bajra.

- Hydrological components namely rainfall (annual, *kharif*, *rabi* and summer), PET, AET, runoff, surface soil moisture, ground water status and water balance are presented.

# LOCATION MAP OF SHIVAPUR SUB-WATERSHED

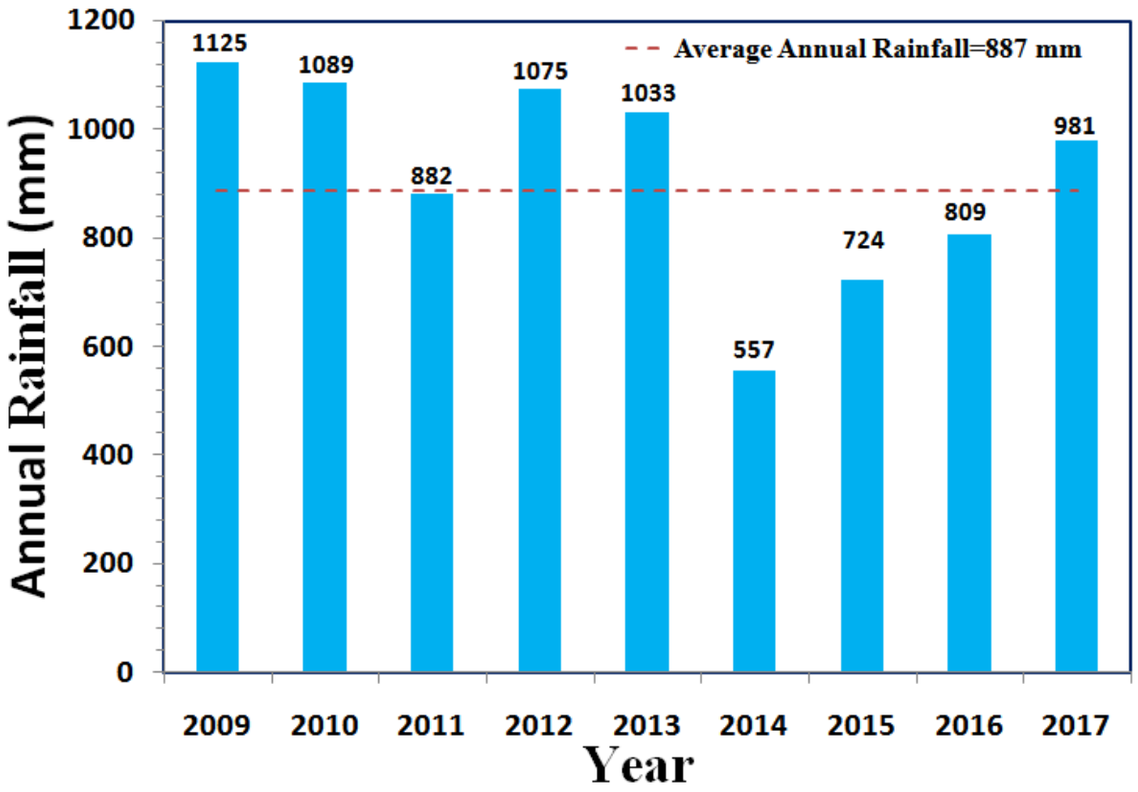


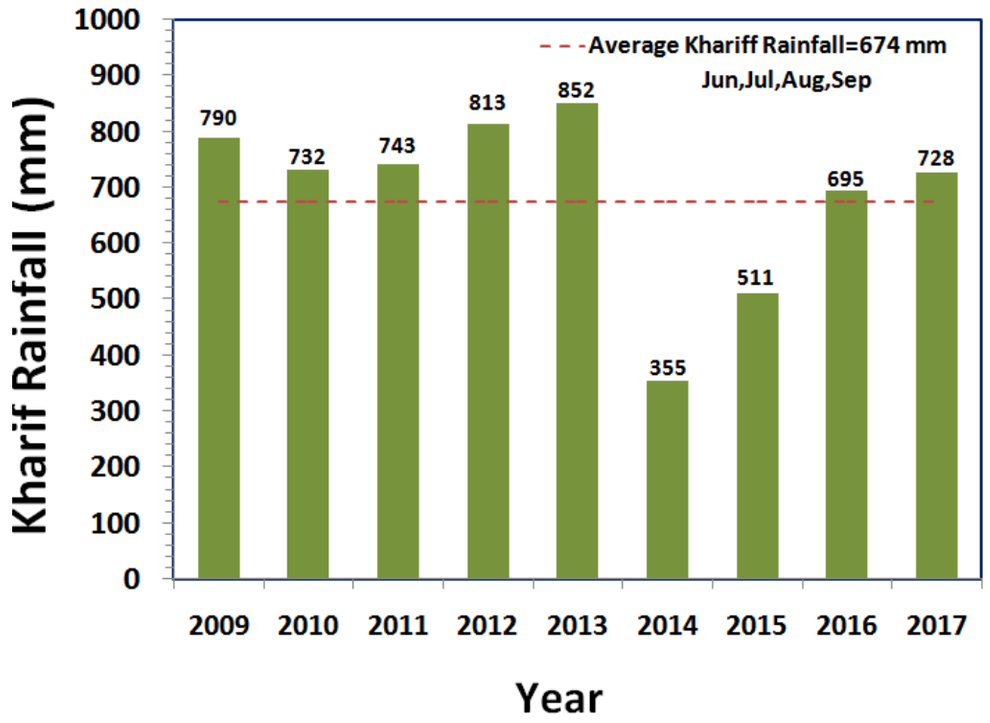

Soil & Water Conservation Structures in Shivapur sub-watershed, Yadgir Taluk, Yadgir District

# RAINFALL INDEX

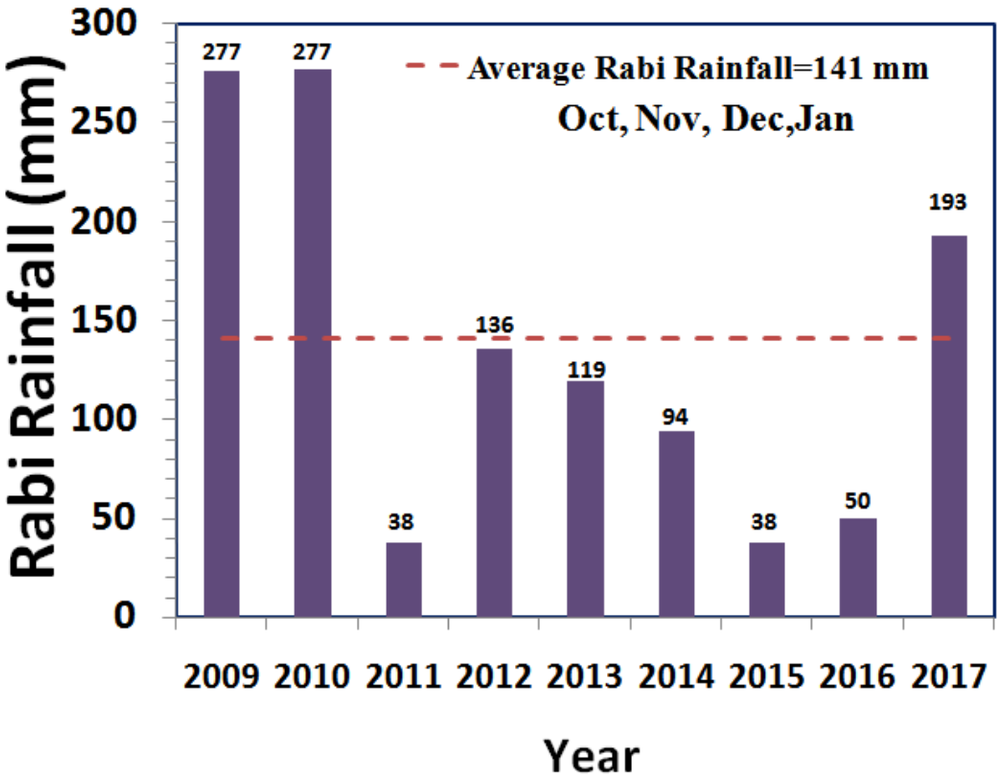



The average annual rainfall (1960-2014) recorded at the Yadgir station in Yadgir taluk of Yadgir district is 887 mm. The annual rainfall at Gurumatkal station (Hobli H.Q.) is presented. During the years 2014, 2015 and 2016 the annual rainfall was deficient by 37%, 18% and 9% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 75% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2014 and 2015 the annual rainfall was deficient by 60% and 42% respectively.

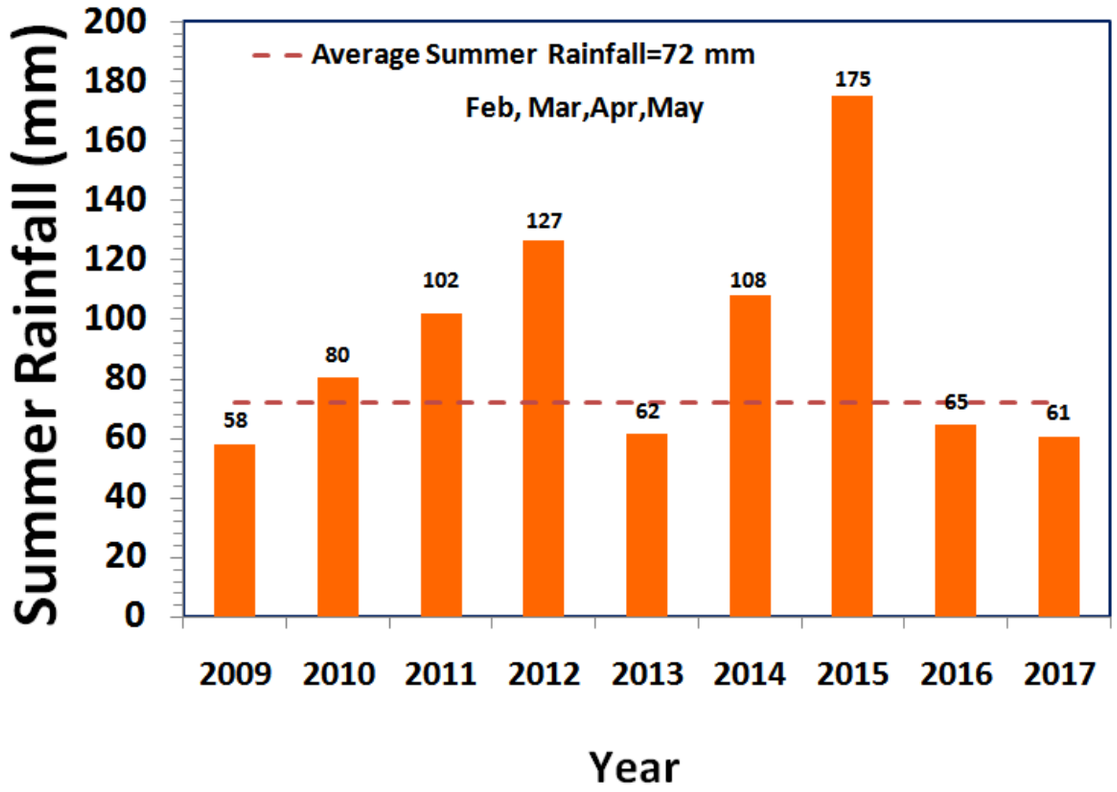


# RAINFALL INDEX

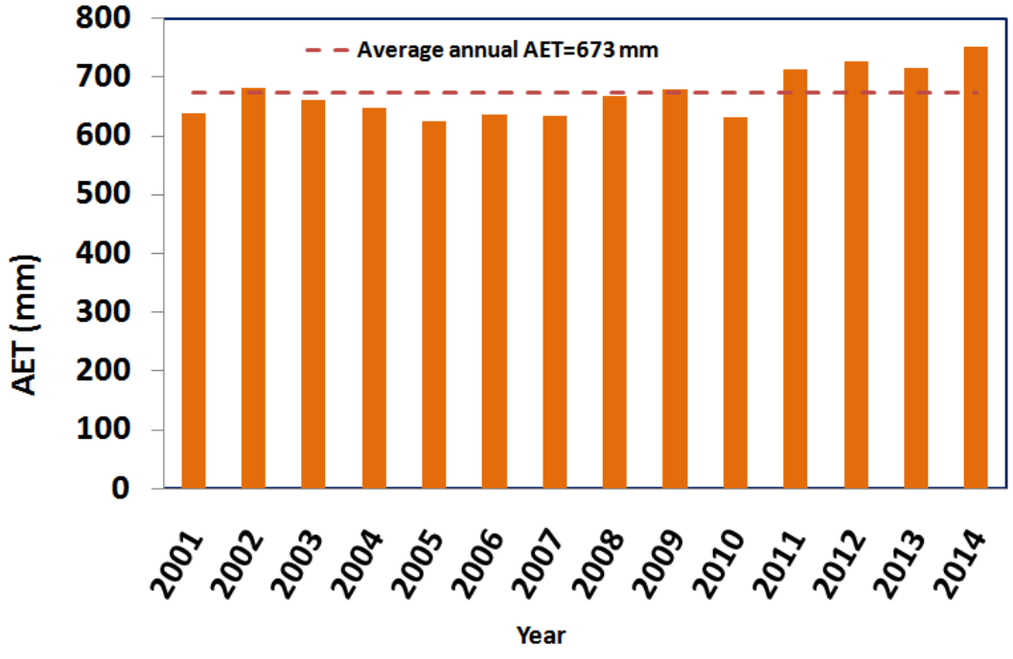


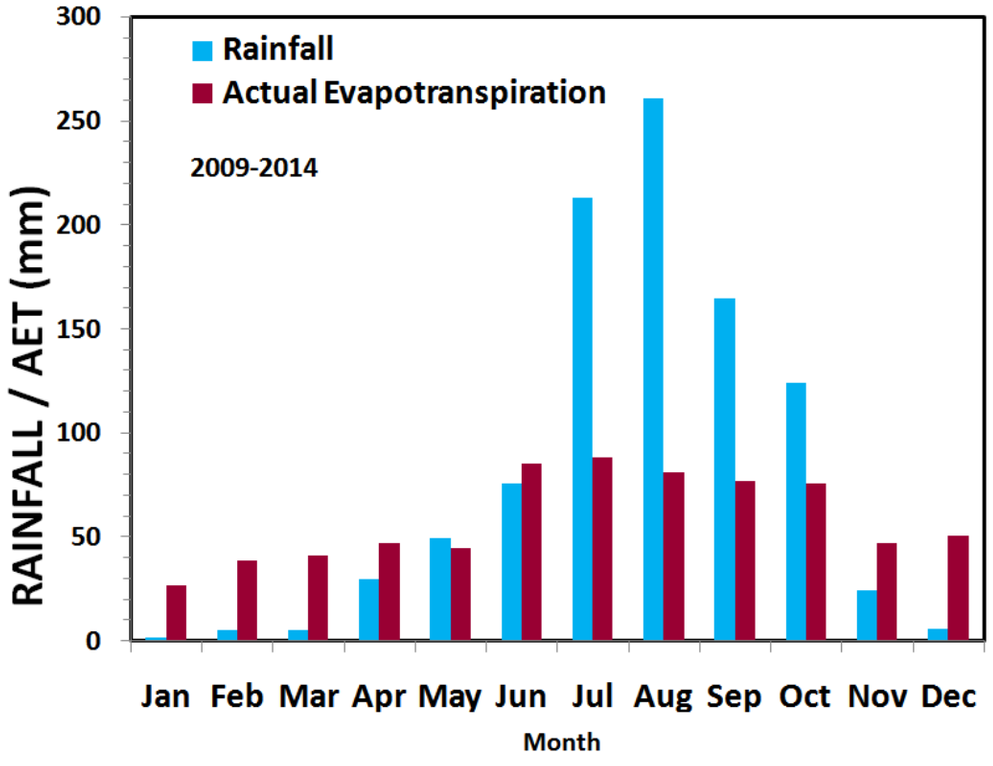

The average *rabi* rainfall (Oct-Jan) is about 13% of the Average annual rainfall. During the years 2011, 2012, 2013, 2014, 2015 and 2016 the annual rainfall was deficient by 73%, 4%, 16%, 33%, 73% and 65% respectively.

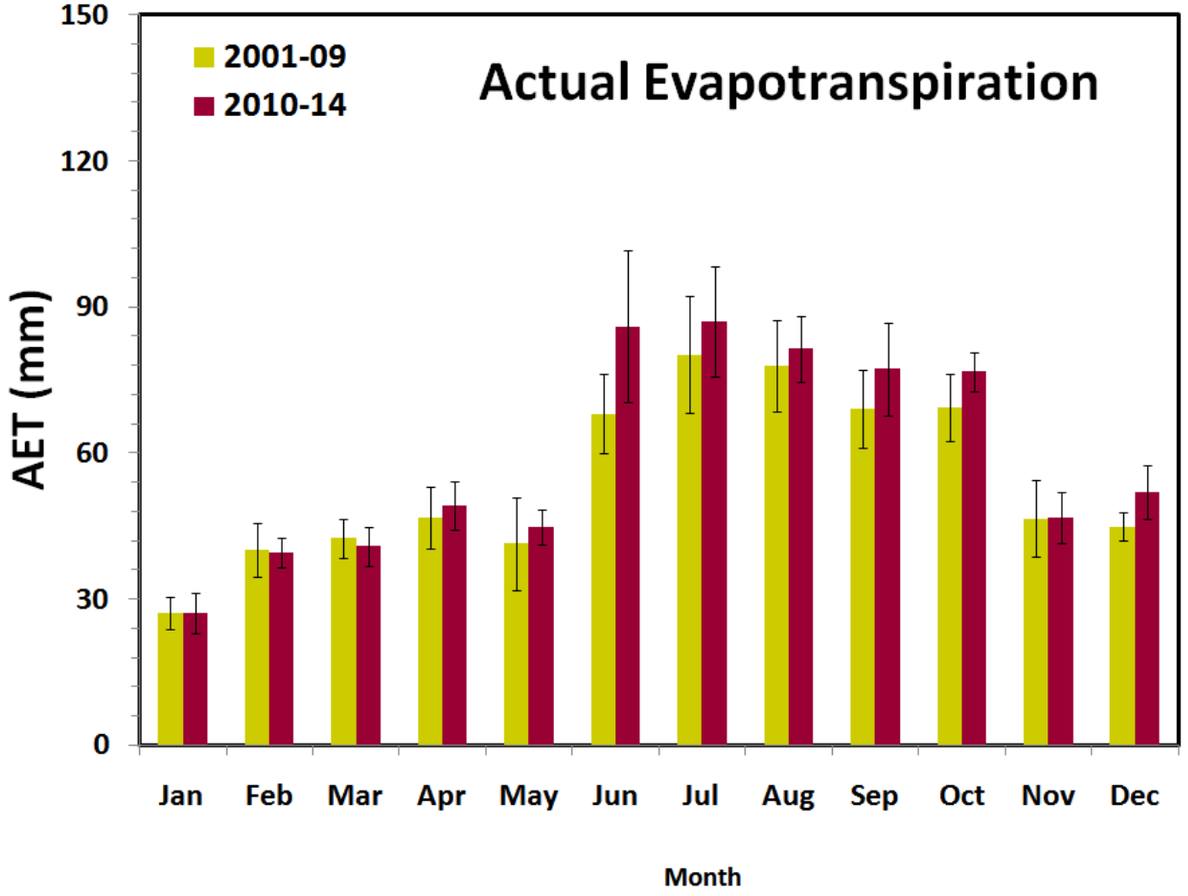
The average summer rainfall (Feb-May) is about 11% of the average annual rainfall.



# EVAPOTRANSPIRATION

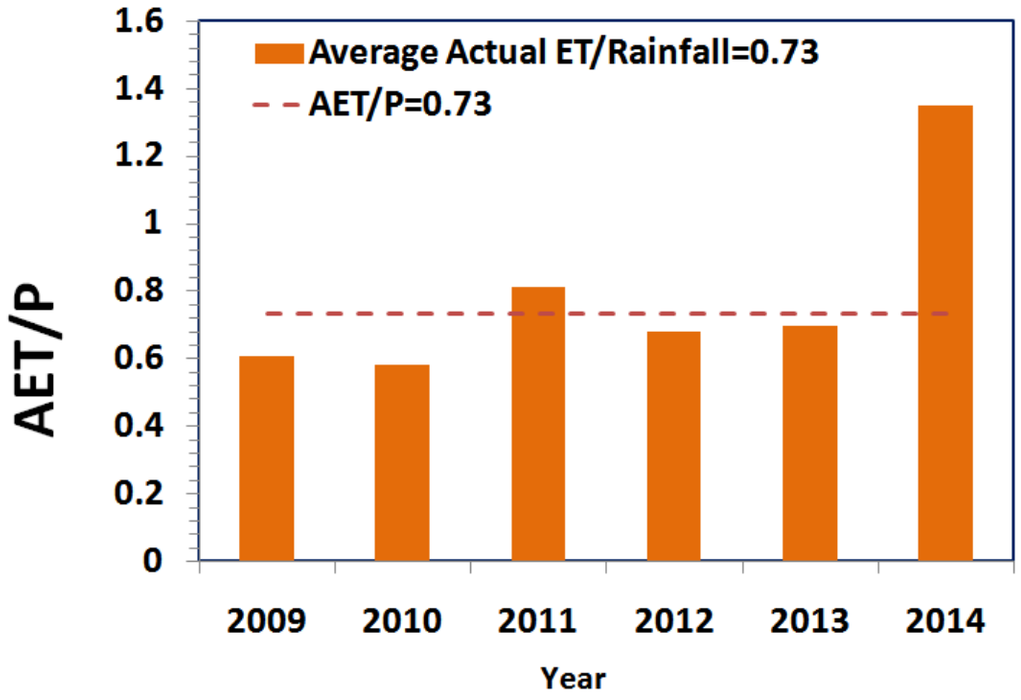


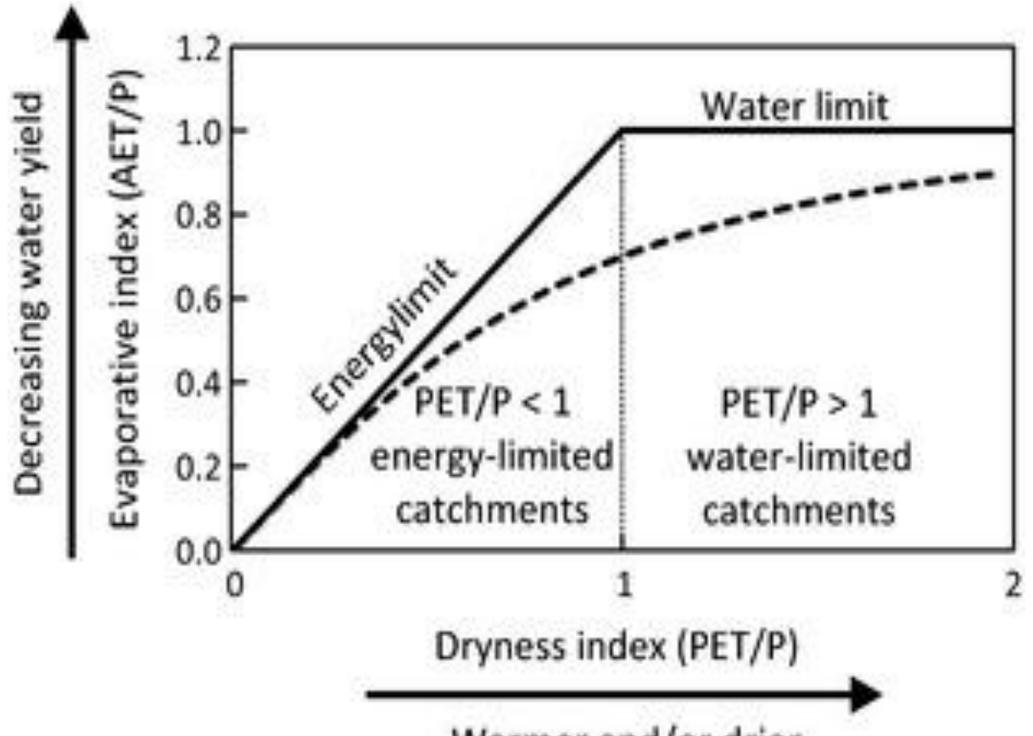



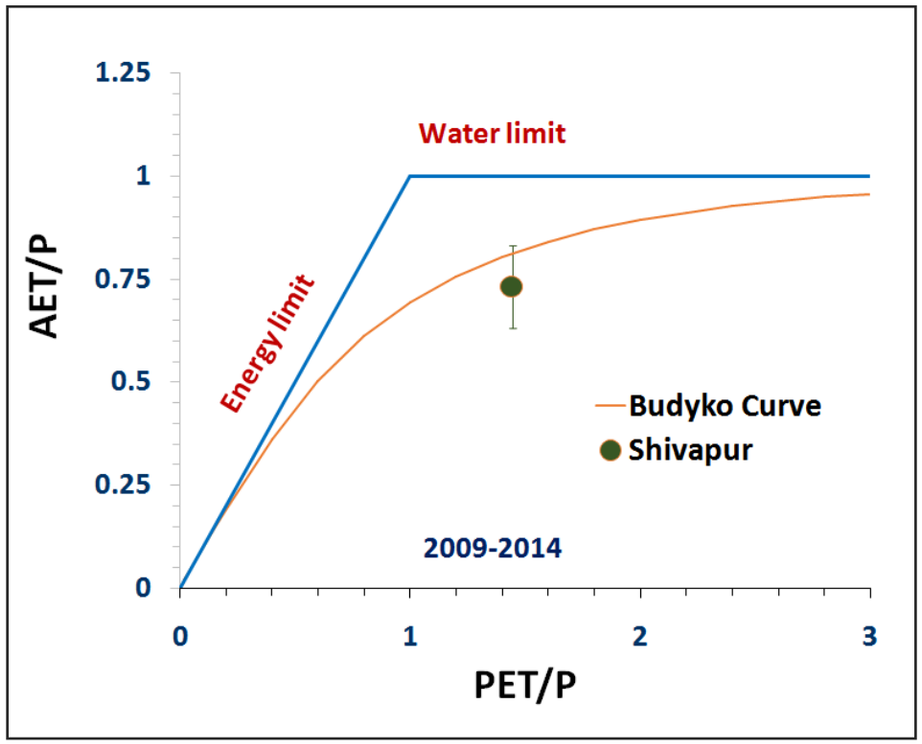

The average annual actual ET is lower than the average rainfall. During *kharif*, average rainfall and AET was found to be 674 mm and 331 mm respectively, whereas in *rabi* it was about 141 mm and 200 mm. The annual ET increased by 8% during 2010-2014 compared to 2001-2009 .

# EVAPOTRANSPIRATION INDEX

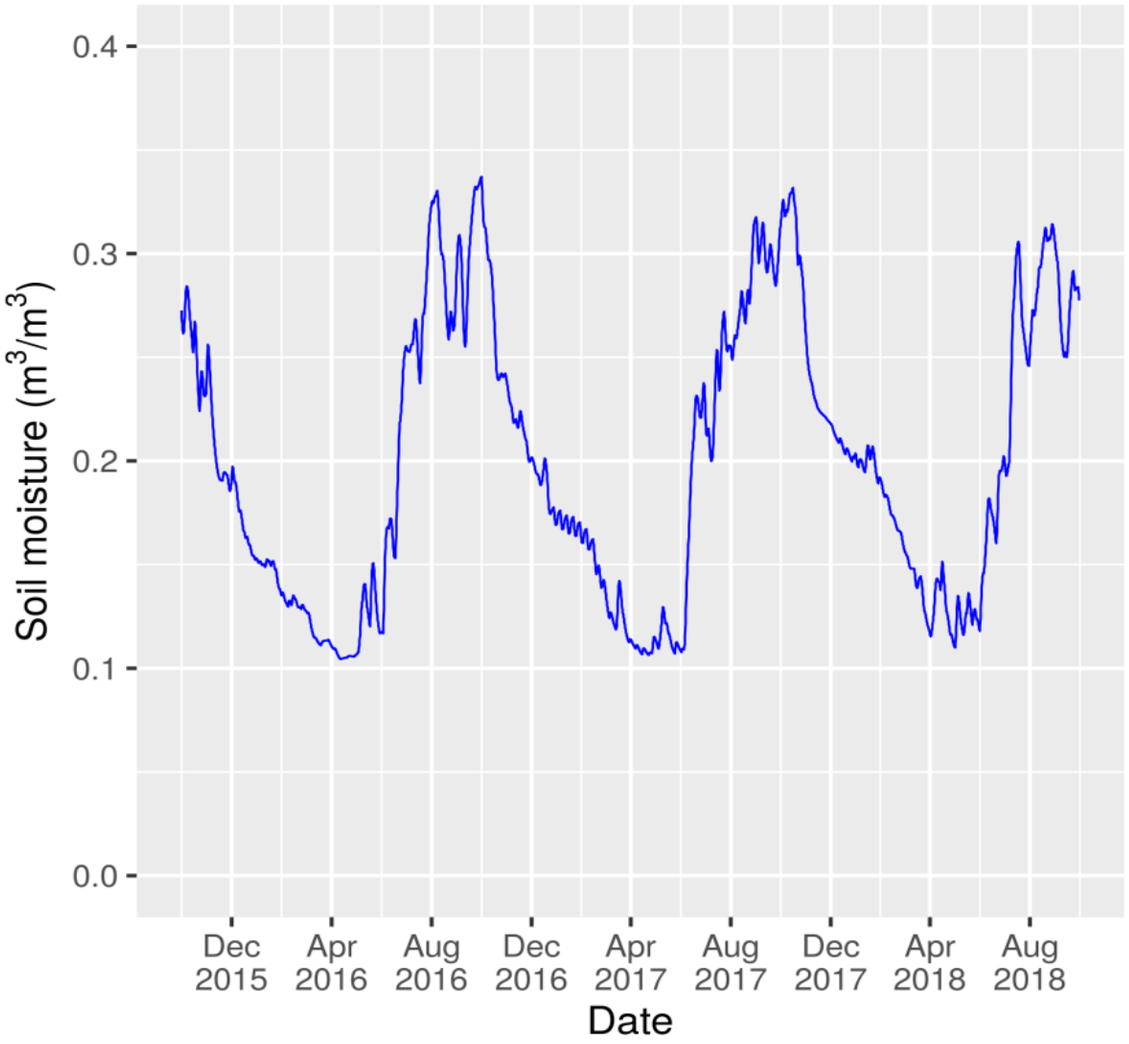


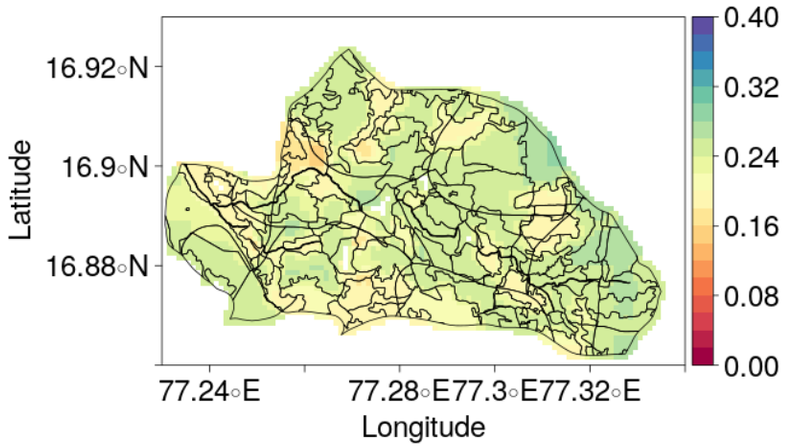

The average AET/P ratio was about 73%, which is lower than the sustainable limit of about 80%. Watershed water balance is sustainable due to higher rainfall during the *kharif* season.



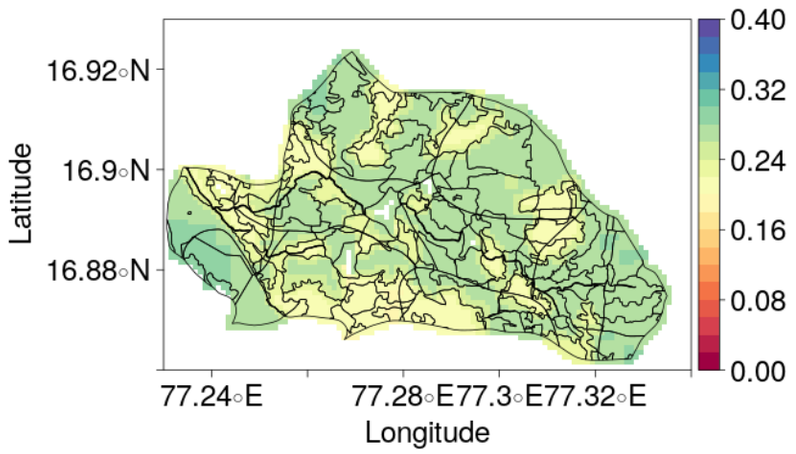
# SATELLITE RETRIEVED SOIL MOISTURE




**Shivapur– Rabi Soil Moisture**




**Shivapur– Kharif Soil Moisture**

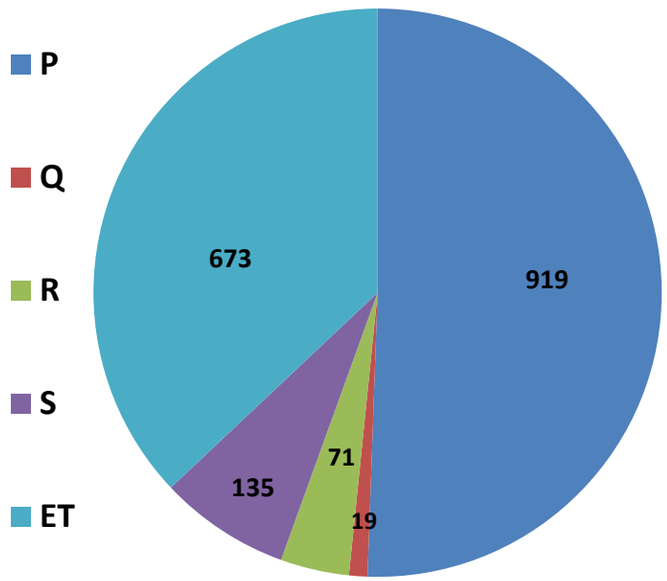



The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 17-31 % in *kharif* and 16-34% in *rabi* seasons of 2016 and 15-32% in *Kharif* and 18-33% in *rabi* seasons of 2017.

# WATER BALANCE

$$Q = P - E - R - S$$

- Q = Runoff
- P = Precipitation
- E = Evapotranspiration
- R = Groundwater recharge
- S = Soil moisture storage change

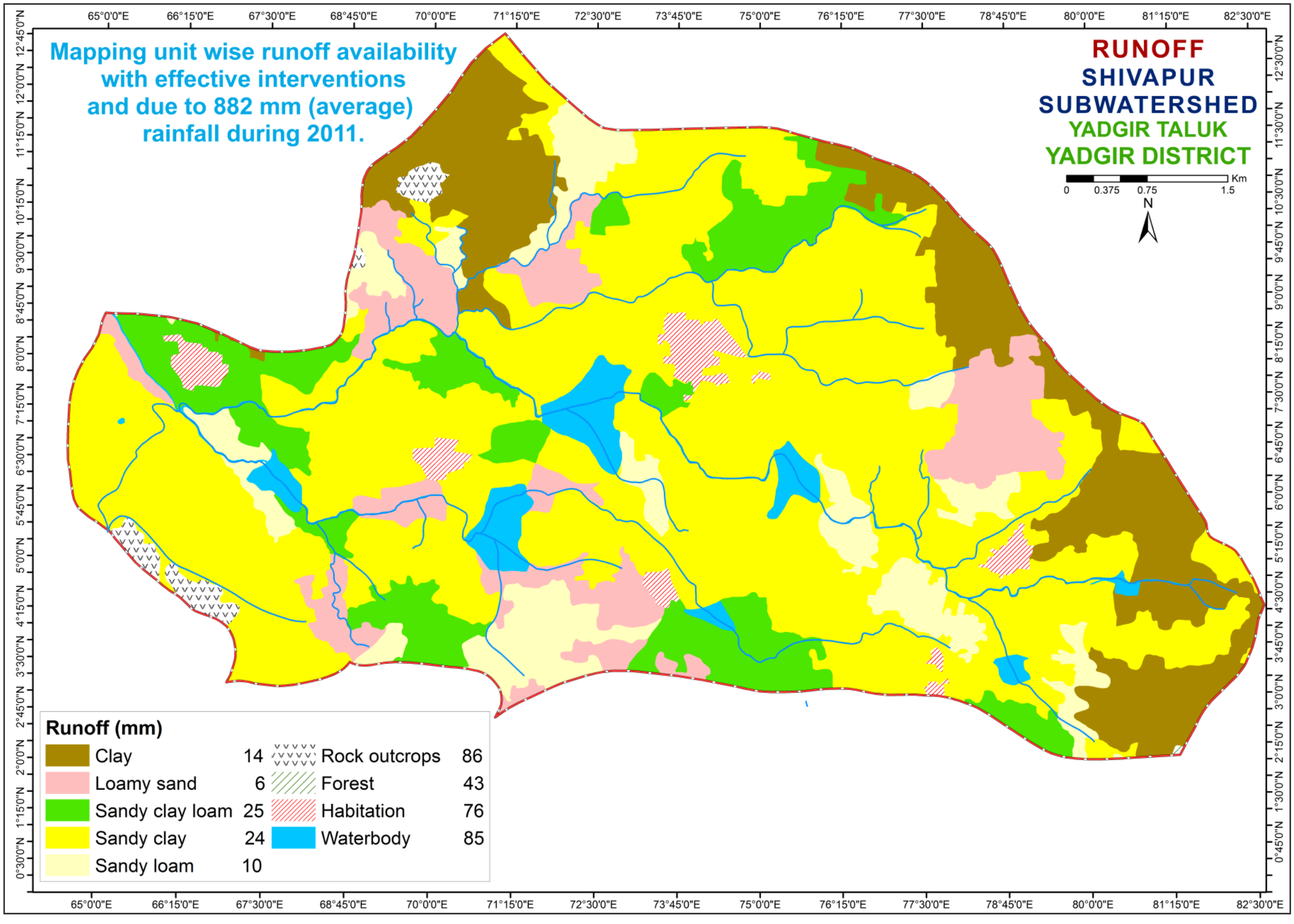



During July-October months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

**P = 919 mm (average of 2009-2017) ET = 673 mm R = 71 mm S = 135 mm Q = 19 mm**

| Sl. No. | Parameters | Average_ 2011 (mm) |
|---|---|---|
| **1.** | Rainfall | 882 |
| **2.** | Runoff availability with existing conditions | 46 |
| **3.** | Runoff availability with effective interventions | 24 |
| **4.** | Runoff allowed as environmental flow at the outlet | 5 |
| **5.** | Runoff excess for harvesting by construction of structures | 19 |

# RUNOFF


Mapping unit wise runoff availability with effective interventions and due to 882 mm (average) rainfall during 2011.
RUNOFF
SHIVAPUR
SUBWATERSHED
YADGIR TALUK
YADGIR DISTRICT
Km
0
0.375
0.75
1.5
N
Runoff (mm)
Clay 14
Loamy sand 6
Sandy clay loam 25
Sandy clay 24
Sandy loam 10
Rock outcrops 86
Forest 43
Habitation 76
Waterbody 85
65°0'0"E
66°15'0"E
67°30'0"E
68°45'0"E
70°0'0"E
71°15'0"E
72°30'0"E
73°45'0"E
75°0'0"E
76°15'0"E
77°30'0"E
78°45'0"E
80°0'0"E
81°15'0"E
82°30'0"E
12°45'0"N
12°30'0"N
12°0'0"N
11°30'0"N
11°15'0"N
10°30'0"N
10°15'0"N
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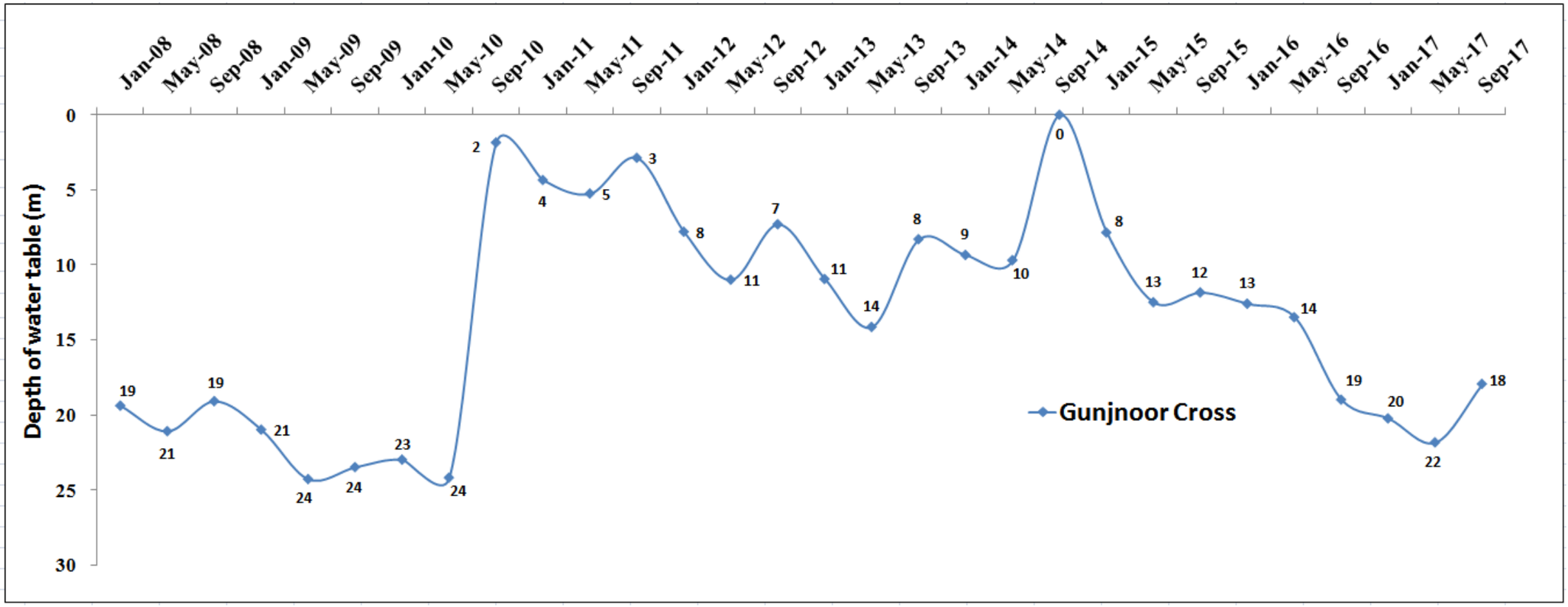
5°0'0"N
4°30'0"N
4°15'0"N
3°45'0"N
3°30'0"N
3°0'0"N
2°45'0"N
2°15'0"N
2°0'0"N
1°30'0"N
1°15'0"N
0°45'0"N
0°30'0"N

# GROUND WATER STATUS

## GUNJNOOR CROSS STATION




The total number of wells present in Shivapur Sub-watershed as per LRI data is 28 wells (25 Bore wells & 3 open well). The groundwater level shown above is from the data obtained from Dept. of Mines & Geology for the nearest station Gunjnoor Cross. The graph depicts the groundwater level during the years 2008-2017 were slightly varying, where as during the year 2014 was found constant.

X

# SUMMARY

- The average annual rainfall of 887 mm in the Shivapur sub-watershed as recorded from the Balichakra station data.

- 75%, 14% and 11% of the annual rainfall occurs during *kharif*, *rabi* and summer seasons respectively and exhibited a higher temporal variability.

- The evapotranspiration estimation tool developed indicates that the watershed water balance is in sustainable condition.

- The estimated runoff available to use is 19 mm for an average annual rainfall of 919 mm (2009-2017). The utilizable groundwater is 49.7 mm (70% of 71 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (135 mm) and utilizable runoff plus recharge is 204 (=135+19+50)

- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the kharif and rabi seasons is 532 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 665 mm (i.e. 125% of AET). This demand for the two seasons is higher by 461 mm, i.e. (665-204). The AET in June-Sept months is only 46% of rainfall. Hence, there is a good opportunity to harvest the excess water through watershed management practices for utilizing during rabi season.

- The total number of wells present in Shivapur Sub-watershed as per LRI data is 28 wells (25 Bore wells & 3 open well). The groundwater level data obtained from Dept. of Mines & Geology for the nearest station Gunjnoor Cross. The groundwater level during the years 2008-2017 were slightly varying, where as during the year 2014 was found constant.