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Land Resource and Hydrological Inventory of Kollur 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.

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PART - A

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

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How to read and use the Atlas

The Land Resource Inventory of Kollur 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.

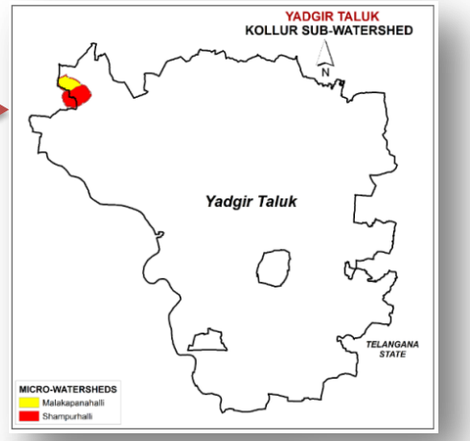
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

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.

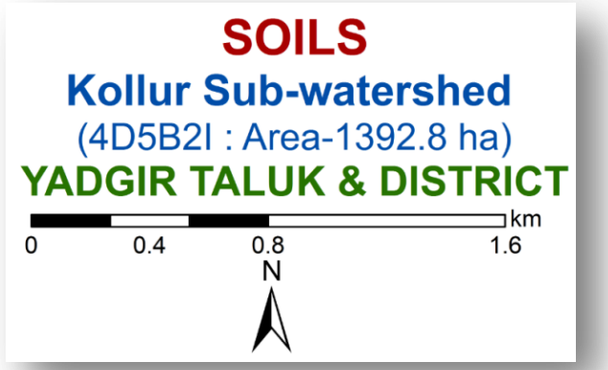
Inset map

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



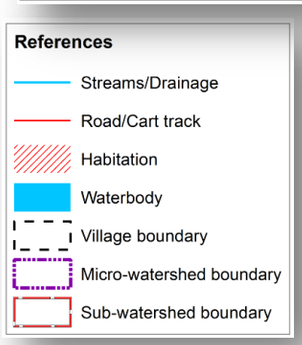
Map title

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



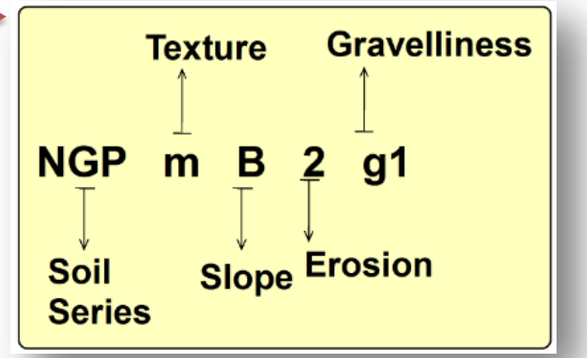
Legends and symbols

*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.*



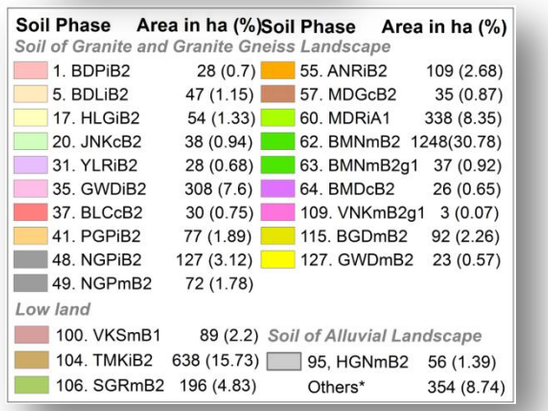
Soil Units

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.



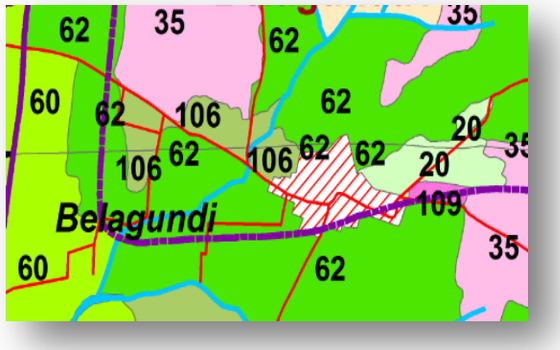
Map colours

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



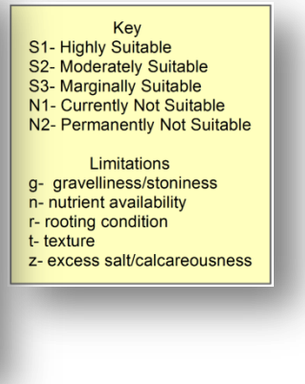
Soil and plot boundaries

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 Kollur Sub-watershed covering an area of 1392.8 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.

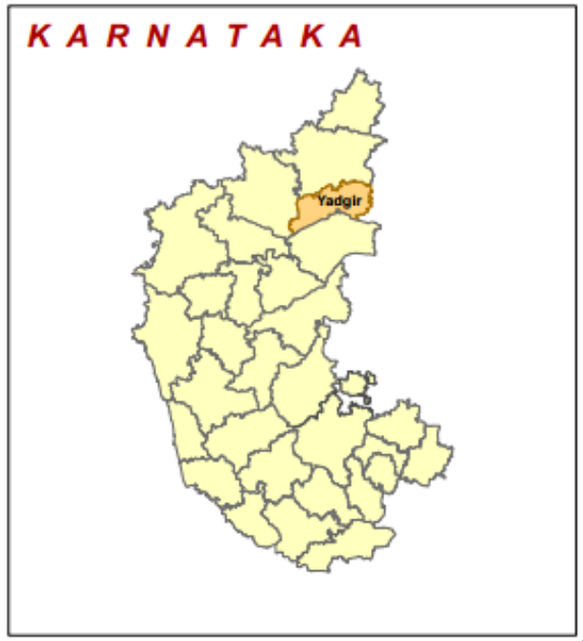
2. General Description of Sub-watershed

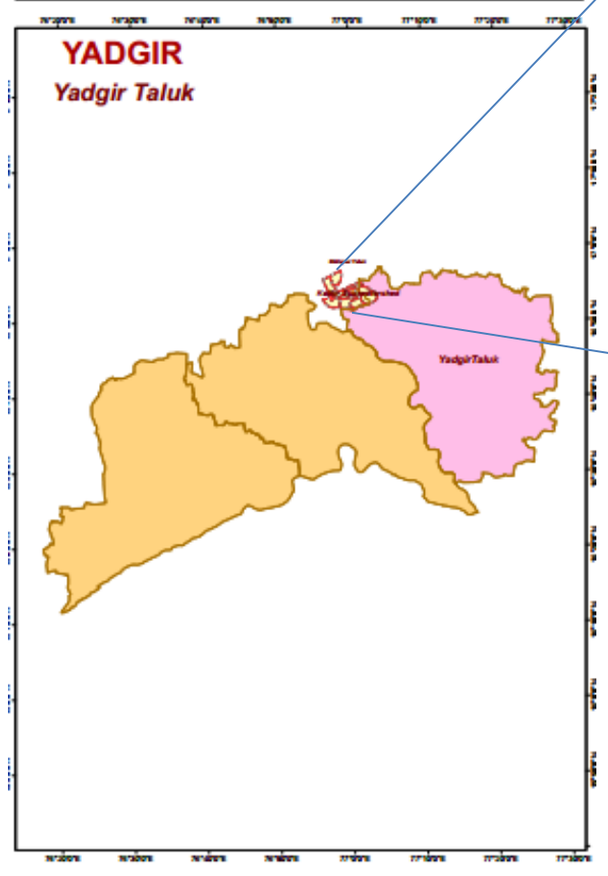
The Yadgir, popularly called as “Yadavagiri” by the local people, district came to existence on 30th Dec 2009 by carving out of erst-while Kalaburagi district of Karnataka with a geographical area of 5234.4 square kilometers, located in the northern part of the state. It lies between north latitudes’ $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.

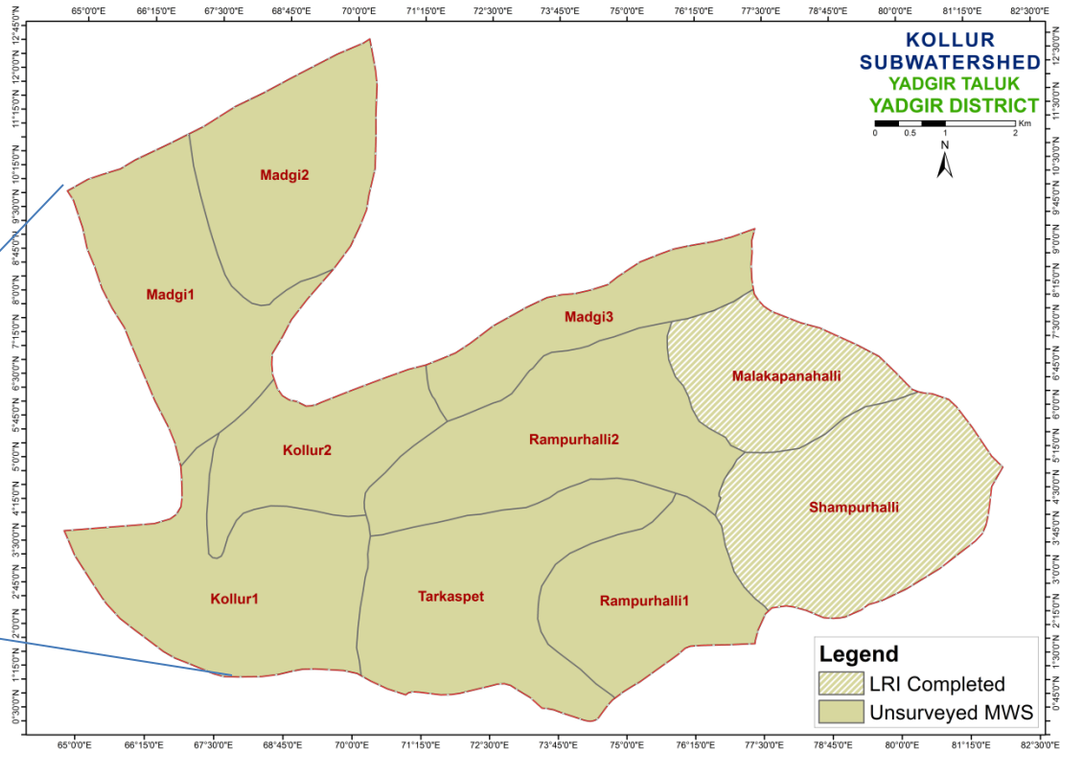
As a pilot study, **ICAR-NBSS&LUP, Bangalore** carried out the generation of Sub-watershed (SWs) - LRI for the Kollur SWs (code– 4D5B2I) in Yadgir taluk, Yadgir district. It was selected for data base generation under Sujala III project. This sub-watershed encompasses of 10 MWs namely Kollur-1 (4D5B2I2e), Kollur-2 (4D5B2I2d), Madgi-1 (4D5B2I2b), Madgi-2 (4D5B2I2a), Madgi-3 (4D5B2I2c), Malakapanahalli (4D5B2I1b), Rampurhalli-1 (4D5B2I1d), Rampurhalli-2 (4D5B2I1c), Shampurhalli (4D5B2I1a) and Tarkaspet (4D5B2I1e). Land Resource Inventory (LRI) was generated for two among the ten micro-watersheds.

2.1. Location and Extent

LOCATION MAP OF KOLLUR SUB-WATERSHED







Kollur sub-watershed (Yadgir Taluk, Yadgir District) is located between $16^0$52'16''-$16^0$55'17'' North latitudes and $77^0$1'2''- $77^0$3'47'' East longitudes, covering an area of about 6700 ha.

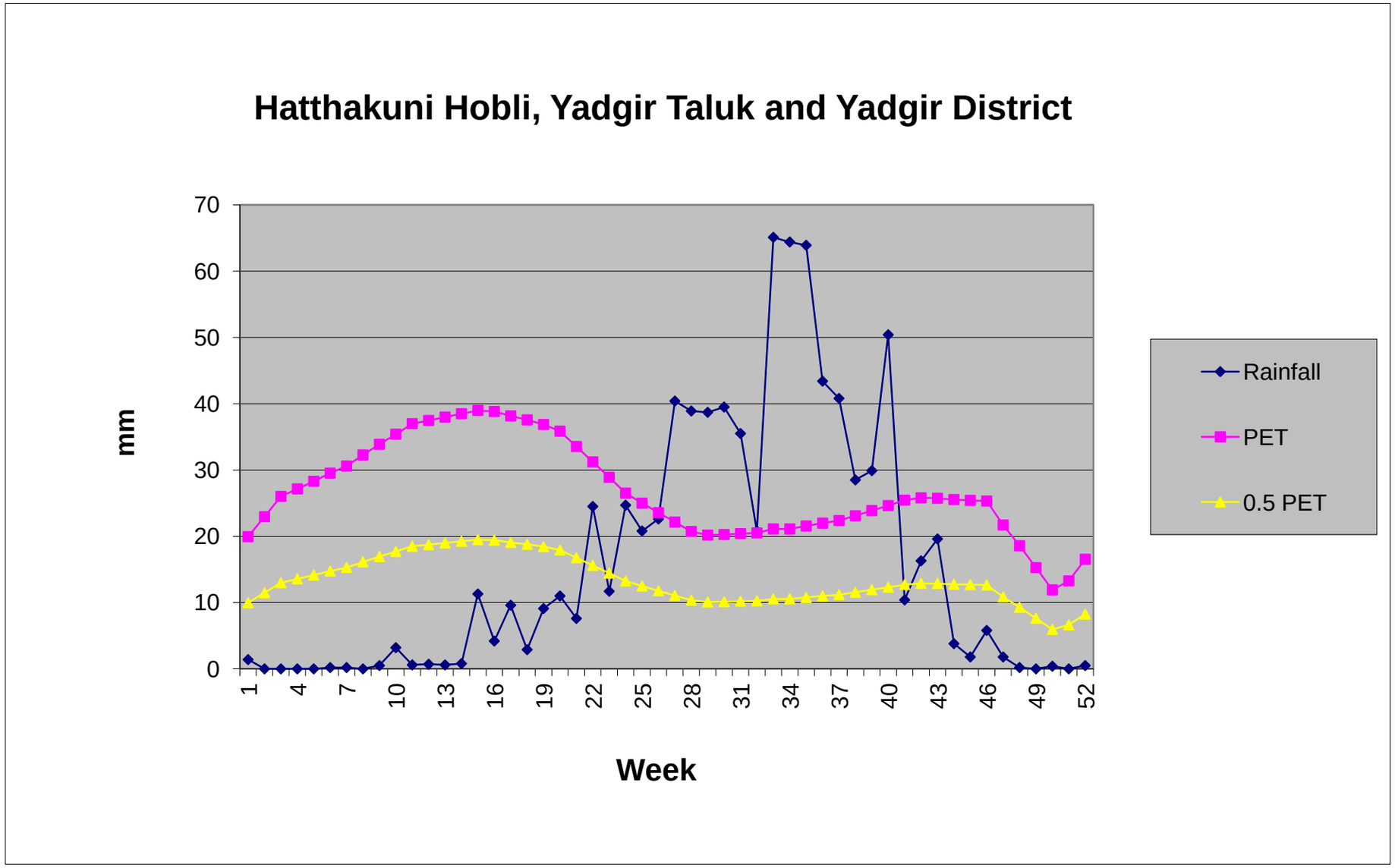
Agro Ecological Sub Region (AESR) 6.2: Central and Western Maharashtra Plateau and North Karnataka Plateau and North Western Telangana Plateau, hot moist semi-arid ESR with shallow and medium loamy to clayey Black soils (medium and deep clayey Black soils as inclusion), medium to high AWC and LGP 120-150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

NOTE: Land Resource Inventory (LRI) was generated for two among the ten micro-watersheds

2.2. Climate

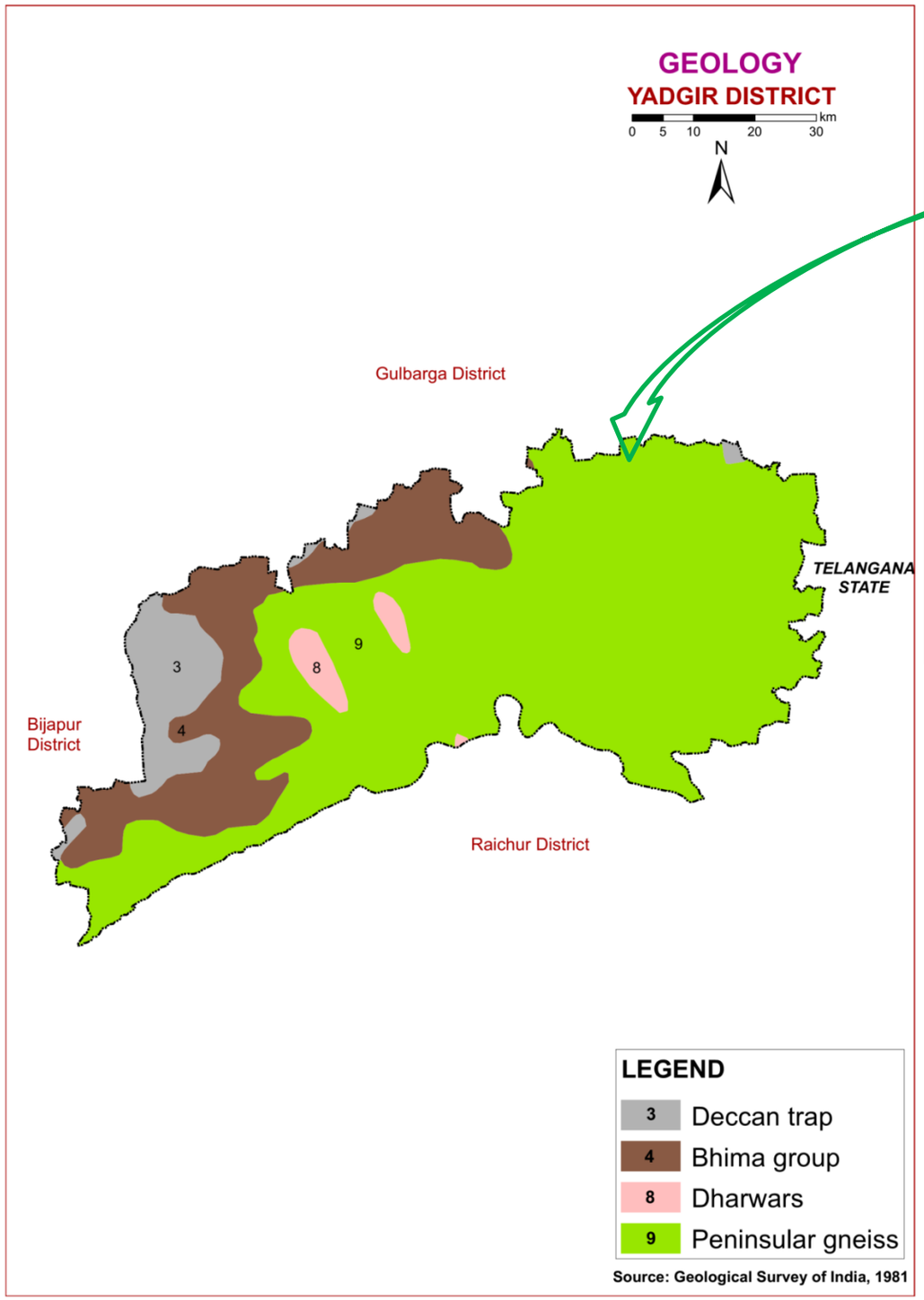


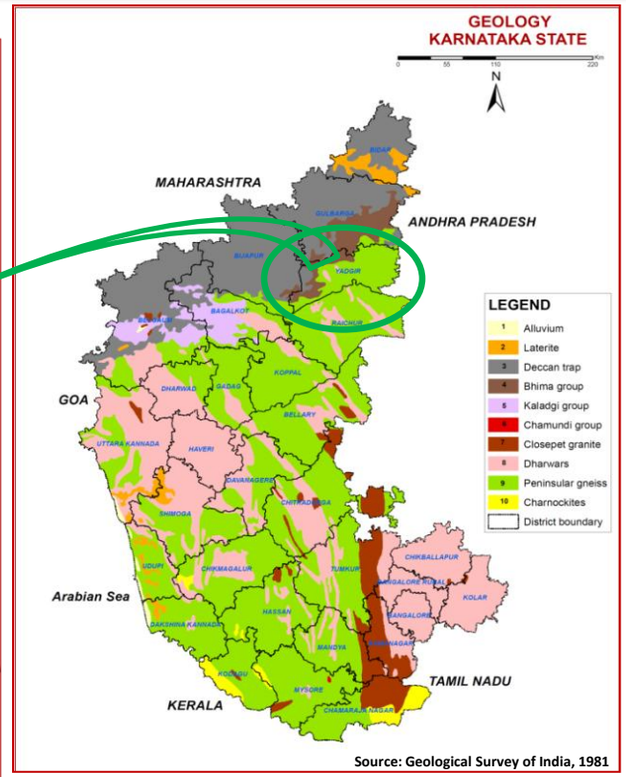
Length of Growing Period (LGP) is varying from June 1st week to 3rd week of October (120 - 150 days)

Annual Rainfall : 829 mm. in the Hatthakuni 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.

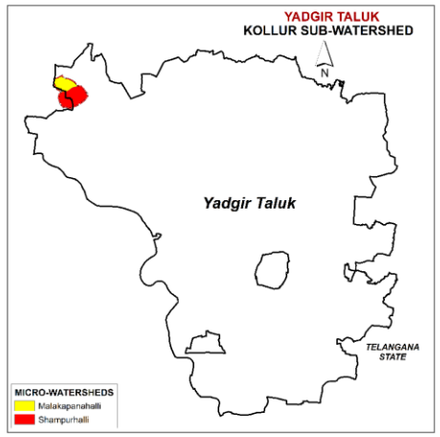
3. Survey Methodology

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



Kollur Sub-watershed
(4D5B2I : Area-1392.8 ha)
YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

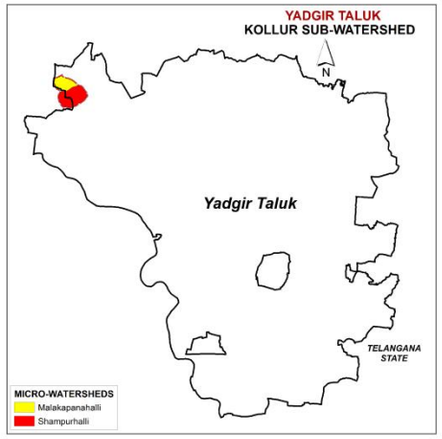
YARAGOLA
Suguru
YARAGOLA
Malakapanahalli
KOLLURU
Yaragola
YARAGOLA
Ramapurahalli
Shampurhalli
Kolluru
KOLLURU
Vadanahalli
VADANAHALLI

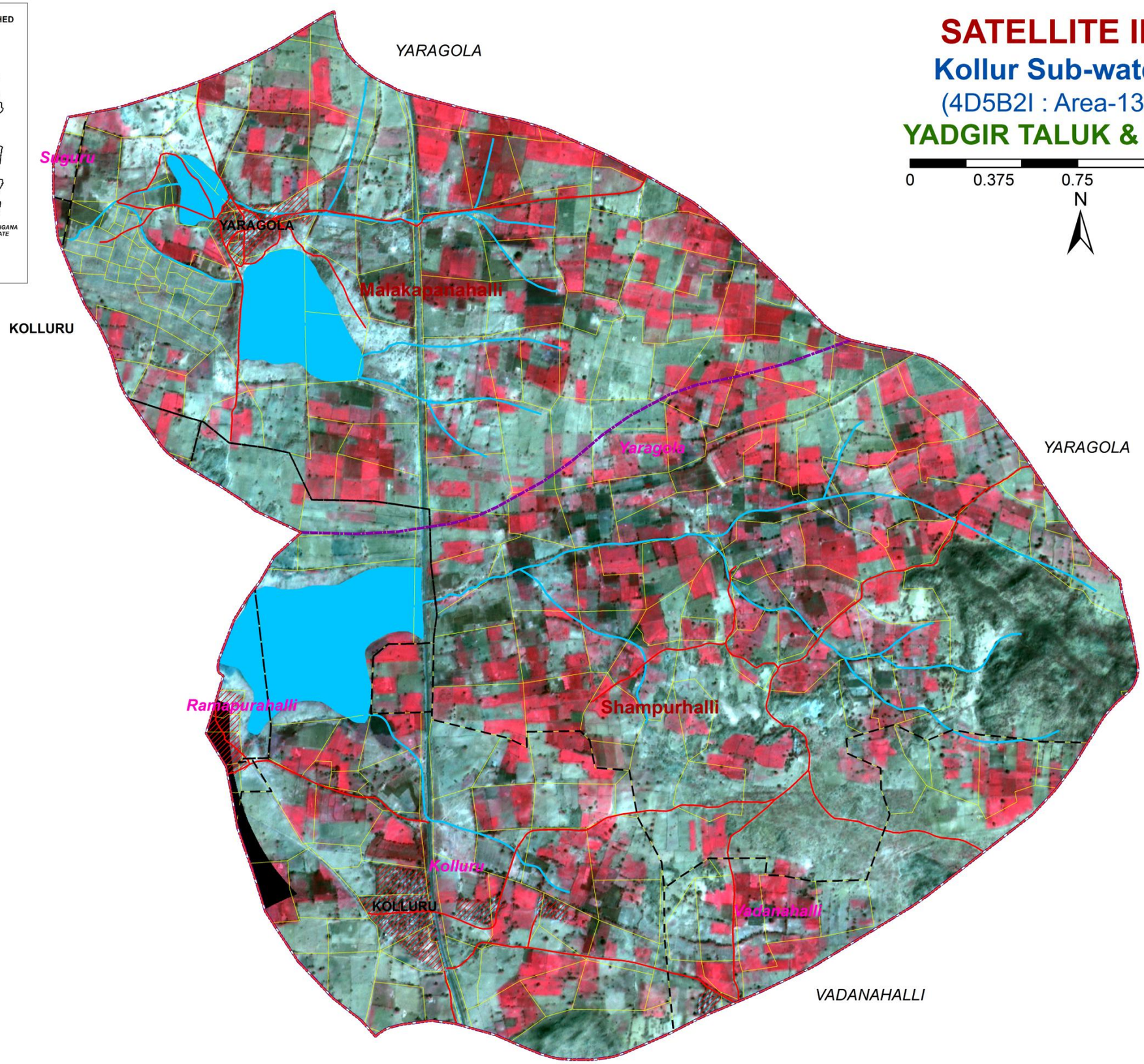
References

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- 749 Land parcel with No's
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

3.2. Database Used - Satellite Image



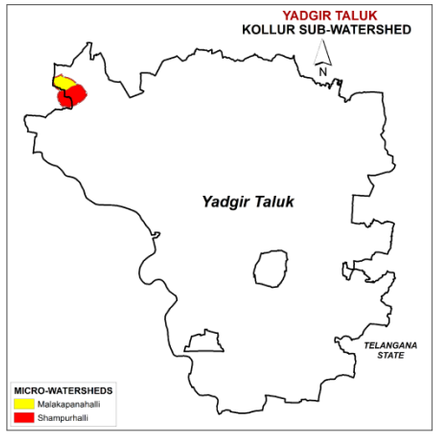


References

- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Land parcel's
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: Cartosat 1 Imagery

3.3. Location of Wells



LOCATION OF WELLS

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

YARAGOLA

Suguru

YARAGOLA

Malakapanahalli

KOLLURU

Yaragola

YARAGOLA

Ramapurahalli

Shampurhalli

Kolluru

KOLLURU

Vadanahalli

VADANAHALLI

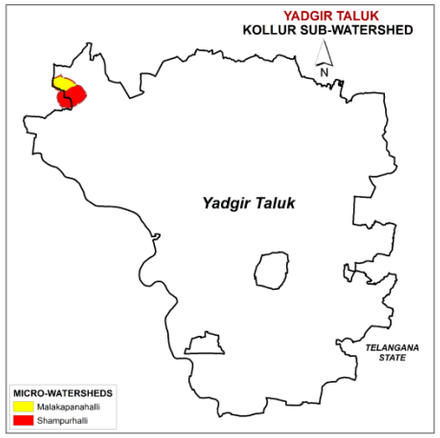
References

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

Legend	No's
Bore well	10

Source: ICAR-NBSS&LUP, Bengaluru

4. The Soils



KEY

TEXTURE
b - Loamy sand
c - Sandy loam
h - Sandy clay loam
i - Sandy clay

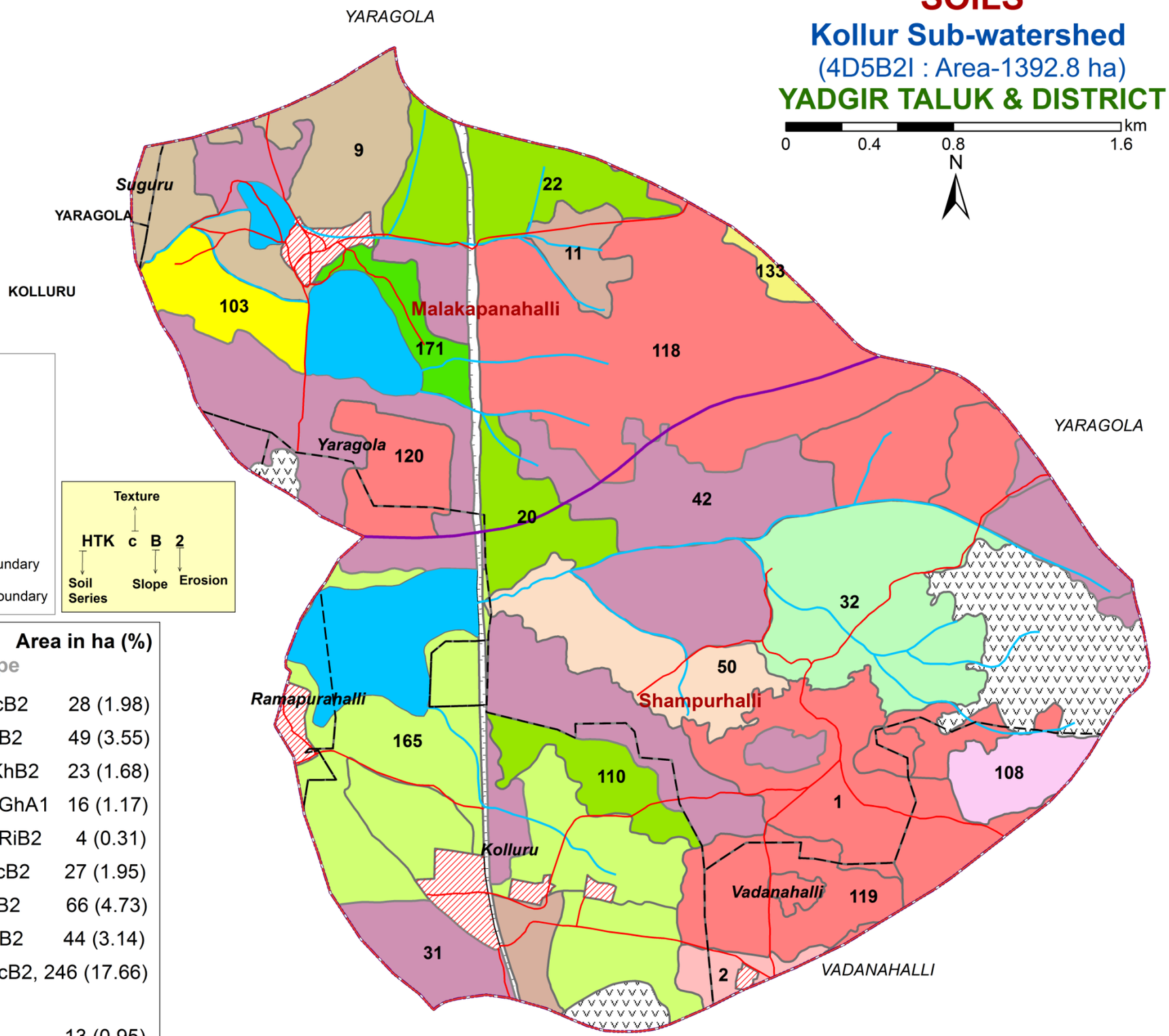
SLOPE
A - Nearly Level (0-1%)
B - Very gently sloping (1-3%)

EROSION
1 – Slight
2 - Moderate
3 – Severe

DEPTH
BDP - Very shallow (10-25)
VNK, BDL, DSB, HTK - Shallow (25-50 cm)
JNK, YLR, SBR - Moderately shallow (50-75 cm)
HSL - Moderately deep (75-100 cm)
YDR, MDG, BGD - Deep (100-150 cm)
TMK, MDR - Very deep (>150 cm)

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

Texture
HTK c B 2
Soil Series | Slope | Erosion



Soil Phase	Area in ha (%)	Soil Phase	Area in ha (%)
Soil of Granite and Granite Gneiss Landscape			
2, BDLbB2	10 (0.7)	20, JNKcB2	28 (1.98)
118, BDPcB2	201 (14.46)	22, JNKiB2	49 (3.55)
119, BDPiB3	48 (3.47)	110, JNKhB2	23 (1.68)
1, BDPiB2	86 (6.19)	171, MDGhA1	16 (1.17)
120, BDPhB2	40 (2.84)	133, MDRiB2	4 (0.31)
50, BGDbB2	45 (3.24)	11, SBRcB2	27 (1.95)
108, DSBiB2	21 (1.48)	9, VNKcB2	66 (4.73)
32, HSLcB2	87 (6.21)	31, YLRiB2	44 (3.14)
165, HTKcB2	147 (10.55)	42, YDRcB2,	246 (17.66)
Low land			
103, TMKhA1	26 (1.83)	Railway	13 (0.95)
Rock outcrops	71 (5.07)	Others*	95 (6.83)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

4.1 Mapping unit description of Kollur (4D5B2I) 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				
	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		**375 (26.96)**
118		BDPcB2	Sandy loam surface, slope 1-3%, moderate erosion	201 (14.46)
120		BDPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	40 (2.84)
1		BDPiB2	Sandy clay surface, slope 1-3%, moderate erosion	86 (6.19)
119		BDPiB3	Sandy clay surface, slope 1-3%, severe erosion	48 (3.47)
	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		**10 (0.7)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion	10 (0.7)
	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		**21 (1.48)**
108		DSBiB2	Sandy clay surface, slope 1-3%, moderate erosion	21 (1.48)
	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		**147 (10.55)**
165		HTKcB2	Sandy loam surface, slope 1-3%, moderate erosion	147 (10.55)
	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		**66 (4.73)**
9		VNKcB2	Sandy loam surface, slope 1-3%, moderate erosion	66 (4.73)
	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		**100 (7.21)**
20		JNKcB2	Sandy loam surface, slope 1-3%, moderate erosion	28 (1.98)
110		JNKhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	23 (1.68)
22		JNKiB2	Sandy clay surface, slope 1-3%, moderate erosion	49 (3.55)
	SBR	Sambara soils are moderately shallow (50-75 cm), somewhat excessively drained, have light gray to pink, loamy sand soils occurring on very gently to gently sloping uplands under cultivation		**27 (1.95)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	27 (1.95)

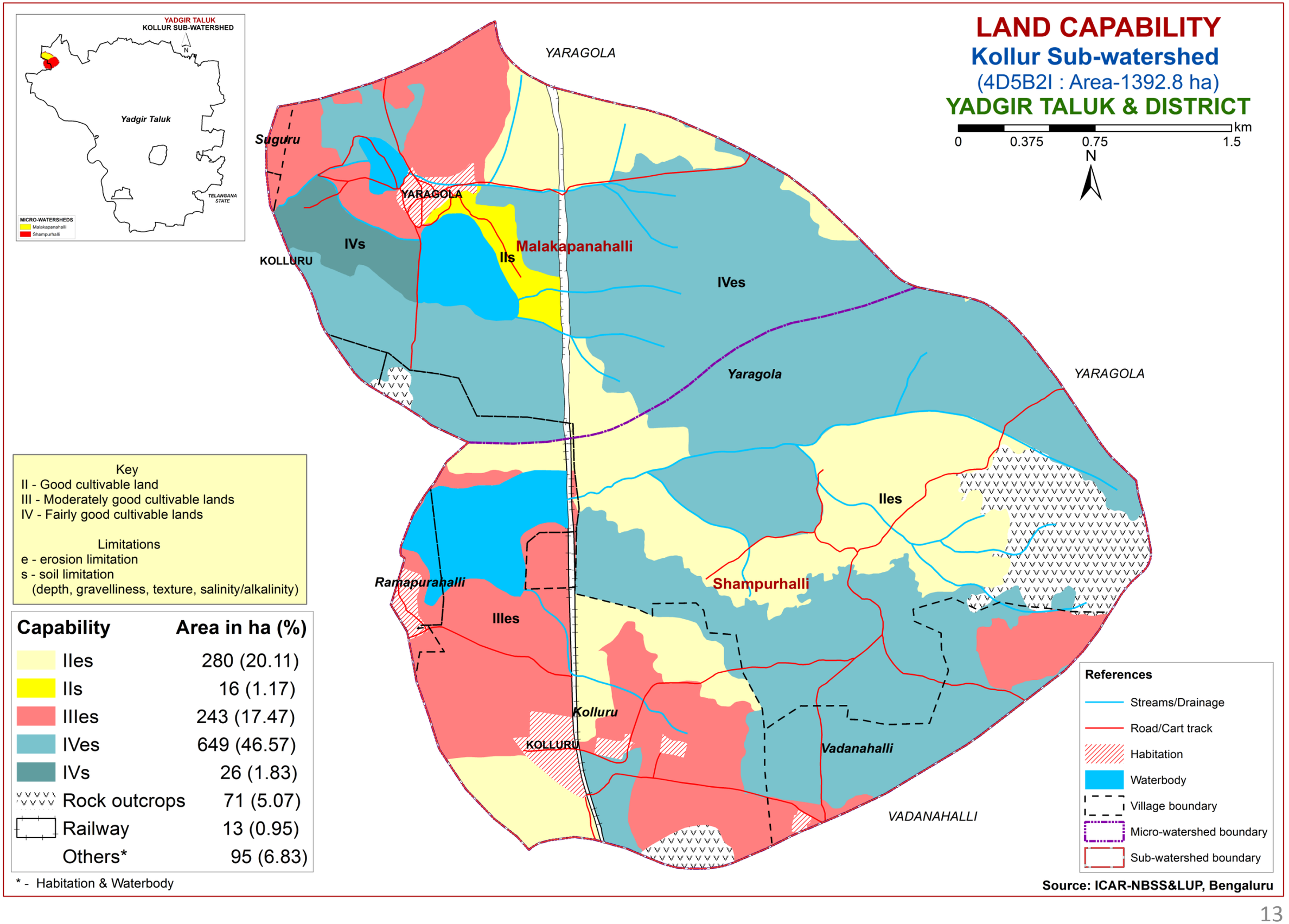
To be continued….

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss Landscape				
	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		**44 (3.14)**
31		YLRiB2	Sandy clay surface, slope 1-3%, moderate erosion	44 (3.14)
	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		**87 (6.21)**
32		HSLcB2	Sandy loam surface, slope 1-3%, moderate erosion	87 (6.21)
	BGD	Belagundi soils are deep (100-150 cm) well drained, have brown to dark yellowish brown, slightly calcareous clayey soils occurring on nearly level to very gently sloping uplands under cultivation		**45 (3.24)**
50		BGDbB2	Loamy sand surface, slope 1-3%, moderate erosion	45 (3.24)
	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		**16 (1.17)**
171		MDGhA1	Sandy clay loam surface, slope 0-1%, slight erosion	16 (1.17)
	YDR	Yadgir soils are deep (100-150 cm), well drained, have brown to dark yellowish brown and olive brown, sodic sandy loam soils occurring on very gently sloping uplands under cultivation		**246 (17.66)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	246 (17.66)
	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		**4 (0.31)**
133		MDRiB2	Sandy clay surface, slope 1-3%, moderate erosion	4 (0.31)
	TMK	Thumakur soils are very deep (>150 cm), moderately well drained, have very dark gray to dark brown, slightly calcareous sodic clay soils occurring on nearly level to very gently sloping low lands under cultivation		**26 (1.83)**
103		TMKhA1	Sandy clay loam surface, slope 0-1%, slight erosion	26 (1.83)
992		Railway	Railway line	**13 (0.95)**
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**71 (5.07)**
1000		Others	Habitation and Waterbody	**95 (6.83)**

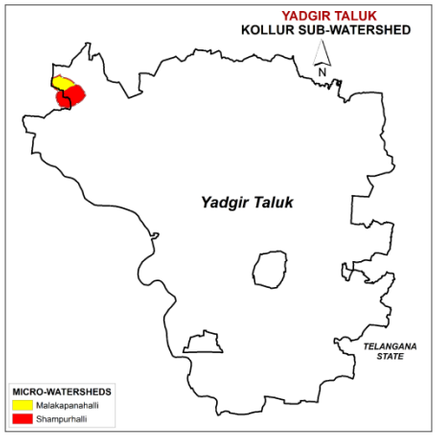
* Soil map unit numbers are continuous for the taluk, not for the sub-watershed

5. Soil Survey Interpretations

5.1. Land Capability Classification



5.2. Soil Depth



SOIL DEPTH
Kollur Sub-watershed
(4D5B2I : Area-1392.8 ha)
YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

YARAGOLA
Suguru
YARAGOLA
Malakapanahalli
KOLLURU
Yaragola
YARAGOLA
Ramapurahalli
Shampurhalli
Kolluru
KOLLURU
Vadanahalli
VADANAHALLI

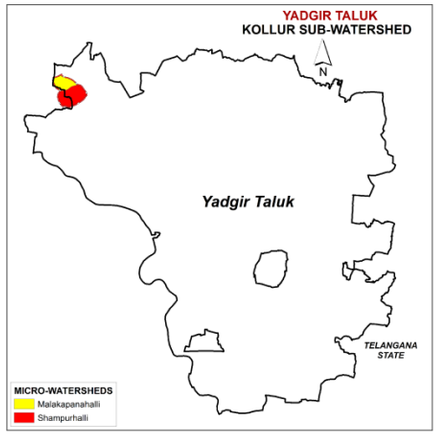
Depth Class	Area in ha (%)
Very shallow (<25 cm)	376 (26.96)
Shallow (25-50 cm)	243 (17.47)
Moderately shallow (50-75 cm)	171 (12.3)
Moderately deep (75-100 cm)	87 (6.21)
Deep (100-150 cm)	307 (22.07)
Very deep (>150 cm)	30 (2.14)
Rock outcrops	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

5.3. Surface Soil Texture



SURFACE SOIL TEXTURE

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

YARAGOLA
Suguru
YARAGOLA
Malakapanahalli
KOLLURU
Yaragola
YARAGOLA
Ramapurahalli
Shampurhalli
Kolluru
KOLLURU
Vadanahalli
VADANAHALLI

Texture Class	Area in ha(%)
Loamy sand	55 (3.94)
Sandy loam	802 (57.55)
Sandy clay loam	105 (7.52)
Sandy clay	253 (18.14)
Railway	13 (0.95)
Rock outcrops	71 (5.07)
Others*	95 (6.83)

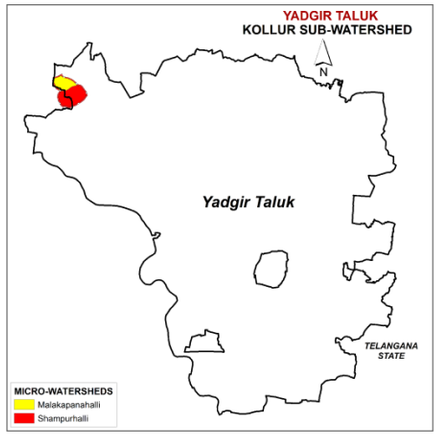
* - Habitation & Waterbody

References

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

Source: ICAR-NBSS&LUP, Bengaluru

5.4. Surface Soil Gravelliness



SOIL GRAVELLINESS

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

YARAGOLA
Suguru
YARAGOLA
Malakapanahalli
KOLLURU
Yaragola
YARAGOLA
Ramapurahalli
Shampurhalli
Kolluru
KOLLURU
Vadanahalli
VADANAHALLI

Gravelly Class	Area in ha (%)
Non gravelly (<15%)	1214 (87.16)
Railway	13 (0.95)
Rock outcrops	71 (5.07)
Others*	95 (6.83)

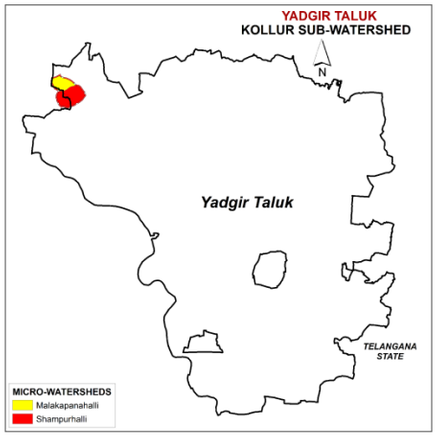
* - Habitation & Waterbody

References

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

Source: ICAR-NBSS&LUP, Bengaluru

5.5. Available Water Capacity



AVAILABLE WATER CAPACITY

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

km
0 0.375 0.75 1.5
N

YARAGOLA
Suguru
YARAGOLA
Malakapanahalli
KOLLURU
Yaragola
YARAGOLA
Ramapurahalli
Shampurhalli
Kolluru
KOLLURU
Vadanahalli
VADANAHALLI

Available Water Capacity	Area in ha (%)
Very low (<50 mm/m)	646 (46.38)
Low (51-100 mm/m)	390 (28.01)
Medium (101-150 mm/m)	87 (6.21)
Very high (>200 mm/m)	91 (6.56)
Railway	13 (0.95)
Rock outcrops	71 (5.07)
Others*	95 (6.83)

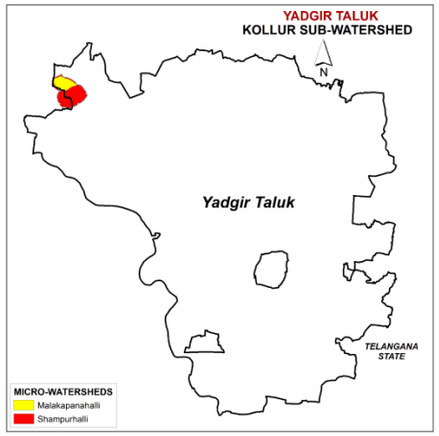
* - Habitation & Waterbody

References

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

Source: ICAR-NBSS&LUP, Bengaluru

5.6.Slope



SLOPE

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

YARAGOLA
Suguru
YARAGOLA
Malakapanahalli
KOLLURU
Yaragola
YARAGOLA
Ramapurahalli
Shampurhalli
Kolluru
KOLLURU
Vadanahalli
VADANAHALLI

Slope Class	Area in ha (%)
Nearly level (0-1%)	42 (3.0)
Very gently sloping (1-3%)	1172 (84.15)
Railway	13 (0.95)
Rock outcrops	71 (5.07)
Others*	95 (6.83)

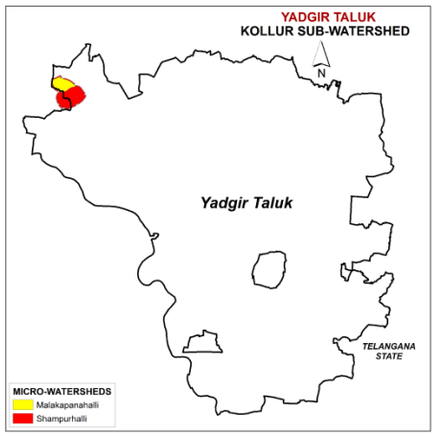
* - Habitation & Waterbody

References

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

Source: ICAR-NBSS&LUP, Bengaluru

5.7.Soil Erosion



SOIL EROSION

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

YARAGOLA

Suguru

YARAGOLA

Malakapanahalli

KOLLURU

Yaragola

YARAGOLA

Ramapurahalli

Shampurhalli

Kolluru

KOLLURU

Vadanahalli

VADANAHALLI

Erosion Class	Area in ha(%)
Slight	42 (3.0)
Moderate	1124 (80.69)
Severe	48 (3.47)
Railway	13 (0.95)
Rock outcrops	71 (5.07)
Others*	95 (6.83)

* - Habitation & Waterbody

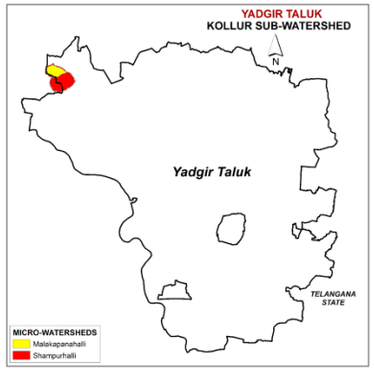
References

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

Source: ICAR-NBSS&LUP, Bengaluru

6. Land Suitability for Major Crops

6.1. Land Suitability for Sorghum

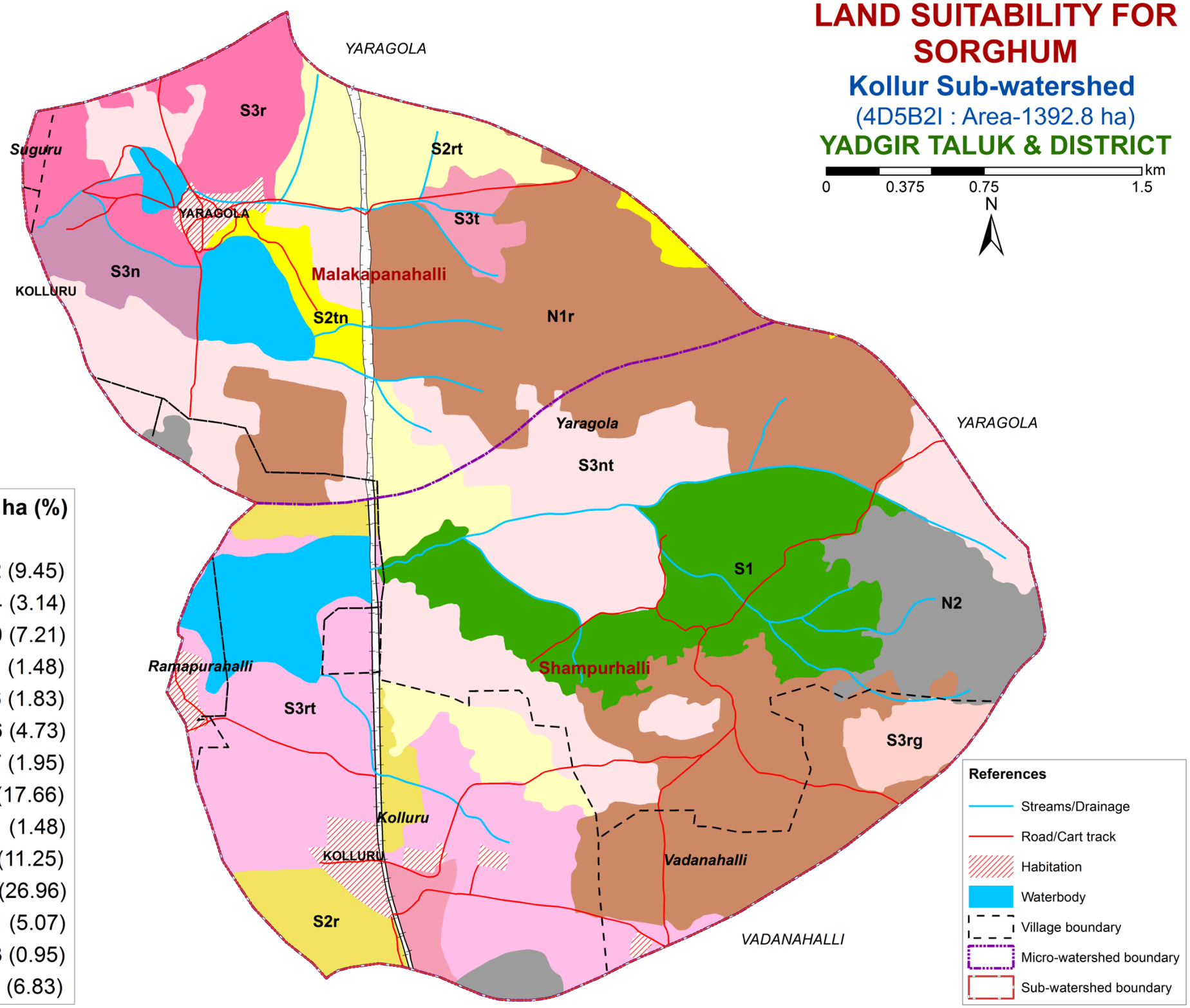


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

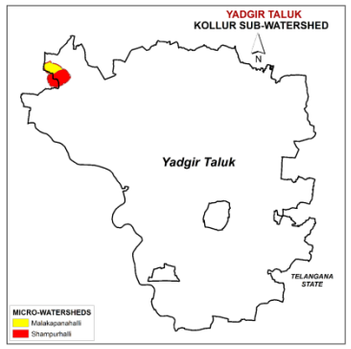
Suitability subclass	Area in ha (%)
S1	132 (9.45)
S2r	44 (3.14)
S2rt	100 (7.21)
S2tn	21 (1.48)
S3n	26 (1.83)
S3r	66 (4.73)
S3t	27 (1.95)
S3nt	246 (17.66)
S3rg	21 (1.48)
S3rt	157 (11.25)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



Source: ICAR-NBSS&LUP, Bengaluru

6.2. Land Suitability for Maize

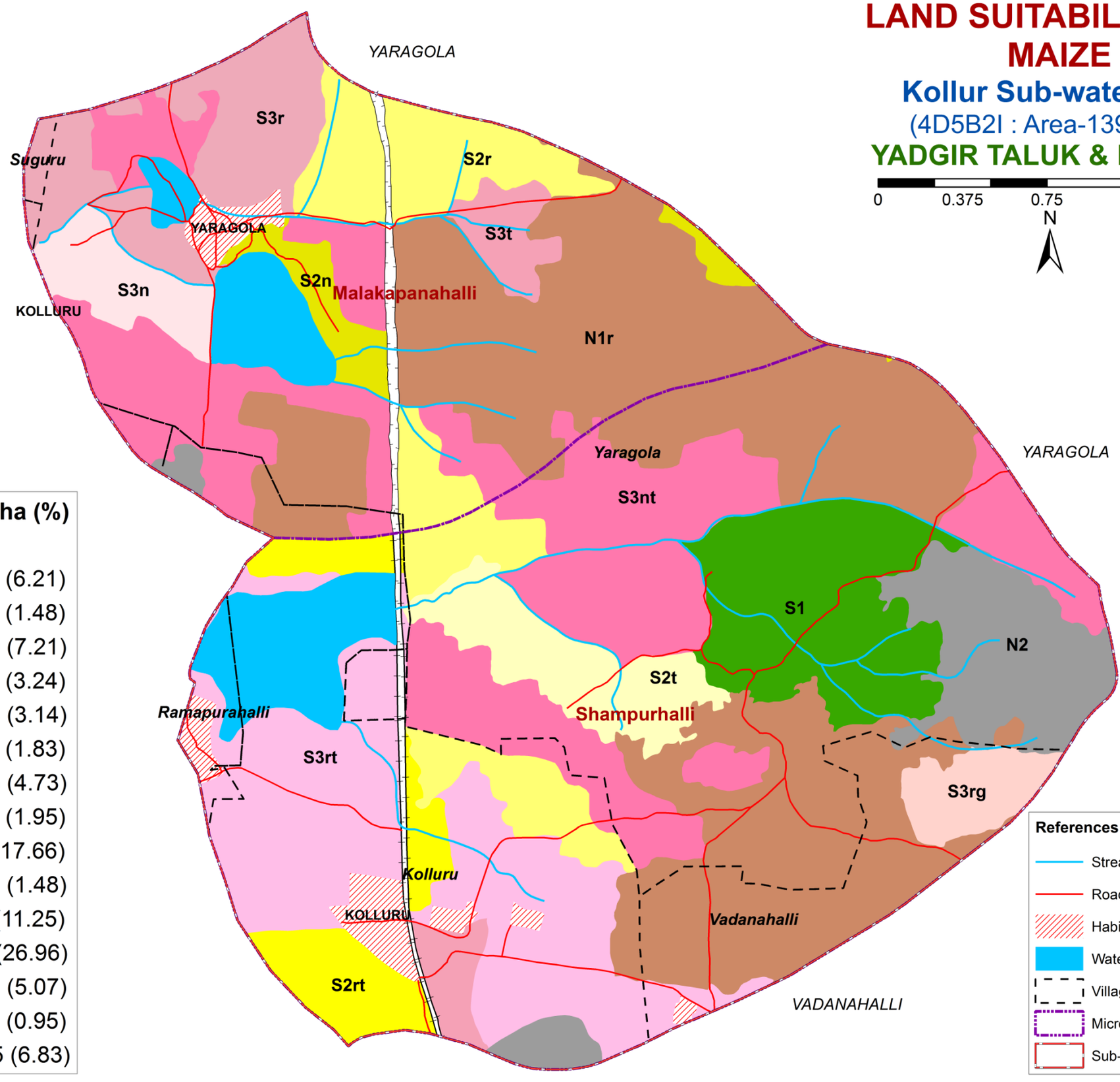


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2n	21 (1.48)
S2r	100 (7.21)
S2t	45 (3.24)
S2rt	44 (3.14)
S3n	26 (1.83)
S3r	66 (4.73)
S3t	27 (1.95)
S3nt	246 (17.66)
S3rg	21 (1.48)
S3rt	157 (11.25)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



LAND SUITABILITY FOR MAIZE

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

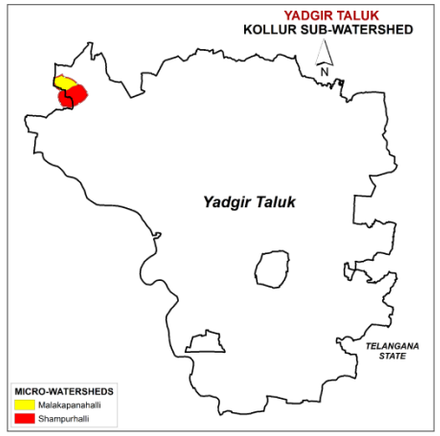
0 0.375 0.75 1.5 km

N

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

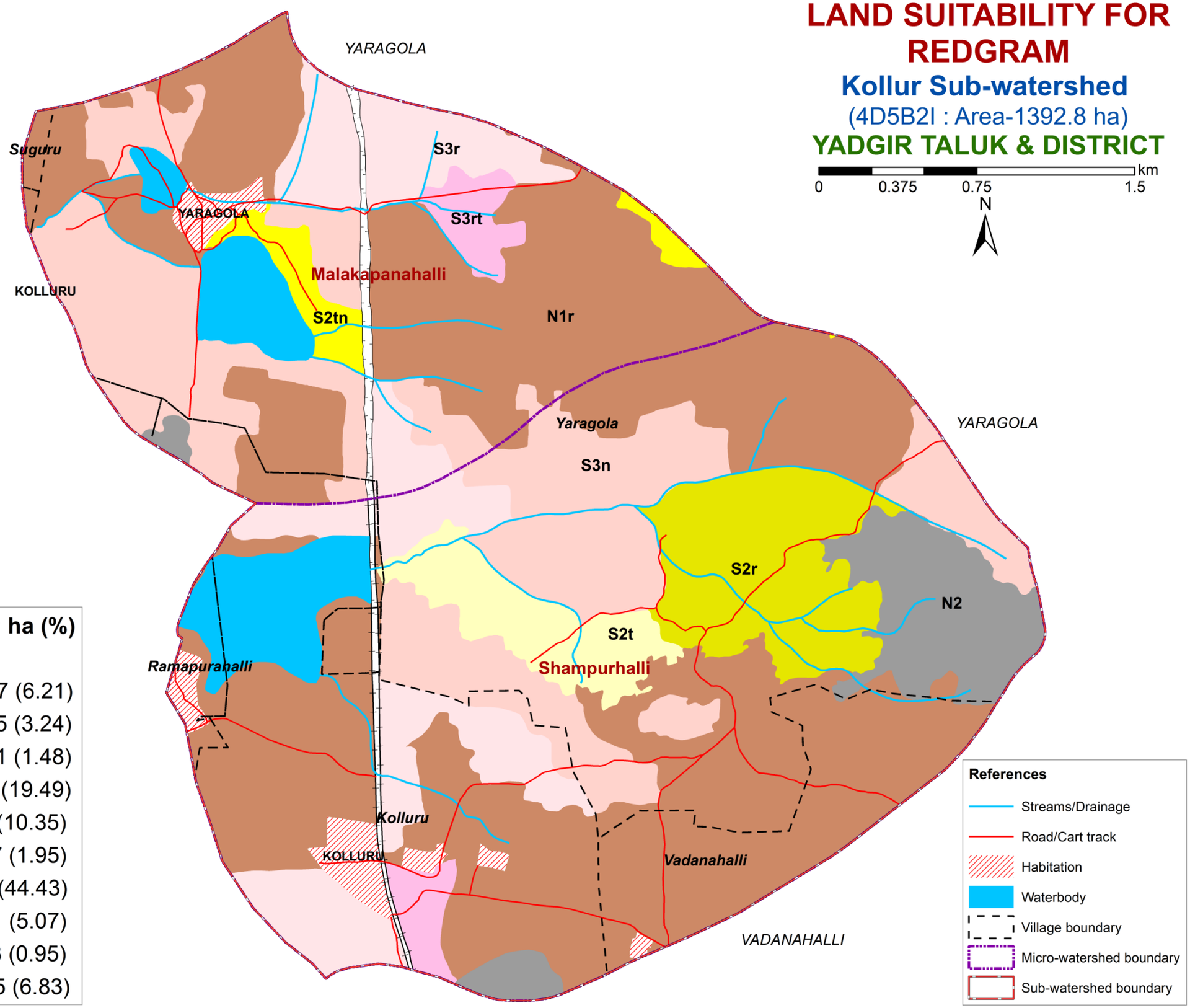
Source: ICAR-NBSS&LUP, Bengaluru

6.3. Land Suitability for Redgram



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

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

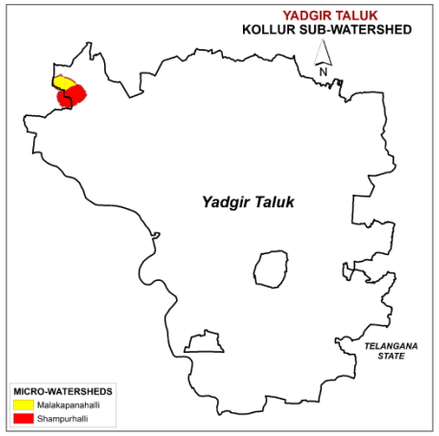


Suitability subclass	Area in ha (%)
S2r	87 (6.21)
S2t	45 (3.24)
S2tn	21 (1.48)
S3n	272 (19.49)
S3r	144 (10.35)
S3rt	27 (1.95)
N1r	619 (44.43)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6.4. Land Suitability for Bajra

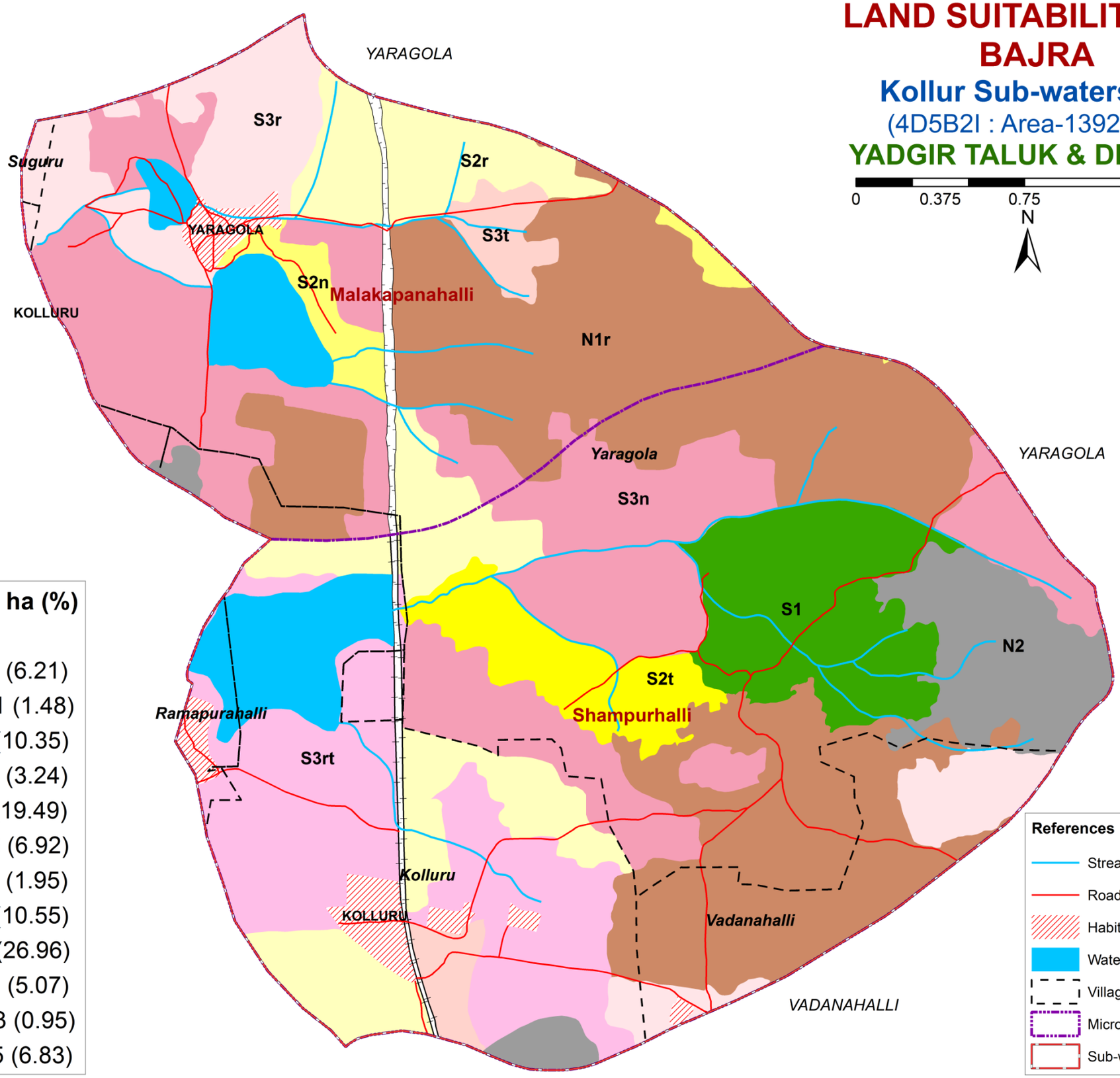


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

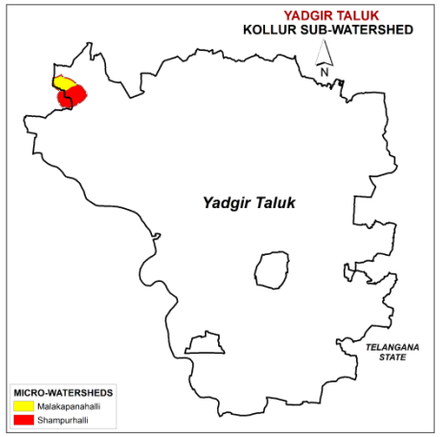
Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2n	21 (1.48)
S2r	144 (10.35)
S2t	45 (3.24)
S3n	272 (19.49)
S3r	96 (6.92)
S3t	27 (1.95)
S3rt	147 (10.55)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



Source: ICAR-NBSS&LUP, Bengaluru

6.5. Land Suitability for Drumstick



LAND SUITABILITY FOR DRUMSTICK

Kollur Sub-watershed

(4D5B2l : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

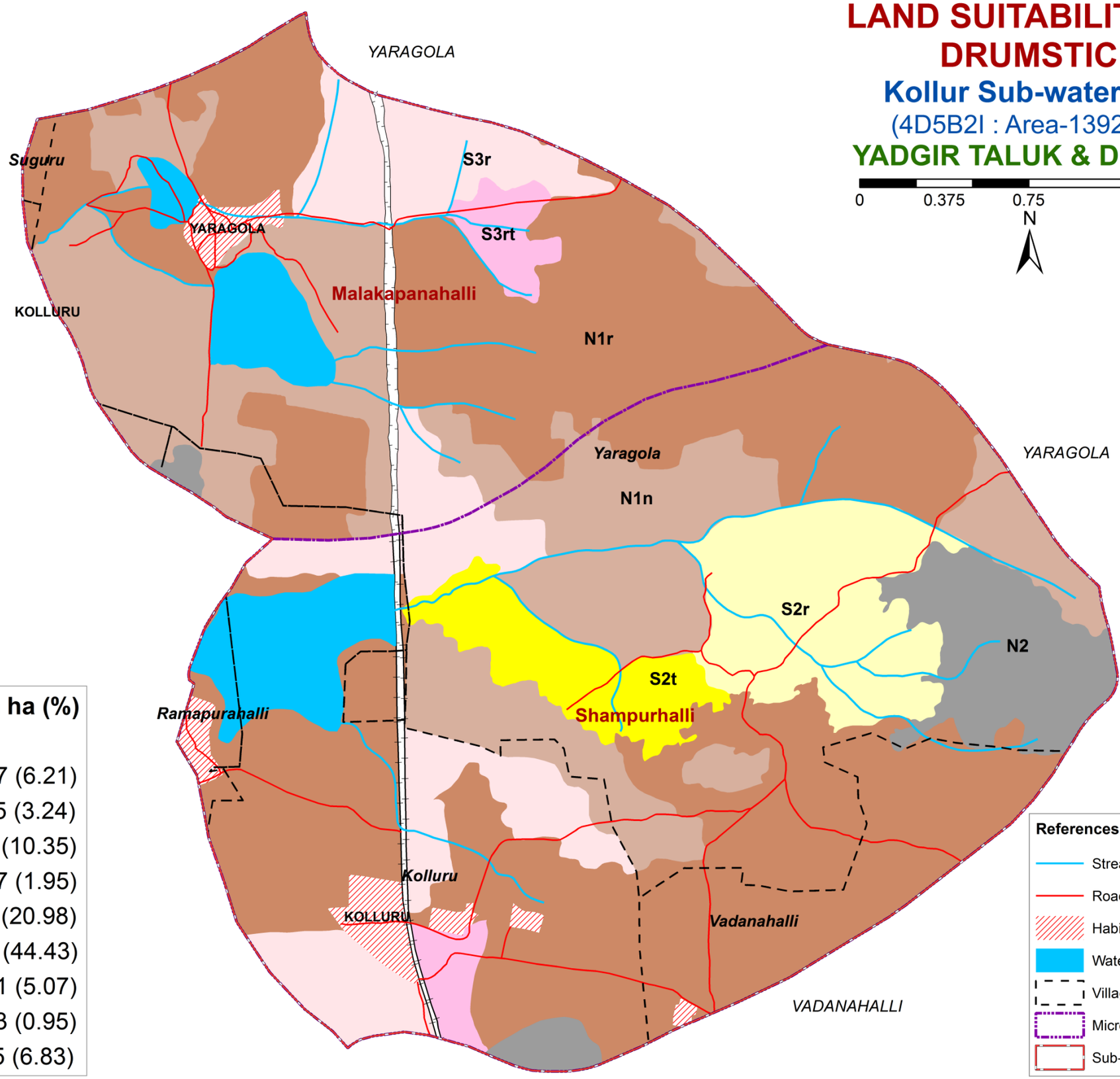
N

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

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

Suitability subclass	Area in ha (%)
S2r	87 (6.21)
S2t	45 (3.24)
S3r	144 (10.35)
S3rt	27 (1.95)
N1n	292 (20.98)
N1r	619 (44.43)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

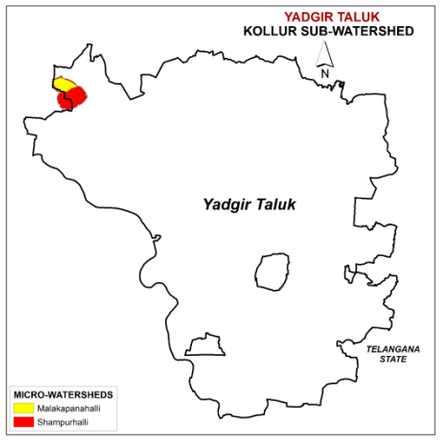
* - Habitation & Waterbody



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

Source: ICAR-NBSS&LUP, Bengaluru

6.6. Land Suitability for Sunflower



LAND SUITABILITY FOR SUNFLOWER

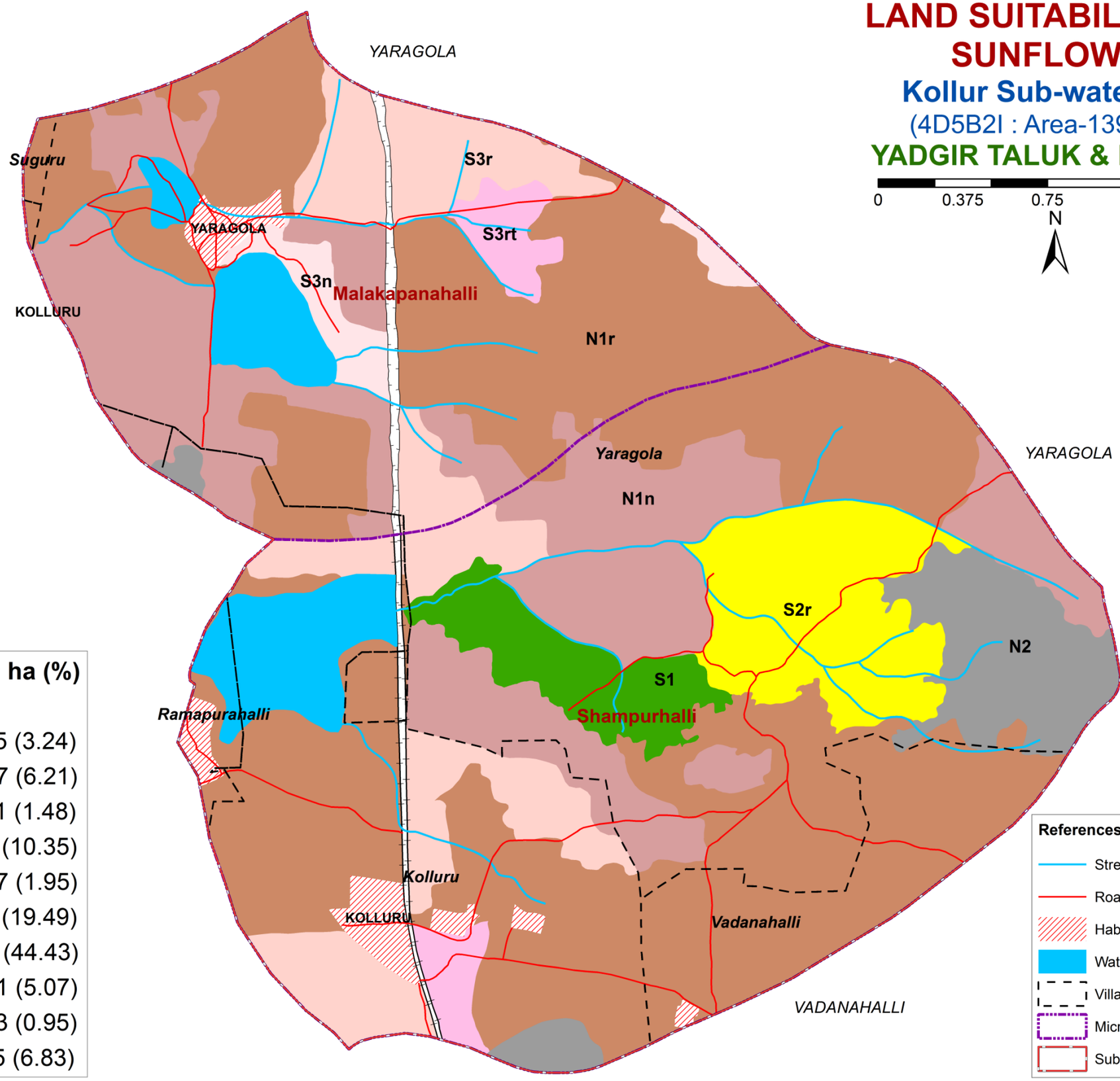
Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N



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

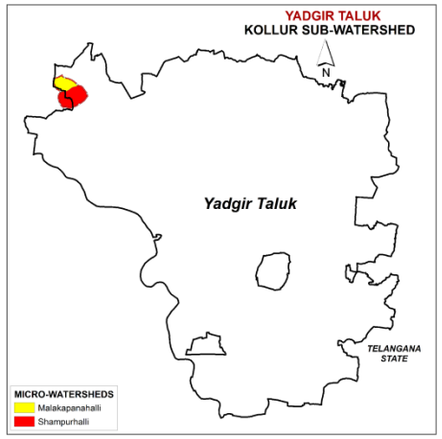
Suitability subclass	Area in ha (%)
S1	45 (3.24)
S2r	87 (6.21)
S3n	21 (1.48)
S3r	144 (10.35)
S3rt	27 (1.95)
N1n	272 (19.49)
N1r	619 (44.43)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

6.7. Land Suitability for Cotton

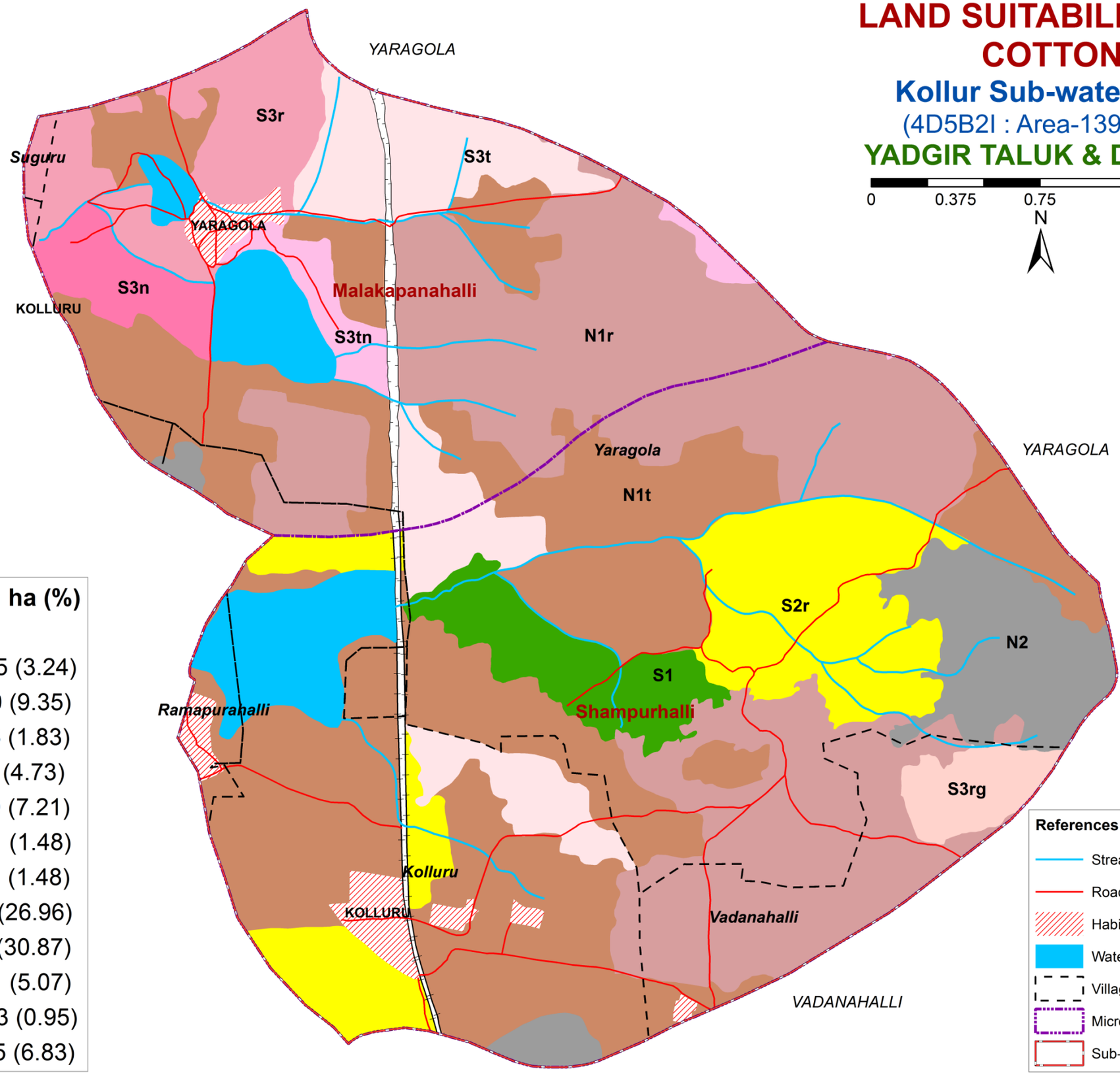


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S1	45 (3.24)
S2r	130 (9.35)
S3n	26 (1.83)
S3r	66 (4.73)
S3t	100 (7.21)
S3rg	21 (1.48)
S3tn	21 (1.48)
N1r	376 (26.96)
N1t	430 (30.87)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



LAND SUITABILITY FOR COTTON

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

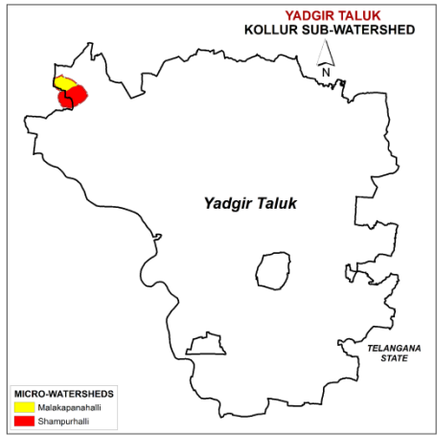
0 0.375 0.75 1.5 km

N

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

Source: ICAR-NBSS&LUP, Bengaluru

6.8. Land Suitability for Chilli

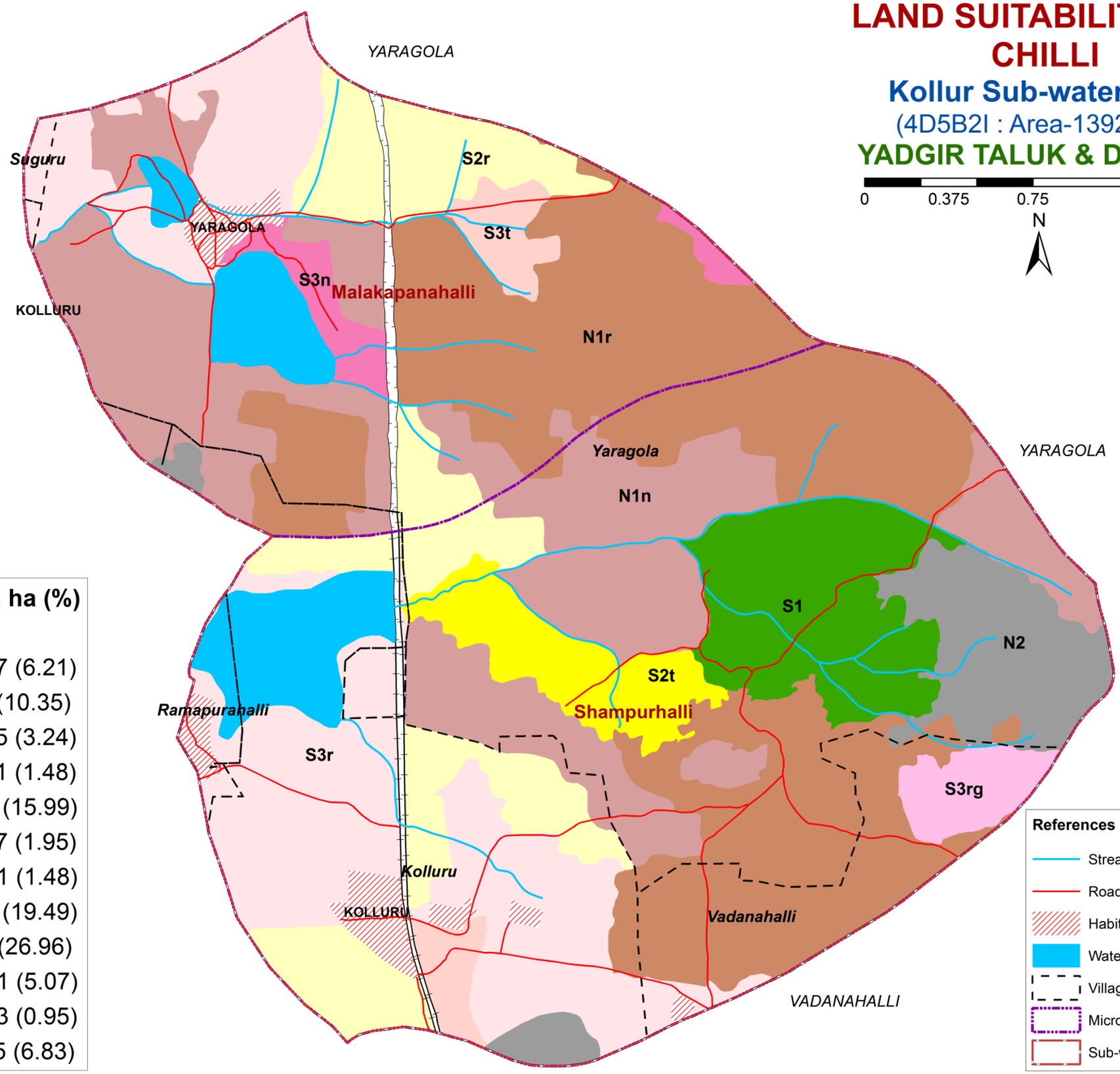


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2r	144 (10.35)
S2t	45 (3.24)
S3n	21 (1.48)
S3r	223 (15.99)
S3t	27 (1.95)
S3rg	21 (1.48)
N1n	272 (19.49)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



LAND SUITABILITY FOR CHILLI

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

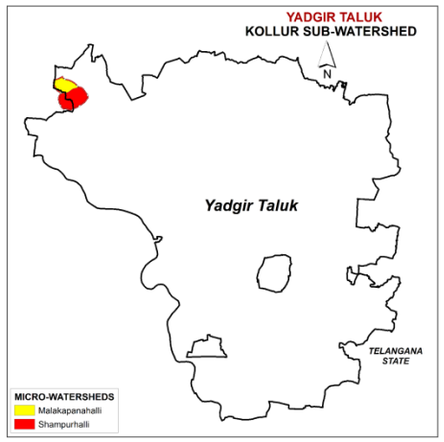
0 0.375 0.75 1.5 km

N

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

Source: ICAR-NBSS&LUP, Bengaluru

6.9. Land Suitability for Tomato

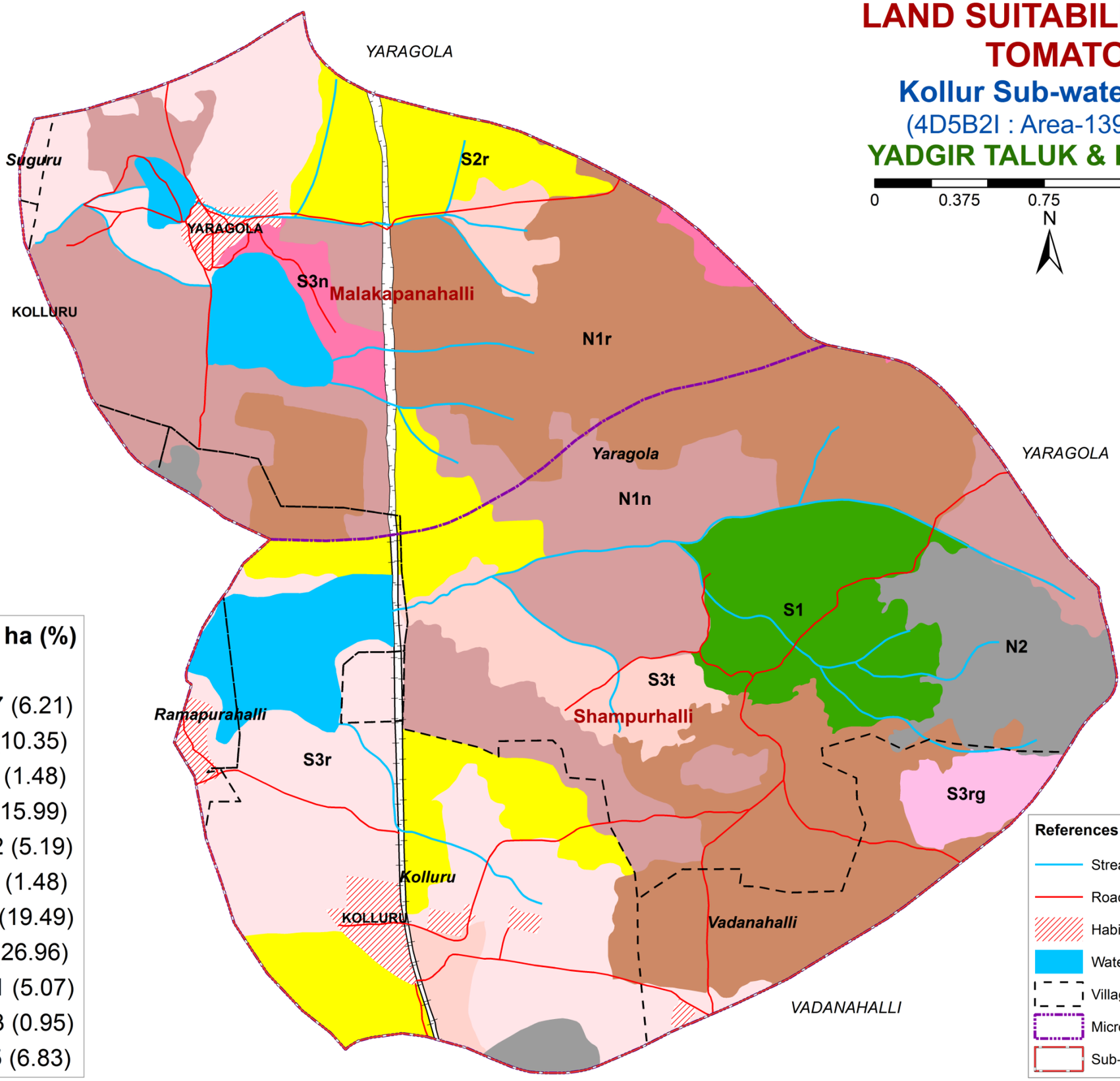


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2r	144 (10.35)
S3n	21 (1.48)
S3r	223 (15.99)
S3t	72 (5.19)
S3rg	21 (1.48)
N1n	272 (19.49)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



LAND SUITABILITY FOR TOMATO

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

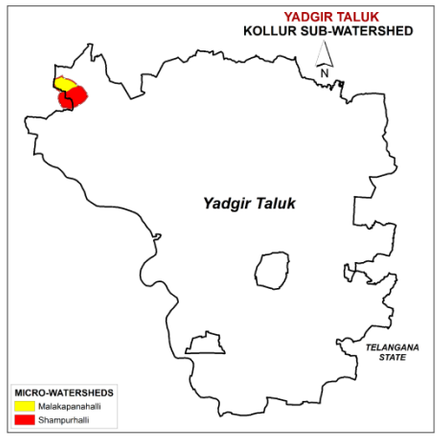
0 0.375 0.75 1.5 km

N

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

Source: ICAR-NBSS&LUP, Bengaluru

6.10. Land Suitability for Sapota



LAND SUITABILITY FOR SAPOTA

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

km
0 0.375 0.75 1.5
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

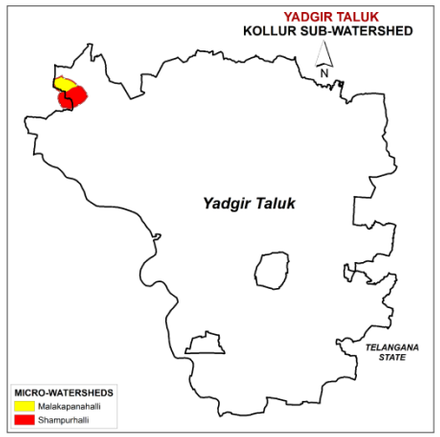
Suitability subclass	Area in ha (%)
S2r	87 (6.21)
S3n	21 (1.48)
S3r	144 (10.35)
S3t	45 (3.24)
S3rt	27 (1.95)
N1n	272 (19.49)
N1r	619 (44.43)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

6.11. Land Suitability for Custard Apple



LAND SUITABILITY FOR CUSTARD APPLE

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

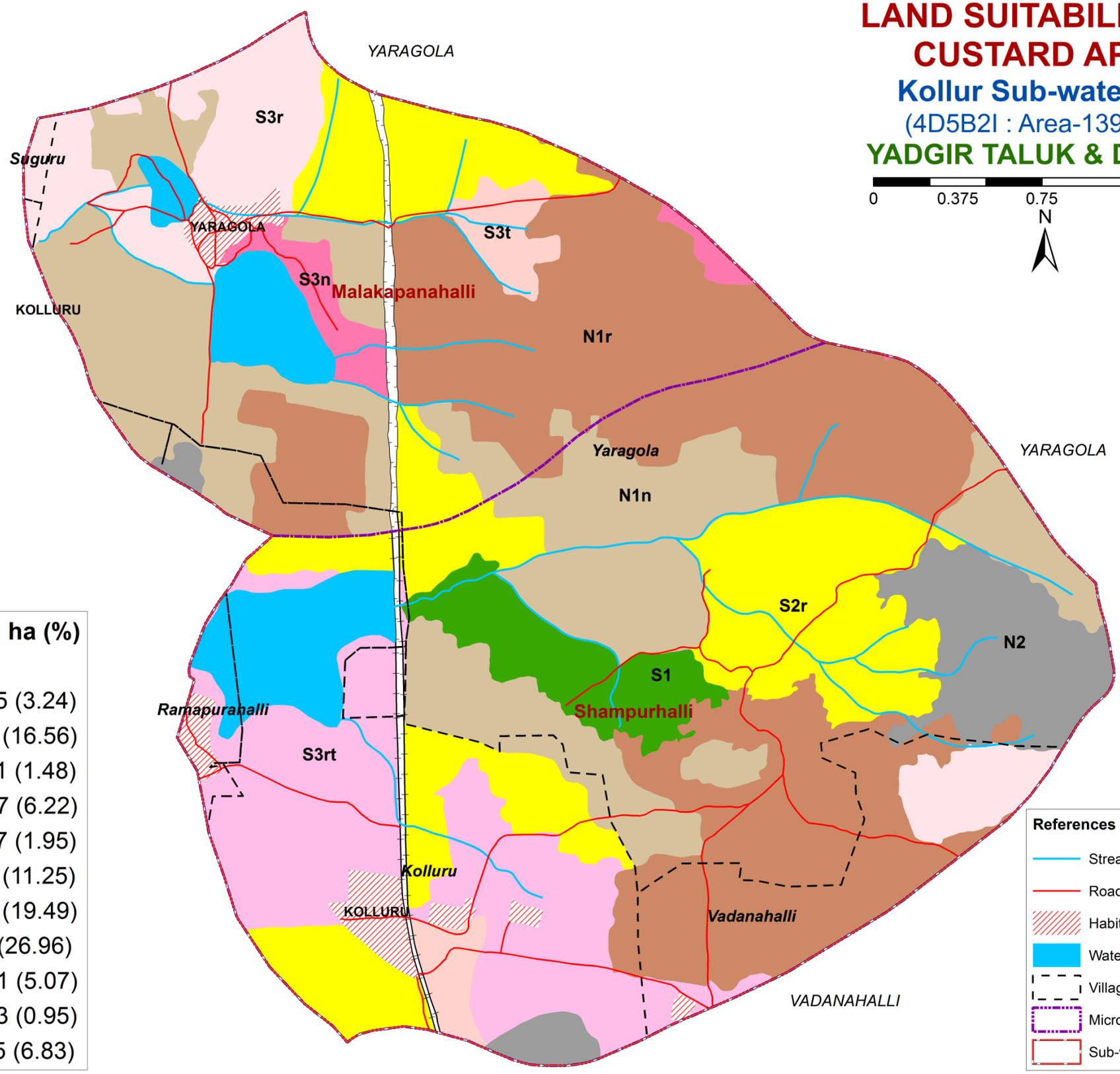
N

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

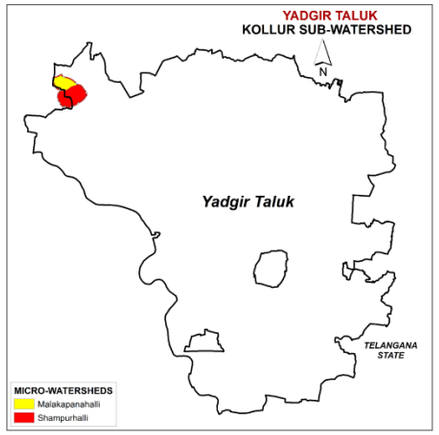
Suitability subclass	Area in ha (%)
S1	45 (3.24)
S2r	231 (16.56)
S3n	21 (1.48)
S3r	87 (6.22)
S3t	27 (1.95)
S3rt	157 (11.25)
N1n	272 (19.49)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



Source: ICAR-NBSS&LUP, Bengaluru

6.12. Land Suitability for Amla



LAND SUITABILITY FOR AMLA

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

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

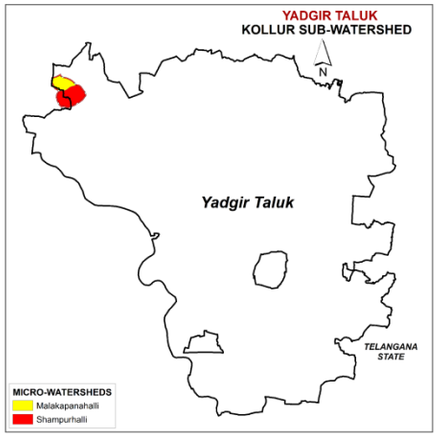
Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2r	144 (10.35)
S2t	45 (3.24)
S3r	87 (6.22)
S3t	27 (1.95)
S3rt	157 (11.25)
N1n	292 (20.98)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody

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

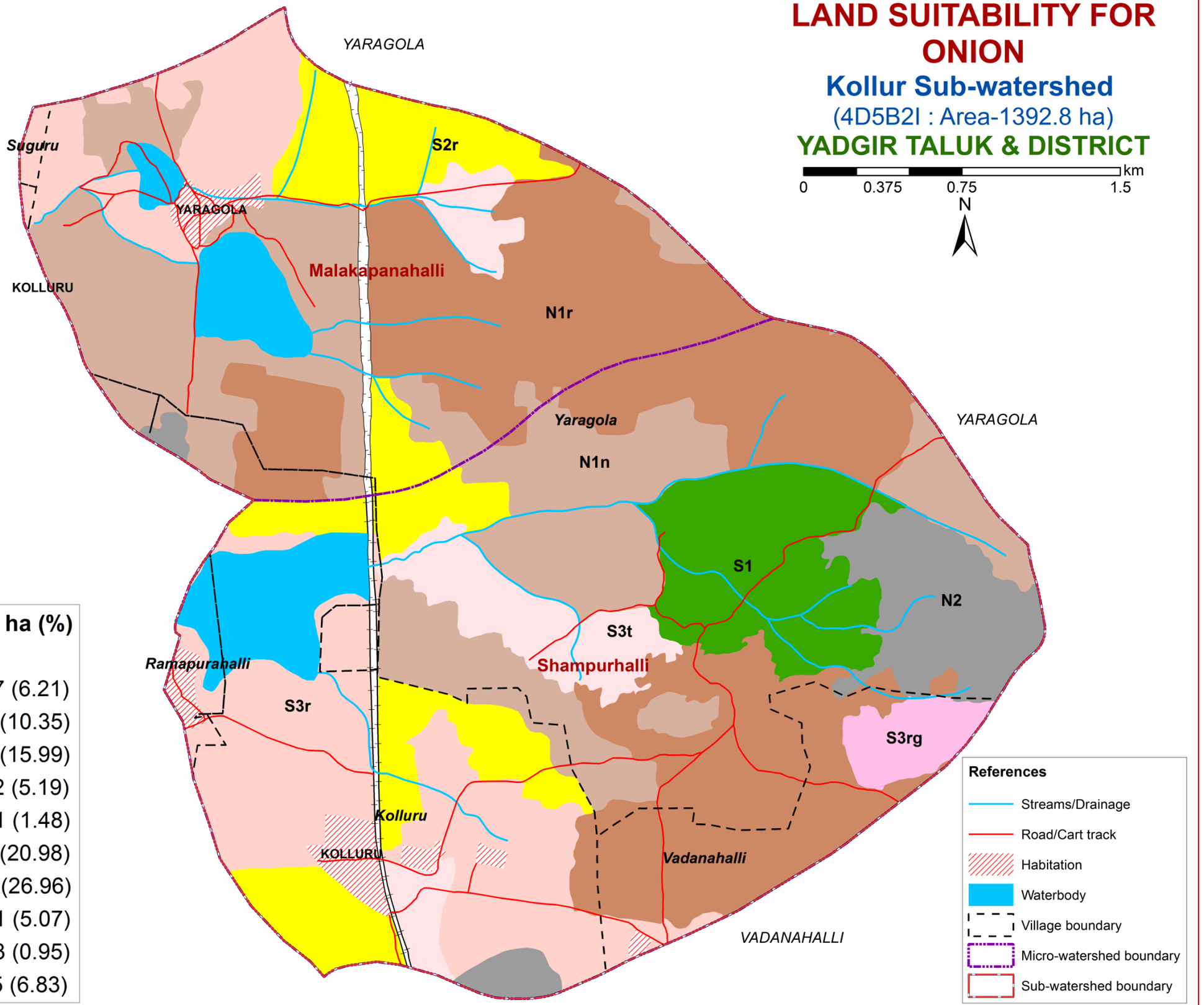
Source: ICAR-NBSS&LUP, Bengaluru

6.13. Land Suitability for Onion



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



LAND SUITABILITY FOR ONION

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

N

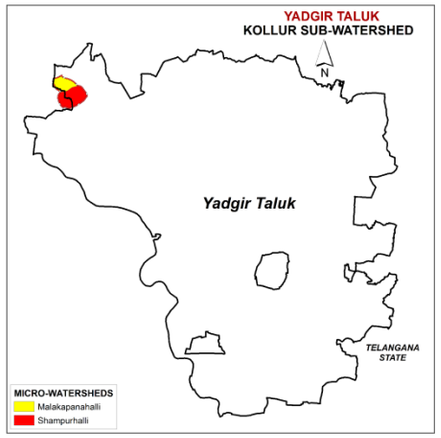
Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2r	144 (10.35)
S3r	223 (15.99)
S3t	72 (5.19)
S3rg	21 (1.48)
N1n	292 (20.98)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

6.14. Land Suitability for Marigold

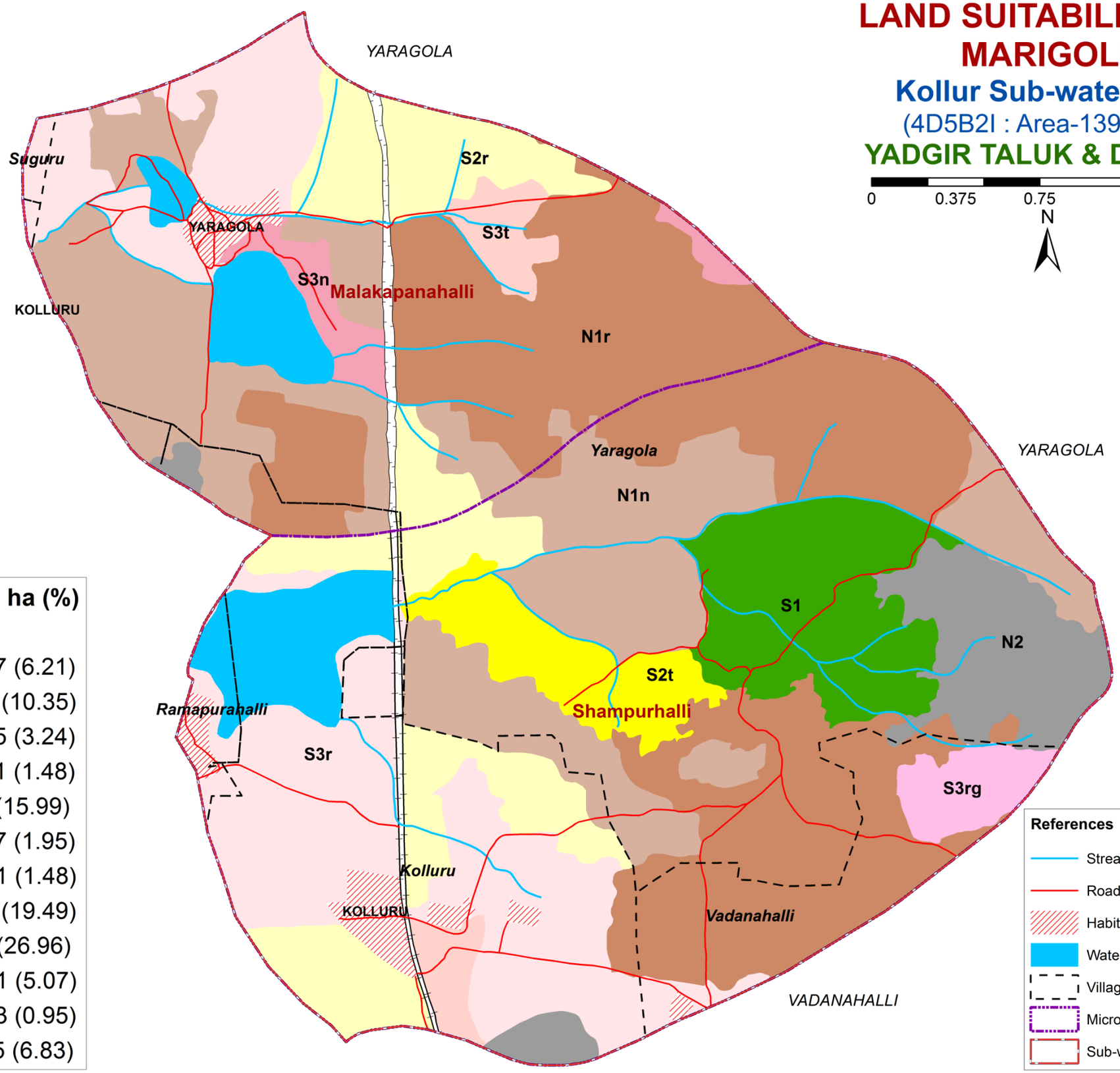


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2r	144 (10.35)
S2t	45 (3.24)
S3n	21 (1.48)
S3r	223 (15.99)
S3t	27 (1.95)
S3rg	21 (1.48)
N1n	272 (19.49)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



LAND SUITABILITY FOR MARIGOLD

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

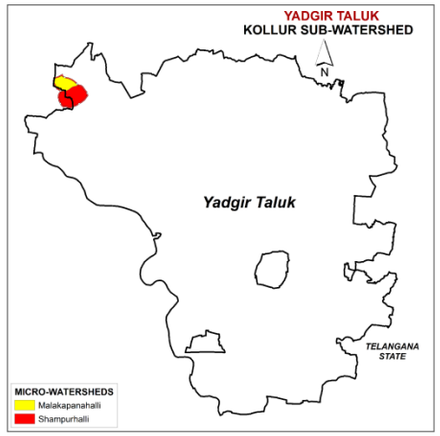
YADGIR TALUK & DISTRICT

km
0 0.375 0.75 1.5
N

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

Source: ICAR-NBSS&LUP, Bengaluru

6.15. Land Suitability for Chrysanthemum

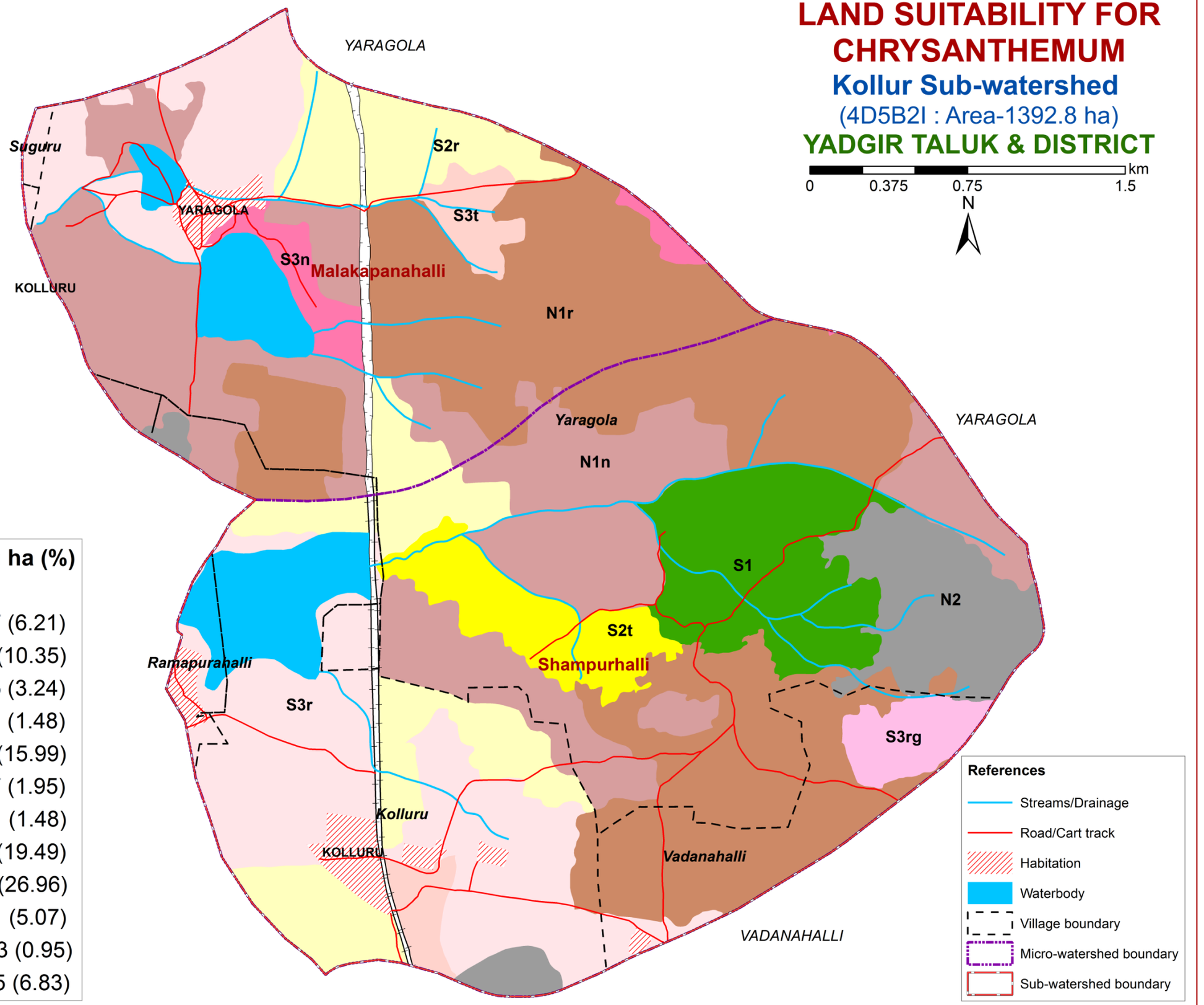


Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S1	87 (6.21)
S2r	144 (10.35)
S2t	45 (3.24)
S3n	21 (1.48)
S3r	223 (15.99)
S3t	27 (1.95)
S3rg	21 (1.48)
N1n	272 (19.49)
N1r	376 (26.96)
N2	71 (5.07)
Railway	13 (0.95)
Others*	95 (6.83)

* - Habitation & Waterbody



LAND SUITABILITY FOR CHRYSANTHEMUM

Kollur Sub-watershed

(4D5B2I : Area-1392.8 ha)

YADGIR TALUK & DISTRICT

0 0.375 0.75 1.5 km

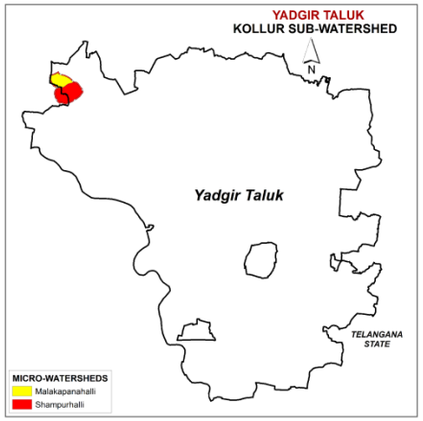
N

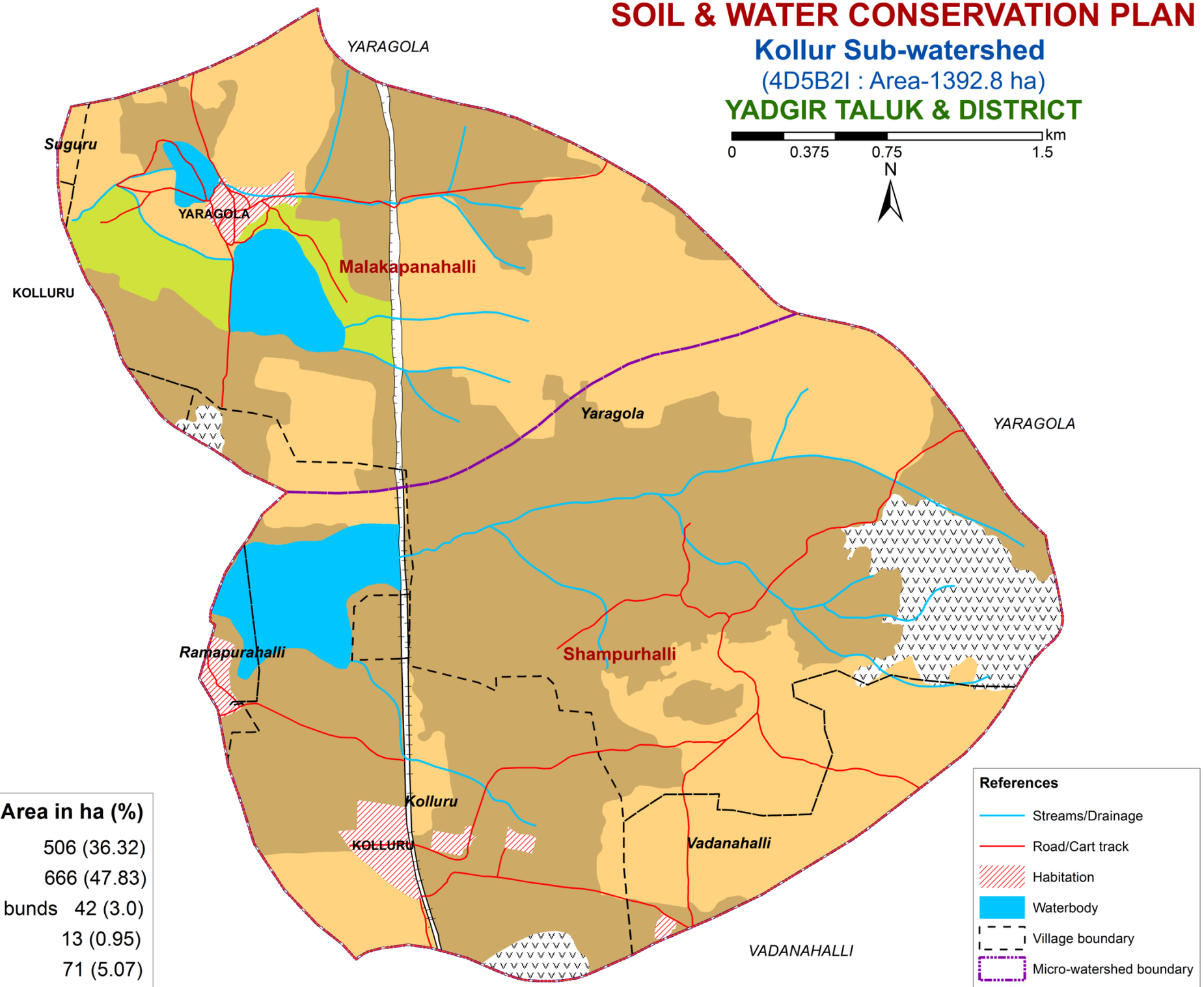
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7. Soil and Water Conservation Measures

7.1. Soil & Water Conservation Plan





Legend	Area in ha (%)
Trench cum bunding	506 (36.32)
Graded bunding	666 (47.83)
Strengthening of existing bunds	42 (3.0)
Railway	13 (0.95)
Rock outcrops	71 (5.07)
Others*	95 (6.83)

* - Habitation & Waterbody

8. Table. Proposed Crop Plan for Kollur Sub-watershed, Hatthakuni 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	171.MDGhA1 133.MDRiB2 (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
2	103.TMKhA1 42.YDRcB2 (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
3	50.BGDbB2 32.HSLcB2 (Moderately deep to deep, black clay soils)	Maize, sorghum, Sunflower, Cotton, Red gram, Bengalgram, Bajra	**Fruit crops:** Lime, Musambi, Custard apple, Pomegranate **Vegetables:** Chilli, Bhendi **Flowers:** Marigold, Chrysanthemum	Application of FYM, Bio-fertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	31.YLRiB2 (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, Bio fertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
5	11.SBRcB2 (Moderately shallow, loamy sand soils)	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Application of FYM, Bio fertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
6	20.JNKcB2 110.JNKhB2 22.JNKiB2 (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, Bio fertilizers 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
7	2.BDLbB2 108.DSBiB2 165.HTKcB2 9.VNKcB2 118.BDPcB2 120.BDPhB2 1.BDPiB2 119.BDPiB3 (Shallow to very shallow soils)	-	Custard apple, Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope

PART - B

Hydrological Inventory of Kollur 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 Kollur 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:nbssrcb@gmail.com**

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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 (Reviewed and approved)	Professor & Lead Scientist, Dept. of Civil Engineering & ICWaR, IISc, Bangalore
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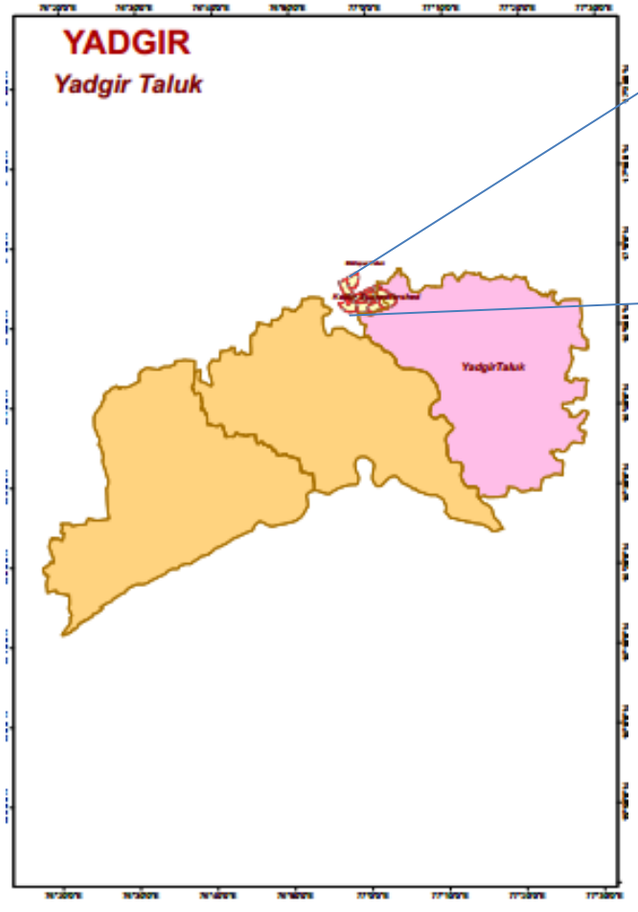
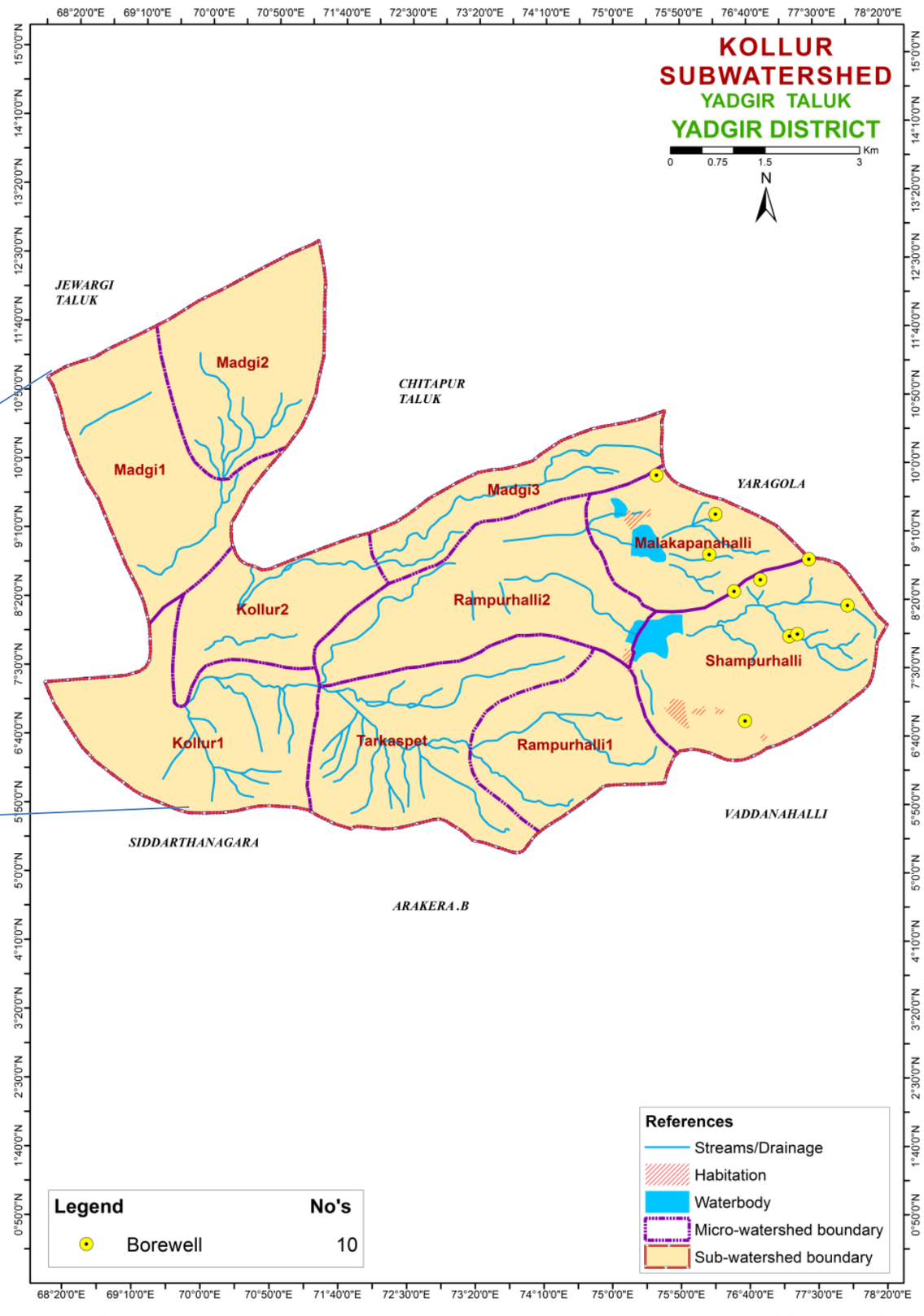
INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Kollur sub-watershed (4D5B2I) in Yadgir Taluk, Yadgir District, has been undertaken for integrated planning, development and management.
- Kollur sub-watershed (Yadgir Taluk, Yadgir District) is located between $16^0$52'16''–$16^0$55'17'' North latitudes and $77^0$1'2''- $77^0$3'47'' East longitudes, covering an area of about 6700 ha.
- This sub-watershed encompasses of 10 MWs namely Kollur-1 (4D5B2I2e), Kollur-2 (4D5B2I2d), Madgi-1 (4D5B2I2b), Madgi-2 (4D5B2I2a), Madgi-3 (4D5B2I2c), Malakapanahalli (4D5B2I1b), Rampurhalli-1 (4D5B2I1d), Rampurhalli-2 (4D5B2I1c), Shampurhalli (4D5B2I1a) and Tarkaspet (4D5B2I1e). Land Resource Inventory (LRI) was generated for two among the ten 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.

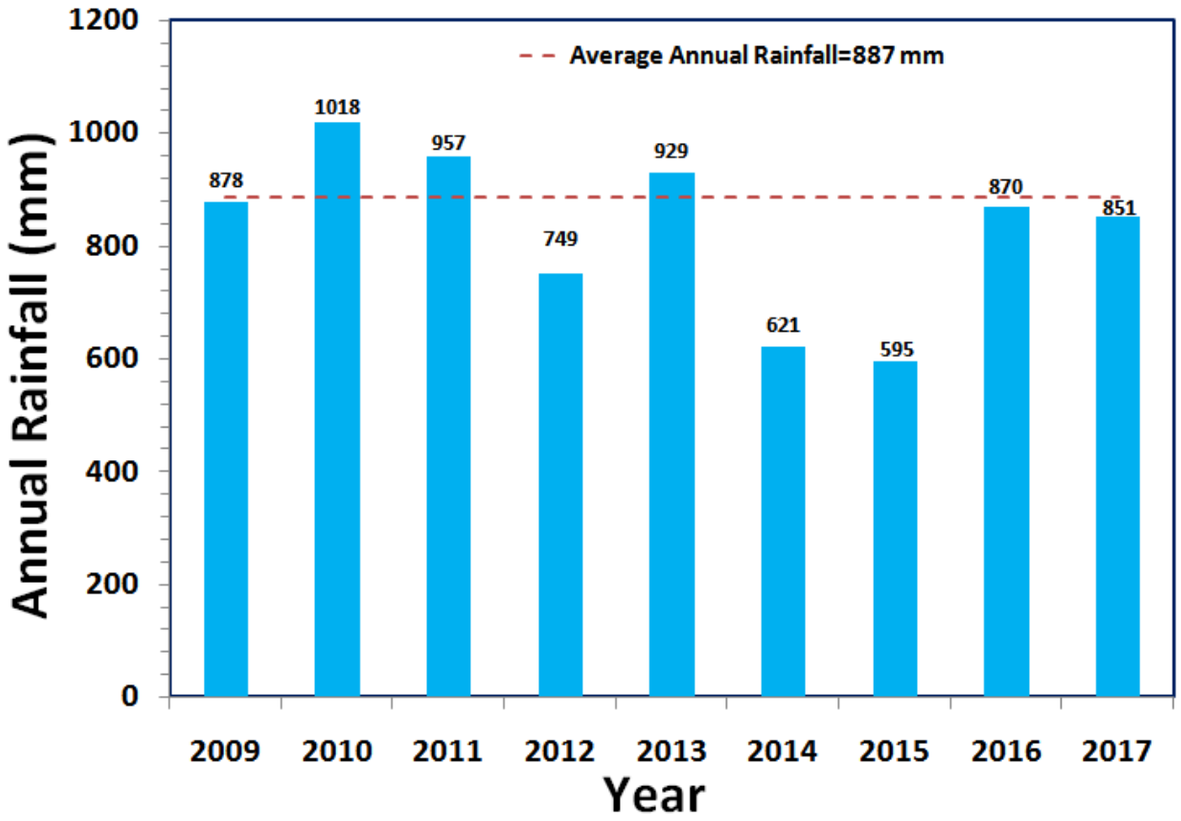
LOCATION MAP OF KOLLUR SUB-WATERSHED





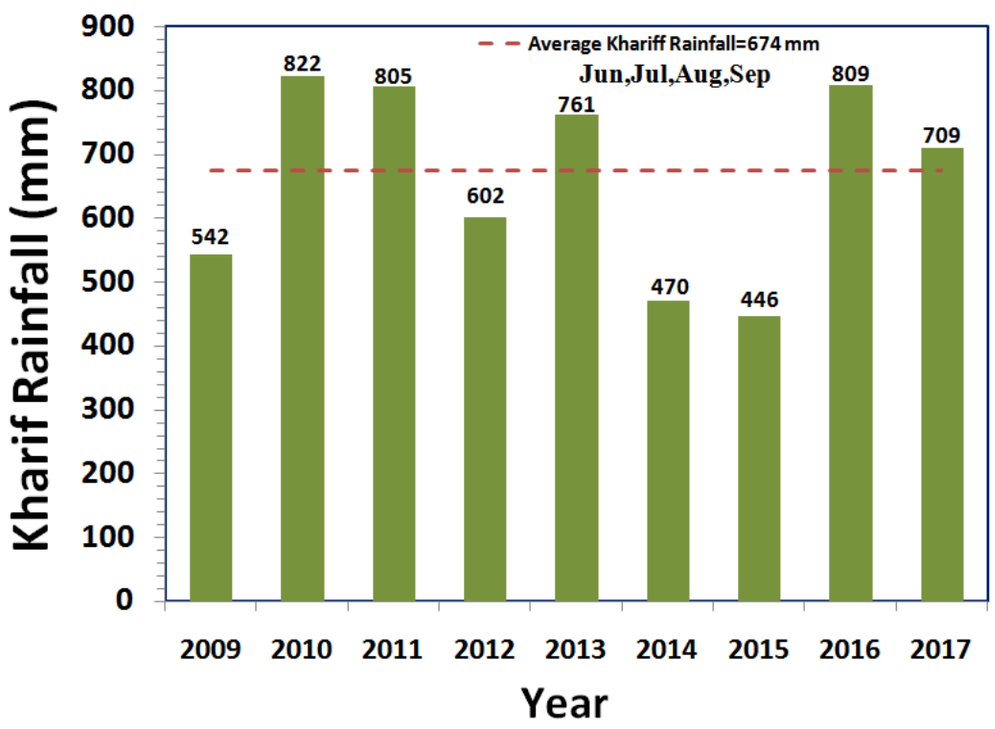
Soil & Water Conservation Structures in Kollur sub-watershed, Yadgir Taluk, Yadgir District

RAINFALL INDEX

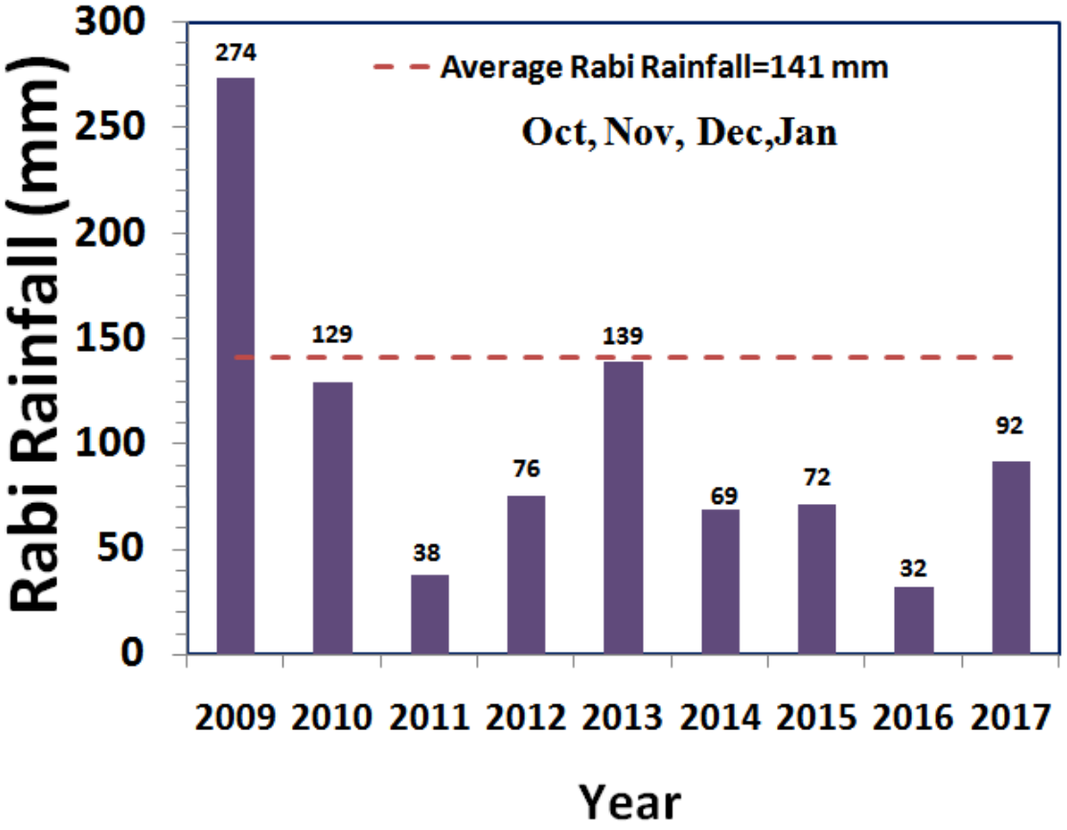


The average annual rainfall (1960-2014) recorded at the Yadgir station in Yadgir taluk of Yadgir district is 887 mm. The annual rainfall at Hatthakuni station (Hobli H.Q.) is presented. During the years 2009, 2012, 2014, 2015, 2016 and 2017 the annual rainfall was deficient by 1%, 22%, 42%, 46%, 3% and 6% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 80% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2009, 2012, 2014 and 2015 the annual rainfall was deficient by 20%, 11%, 30% and 34% respectively.

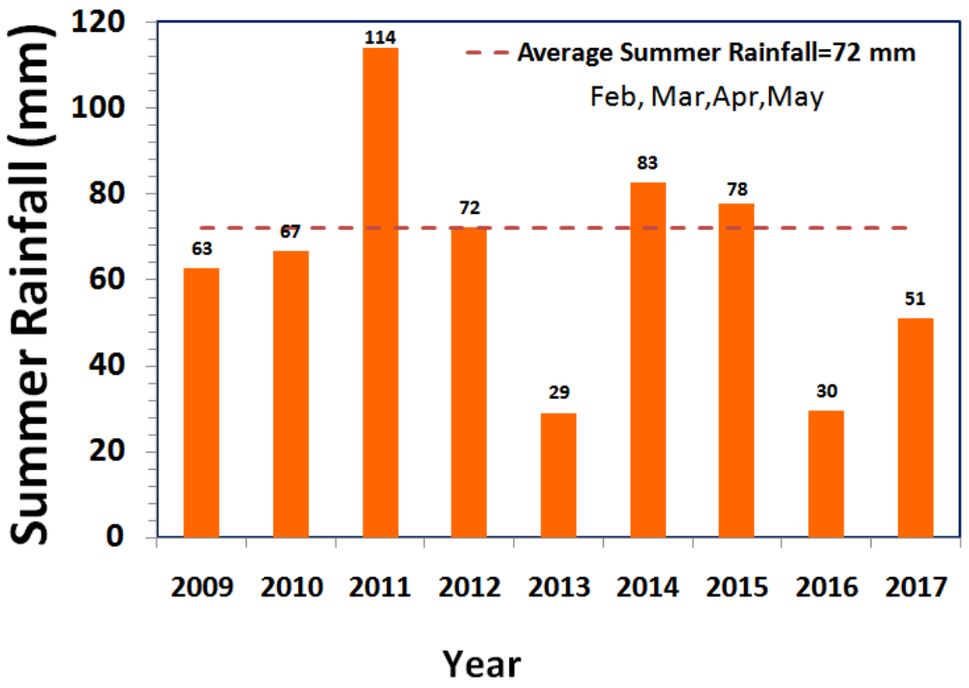


RAINFALL INDEX

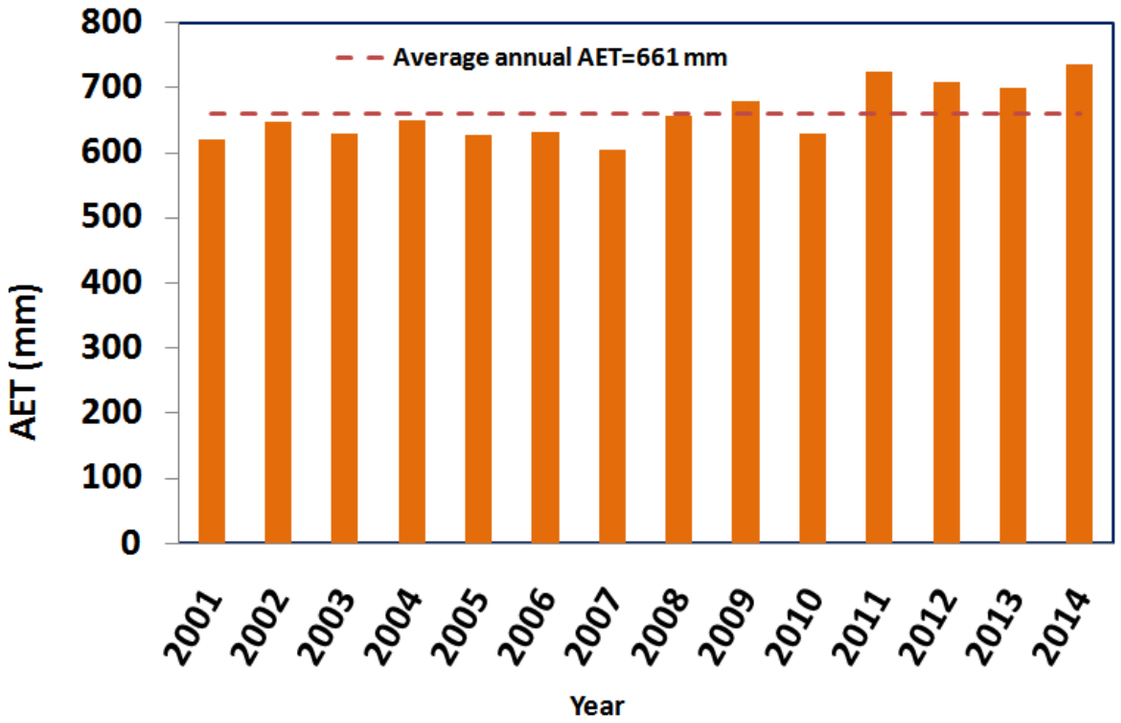


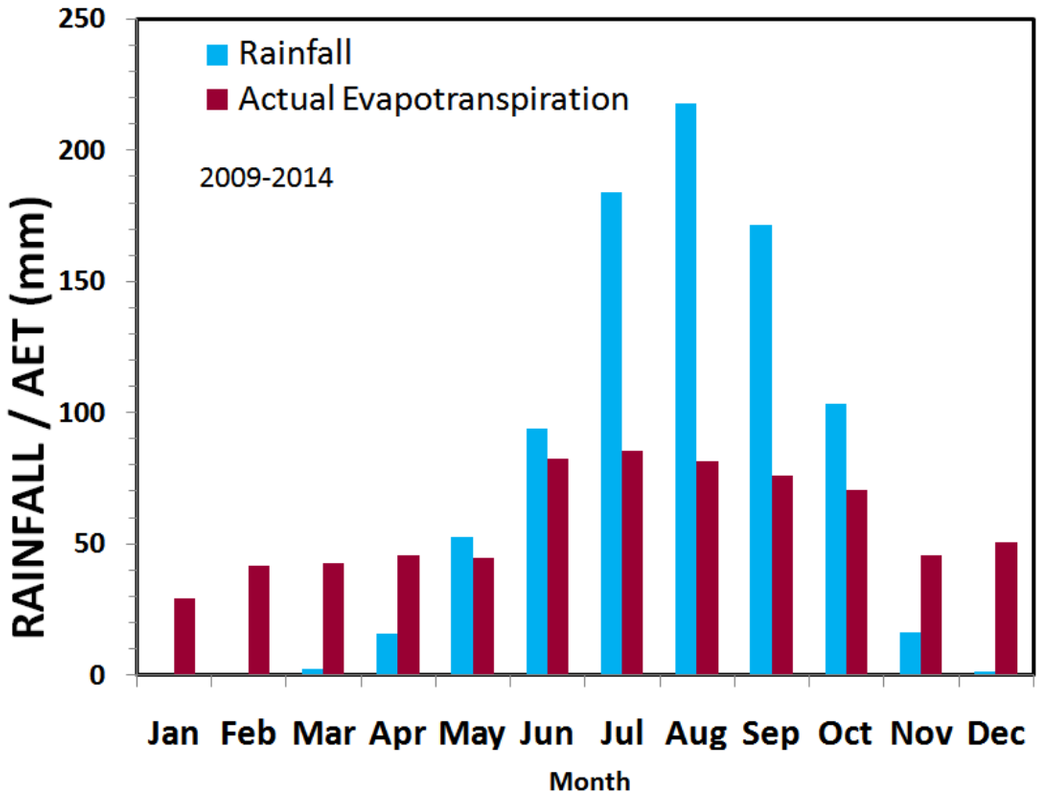
The average *rabi* rainfall (Oct-Jan) is about 12% of the Average annual rainfall. During the year 2009 high *rabi* rainfall was received, where as other years showed deficient rainfall.

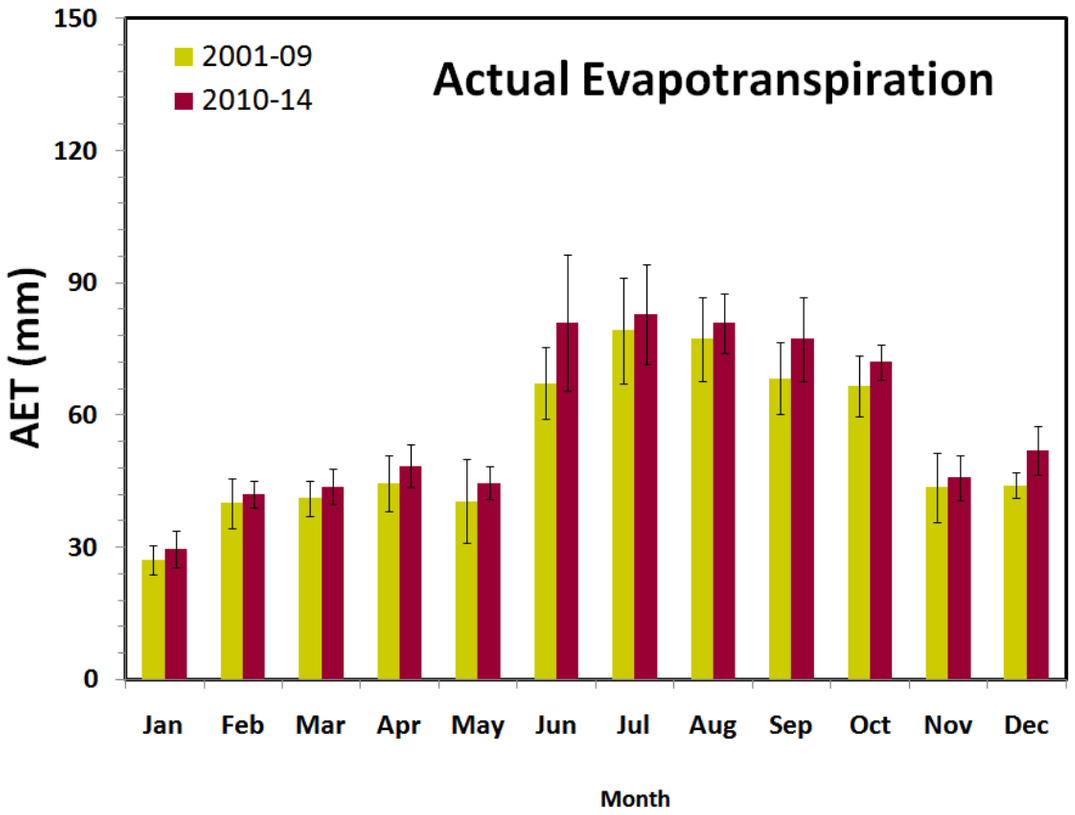
The average summer rainfall (Feb-May) is about 8% of the average annual rainfall.



EVAPOTRANSPIRATION

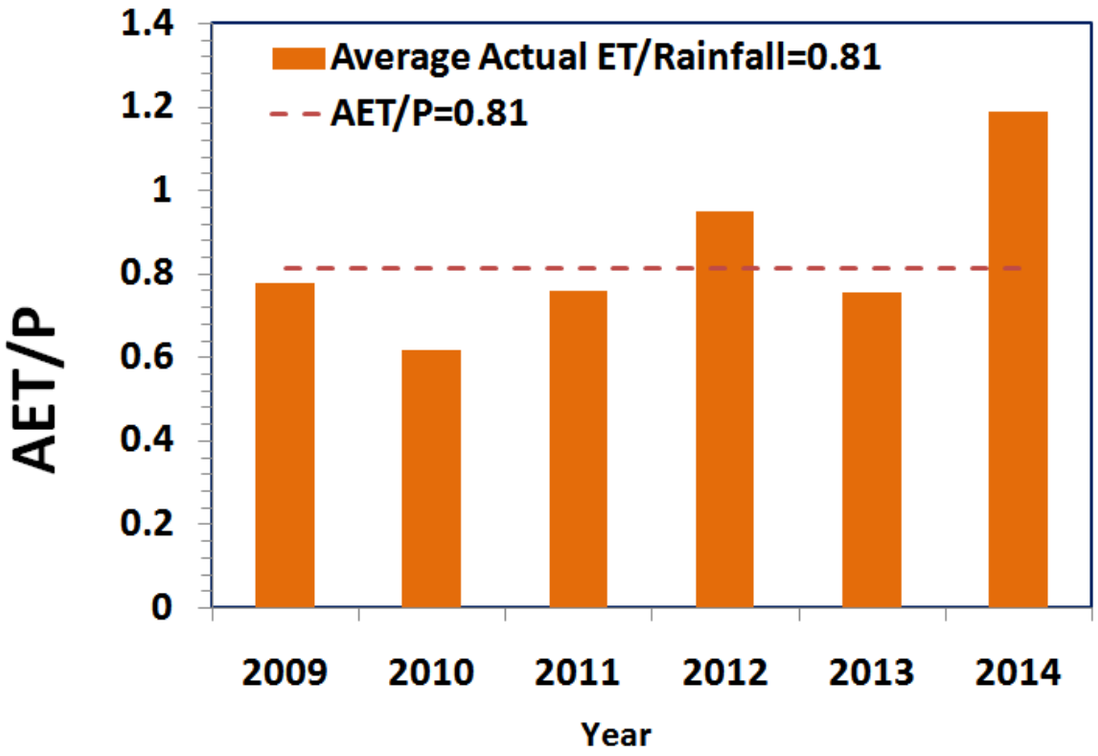


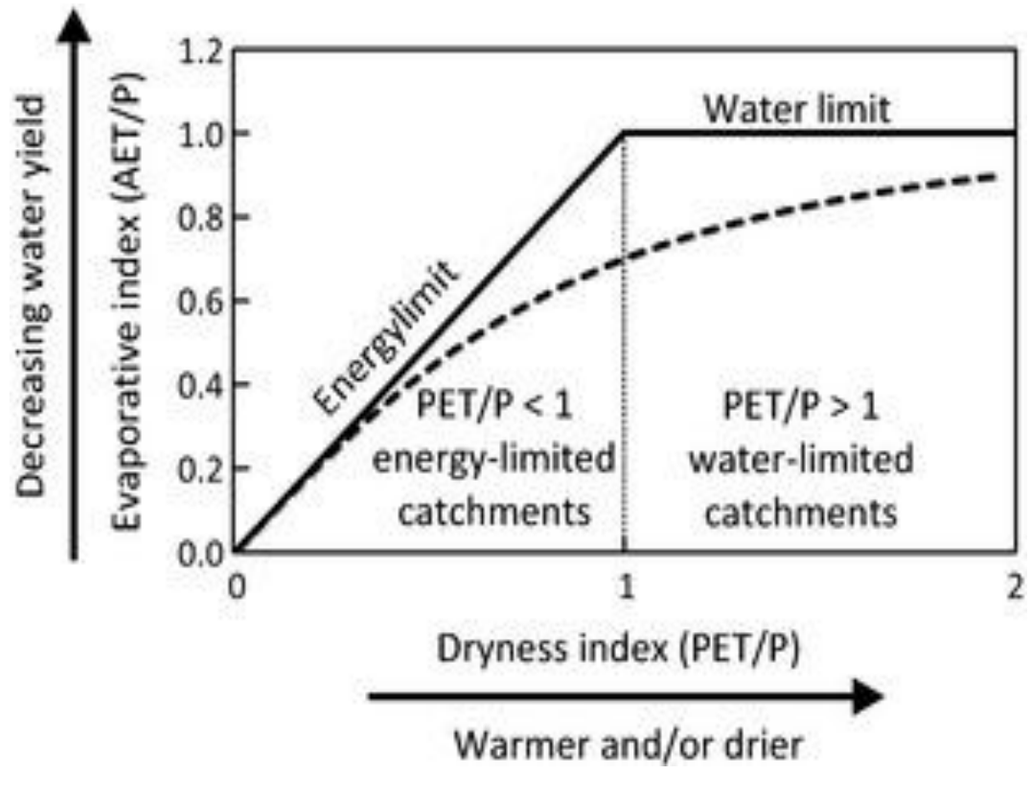




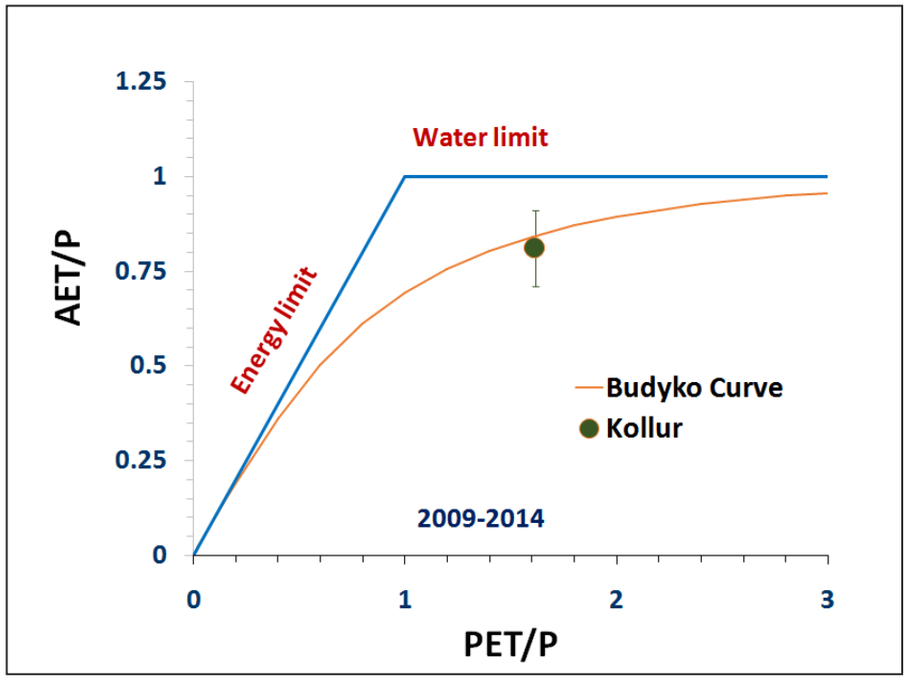
The average annual actual ET is lower than the average rainfall. During *kharif*, average rainfall and AET was found to be 674 mm and 325mm respectively, whereas in *rabi* it was about 141 mm and 196 mm. The annual ET increased by 9% during 2010-2014 compared to 2001-2009 .

EVAPOTRANSPIRATION INDEX

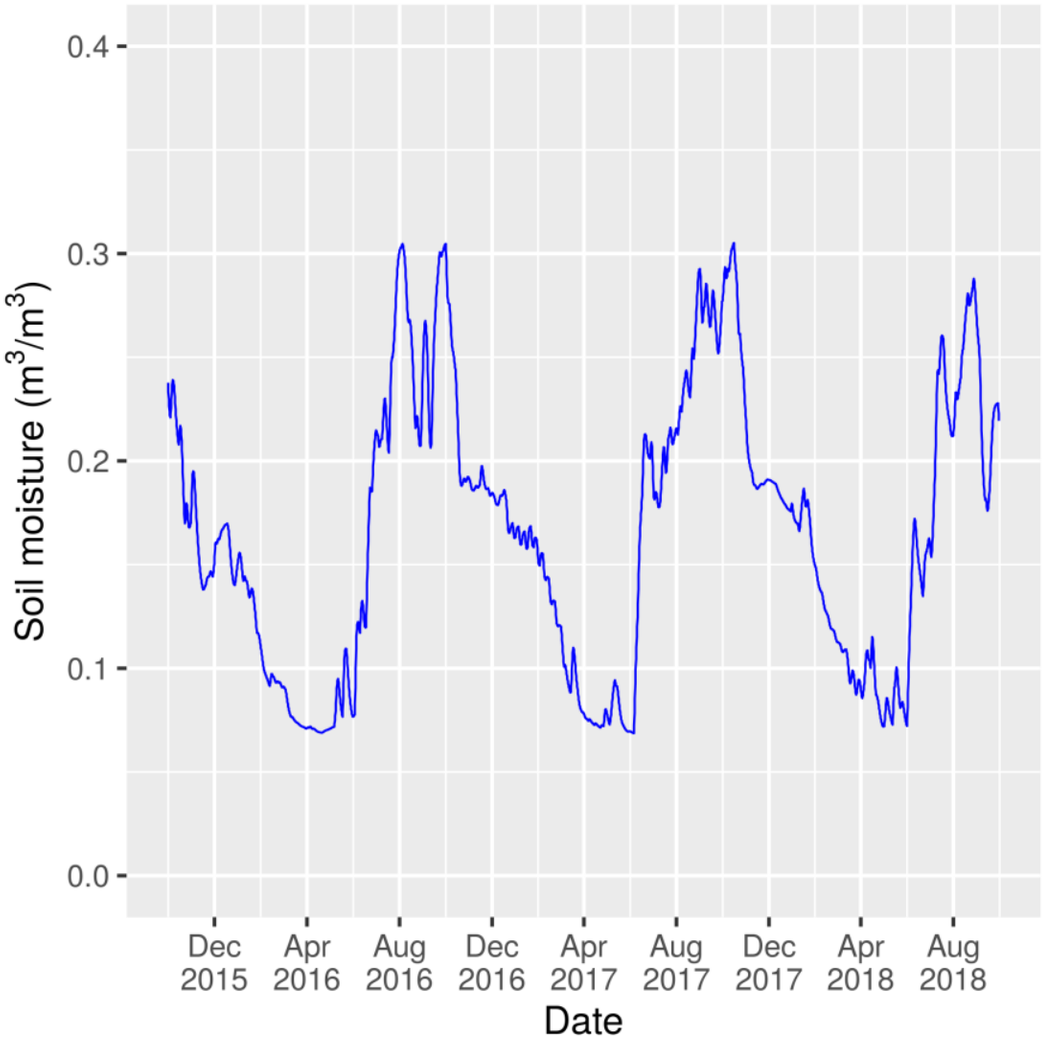




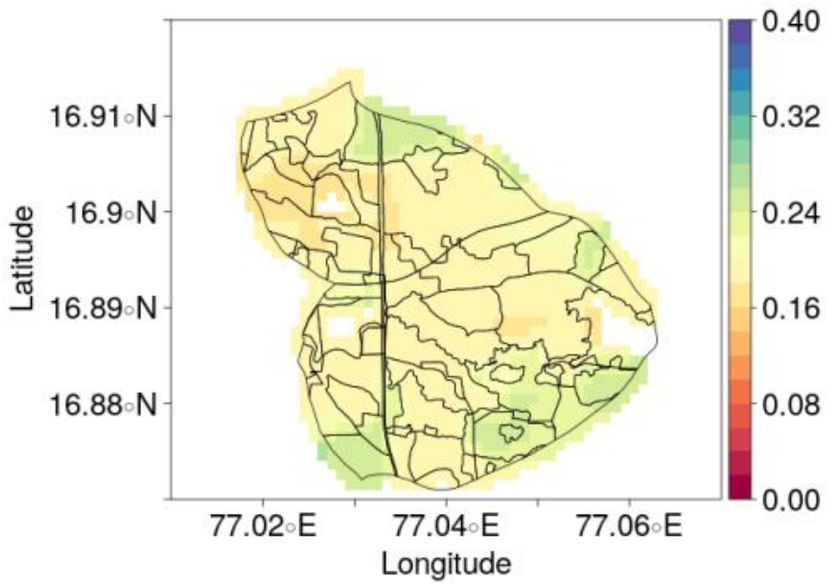
The average AET/P ratio was about 81%, which is slightly higher than the sustainable limit of about 80%. Even during extremely lower rainfall year of 2015, AET was 670 mm. This suggests the presence of water storage and utilization from other sources such as groundwater, which buffered the lower rainfall.



SATELLITE RETRIEVED SOIL MOISTURE

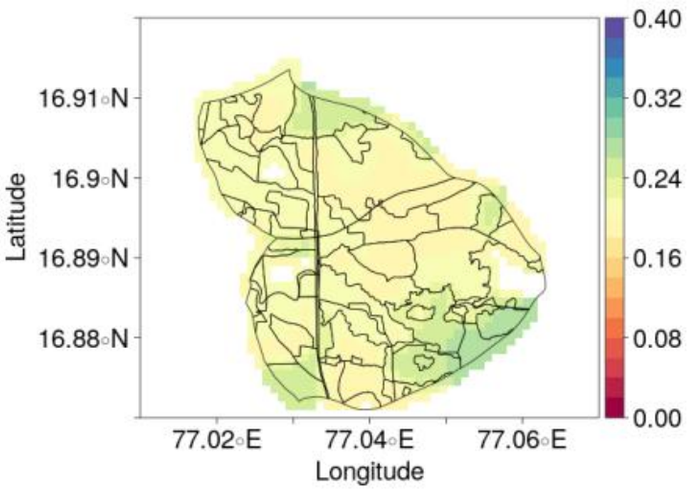


Kollur– Rabi Soil Moisture



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 13-27 % in *kharif* and 16-31% in *rabi* seasons of 2016 and 10-28% in *Kharif* and 17-28% in *rabi* seasons of 2017.

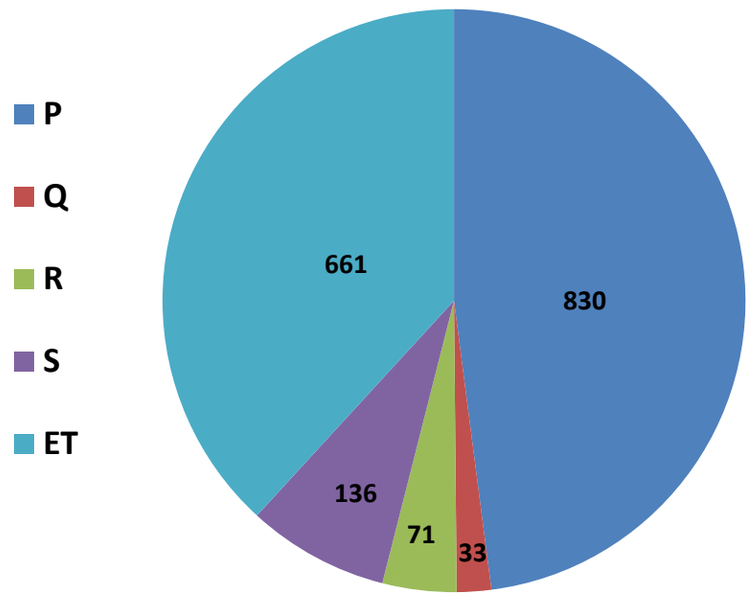
Kollur– Kharif Soil Moisture



WATER BALANCE

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

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

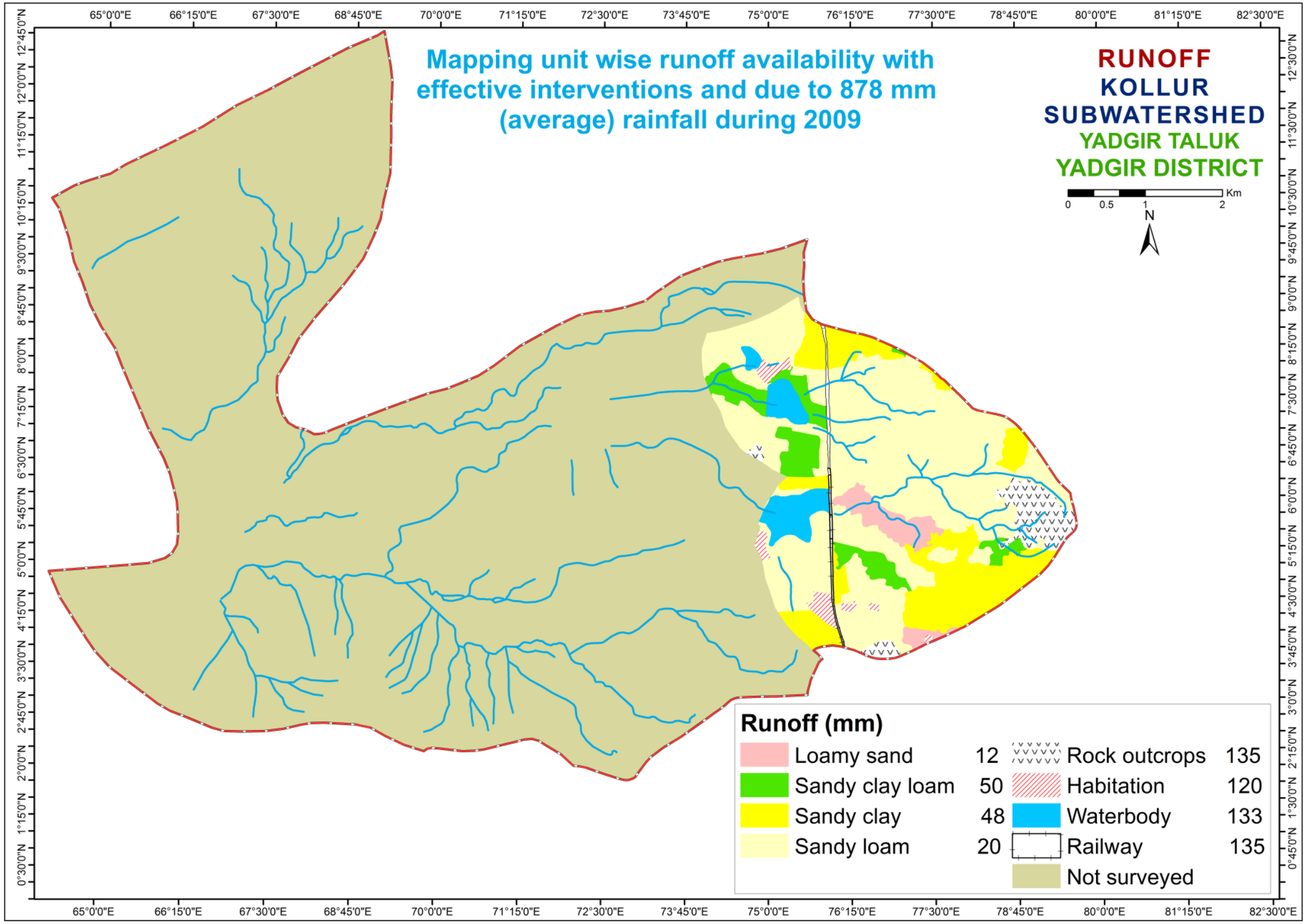


During June-October months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

P = 830 mm (average of 2009-2017) ET = 661 mm R = 71 mm S = 136 mm Q = 33 mm

Sl. No.	Parameters	Average_ 2009 (mm)
1.	Rainfall	878
2.	Runoff availability with existing conditions	74
3.	Runoff availability with effective interventions	41
4.	Runoff allowed as environmental flow at the outlet	8
5.	Runoff excess for harvesting by construction of structures	33

RUNOFF


Mapping unit wise runoff availability with effective interventions and due to 878 mm (average) rainfall during 2009
RUNOFF
KOLLUR
SUBWATERSHED
YADGIR TALUK
YADGIR DISTRICT
0 0.5 1 2 Km
N
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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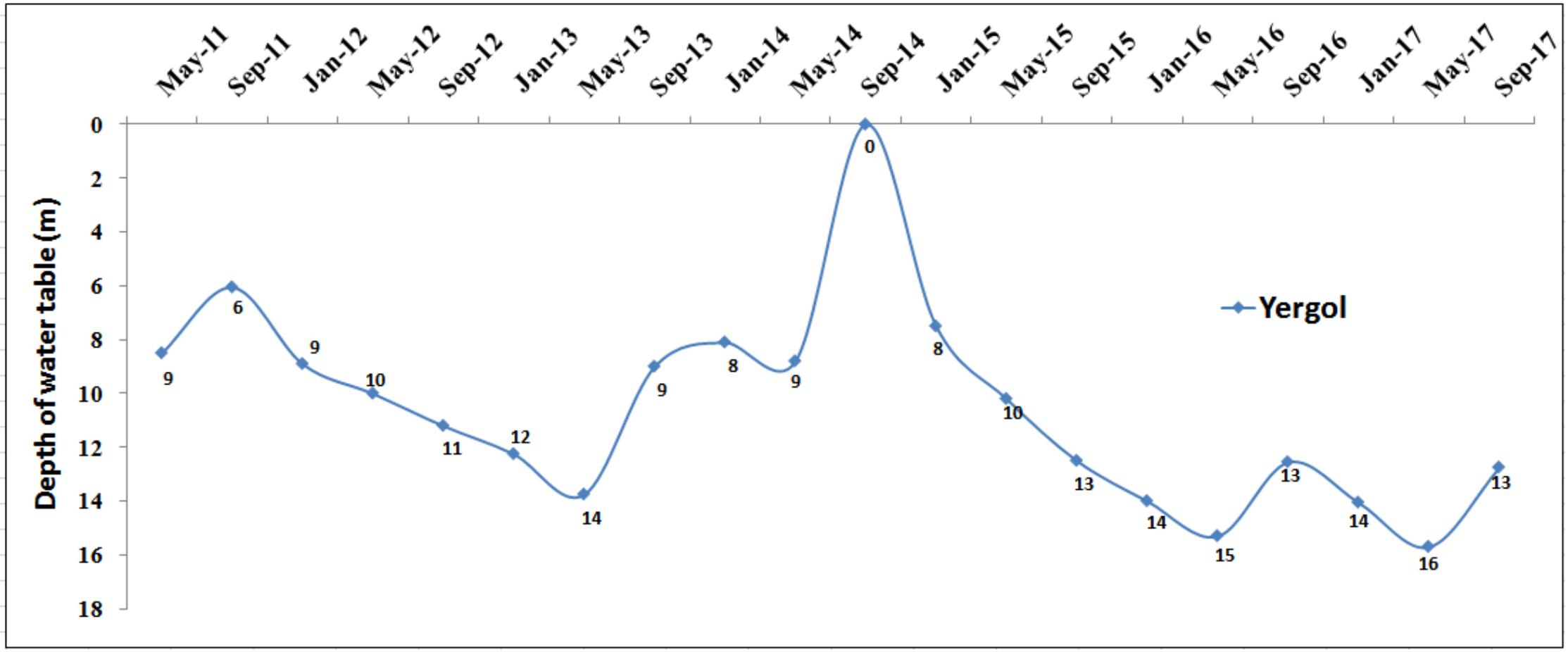
2°45'0"N
2°15'0"N
2°0'0"N
1°30'0"N
1°15'0"N
0°45'0"N
0°30'0"N
Runoff (mm)
Loamy sand 12
Sandy clay loam 50
Sandy clay 48
Sandy loam 20
Rock outcrops 135
Habitation 120
Waterbody 133
Railway 135
Not surveyed

GROUND WATER STATUS

YERGOL STATION



The total number of wells present in Kollur Sub-watershed as per LRI data is 10 Bore wells. The groundwater level shown above is from the data obtained from Dept. of Mines & Geology for the nearest station Yergol. The graph depicts the groundwater level during the years 2011-2017 were slightly varying, where as during the year 2014 was found constant.

x

SUMMARY

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

- 80%, 12% and 8% 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 33 mm for an average annual rainfall of 830 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 (136 mm) and utilizable runoff plus recharge is 219 (=136+33+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 522 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 652 mm (i.e 125% of AET). This demand for the two seasons is higher by 433 mm, i.e. (652-219). The AET in June-Sept months is only 49% 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 Kollur Sub-watershed as per LRI data is 10 Bore wells. The groundwater level data obtained from Dept. of Mines & Geology for the nearest station Yergol. The groundwater level during the years 2011-2017 were slightly varying, where as during the year 2014 was found constant.