हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
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Land Resource and Hydrological Inventory of Mungal 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 Mungal 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 Mungal 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.

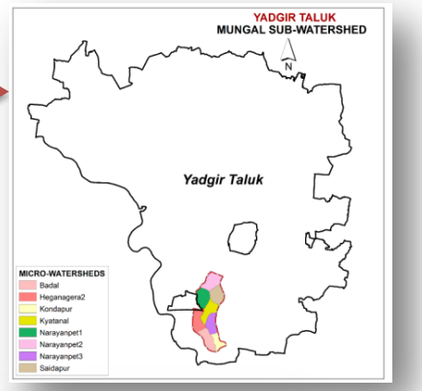
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

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.

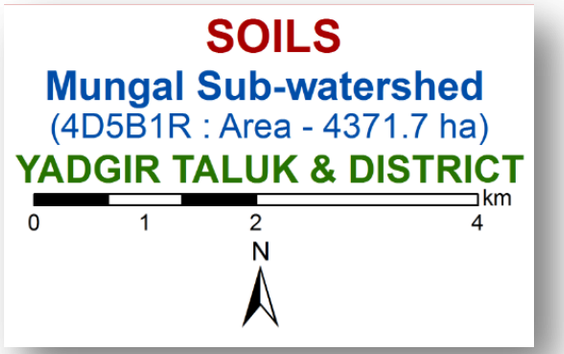
Inset map

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



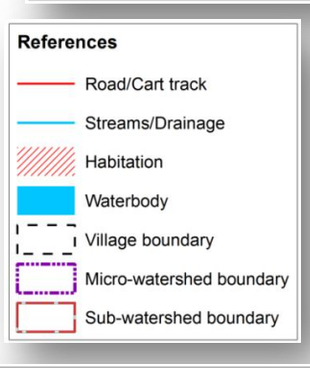
Map title

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



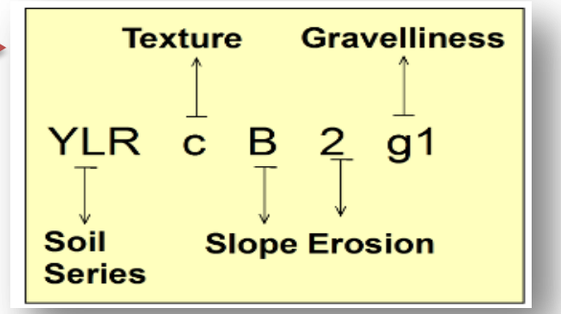
Legends and symbols

*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.*



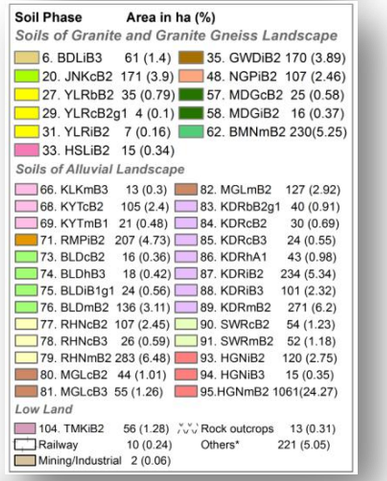
Soil Units

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.



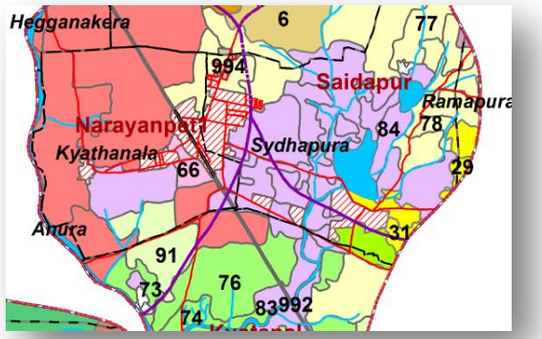
Map colours

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



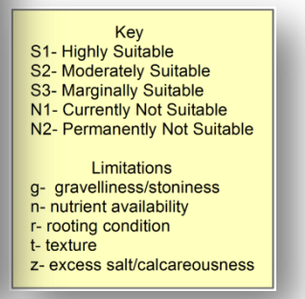
Soil and plot boundaries

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 Mungal Sub-watershed covering an area 4371.7 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.

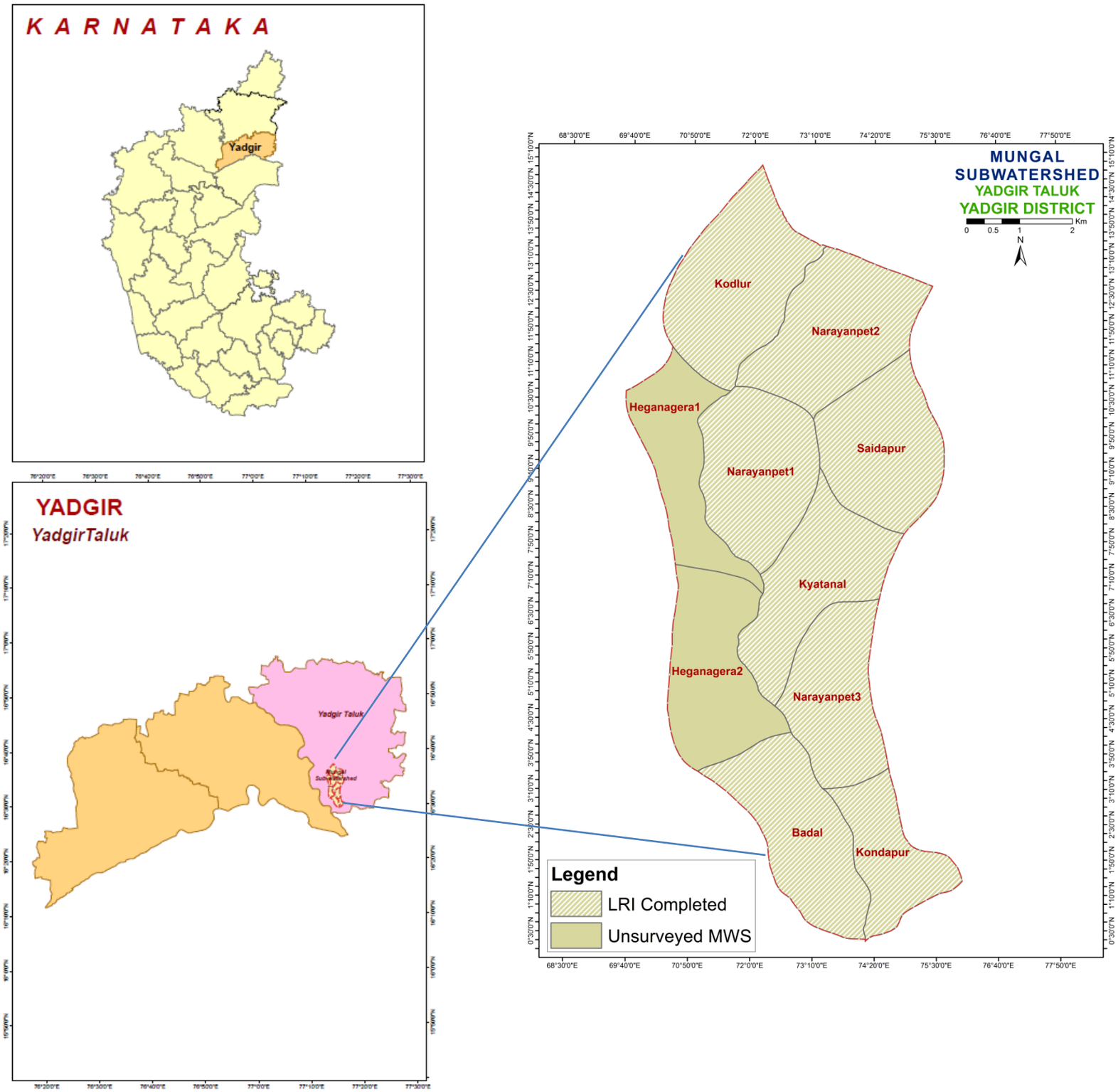
2. General Description of Sub-watershed

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$36’ – $16^0$29’ and east longitudes 77^0 13’ – 77^0 16’. 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 Mungal SWs (code–4D5B1R) in Yadgir taluk, Yadgir district. It was selected for data base generation under Sujala III project. This sub-watershed encompasses of 10 MWs namely, Narayanpet-1 (4D5B1R1b), Heganagera-1 (4D5B1R2b), Kodlur (4D5B1R2a), Badal (4D5B1R2d), Kondapur (4D5B1R1f), Narayanpet-2 (4D5B1R1a), Saidapur (4D5B1R1c), Kyatanal (4D5B1R1d), Heganagera-2 (4D5B1R2c) and Narayanpet-3 (4D5B1R1e) micro watersheds. Land Resource Inventory (LRI) was generated for eight among the ten micro-watersheds.

2.1. Location and Extent

LOCATION MAP OF MUNGAL SUB-WATERSHED



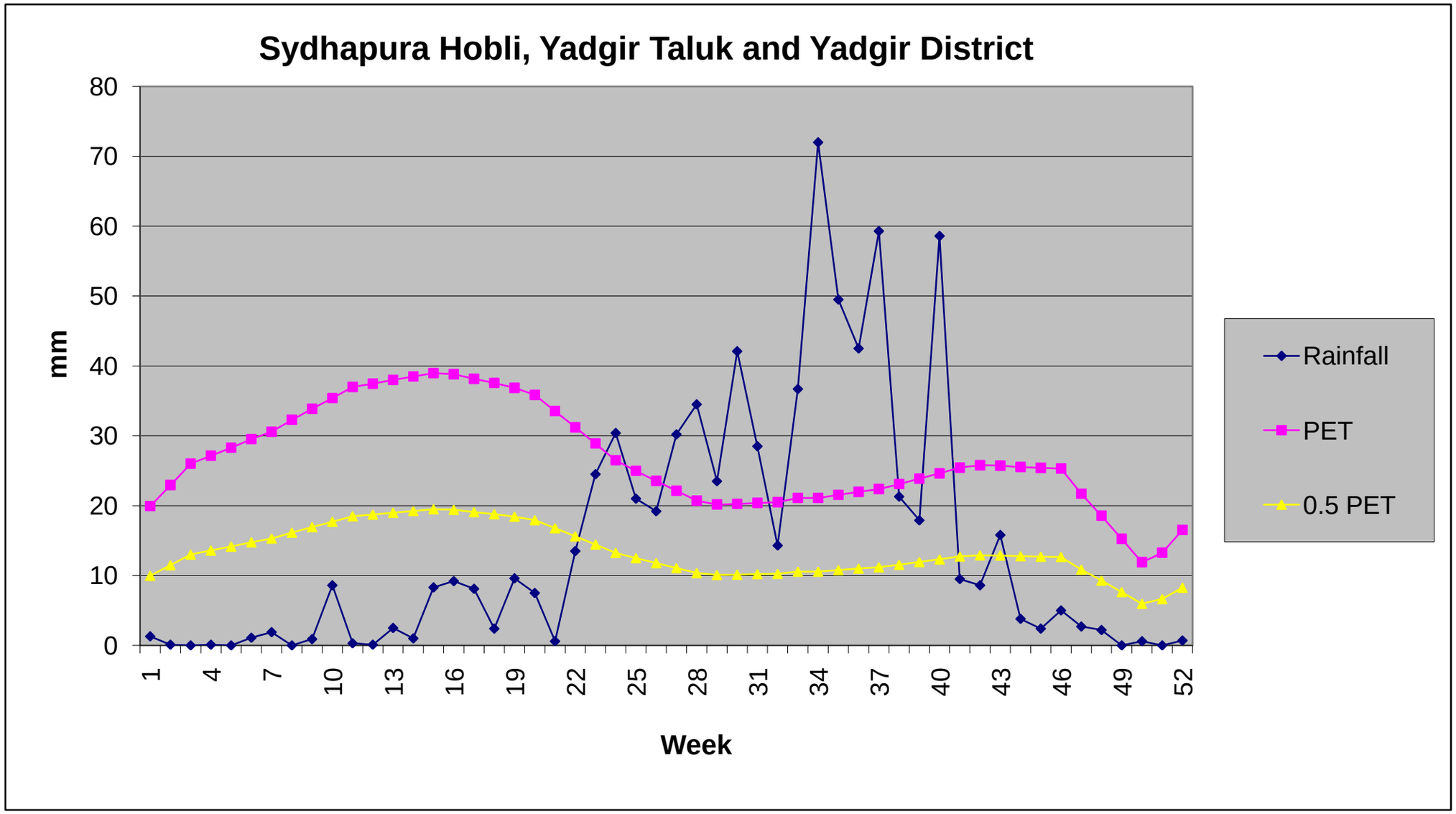
Mungal sub-watershed (Yadgir taluk, Yadgir district) is located between $16^0 29'23''–16^0 37'13''$ North latitudes and $77^0 12'15''–77^0 18'45''$ East longitudes, covering an area of about 5493 ha.

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 eight among the ten micro-watersheds

Climate

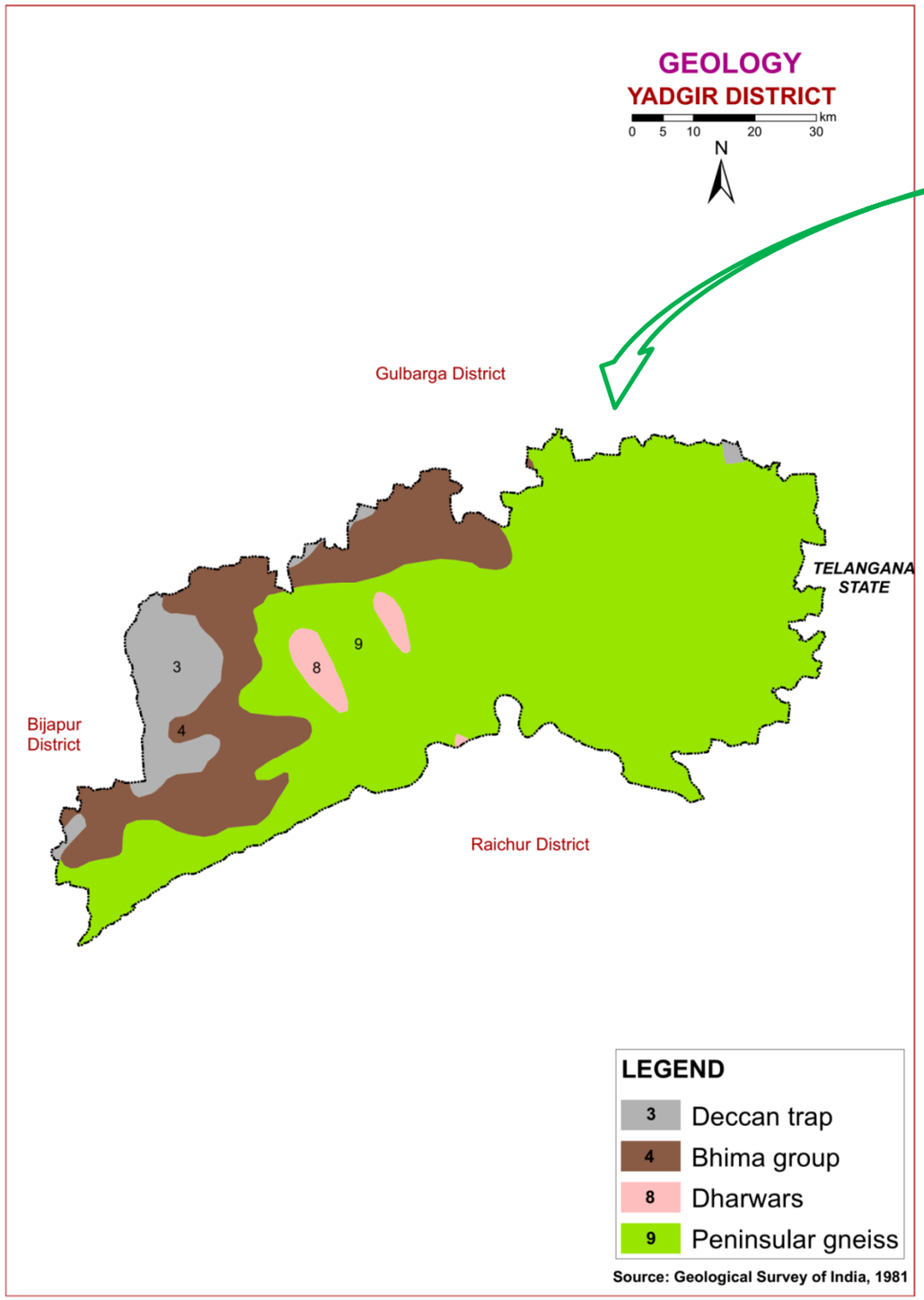


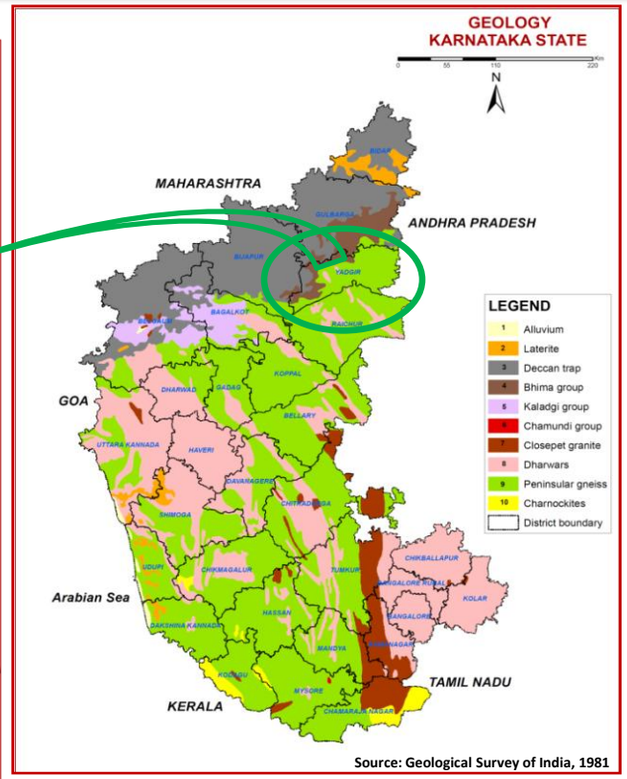
Length of Growing Period (LGP) is varying from June 1st week to 4th week of October (120 - 150 days)

Annual Rainfall : 754 mm. in the Sydhapura 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.

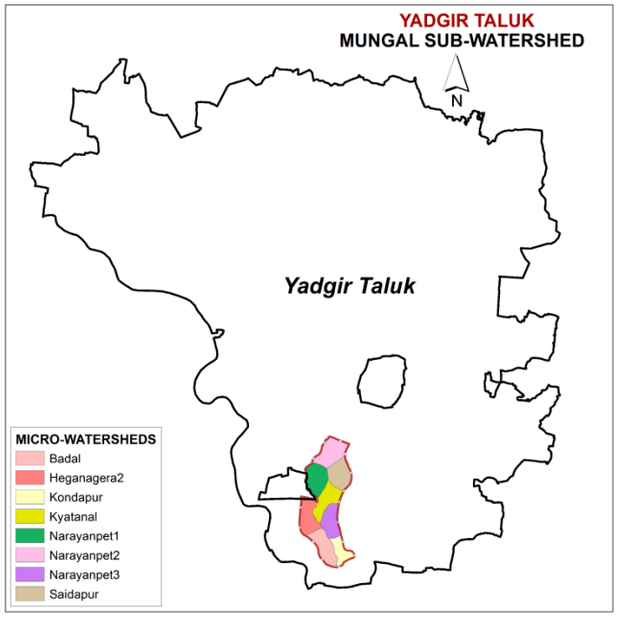
3. Survey Methodology

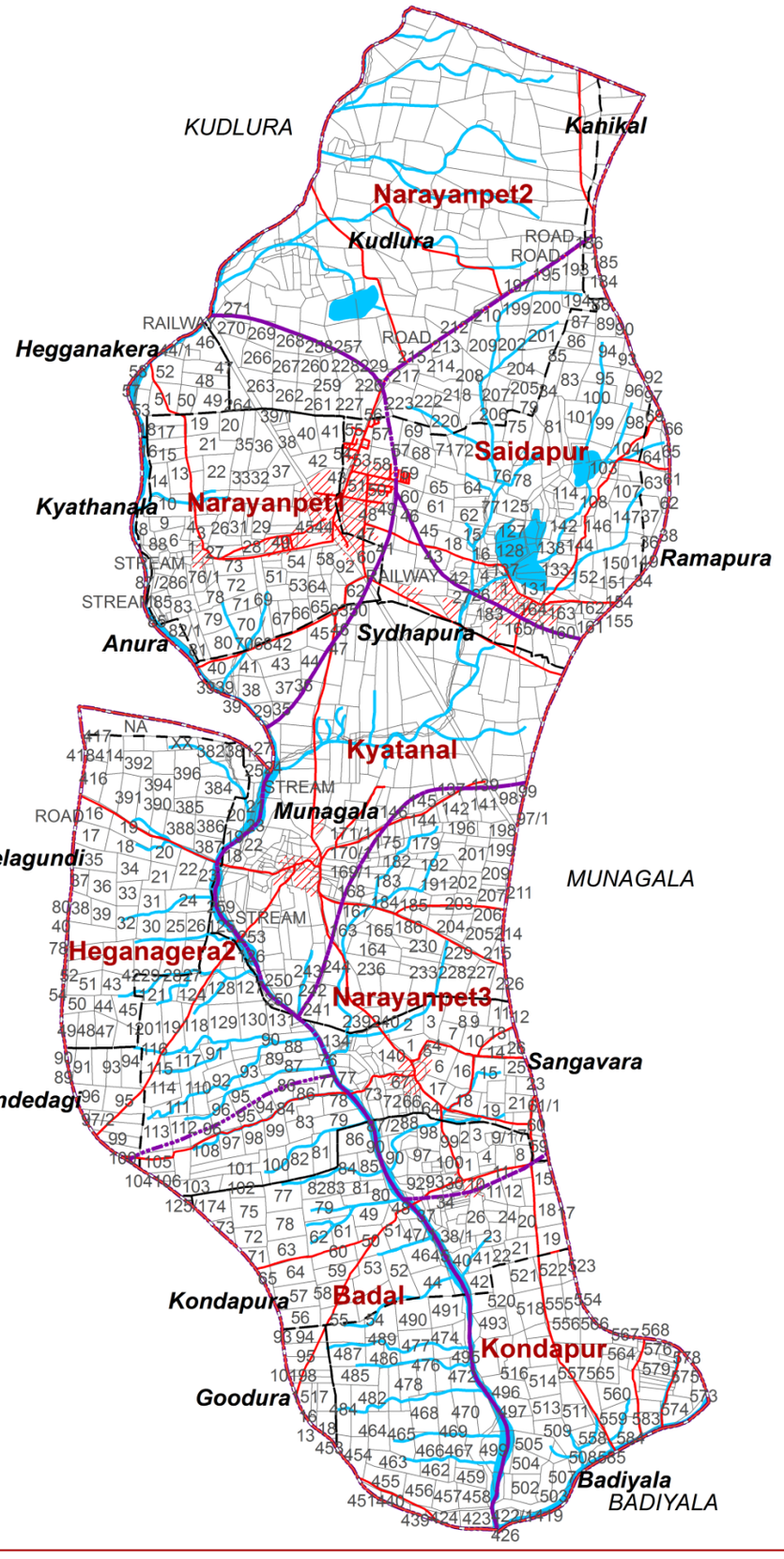
Sequence of activities in generation of LRI

- 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 2m 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





Mungal Sub-watershed
(4D5B1R : Area - 4371.7 ha)
YADGIR TALUK & DISTRICT

0 1 2 4 km

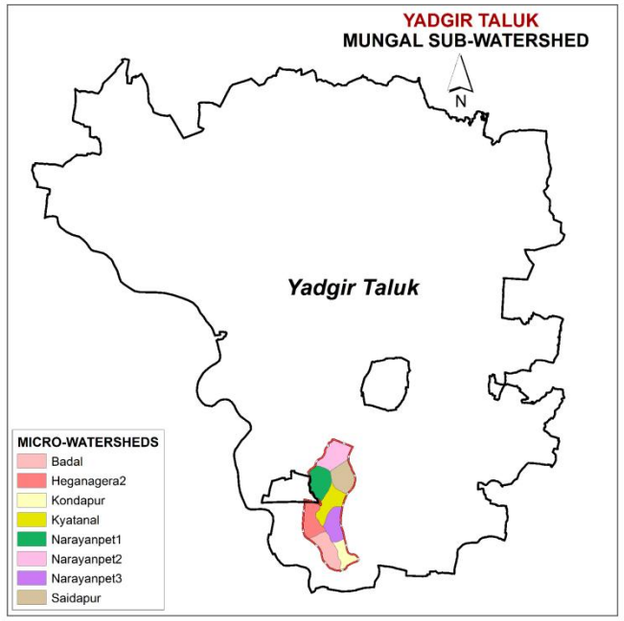
N

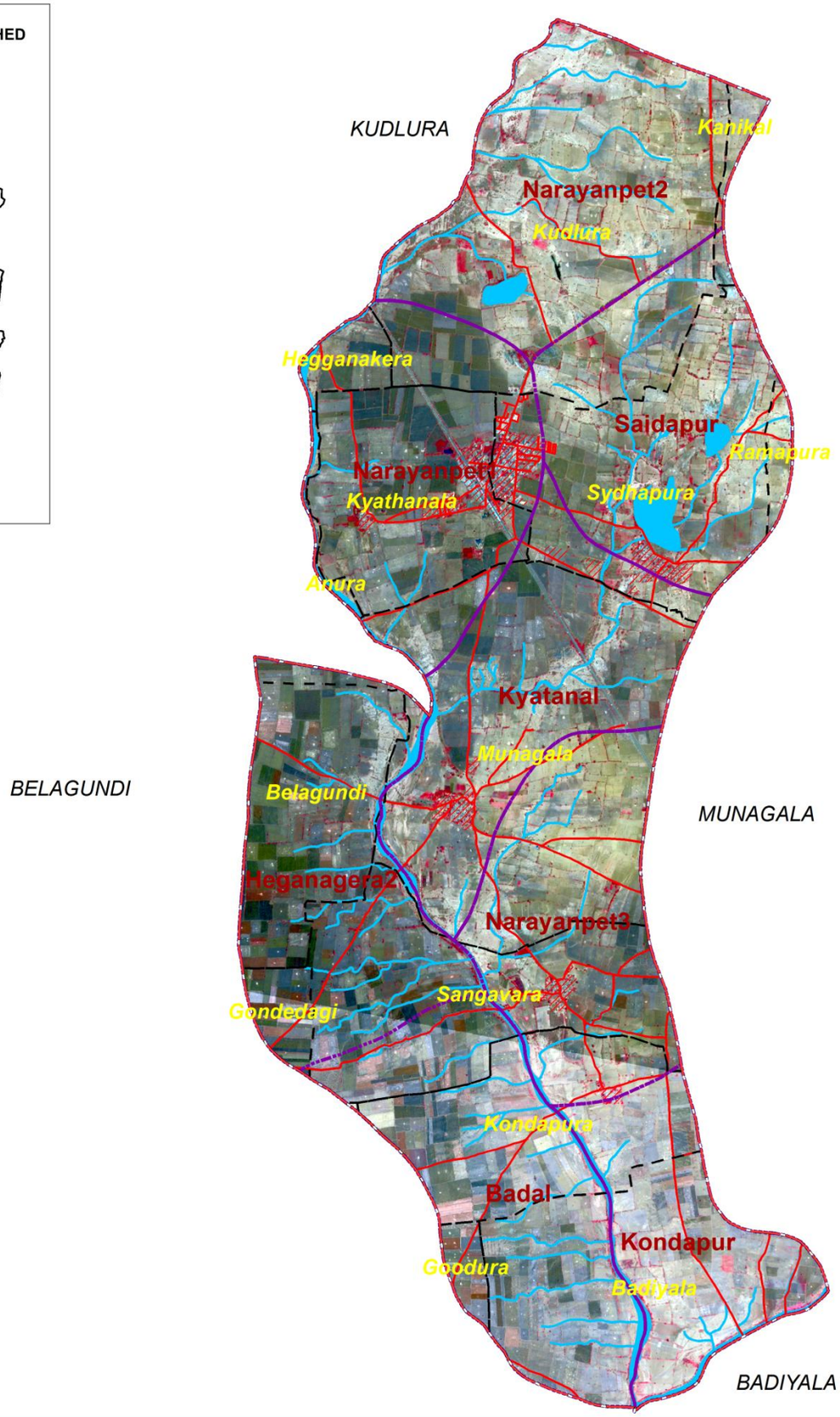
References

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

Source: ICAR-NBSS&LUP, Bengaluru

3.2. Database Used - Satellite Image





SATELLITE IMAGE

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

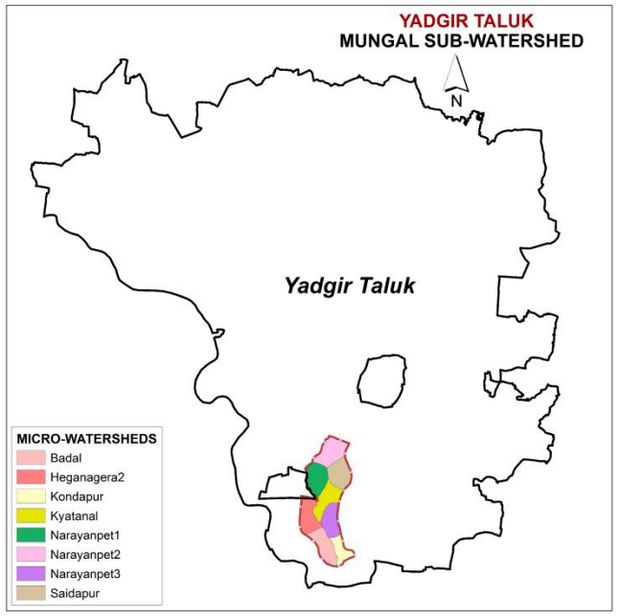
N

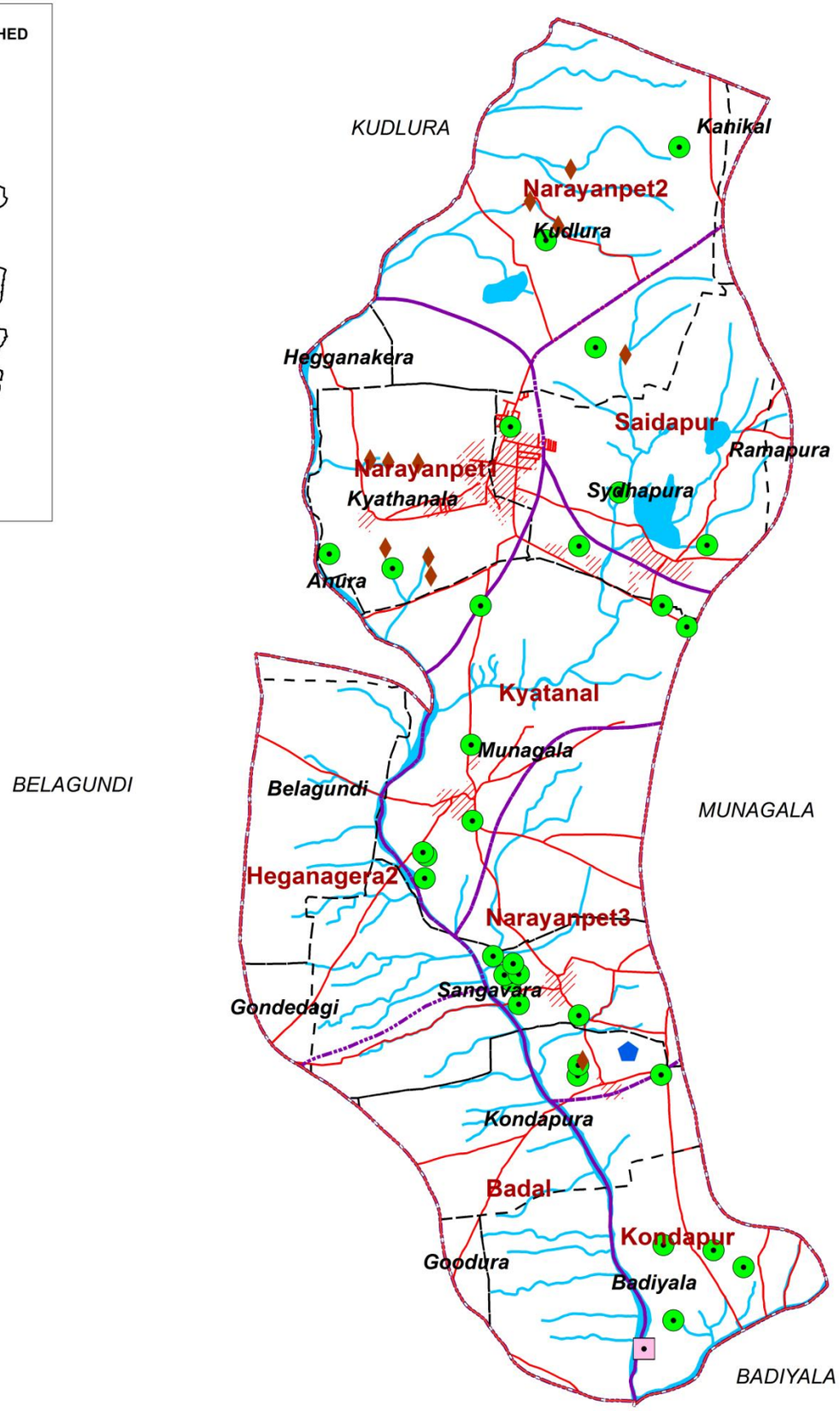
References

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

Source : Cartosat 1 Imagery

3.3. Location of Wells





LOCATION OF WELLS

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

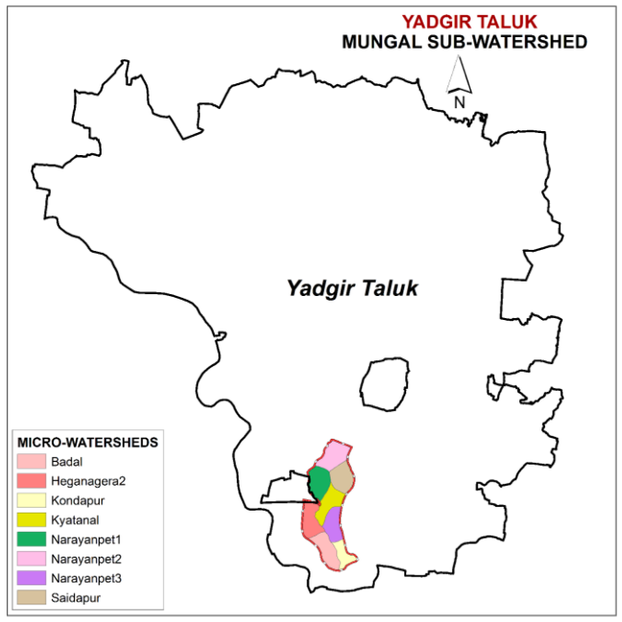
References

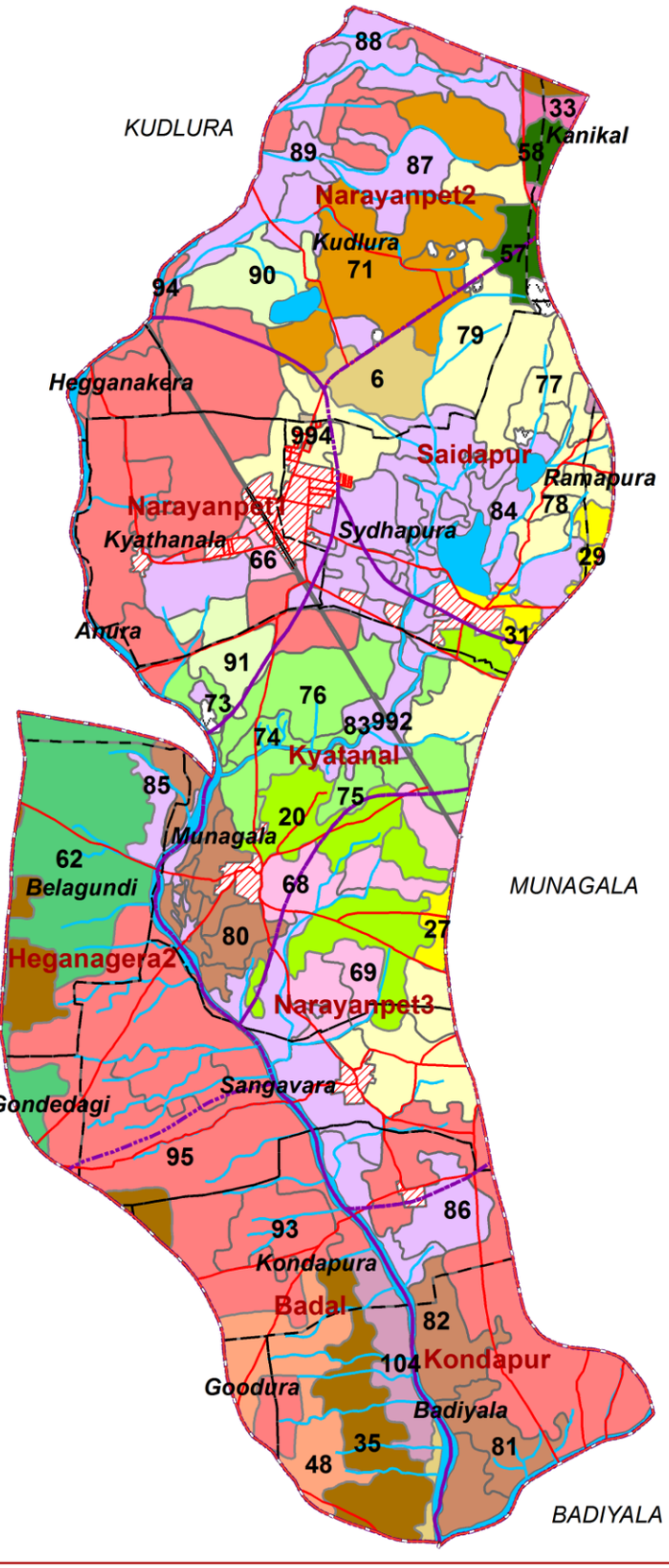
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Sub-watershed boundary
- Micro-watershed boundary
- Village boundary

Wells	No's
Bore Well	31
Check dam	11
Farm pond	1
Open well	1

Source: ICAR-NBSS&LUP, Bengaluru

4. The Soils





SOILS

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Texture Gravelliness

YLR c B 2 g1

Soil Series | Slope | Erosion

References

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

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%)

EROSION
1 – Slight
2 - Moderate
3 - Severe

GRAVELLINESS
g1 – Gravelly (15-35 %)

DEPTH
BDL,KLK,KYT - Shallow (25-50 cm)
BLD,JNK,MRP,YLR - Moderately shallow (50-75 cm)
RHN,MGL,HSL,GWD - Moderately deep (75-100 cm)
SWR,NGP,MDG,KDR - Deep (100-150 cm)

Soil Phase	Area in ha (%)		
Soils of Granite and Granite Gneiss Landscape			
6. BDLiB3	61 (1.4)	35. GWDiB2	170 (3.89)
20. JNKcB2	171 (3.9)	48. NGPiB2	107 (2.46)
27. YLRbB2	35 (0.79)	57. MDGcB2	25 (0.58)
29. YLRcB2g1	4 (0.1)	58. MDGiB2	16 (0.37)
31. YLRiB2	7 (0.16)	62. BMNmB2	230(5.25)
33. HSLiB2	15 (0.34)		
Soils of Alluvial Landscape			
66. KLKmB3	13 (0.3)	82. MGLmB2	127 (2.92)
68. KYTcB2	105 (2.4)	83. KDRbB2g1	40 (0.91)
69. KYTmB1	21 (0.48)	84. KDRcB2	30 (0.69)
71. RMPiB2	207 (4.73)	85. KDRcB3	24 (0.55)
73. BLDcB2	16 (0.36)	86. KDRhA1	43 (0.98)
74. BLDhB3	18 (0.42)	87. KDRiB2	234 (5.34)
75. BLDiB1g1	24 (0.56)	88. KDRiB3	101 (2.32)
76. BLDmB2	136 (3.11)	89. KDRmB2	271 (6.2)
77. RHNcB2	107 (2.45)	90. SWRcB2	54 (1.23)
78. RHNcB3	26 (0.59)	91. SWRmB2	52 (1.18)
79. RHNmB2	283 (6.48)	93. HGNiB2	120 (2.75)
80. MGLcB2	44 (1.01)	94. HGNiB3	15 (0.35)
81. MGLcB3	55 (1.26)	95.HGNmB2	1061(24.27)
Low Land			
104. TMKiB2	56 (1.28)	Rock outcrops	13 (0.31)
Railway	10 (0.24)	Others*	221 (5.05)
Mining/Industrial	2 (0.06)		

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

4.1 Mapping unit description of Mungal (4D5B1R) 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				
	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		**61 (1.4)**
6		BDLiB3	Sandy clay surface, slope 1-3%, severe erosion	61 (1.4)
	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		**171 (3.9)**
20		JNKcB2	Sandy loam surface, slope 1-3%, moderate erosion	171 (3.9)
	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		**46 (1.05)**
27		YLRbB2	Loamy sand surface, slope 1-3%, moderate erosion	35 (0.79)
29		YLRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	4 (0.1)
31		YLRiB2	Sandy clay surface, slope 1-3%, moderate erosion	7 (0.16)
	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		**15 (0.34)**
33		HSLiB2	Sandy clay surface, slope 1-3%, moderate erosion	15 (0.34)
	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		**170 (3.89)**
35		GWDiB2	Sandy clay surface, slope 1-3%, moderate erosion	170 (3.89)
	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		**107 (2.46)**
48		NGPiB2	Sandy clay surface, slope 1-3%, moderate erosion	107 (2.46)
	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		**41 (0.95)**
57		MDGcB2	Sandy loam surface, slope 1-3%, moderate erosion	25 (0.58)
58		MDGiB2	Sandy clay surface, slope 1-3%, moderate erosion	16 (0.37)
	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		**230 (5.25)**
62		BMNmB2	Clay surface, slope 1-3%, moderate erosion	230 (5.25)

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				
	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		**56 (1.28)**
104		TMKiB2	Sandy clay surface, slope 1-3%, moderate erosion	56 (1.28)
Soils of Alluvial Landscape				
	KLK	Kilakera soils are shallow (25-50 cm), well drained, have very dark grayish brown to dark gray brown slightly calcareous clay soils occurring on very gently sloping plains under cultivation.		**13 (0.3)**
66		KLKmB3	Clay surface, slope 1-3%, severe erosion	13 (0.3)
	KYT	Kyathanala soils are shallow (25-50 cm), well drained, have dark brown to strong brown and dark reddish brown sandy clay loam soils occurring on very gently 326 (0.23)sloping plains under cultivation		**126 (2.88)**
68		KYTcB2	Sandy loam surface, slope 1-3%, moderate erosion	105 (2.4)
69		KYTmB1	Clay surface, slope 1-3%,slight erosion	21 (0.48)
	RMP	Rampur soils are moderately shallow (50-75 cm), well drained, have very dark to yellowish brown, sandy clay loam soils occurring on very gently sloping plains under cultivation		**207 (4.73)**
71		RMPiB2	Sandy clay surface, slope 1-3%, moderate erosion	207 (4.73)
	BLD	Balched soils are moderately shallow (50-75 cm), moderately well drained, have black to very dark grayish brown, slightly calcareous clay loam soils. occurring on very gently to gently sloping plains under cultivation		**194 (4.45)**
73		BLDcB2	Sandy loam surface, slope 1-3%, moderate erosion	16 (0.36)
74		BLDhB3	Sandy clay loam surface, slope 1-3%, severe erosion	18 (0.42)
75		BLDiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	24 (0.56)
76		BLDmB2	Clay surface, slope 1-3%, moderate erosion	136 (3.11)
	RHN	Rachanalli soils are moderately deep (75-100 cm), well drained, have very dark grayish brown to dark brown, slightly calcareous sodic sandy clay loam soils occurring on very gently sloping plains under cultivation.		**416 (9.52)**
77		RHNcB2	Sandy loam surface, slope 1-3%, moderate erosion	107 (2.45)
78		RHNcB3	Sandy loam surface, slope 1-3%, severe erosion	26 (0.59)
79		RHNmB2	Clay surface, slope 1-3%, moderate erosion	283 (6.48)
	MGL	Mungala soils are moderately deep (75-100 cm), moderately well drained, very dark gray to dark gray, slightly calcareous cracking clay soils occurring on very gently sloping plains under cultivation		**226 (5.19)**
80		MGLcB2	Sandy loam surface, slope 1-3%, moderate erosion	44 (1.01)
81		MGLcB3	Sandy loam surface, slope 1-3%, severe erosion	55 (1.26)
82		MGLmB2	Clay surface, slope 1-3%, moderate erosion	127 (2.92)

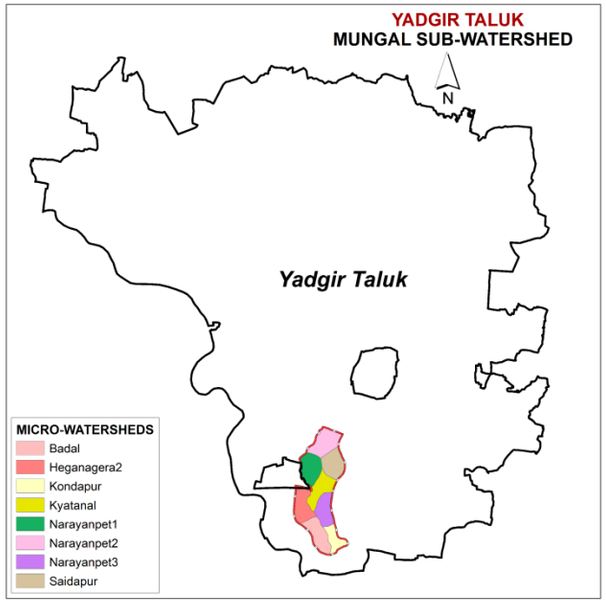
To be continued….

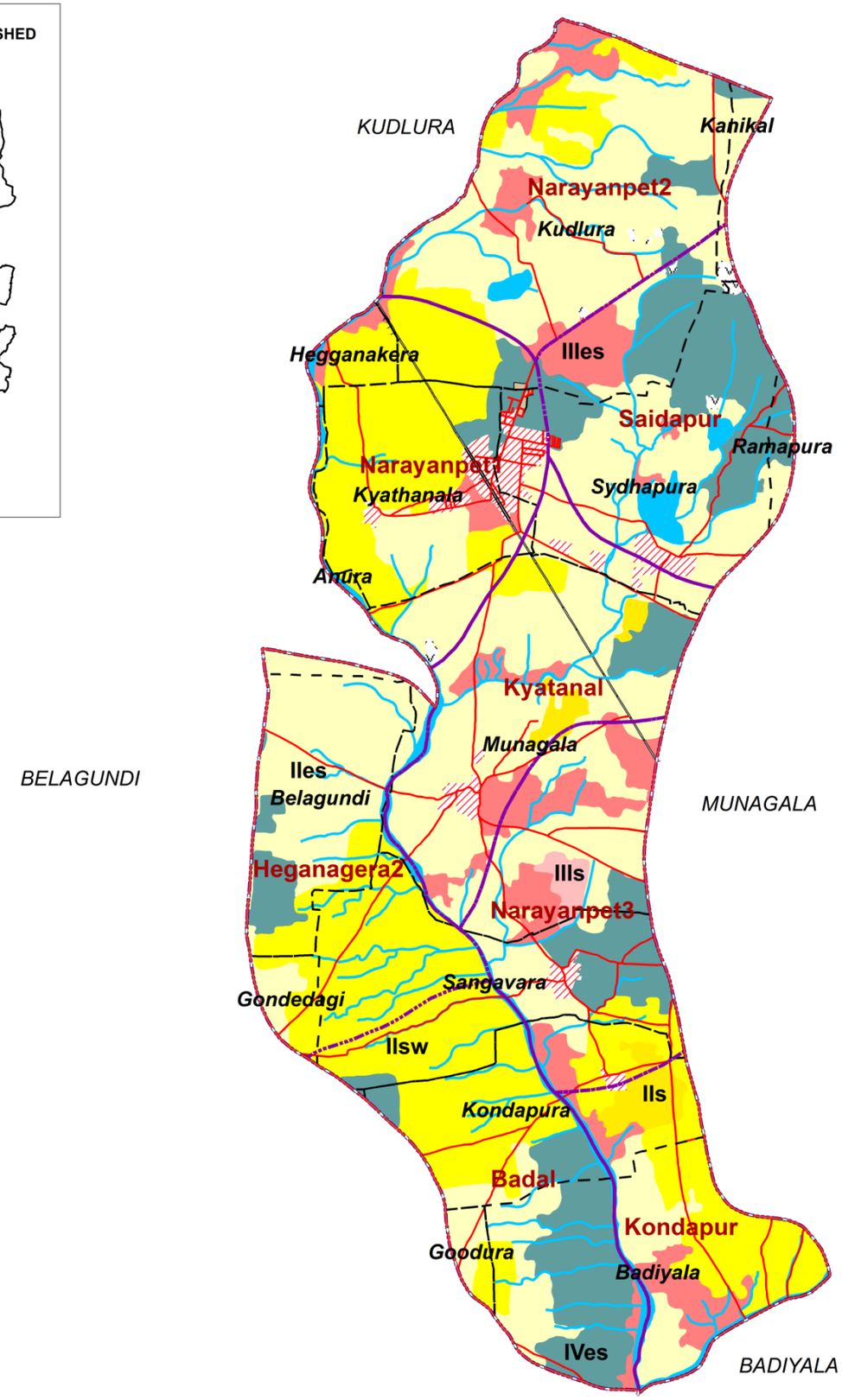
Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss Landscape				
	KDR	Kudlura soils are deep (100-150 cm), moderately well drained, have very dark gray to grayish brown, calcareous cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**743 (16.9)**
83		KDRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	40 (0.91)
84		KDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	30 (0.69)
85		KDRcB3	Sandy loam surface, slope 1-3%, severe erosion	24 (0.55)
86		KDRhA1	Sandy clay loam surface, slope 0-1%, slight erosion	43 (0.98)
87		KDRiB2	Sandy clay surface, slope 1-3%, moderate erosion	234 (5.34)
88		KDRiB3	Sandy clay surface, slope 1-3%, severe erosion	101 (2.32)
89		KDRmB2	Clay surface, slope 1-3%, moderate erosion	271 (6.2)
	SWR	Sowrashtrahalli soils are deep (100-150 cm), moderately well drained, have very dark gray to dark gray, calcareous cracking clay soils occurring on very gently sloping plains under cultivation		**106 (2.41)**
90		SWRcB2	Sandy loam surface, slope 1-3%, moderate erosion	54 (1.23)
91		SWRmB2	Clay surface, slope 1-3%, moderate erosion	52 (1.18)
	HGN	Hegganakera soils are very deep (>150 cm), moderately well drained, have very dark gray to dark grayish brown, slightly calcareous cracking clay soils occurring on very gently sloping plains under cultivation		**1196 (27.37)**
93		HGNiB2	Sandy clay surface, slope 1-3%, moderate erosion	120 (2.75)
94		HGNiB3	Sandy clay surface, slope 1-3%, severe erosion	15 (0.35)
95		HGNmB2	Clay surface, slope 1-3%, moderate erosion	1061 (24.27)
992		Railway	Railway line	**10 (0.24)**
994		Mining/Industrial	Mining/Industrial area	**2 (0.06)**
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**13 (0.31)**
1000		Others	Habitation and Waterbody	**221 (5.05)**

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

5. Soil Survey Interpretations

5.1. Land Capability Classification





LAND CAPABILITY

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 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
w- drainage
z- excess salt/calcareousness

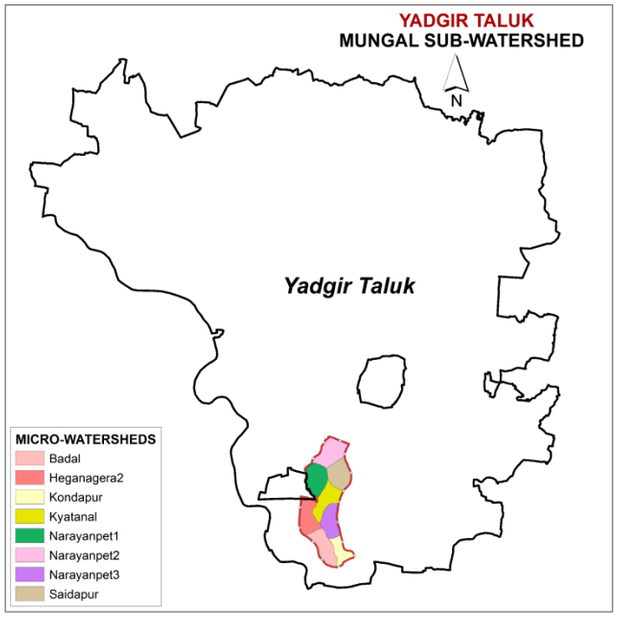
LCC	Area in ha (%)
IIs	67 (1.54)
Iles	1844 (42.17)
IIsw	1182 (27.03)
IIIs	21 (0.48)
IIIes	369 (8.43)
IVes	642 (14.69)
Mining/Industrial	2(0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

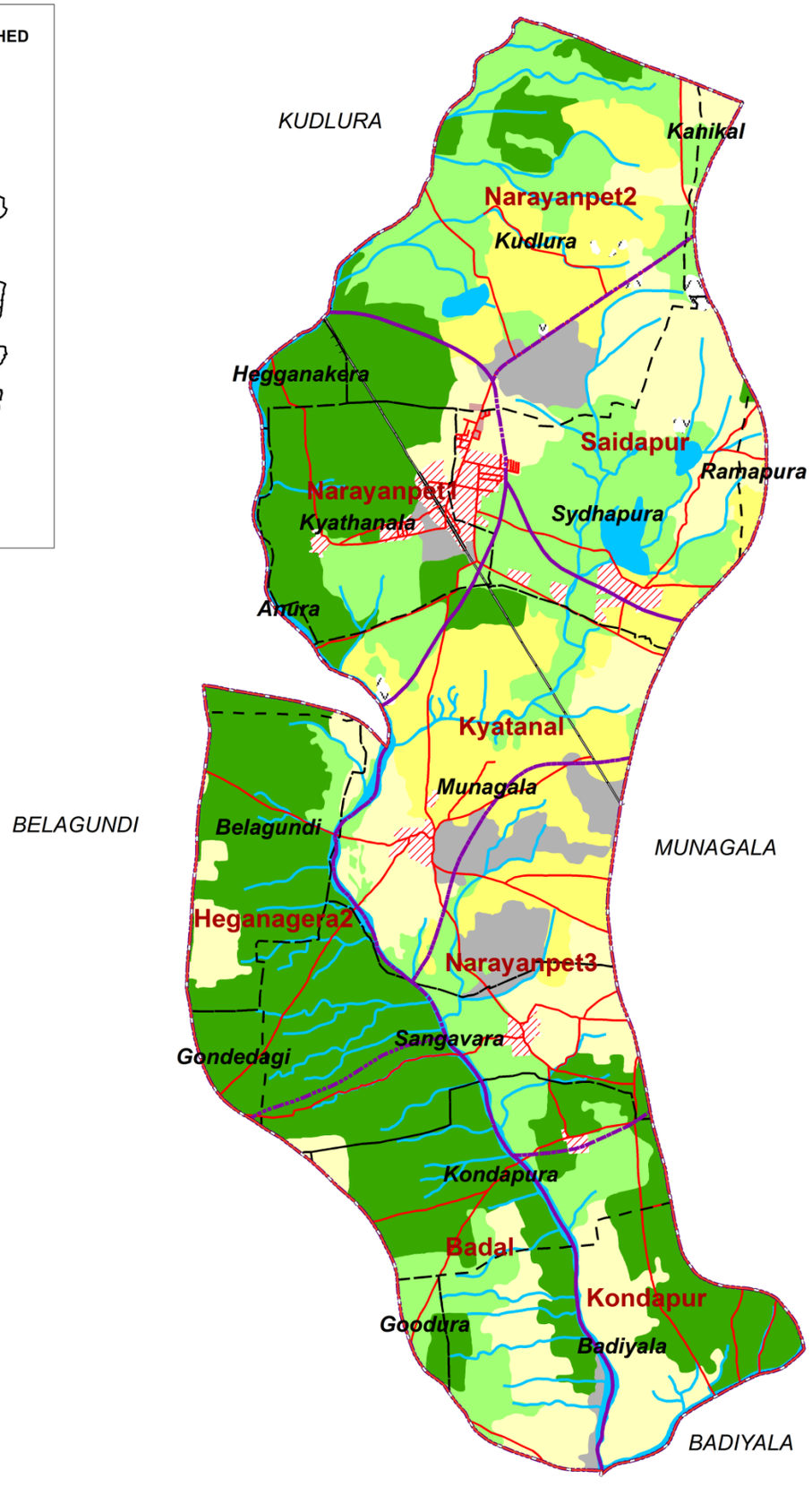
* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

5.2. Soil Depth





SOIL DEPTH

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

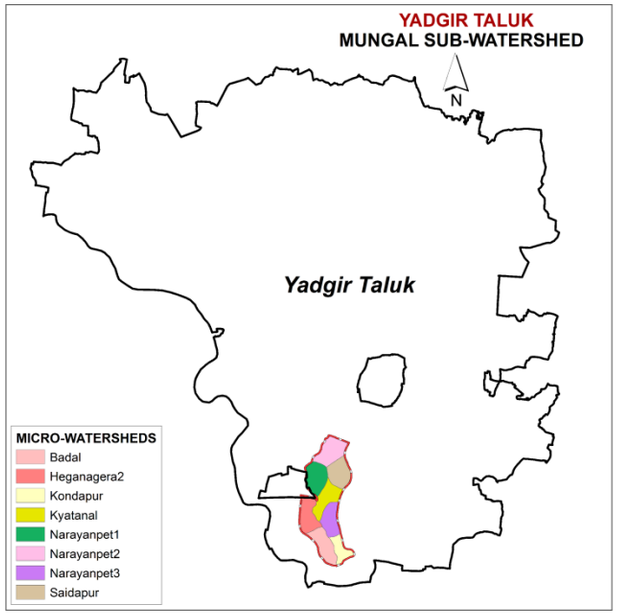
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

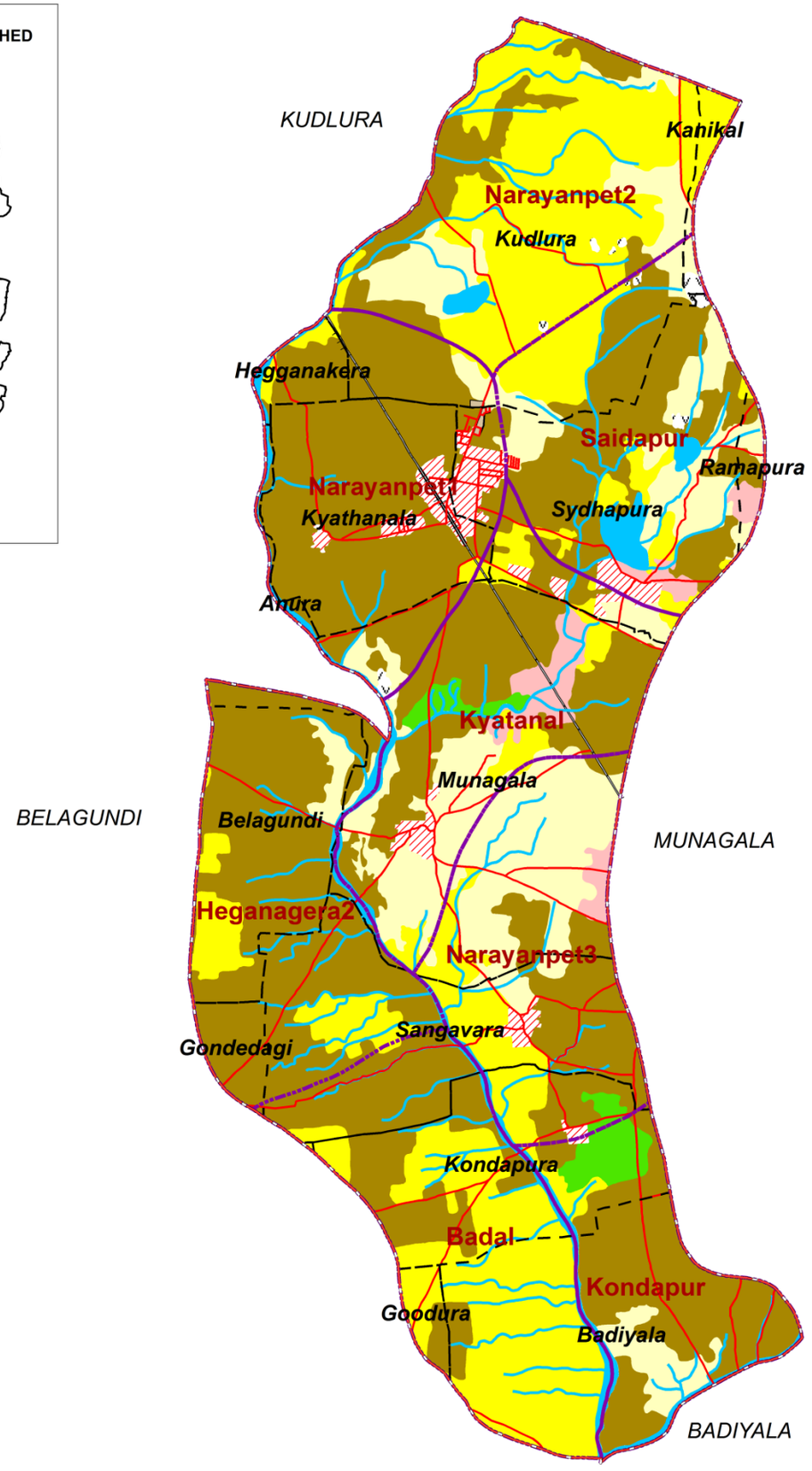
Depth Class	Area in ha (%)
Shallow (25-50 cm)	200 (4.57)
Moderately shallow (50-75 cm)	617 (14.12)
Moderately deep (75-100 cm)	828 (18.93)
Deep (100-150 cm)	997 (22.81)
Very deep (>150 cm)	1483 (33.91)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.3. Surface Soil Texture





SURFACE SOIL TEXTURE

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

km
0 1 2 4

N

References

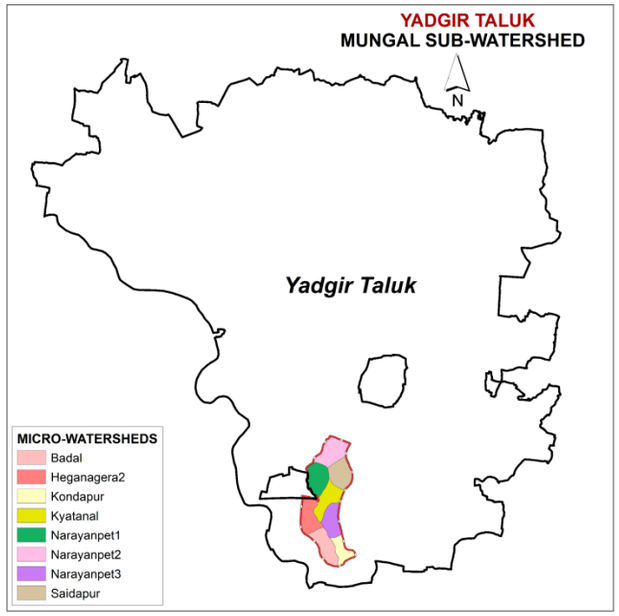
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

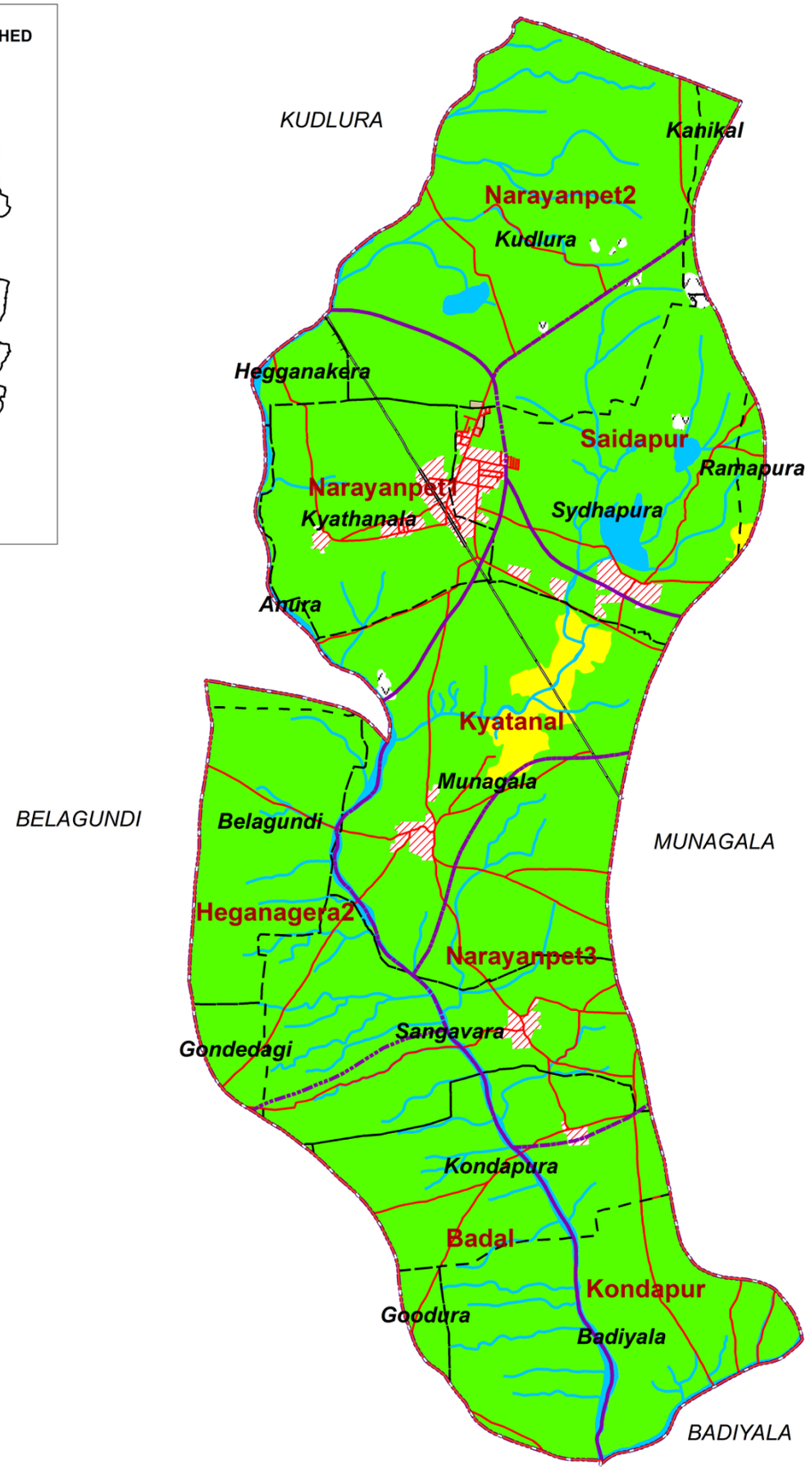
Texture Class	Area in ha(%)
Loamy sand	74 (1.7)
Sandy loam	661 (15.12)
Sandy clay loam	61 (1.4)
Sandy clay	1134 (25.94)
Clay	2194 (50.19)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.4. Surface Soil Gravelliness





SOIL GRAVELLINESS

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

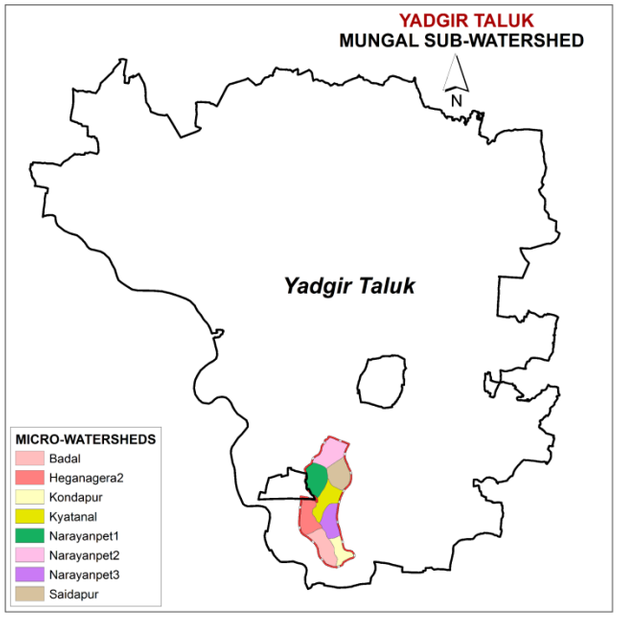
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

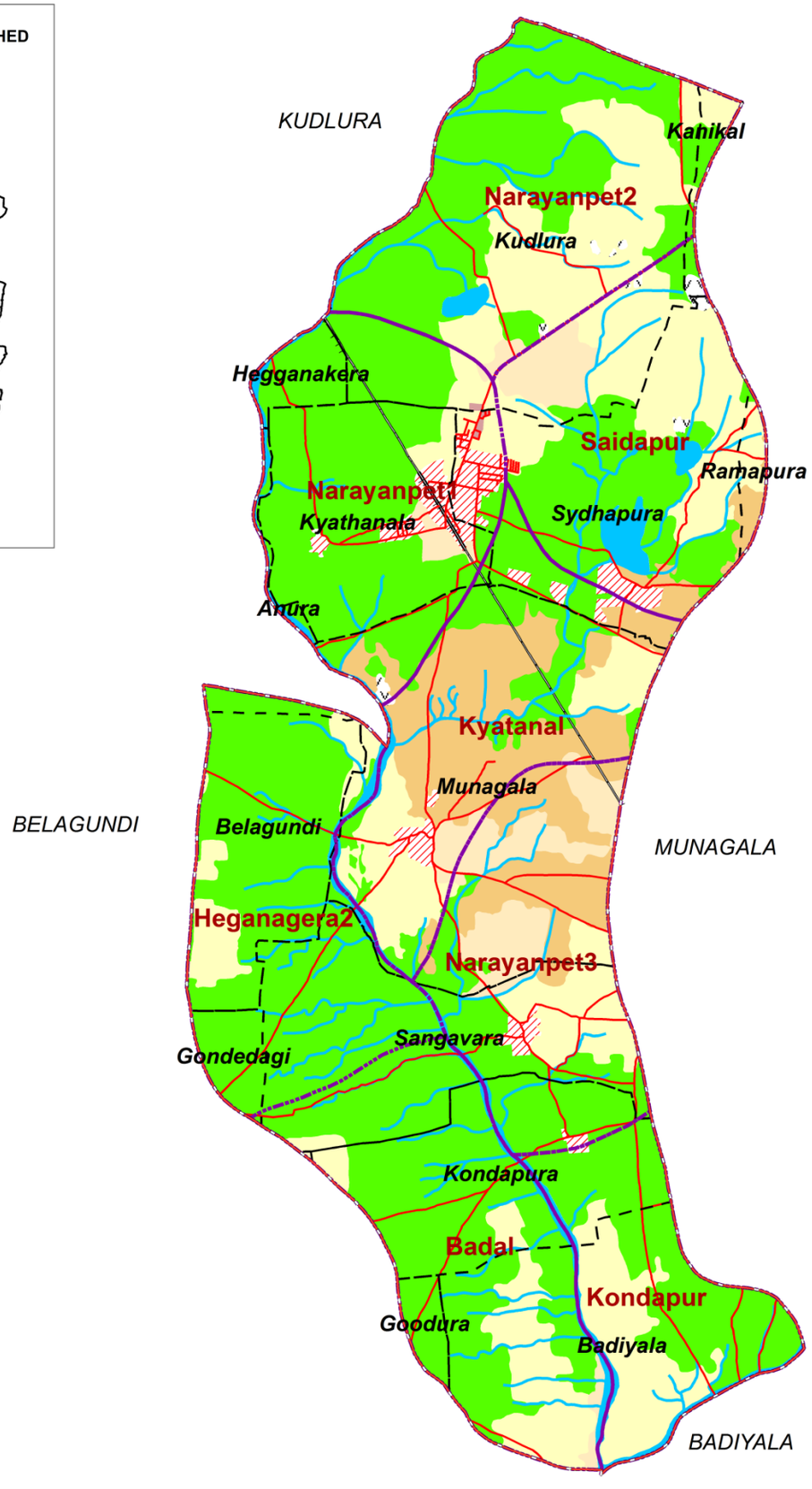
Gravelly Class	Area in ha (%)
Non gravelly (<15%)	4056 (92.79)
Gravelly (15-35%)	68 (1.57)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.5. Available Water Capacity





AVAILABLE WATER CAPACITY

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

km
0 1 2 4
N

References

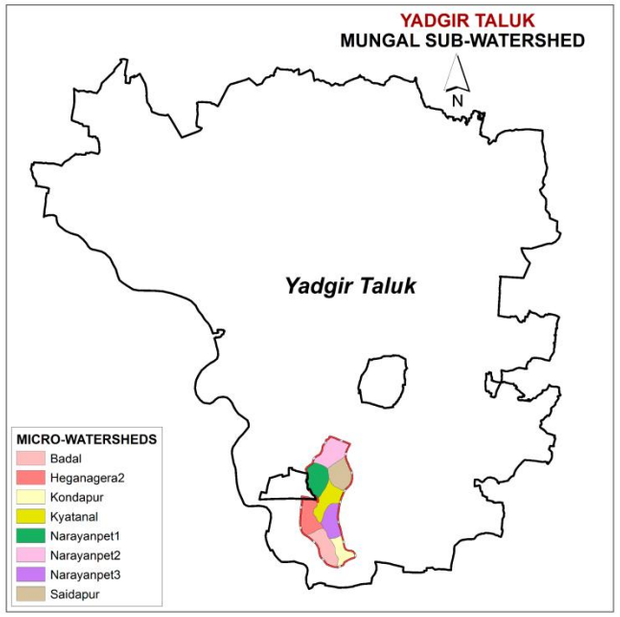
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

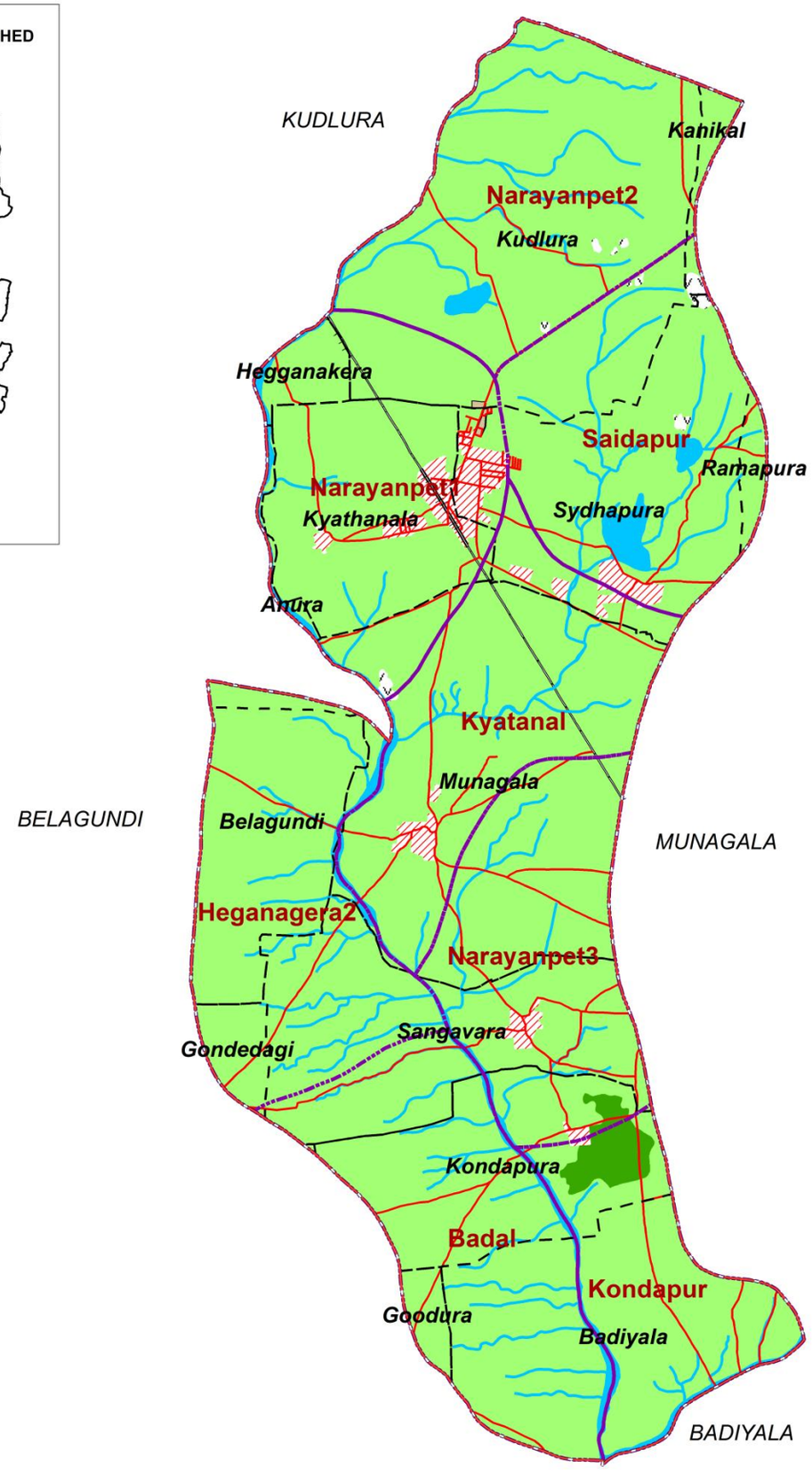
Available Water Capacity	Area in ha (%)
Very low (<50 mm/m)	200 (4.57)
Low (51-100 mm/m)	411 (9.4)
Medium (101-150 mm/m)	1034 (23.66)
Very high (>200 mm/m)	2480 (56.72)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.6.Slope





SLOPE

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

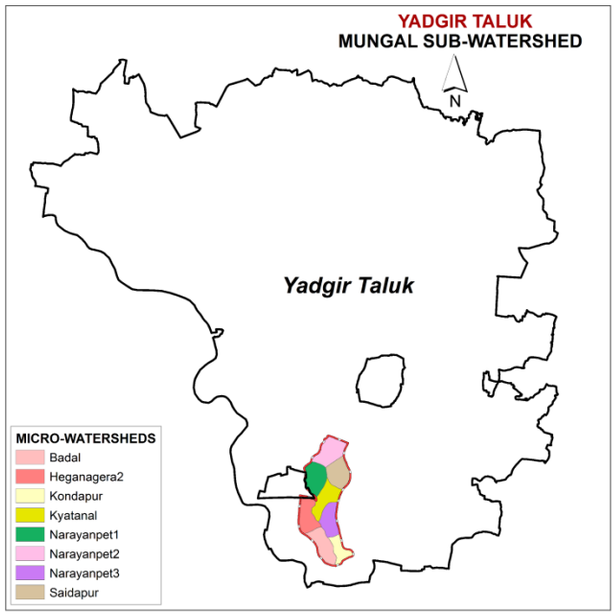
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

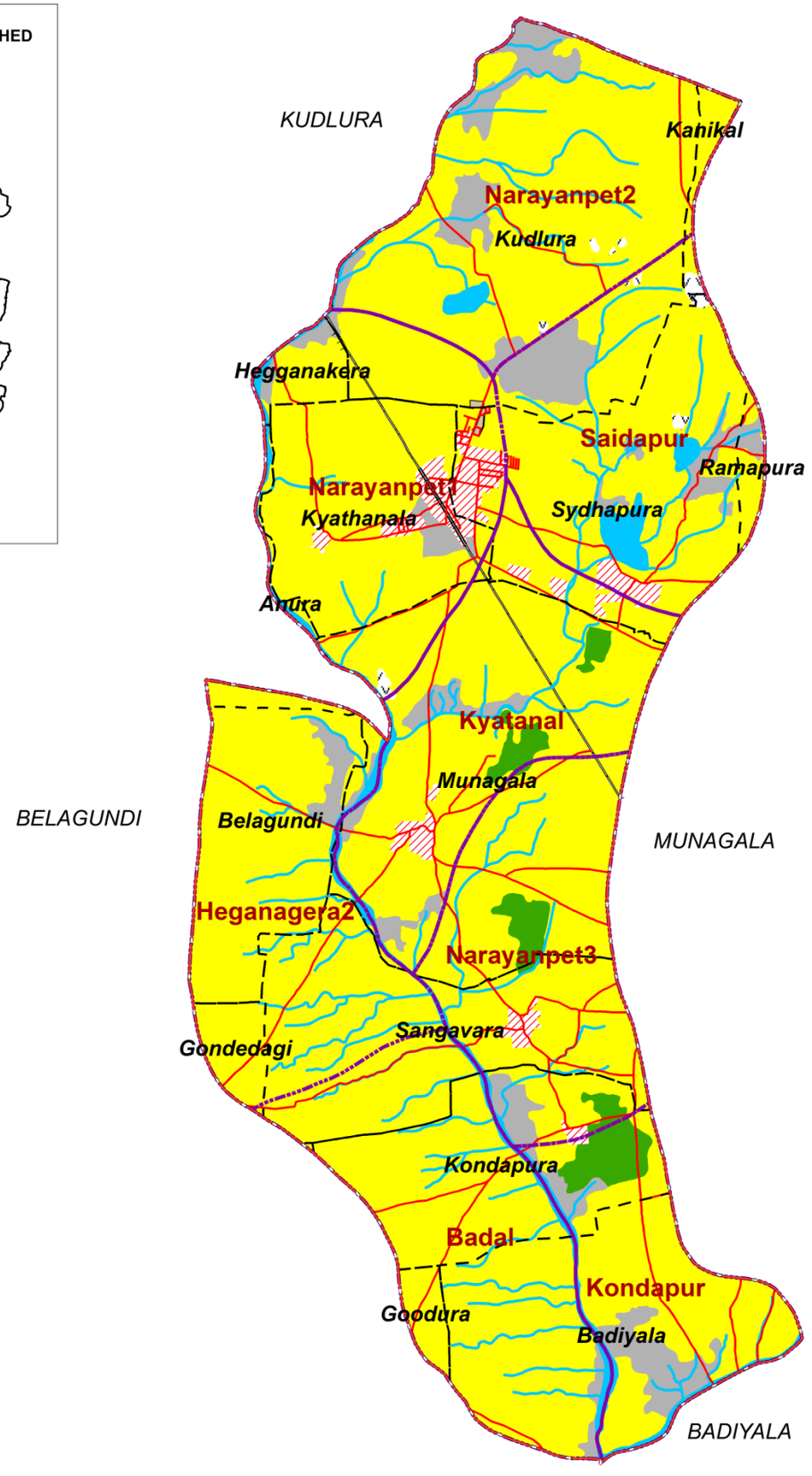
Slope Class	Area in ha (%)
Nearly level (0-1%)	43 (0.98)
Very gently sloping (1-3%)	4082 (93.37)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.7.Soil Erosion





SOIL EROSION

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

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

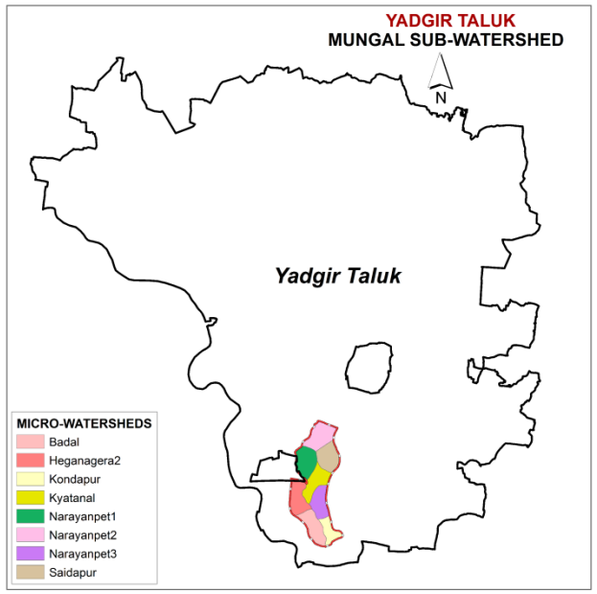
Erosion Class	Area in ha(%)
Slight	89 (2.02)
Moderate	3722 (85.15)
Severe	314 (7.18)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

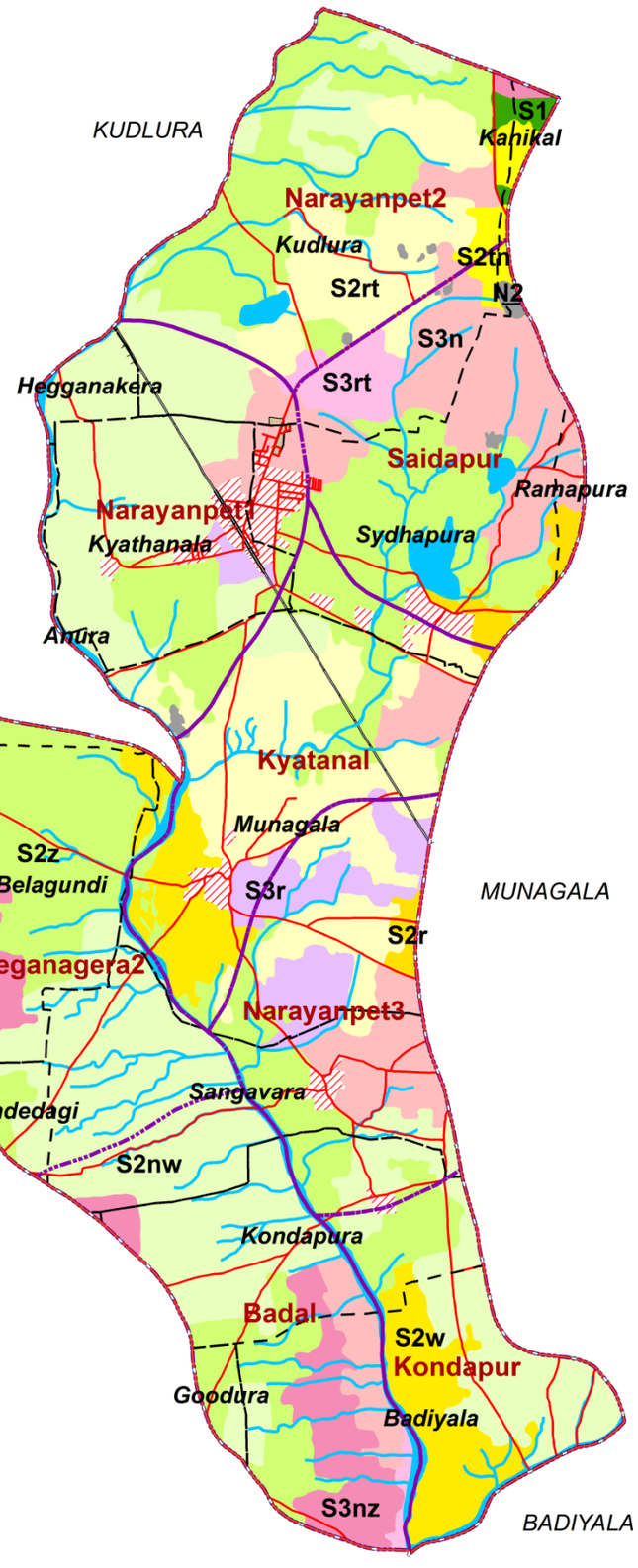
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6. Land Suitability for Major Crops

6.1. Land Suitability for Sorghum





LAND SUITABILITY FOR SORGHUM

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	46 (1.05)
S2w	227 (5.19)
S2z	1185 (27.12)
S2nw	1197 (27.38)
S2rt	571 (13.07)
S2tn	41 (0.95)
S3n	472 (10.81)
S3r	139 (3.18)
S3nz	170 (3.89)
S3rt	61 (1.4)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

References

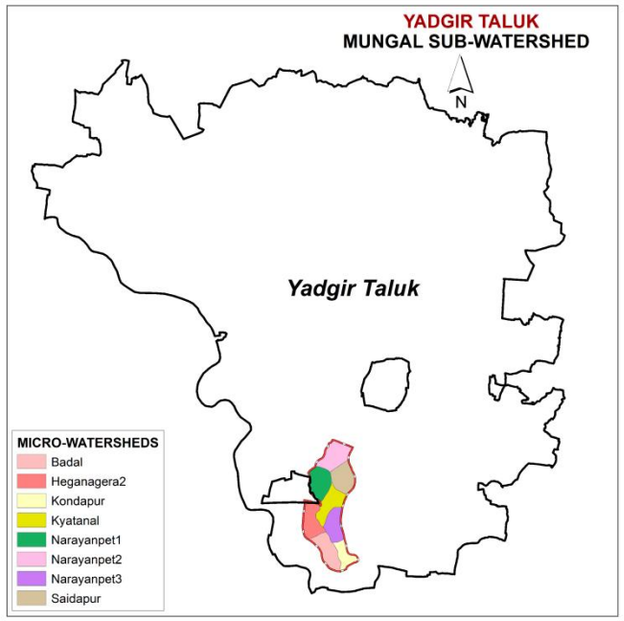
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

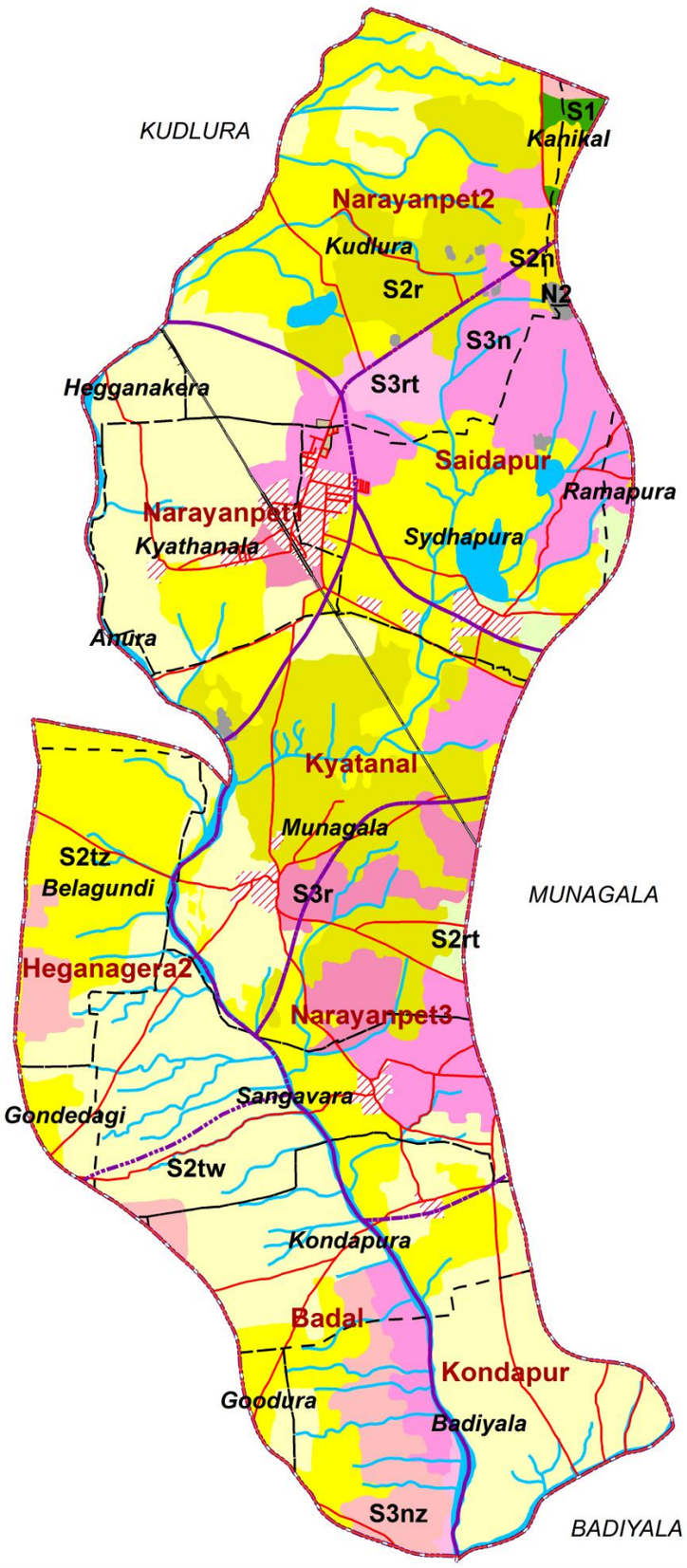
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

6.2. Land Suitability for Maize





LAND SUITABILITY FOR MAIZE

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2n	41 (0.95)
S2r	571 (13.07)
S2rt	46 (1.05)
S2tw	1424 (32.57)
S2tz	1185 (27.12)
S3n	472 (10.81)
S3r	139 (3.18)
S3nz	170 (3.89)
S3rt	61 (1.4)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

References

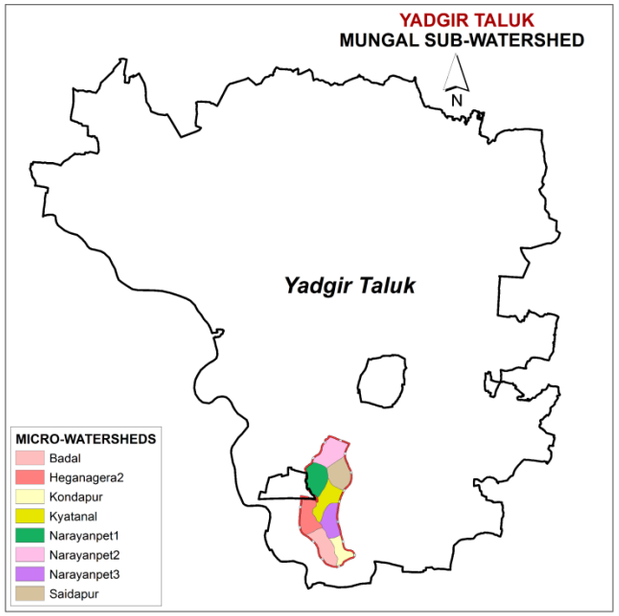
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

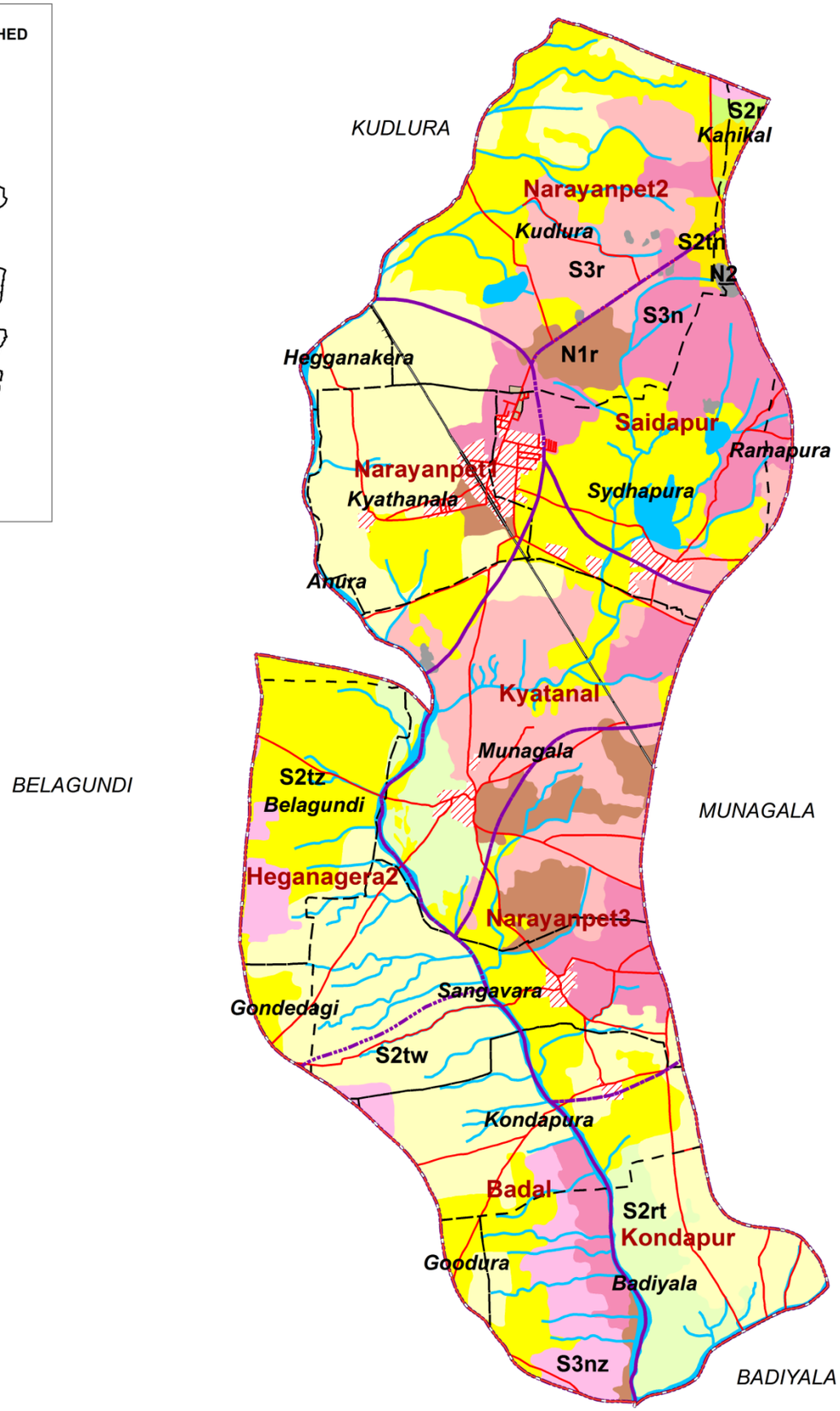
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

6.3. Land Suitability for Redgram





LAND SUITABILITY FOR REDGRAM

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 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
w- drainage
z- excess salt/calcareousness

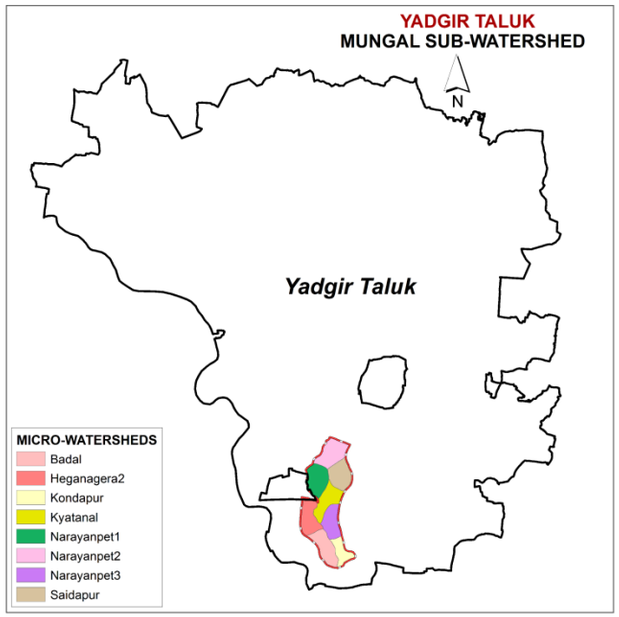
Suitability subclass	Area in ha (%)
S2r	15 (0.34)
S2rt	227 (5.19)
S2tn	41 (0.95)
S2tw	1197 (27.38)
S2tz	1185 (27.12)
S3n	472 (10.81)
S3r	617 (14.12)
S3nz	170 (3.89)
N1r	200 (4.57)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

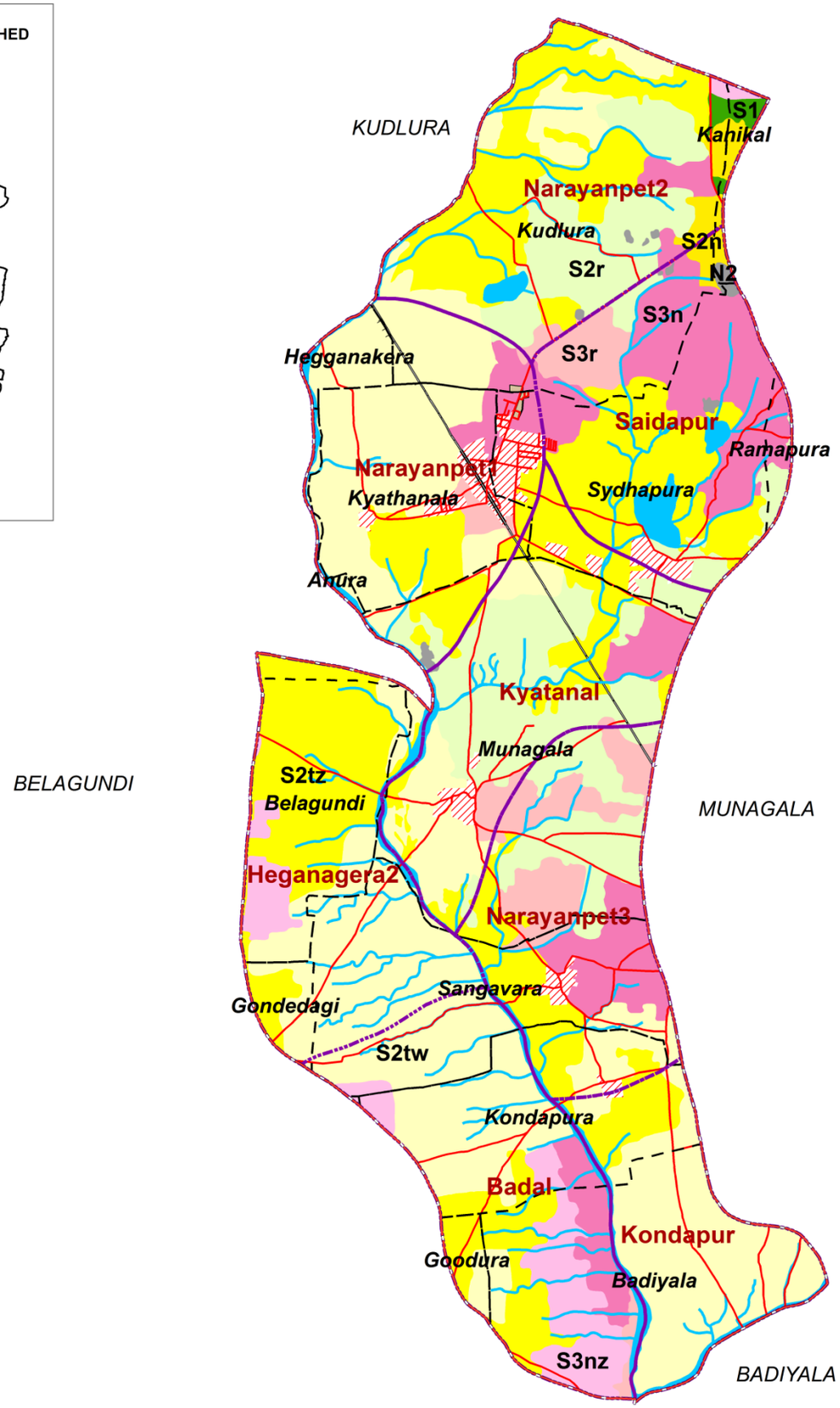
* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

6.4. Land Suitability for Bajra





LAND SUITABILITY FOR BAJRA

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

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

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

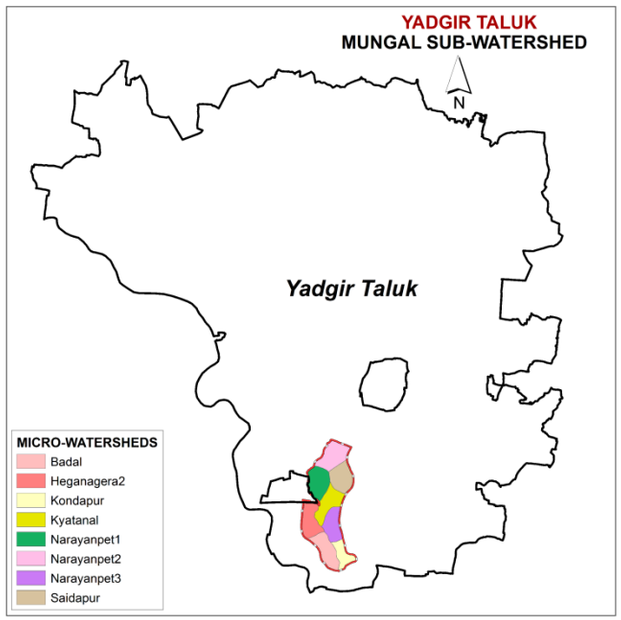
Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2n	41 (0.95)
S2r	617 (14.12)
S2tw	1424 (32.57)
S2tz	1185 (27.12)
S3n	472 (10.81)
S3r	200 (4.57)
S3nz	170 (3.89)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

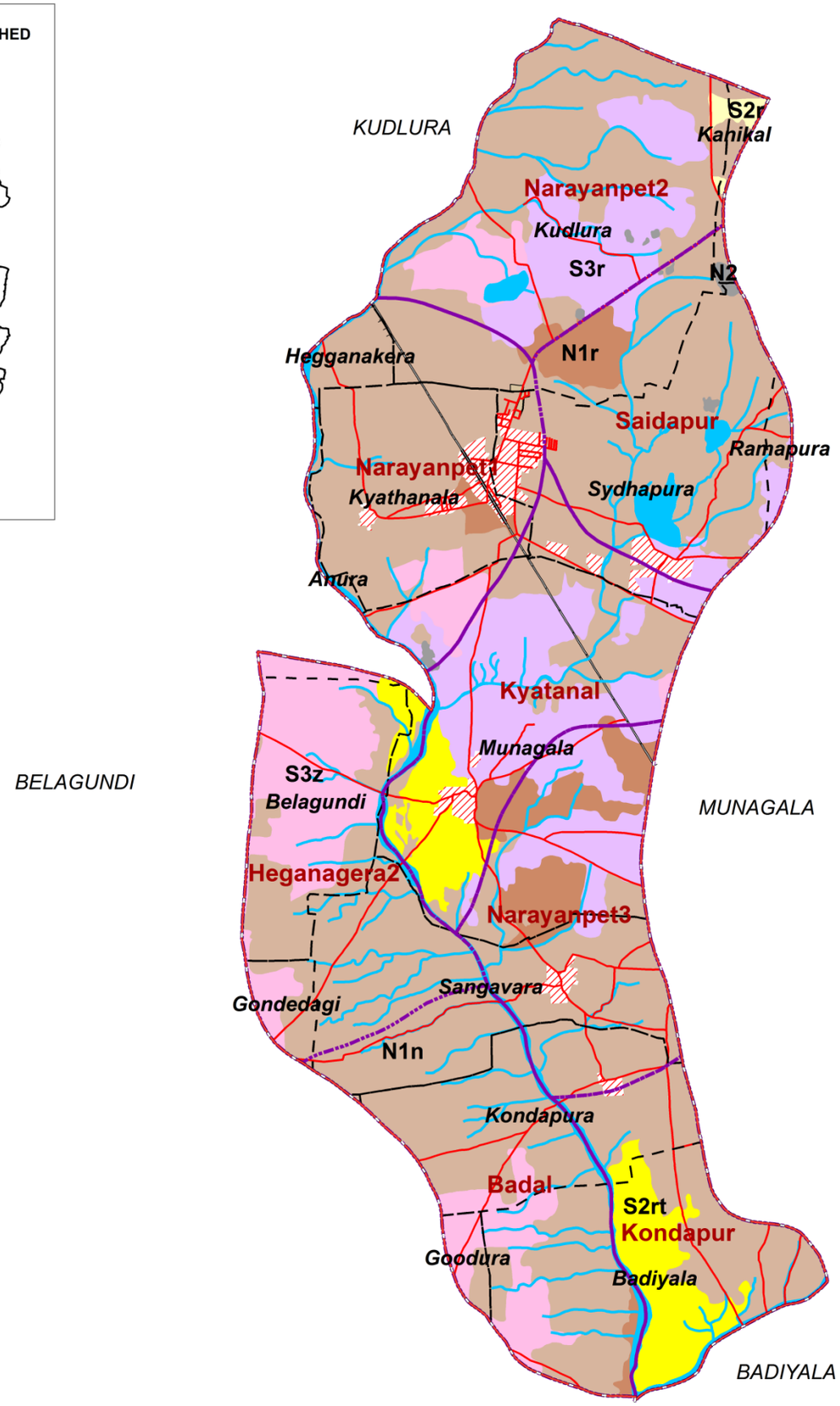
* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

6.5. Land Suitability for Drumstick





LAND SUITABILITY FOR DRUMSTICK

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 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
z- excess salt/calcareousness

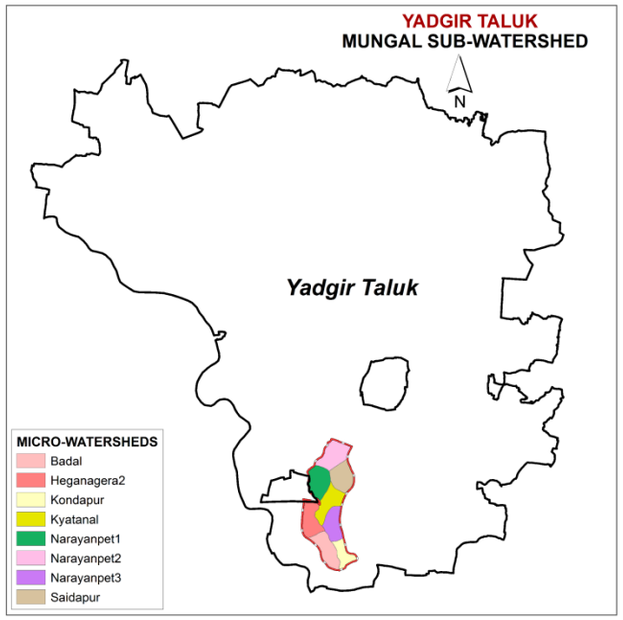
Suitability subclass	Area in ha (%)
S2r	15 (0.34)
S2rt	227 (5.19)
S3r	617 (14.12)
S3z	443 (10.12)
N1n	2623 (60.01)
N1r	200 (4.57)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

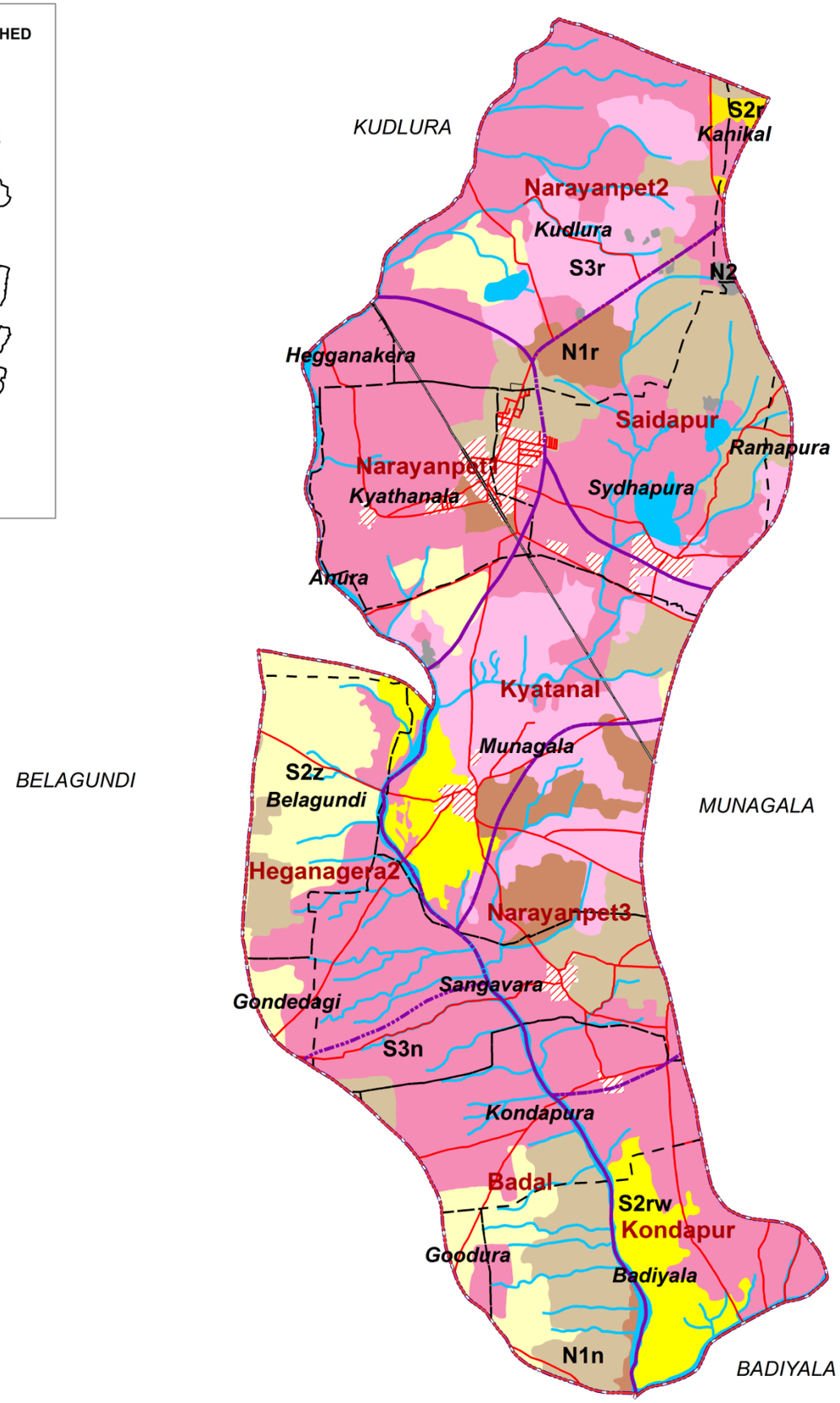
* - Habitation & Waterbody

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

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

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

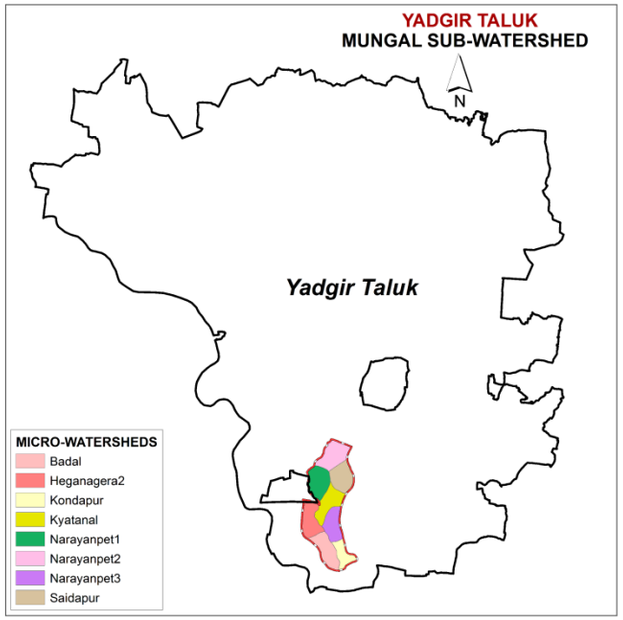
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

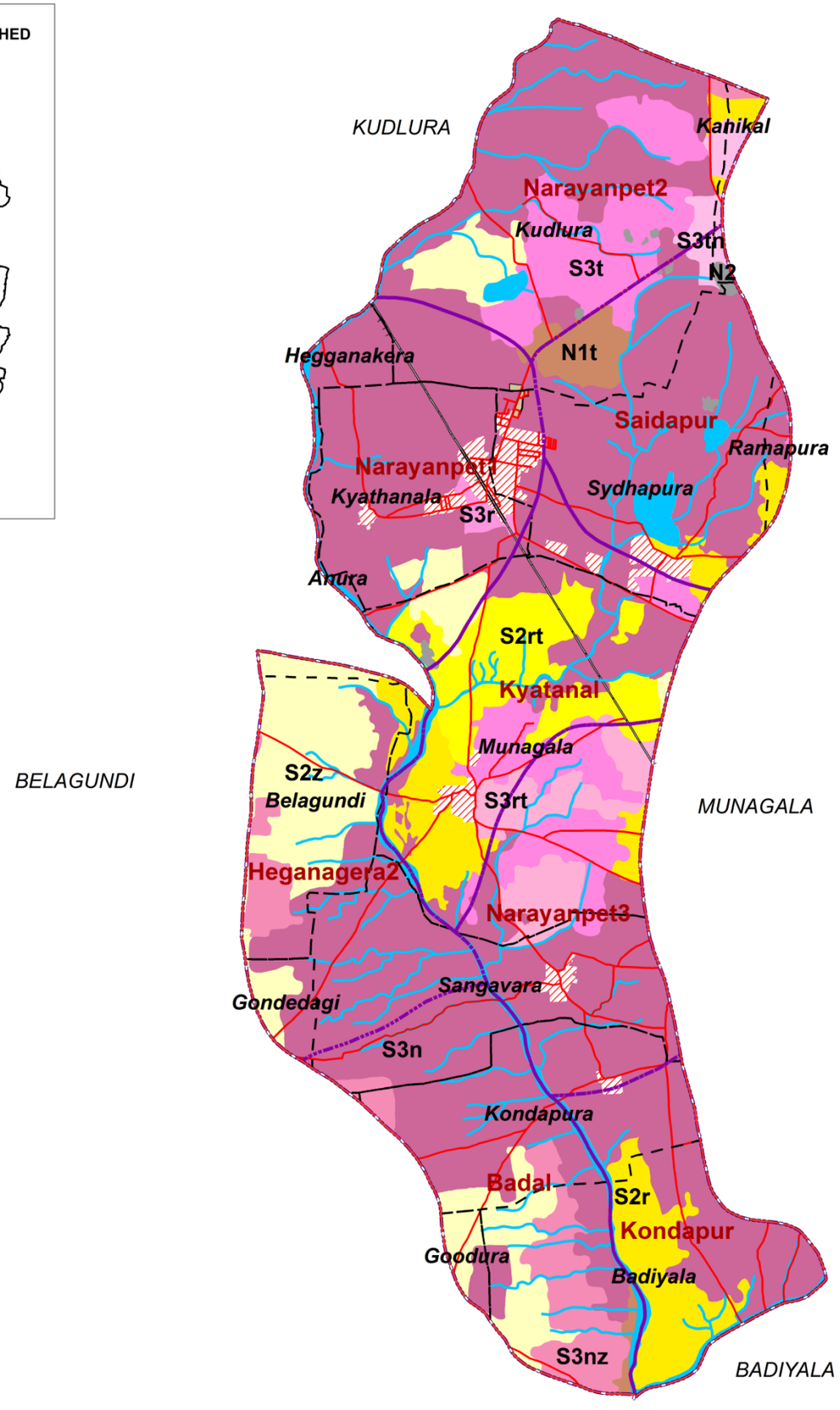
Suitability subclass	Area in ha (%)
S2r	15 (0.34)
S2z	443 (10.12)
S2rw	227 (5.19)
S3n	1981 (45.32)
S3r	617 (14.12)
N1n	642 (14.69)
N1r	200 (4.57)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6.7. Land Suitability for Cotton





LAND SUITABILITY FOR COTTON

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 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
z- excess salt/calcareousness

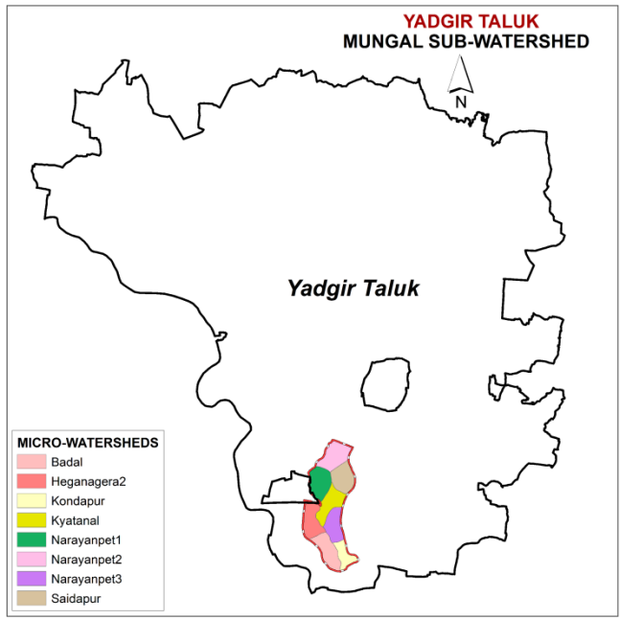
Suitability subclass	Area in ha (%)
S2r	287 (6.58)
S2z	443 (10.12)
S2rt	194 (4.44)
S3n	2412 (55.18)
S3r	13 (0.3)
S3t	377 (8.63)
S3nz	170 (3.89)
S3rt	126 (2.88)
S3tn	41 (0.95)
N1t	61 (1.4)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

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

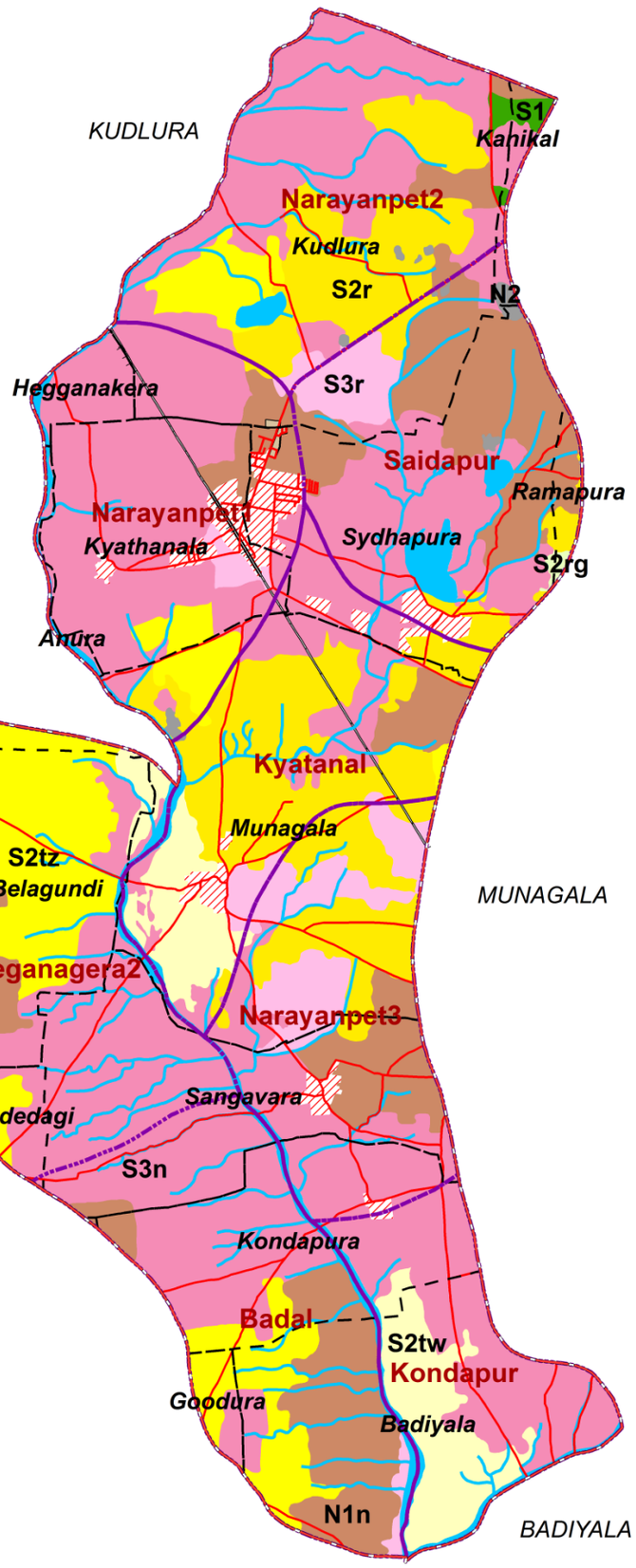


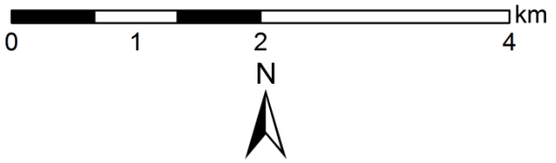
LAND SUITABILITY FOR CHILLI

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT





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

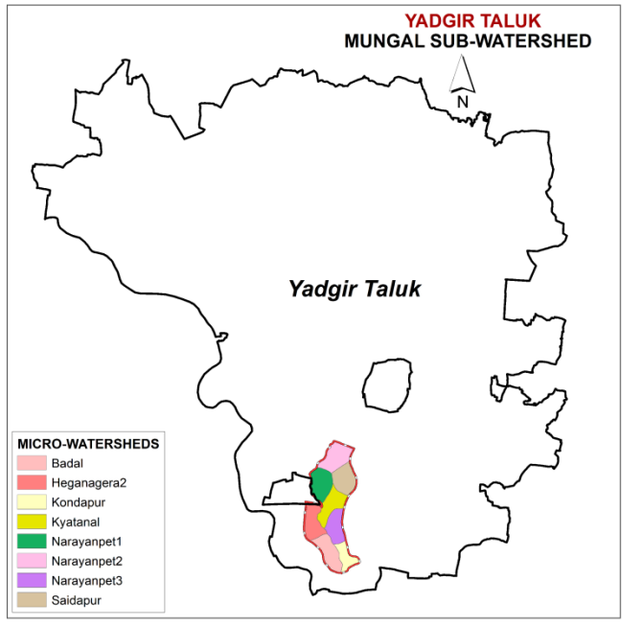
Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	613 (14.02)
S2rg	4 (0.1)
S2tw	227 (5.19)
S2tz	443 (10.12)
S3n	1981 (45.32)
S3r	200 (4.57)
N1n	642 (14.69)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

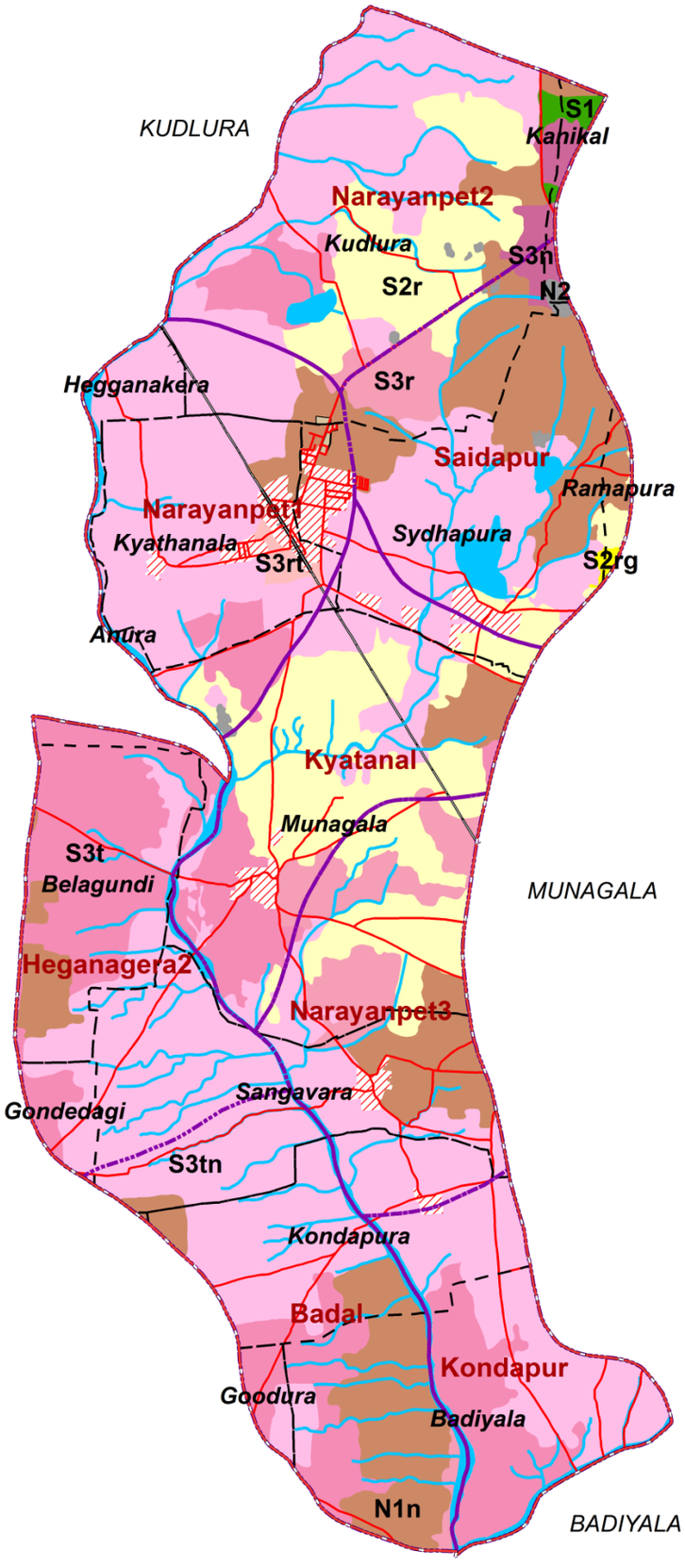
* - Habitation & Waterbody

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





LAND SUITABILITY FOR TOMATO

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	613 (14.02)
S2rg	4 (0.1)
S3n	41 (0.95)
S3r	187 (4.28)
S3t	669 (15.31)
S3rt	13 (0.3)
S3tn	1940 (44.37)
N1n	642 (14.69)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

References

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

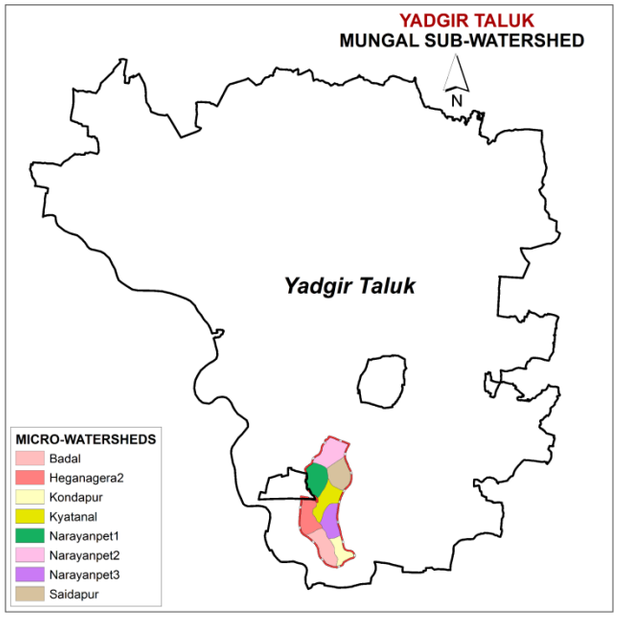
Key

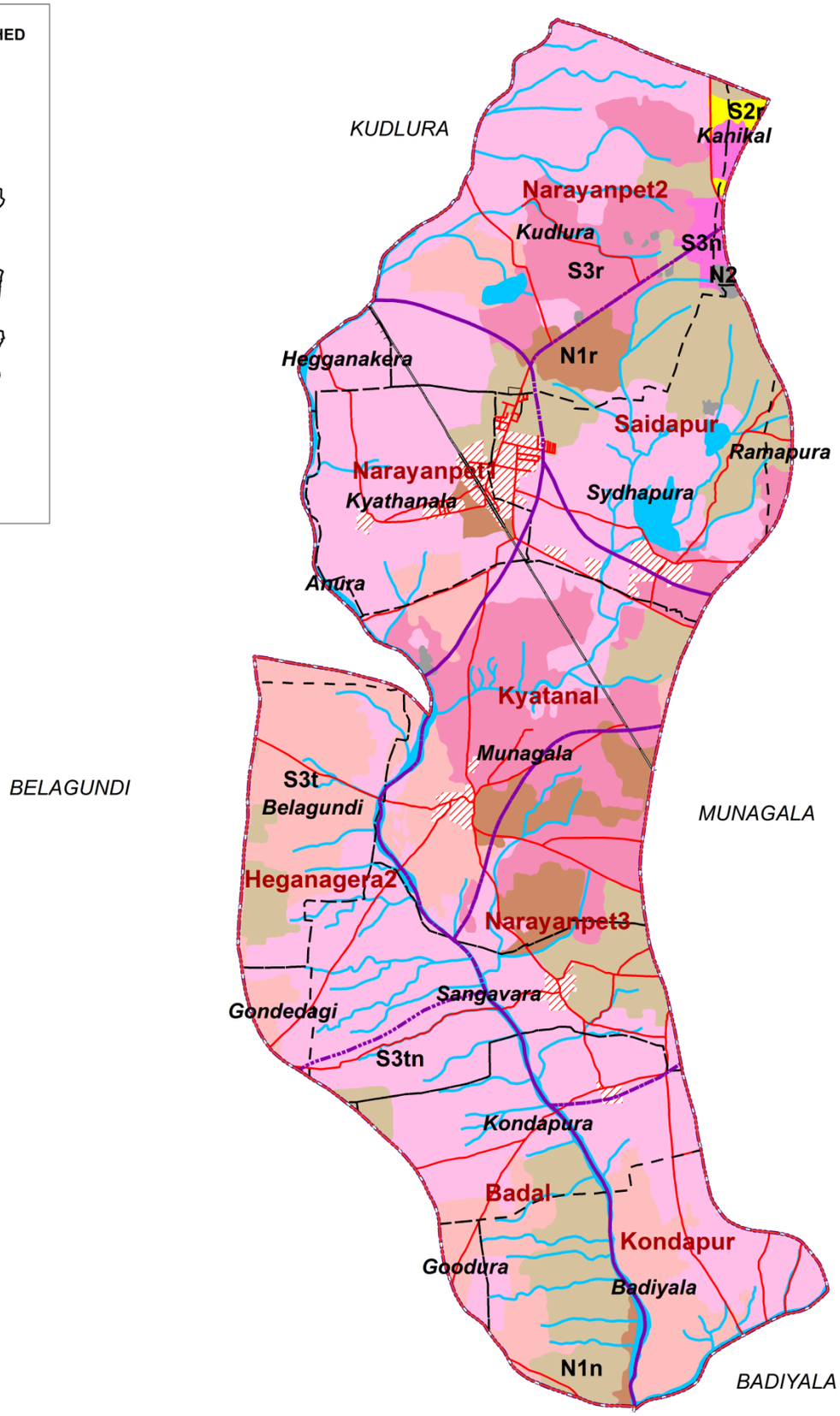
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

Limitations

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

6.10. Land Suitability for Sapota





LAND SUITABILITY FOR SAPOTA

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 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

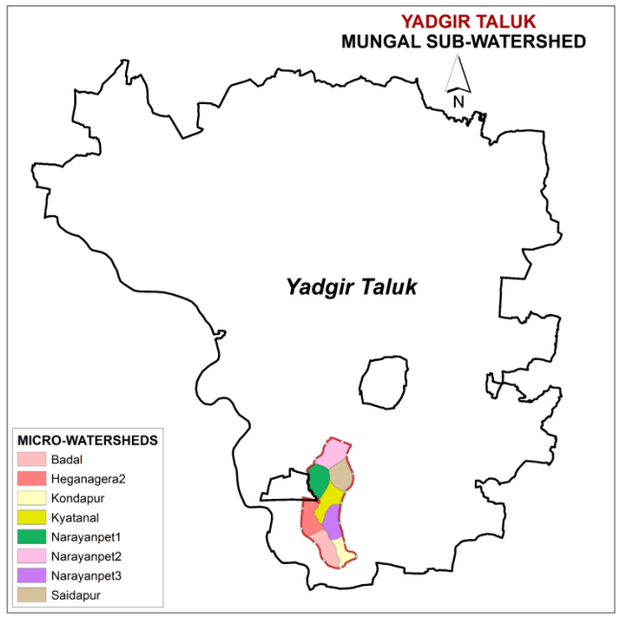
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

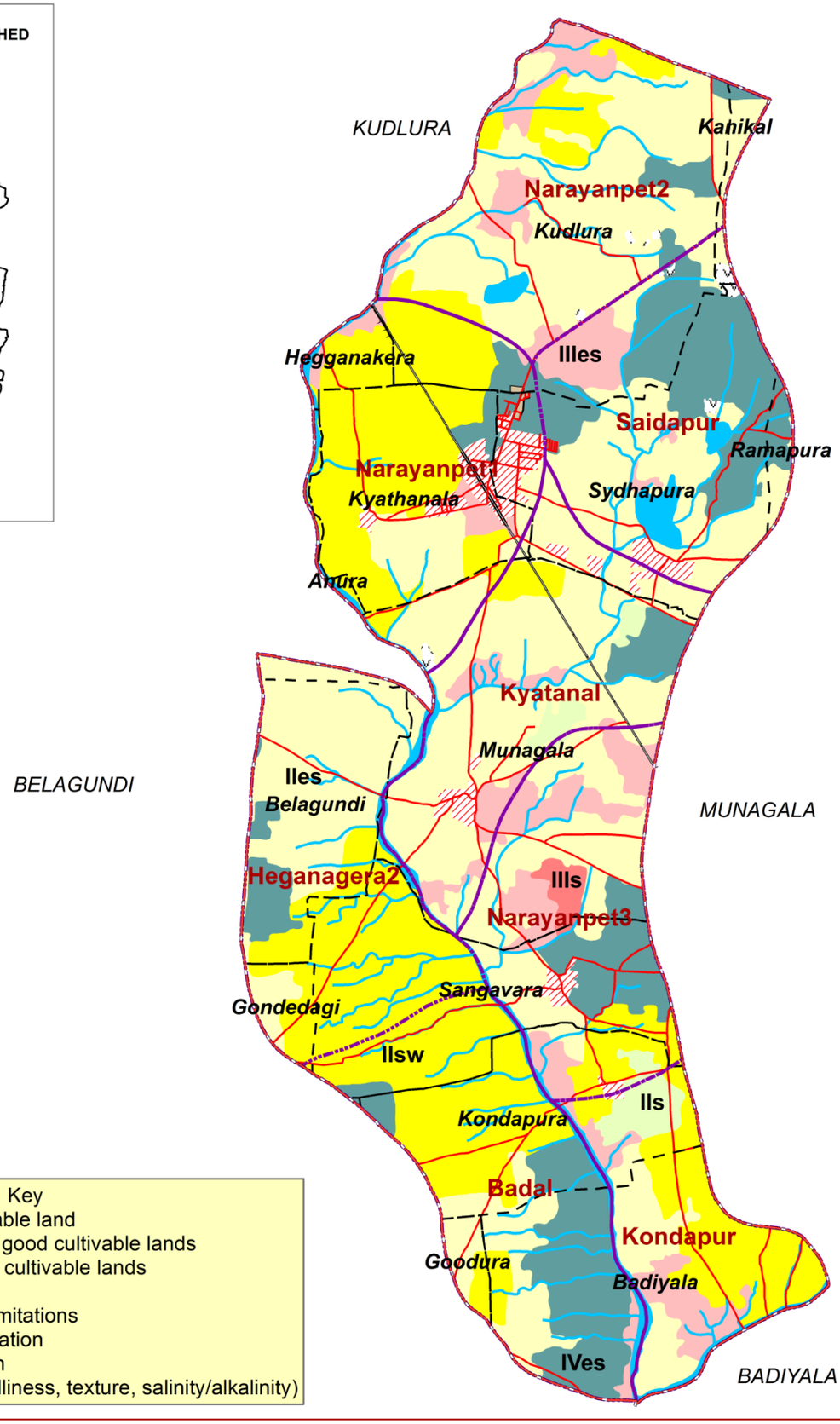
Suitability subclass	Area in ha (%)
S2r	15 (0.34)
S3n	41 (0.95)
S3r	617 (14.12)
S3t	669 (15.31)
S3tn	1940 (44.37)
N1n	642 (14.69)
N1r	200 (4.57)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6.11. Land Suitability for Custard Apple





LAND SUITABILITY FOR CUSTARD APPLE

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

LCC	Area in ha (%)
IIs	67 (1.54)
IIes	1844 (42.17)
IIsw	1182 (27.03)
IIIs	21 (0.48)
IIIes	369 (8.43)
IVes	642 (14.69)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others	221 (5.05)

* - Habitation & Waterbody

References

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

Key

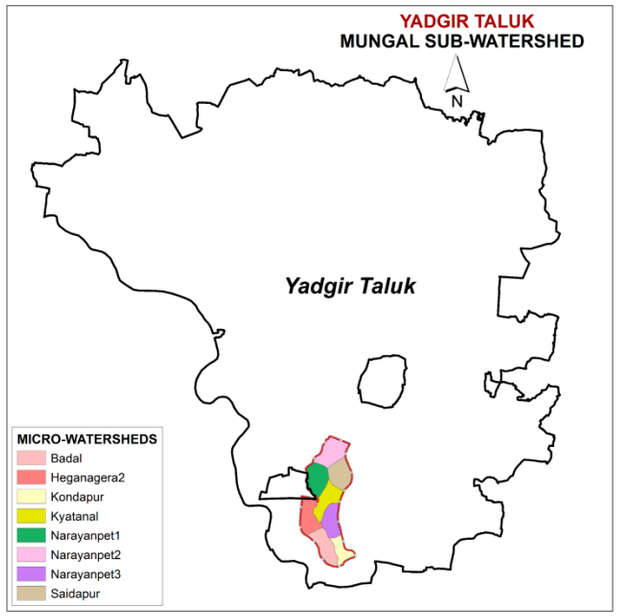
II - Good cultivable land
III - Moderately good cultivable lands
IV - Fairly good cultivable lands

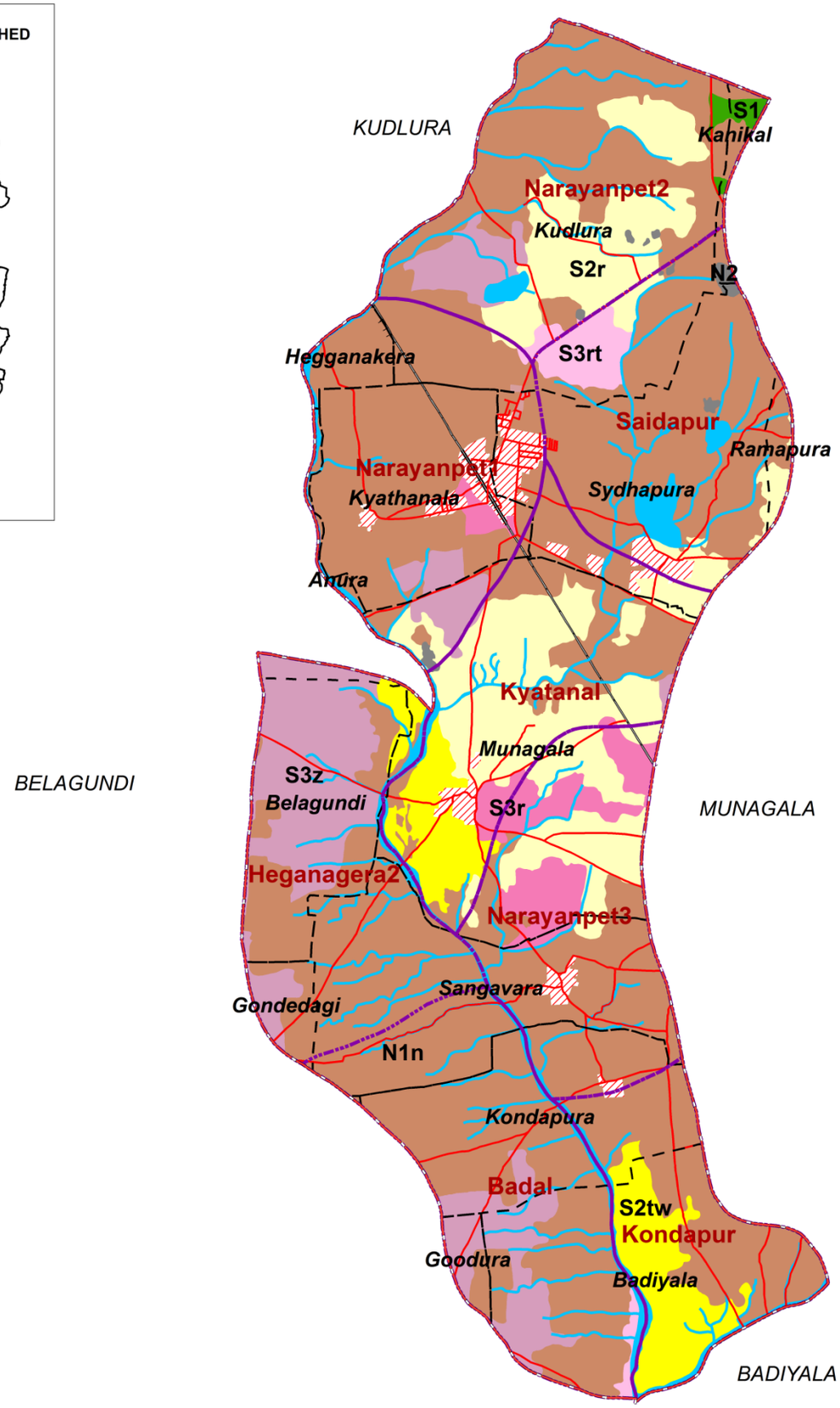
Limitations

e - erosion limitation
s - soil limitation
(depth, gravelliness, texture, salinity/alkalinity)

Source: ICAR-NBSS&LUP, Bengaluru

6.12. Land Suitability for Amla





LAND SUITABILITY FOR AMLA

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 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
w- drainage
z- excess salt/calcareousness

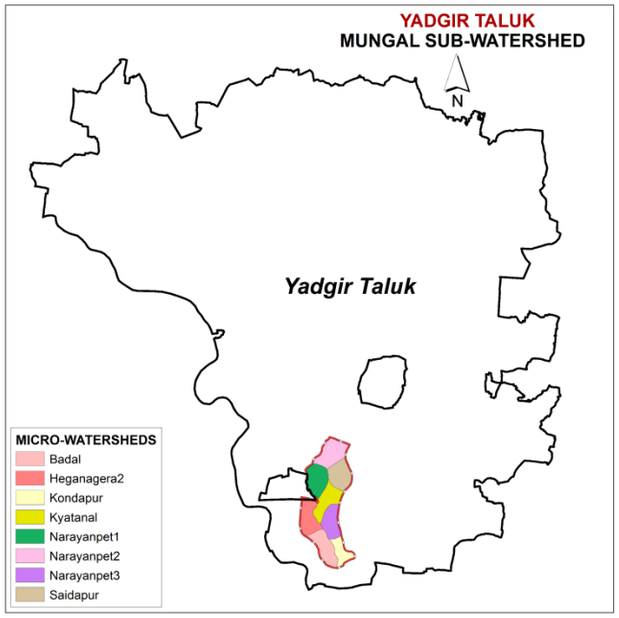
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

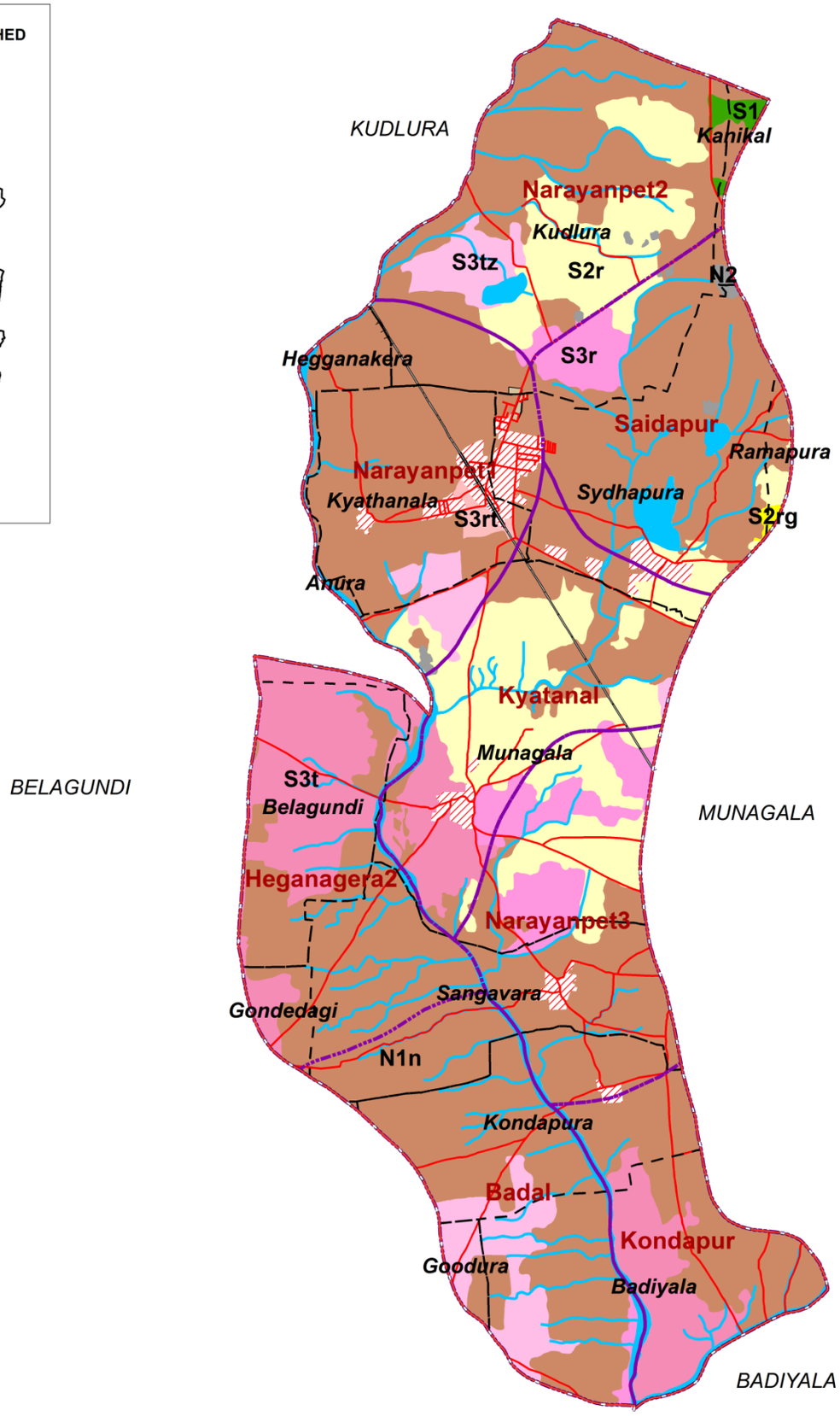
Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	617 (14.12)
S2tw	227 (5.19)
S3r	139 (3.18)
S3z	443 (10.12)
S3rt	61 (1.4)
N1n	2623 (60.01)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6.13. Land Suitability for Onion





LAND SUITABILITY FOR ONION

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

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
z- excess salt/calcareousness

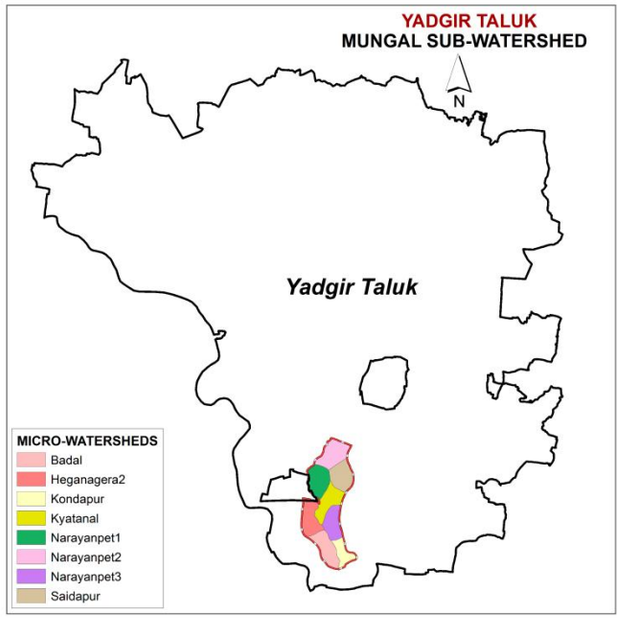
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	613 (14.02)
S2rg	4 (0.1)
S3r	187 (4.28)
S3t	457 (10.44)
S3rt	13 (0.3)
S3tz	213 (4.87)
N1n	2623 (60.01)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6.14. Land Suitability for Marigold



LAND SUITABILITY FOR MARIGOLD

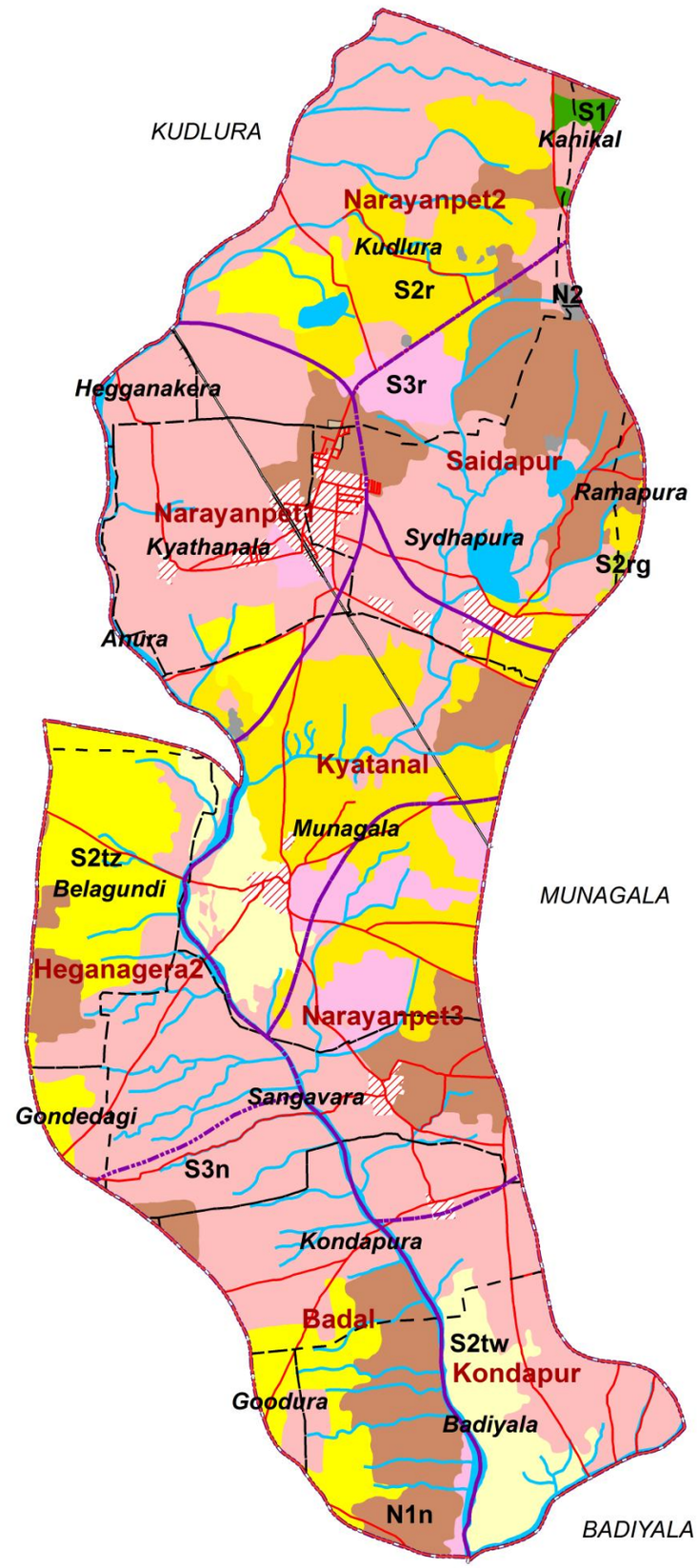
Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N



Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	613 (14.02)
S2rg	4 (0.1)
S2tw	227 (5.19)
S2tz	443 (10.12)
S3n	1981 (45.32)
S3r	200 (4.57)
N1n	642 (14.69)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

* - Habitation & Waterbody

References

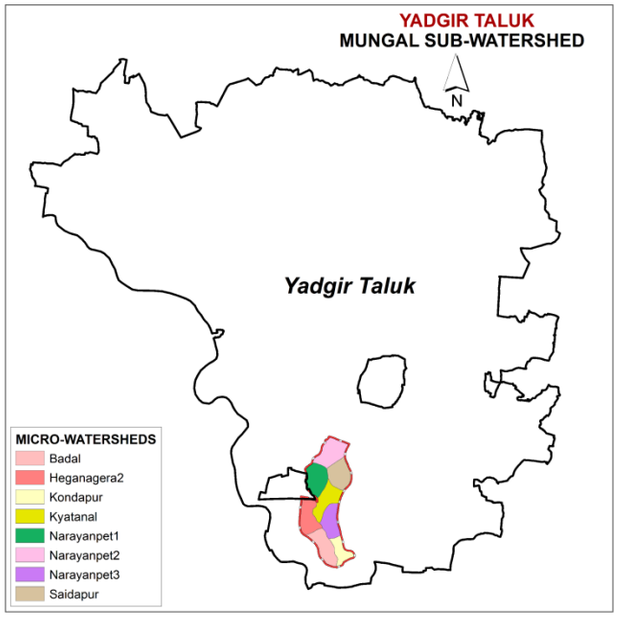
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

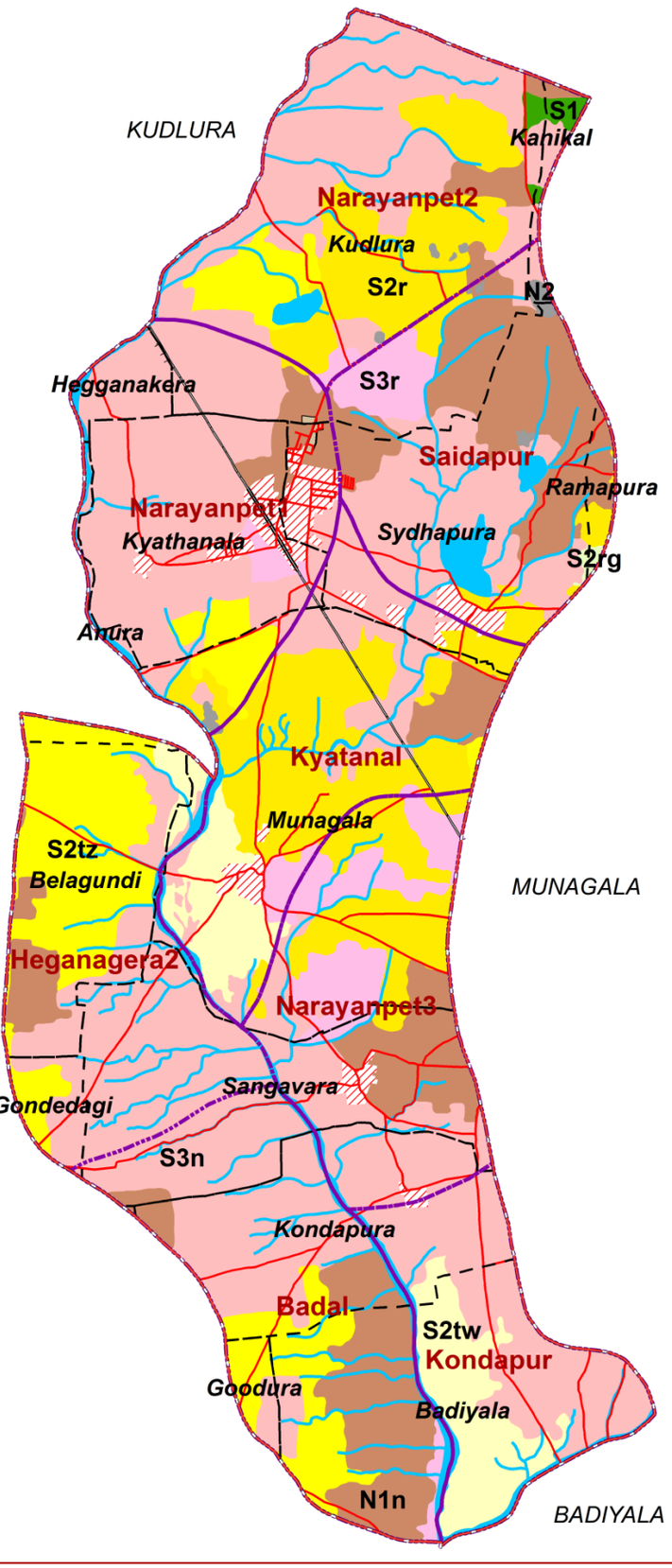
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

6.15. Land Suitability for Chrysanthemum





LAND SUITABILITY FOR CHRYSANTHEMUM

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

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

Suitability subclass	Area in ha (%)
S1	15 (0.34)
S2r	613 (14.02)
S2rg	4 (0.1)
S2tw	227 (5.19)
S2tz	443 (10.12)
S3n	1981 (45.32)
S3r	200 (4.57)
N1n	642 (14.69)
N2	13 (0.31)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Others*	221 (5.05)

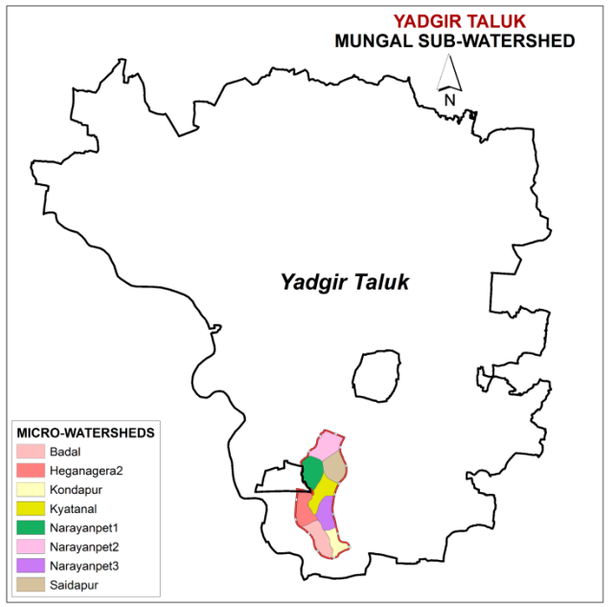
* - Habitation & Waterbody

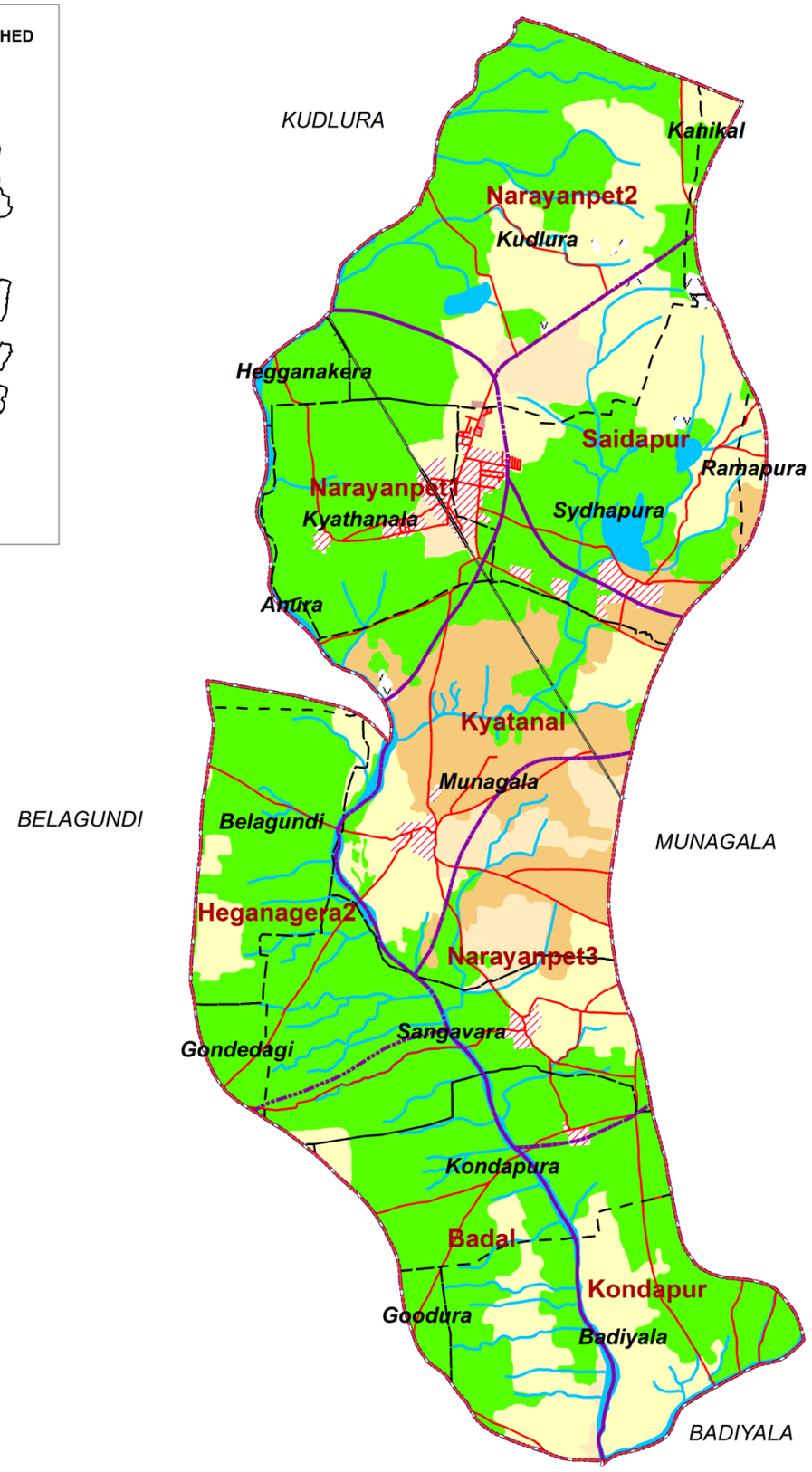
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

7. Soil and Water Conservation Measures

7.1. Soil & Water Conservation Plan





AVAILABLE WATER CAPACITY

Mungal Sub-watershed

(4D5B1R : Area - 4371.7 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

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)	200 (4.57)
Low (51-100 mm/m)	411 (9.4)
Medium (101-150 mm/m)	1034 (23.66)
Very high (>200 mm/m)	2480 (56.72)
Mining/Industrial	2 (0.06)
Railway	10 (0.24)
Rock outcrops	13 (0.31)
Others*	221 (5.05)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

8. Table. Proposed Crop Plan for Mungal Sub-watershed, Sydhapura 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	35.GWDiB2 77.RHNcB2 78.RHNcB3 79.RHNmB2 90.SWRcB2 91.SWRmB2 104.TMKiB2 (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	57.MDGcB2 58.MDGiB2 83.KDRbB2g1 84.KDRcB2 85.KDRcB3 86.KDRhA1 87.KDRiB2 88.KDRiB3 89.KDRmB2 93.HGNiB2 94.HGNiB3 95.HGNmB2 (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
3	33.HSLiB2 48.NGPiB2 62.BMNmB2 80.MGLcB2 81.MGLcB3 82.MGLmB2 (Moderately deep to very deep, black calcareous 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

To be continued….

LMU.No	Soil Map Units	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
4	20.JNKcB2 71.RMPiB2 73.BLDcB2 74.BLDhB3 75.BLDiB1g1 76.BLDmB2 (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
5	27YLRbB2 29YLRcB2g1 31YLRiB2 (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
6	6BDLiB3 66KLKmB3 68KYTcB2 69KYTmB1 (Shallow to very 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

PART - B

Hydrological Inventory of Mungal 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 Mungal 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

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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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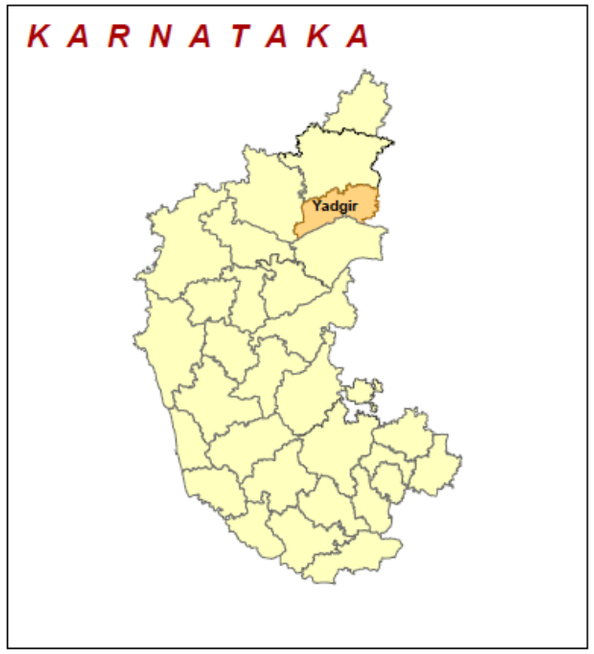
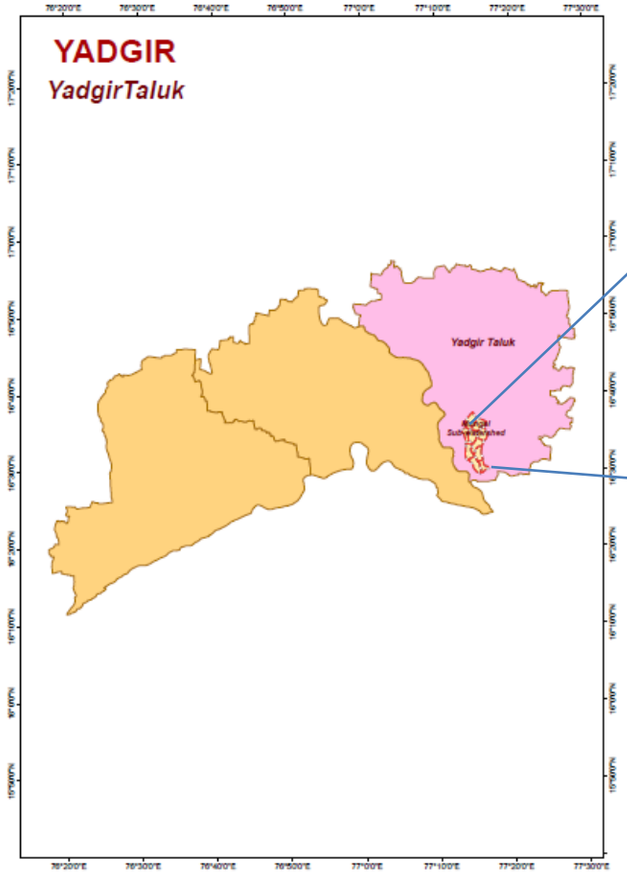
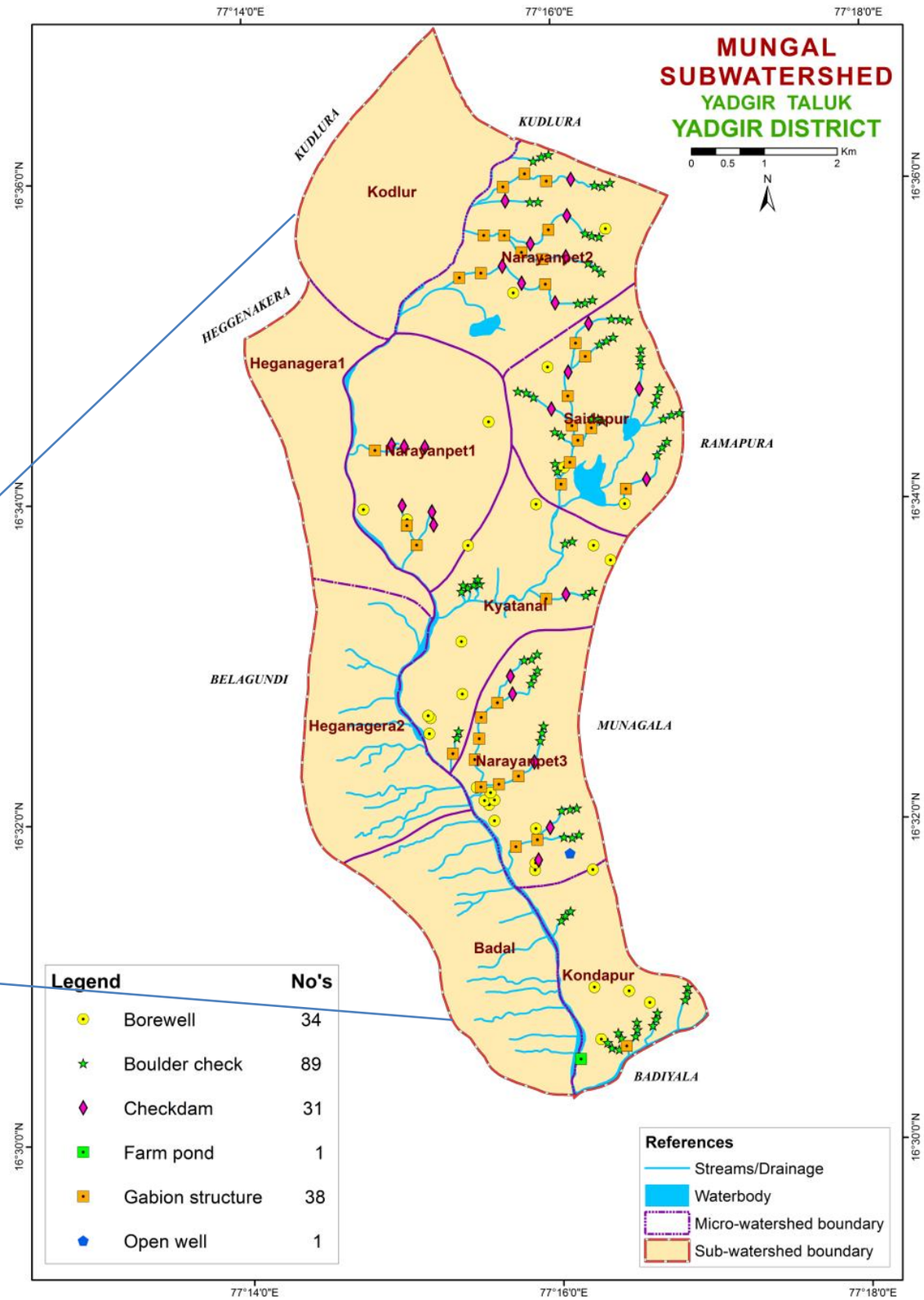
INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Mungal sub-watershed (4D5B1R) in Yadgir taluk, Yadgir district, has been undertaken for integrated planning, development and management at the level of soil mapping units.
- Mungal sub-watershed (Yadgir taluk, Yadgir district) is located between 16^0 29'23"– 16^0 37'13" North latitudes and $77^0$12'15"–$77^0$18'45" East longitudes, covering an area of about 5493 ha.
- This sub-watershed encompasses of 10 MWs namely, Narayanpet-1 (4D5B1R1b), Heganagera-1 (4D5B1R2b), Kodlur (4D5B1R2a), Badal (4D5B1R2d), Kondapur (4D5B1R1f), Narayanpet-2 (4D5B1R1a), Saidapur (4D5B1R1c), Kyatanal (4D5B1R1d), Heganagera-2 (4D5B1R2c) and Narayanpet-3 (4D5B1R1e) micro watersheds. Land Resource Inventory (LRI) was generated for eight 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, Chilli, Soybean, Paddy and major *rabi* crops are Sorghum, Bengal gram and 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 MUNGAL SUB-WATERSHED

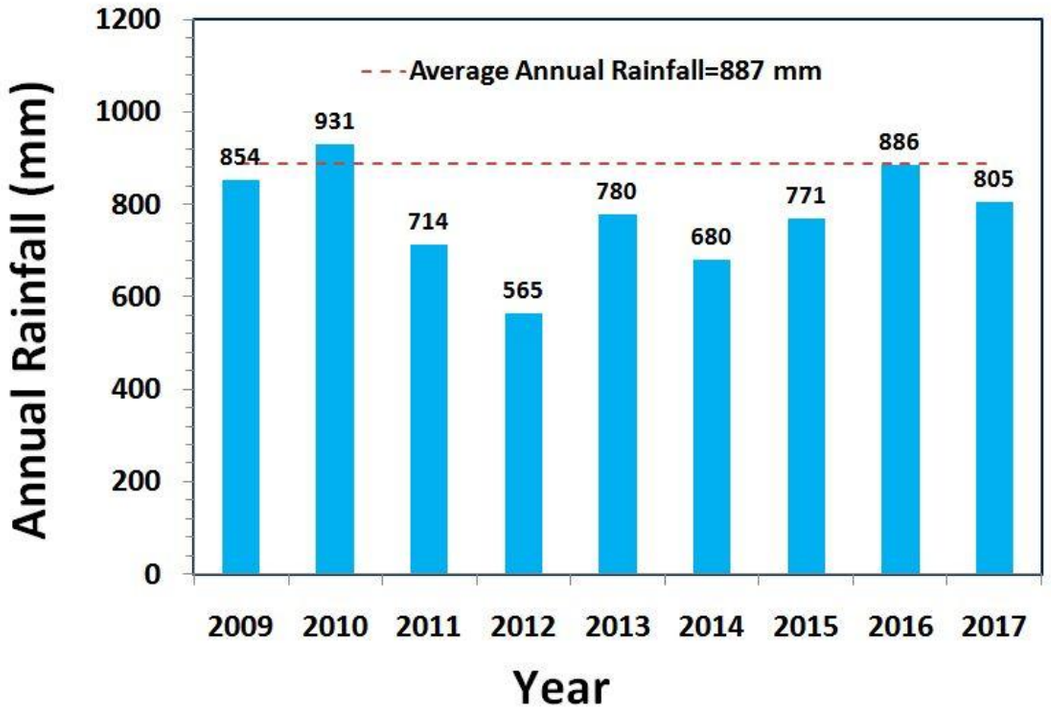






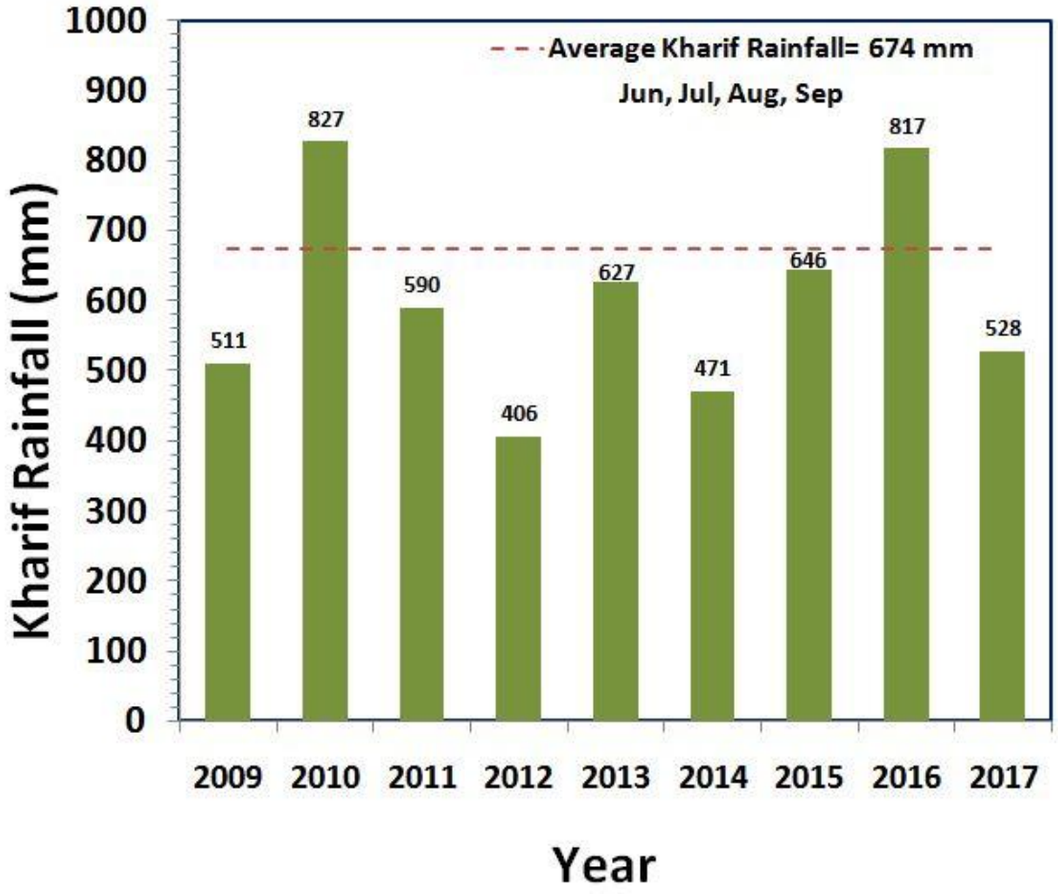
Soil & Water Conservation Structures in Mungal Sub-watershed, Yadgir taluk, Yadgir district

RAINFALL INDEX

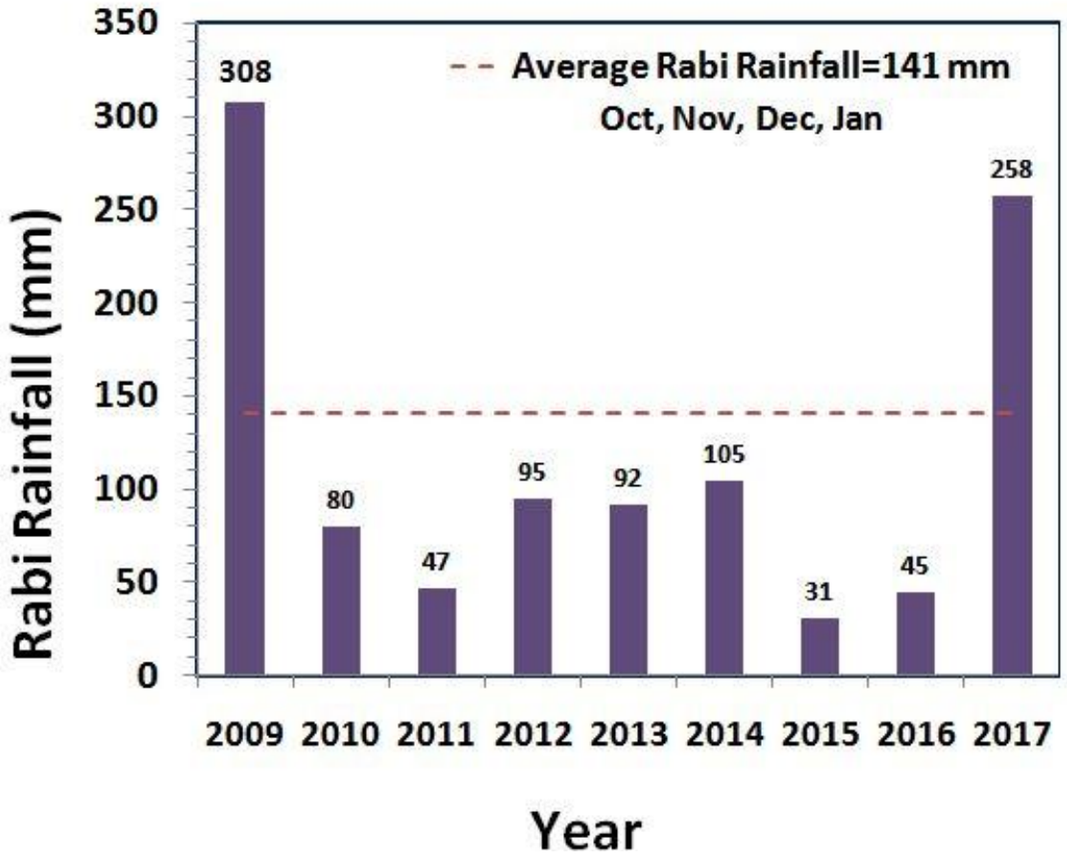


The average annual rainfall (1960-2014) recorded at the Yadgir station in Yadgir taluk of Yadgir district is 887 mm. The annual rainfall at Sydhapura station (Hobli H.Q.) is presented. During the years 2009, 2011, 2012, 2013, 2014, 2015 and 2017 the annual rainfall was deficient by 4%, 20%, 36%, 12%, 23%, 13% and 9% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 77% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2009, 2011, 2012, 2013, 2014, 2015 and 2017 the *kharif* rainfall was deficient by 24%, 12%, 40%, 7%, 30%, 4% and 22% respectively.

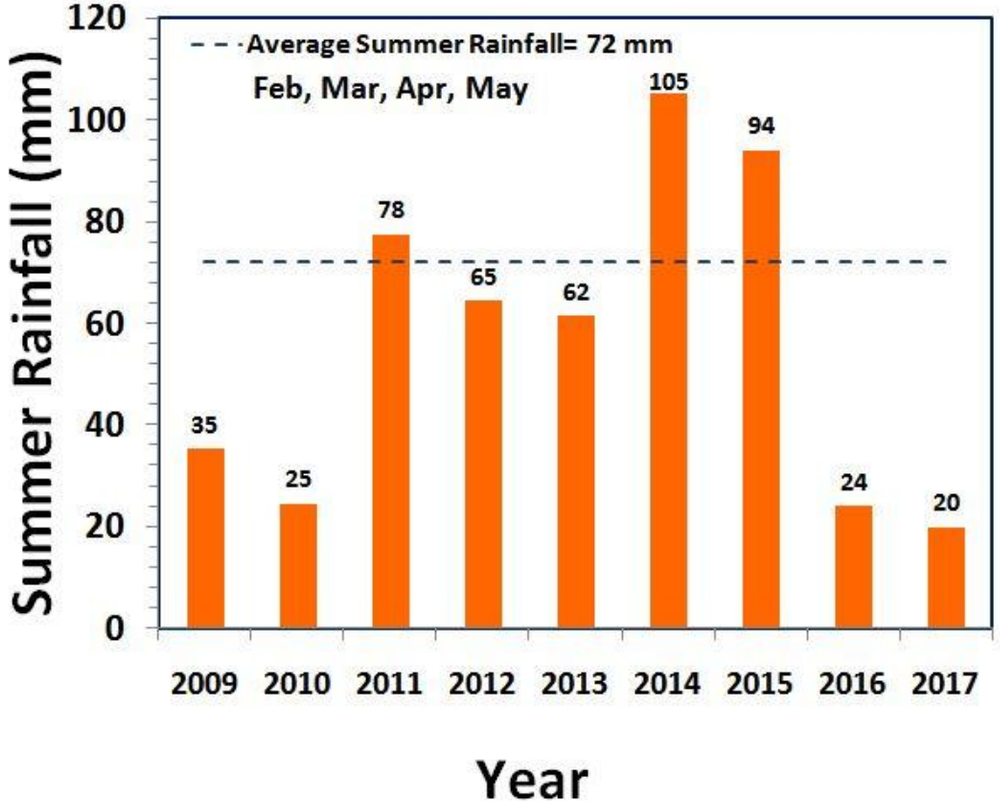


RAINFALL INDEX

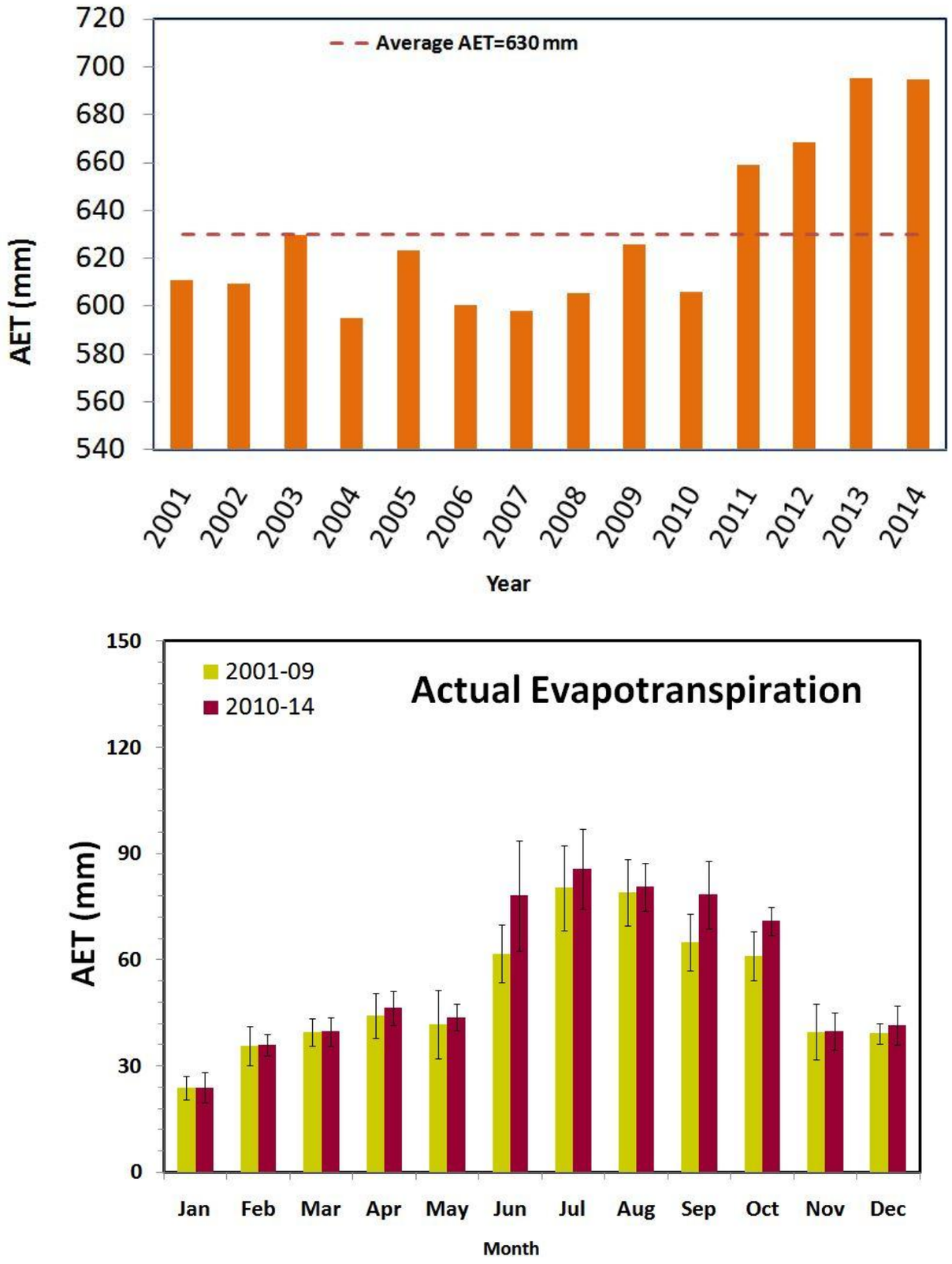


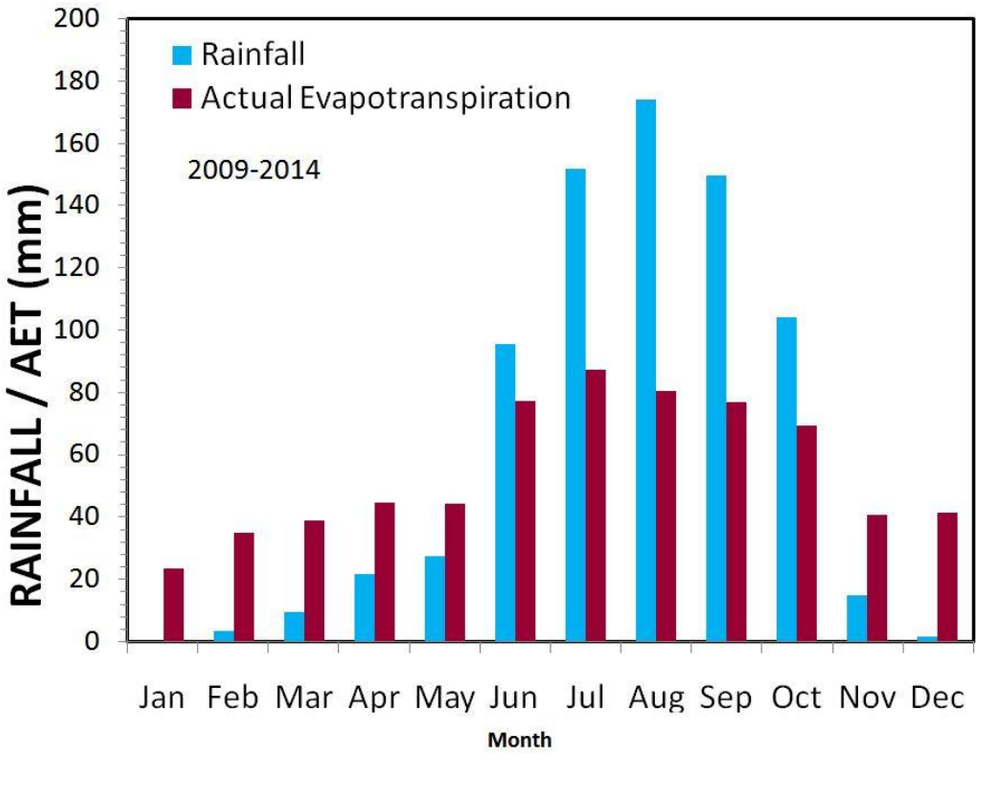
The average *rabi* rainfall (Oct-Jan) is about 15 % of the average annual rainfall. During the years 2009 and 2017 high *rabi* rainfall was received, where as other years showed deficient rainfall.

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



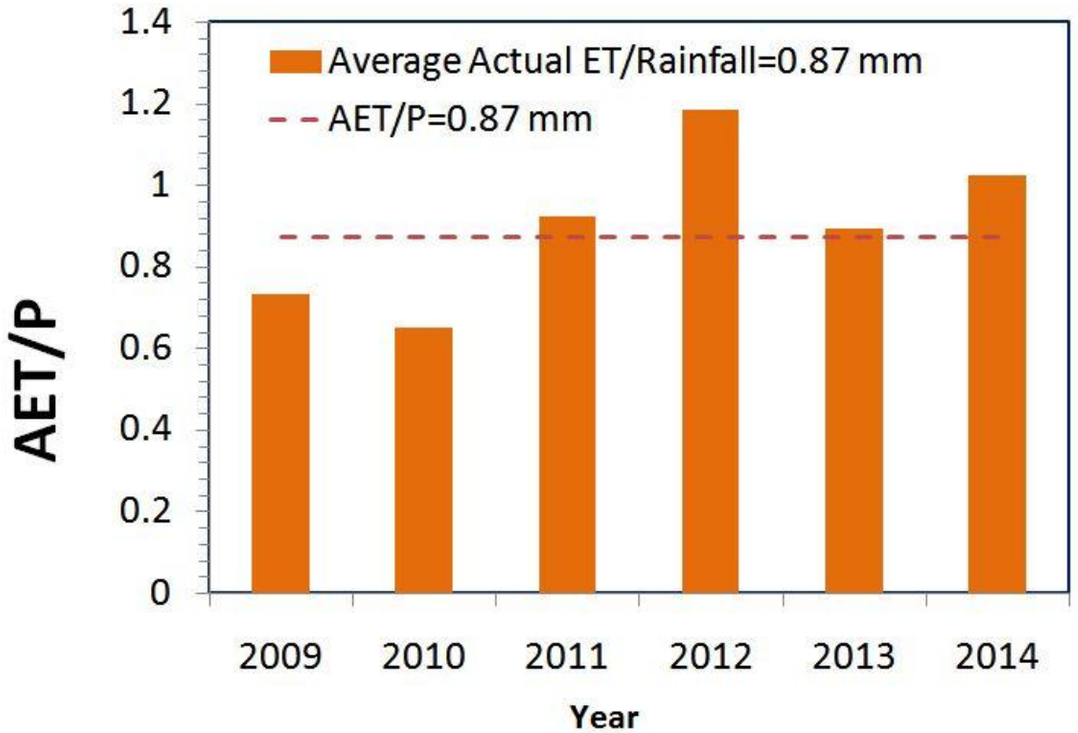
EVAPOTRANSPIRATION

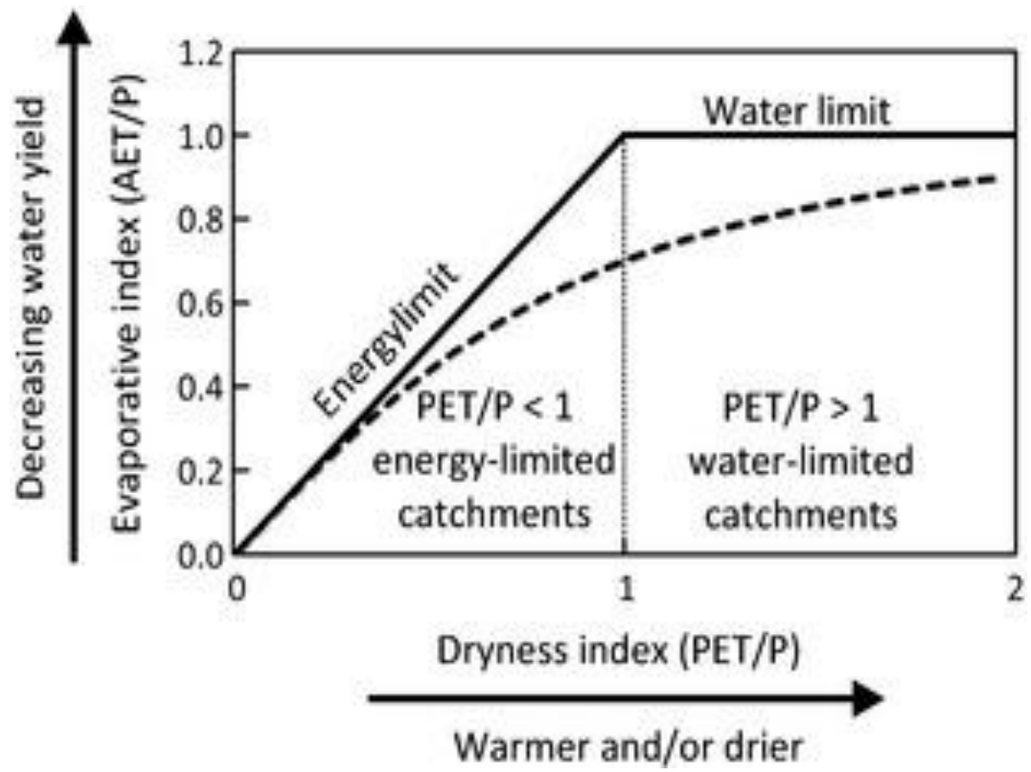




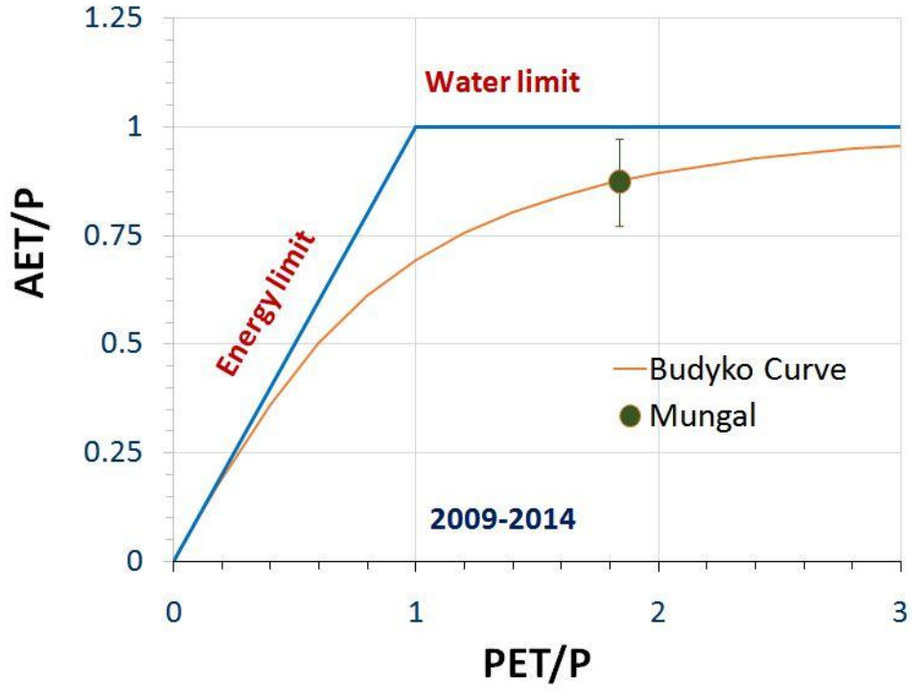
The average annual actual ET is lower than the average annual rainfall. During *kharif*, average rainfall and ET was found to be 602 mm and 321 mm respectively, whereas in *rabi* it was about 118 mm and 175 mm. In comparison to the 2001-2009, the annual ET increased by 8 % during 2010-2014.

EVAPOTRANSPIRATION INDEX

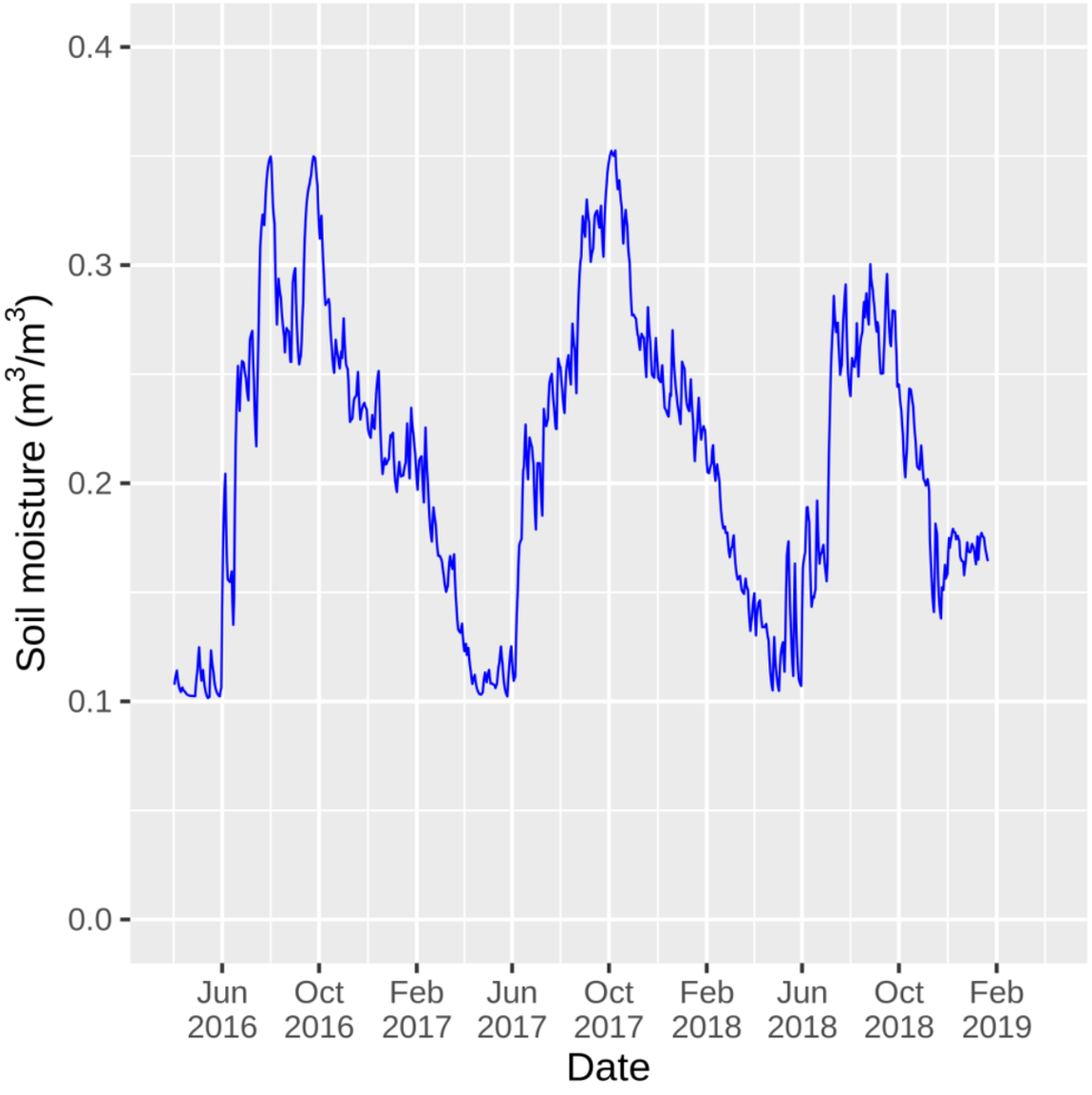


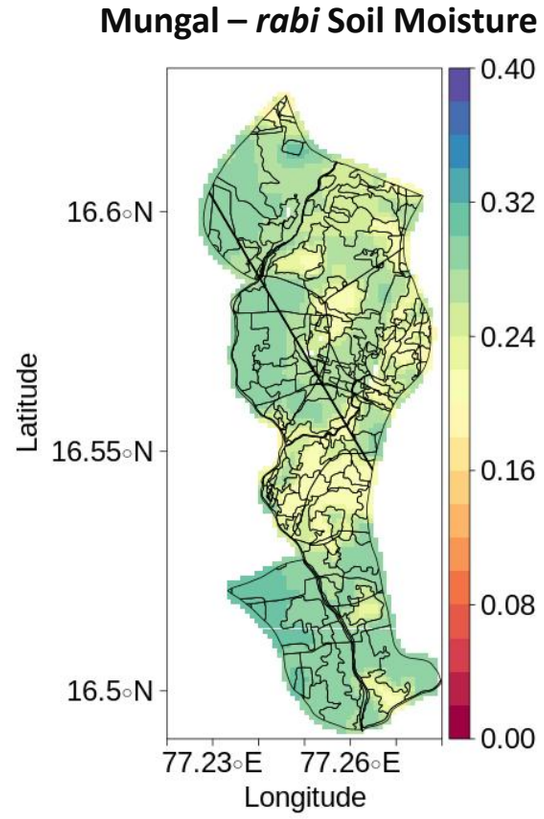


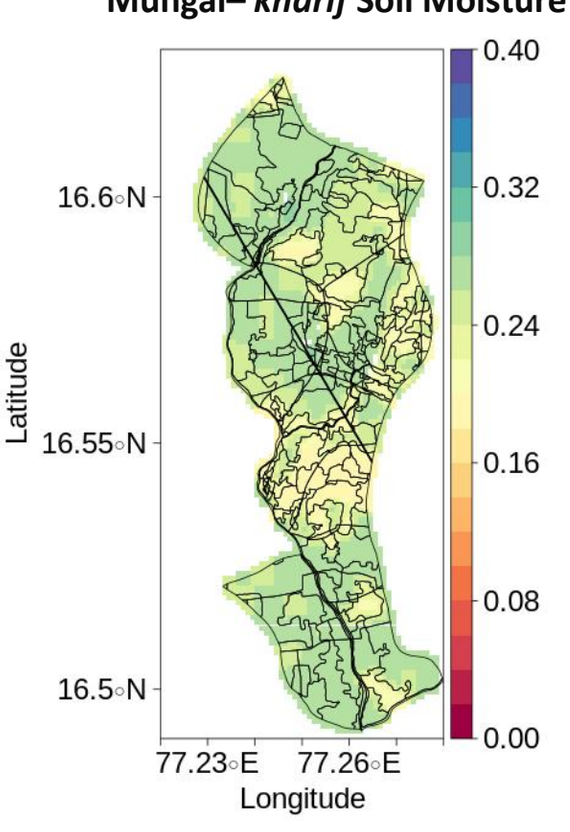
The average AET/P ratio was about 87%, which is slightly higher than the sustainable limit of about 80%.This suggests the sub-watershed is in sustainable limit due to good rainfall during *kharif* season.



SATELLITE RETRIEVED SOIL MOISTURE





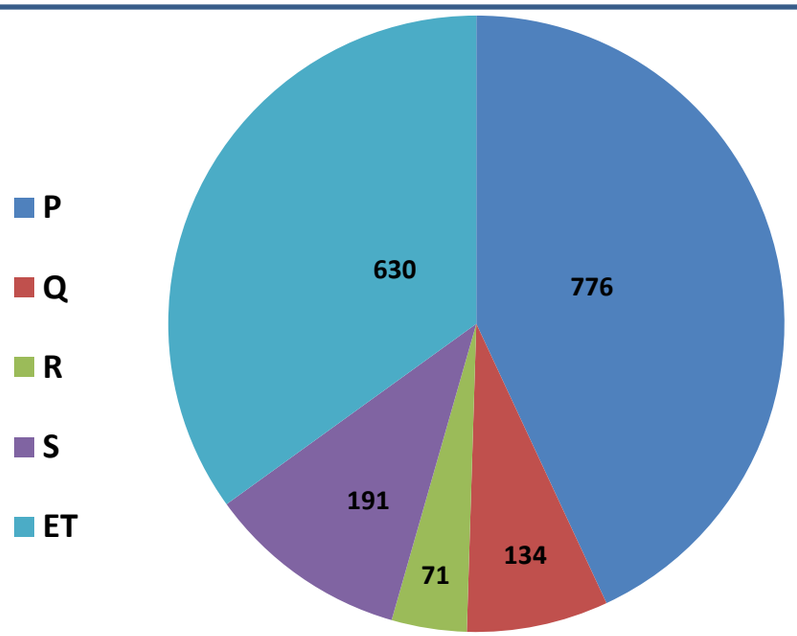


The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 10-30% in *kharif* and 22-35% in *rabi* seasons of 2016, 12-30% in *kharif* and 26-35% in *rabi* seasons of 2017 and 11-25% in *kharif* and 17-27% in *rabi* seasons of 2018.

WATER BALANCE

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

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

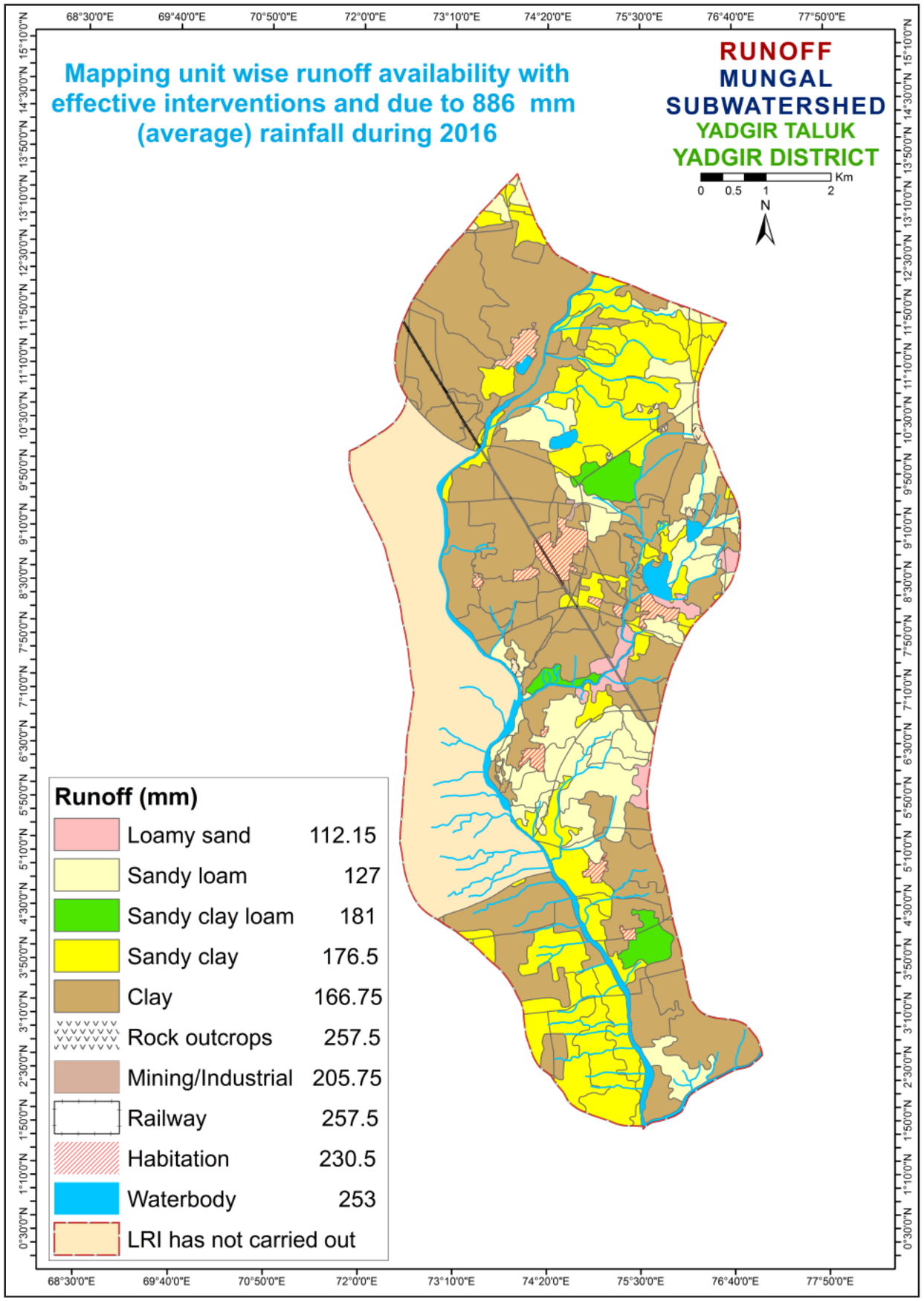


During June-September months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

P = 776 mm (average of 2009-2017) ET = 630 mm R = 71 mm S = 191 mm Q = 134 mm

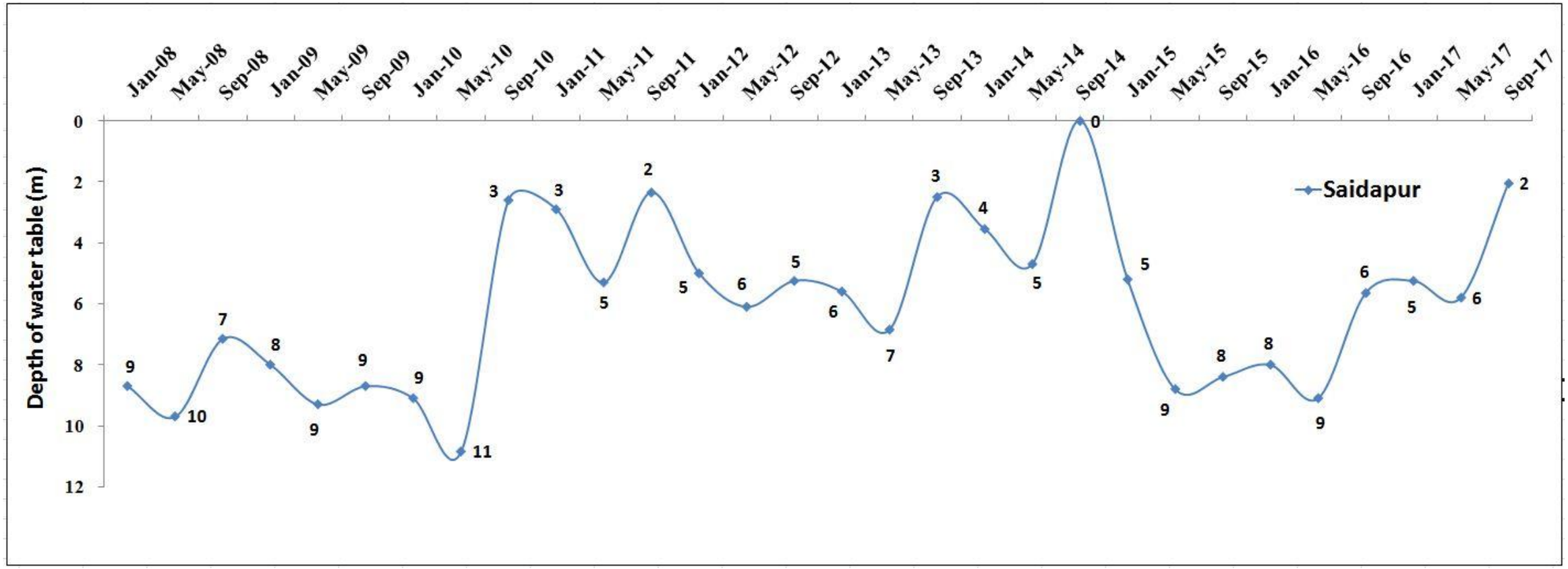
Sl. No.	Parameters	Average_ 2016 (mm)
1.	Rainfall	886
2.	Runoff availability with existing conditions	204
3.	Runoff availability with effective interventions	167
4.	Runoff allowed as environmental flow at the outlet	33
5.	Runoff excess for harvesting by construction of structures	134

RUNOFF


Mapping unit wise runoff availability with effective interventions and due to 886 mm (average) rainfall during 2016
RUNOFF
MUNGAL
SUBWATERSHED
YADGIR TALUK
YADGIR DISTRICT
0 0.5 1 2 Km
N
Runoff (mm)
Loamy sand 112.15
Sandy loam 127
Sandy clay loam 181
Sandy clay 176.5
Clay 166.75
Rock outcrops 257.5
Mining/Industrial 205.75
Railway 257.5
Habitation 230.5
Waterbody 253
LRI has not carried out
68°30'0"E
69°40'0"E
70°50'0"E
72°0'0"E
73°10'0"E
74°20'0"E
75°30'0"E
76°40'0"E
77°50'0"E

GROUND WATER STATUS

SAIDAPUR STATION



The total number of wells present in Mungal Sub-watershed as per LRI data is 34 (34-Borewells & Openwell-1). The groundwater level was found from the data obtained from KSNDMC for the nearest station Saidapur. The above graph depicts the groundwater levels during the years 2008-2010 was constant except September 2010 were groundwater level inclined and slightly varied. Deepest levels were found in 2010.

x

SUMMARY

- The average annual rainfall of 887 mm in the Mungal sub-watershed as recorded from the Sydhapura station data by KSNDMC.

- 77 percent, 15 percent and 8 percent 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 limit.

- The estimated runoff available to use is 134 mm for an average annual rainfall of 776 mm (2009-2017). The utilizable groundwater is 50 mm (70% of 71 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (191 mm) and utilizable runoff plus recharge is 375 (=191+50+134)

- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the kharif and rabi seasons is 495 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 619 mm (i.e 125% of AET). This demand for the two seasons is higher by 244 mm, i.e. (619-375). The AET in June-Sept months is 56% 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 Mungal Sub-watershed as per LRI data is 34 (34-Borewells & Openwell-1). The groundwater level was found from the data obtained from KSNDMC for the nearest station Saidapur. Deepest levels were found in 2010.