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

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

ICAR - NBSS & LUP

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

About ICAR - NBSS&LUP

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

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

Citation: Rajendra Hegde, B.A. Dhanorkar,, S. Srinivas, K.V. Niranjana, R.S.Reddy and S.K. Singh (2019). "Land Resource and Hydrological Inventory of Chandaraki Sub-watershed for Watershed Planning and Development, Yadgir Taluk, Yadgir District, Karnataka", Sujala SWs-LRI Atlas No. 21, ICAR – NBSS & LUP, RC, Bangalore. p.58.

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PART-A

Land Resource Inventory of Chandaraki 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 Chandaraki 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.

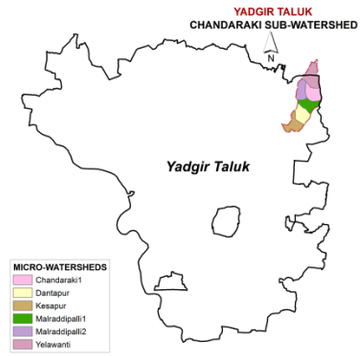
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

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.

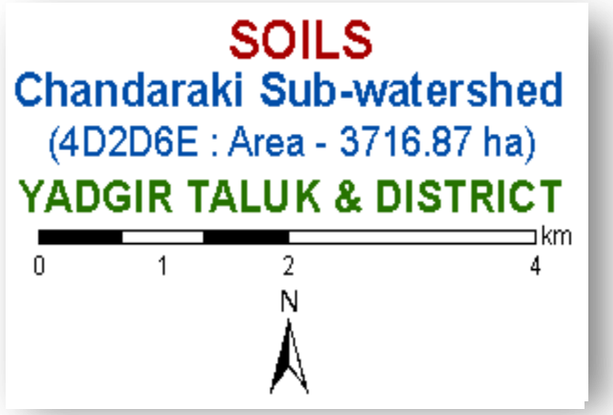
Inset map

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



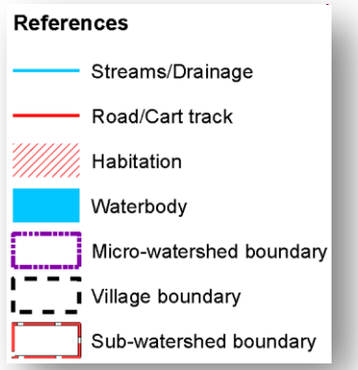
Map title

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



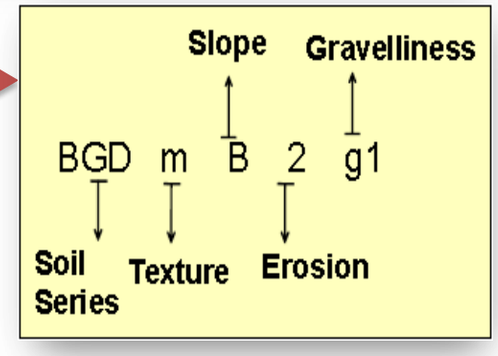
Legends and symbols

*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.*



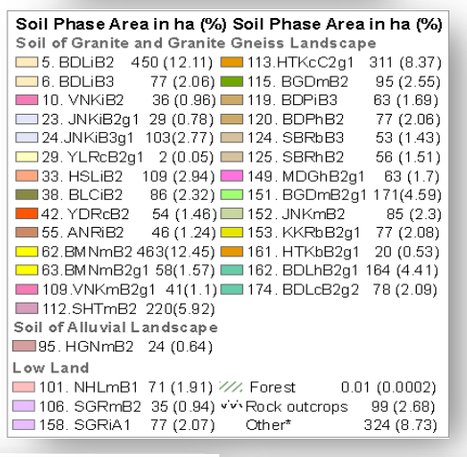
Soil Units

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.



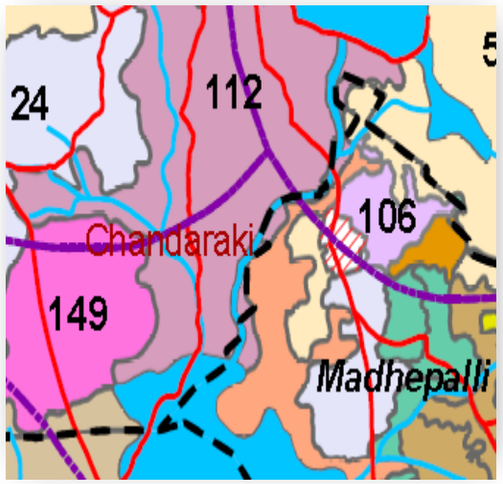
Map colours

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



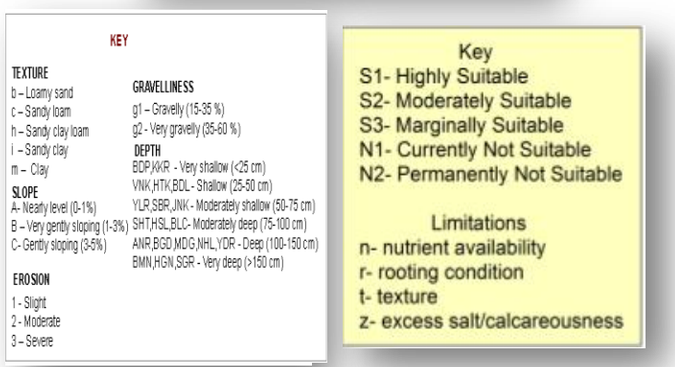
Soil and plot boundaries

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 Chandaraki Sub-watershed covering an area of 3716.87 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.

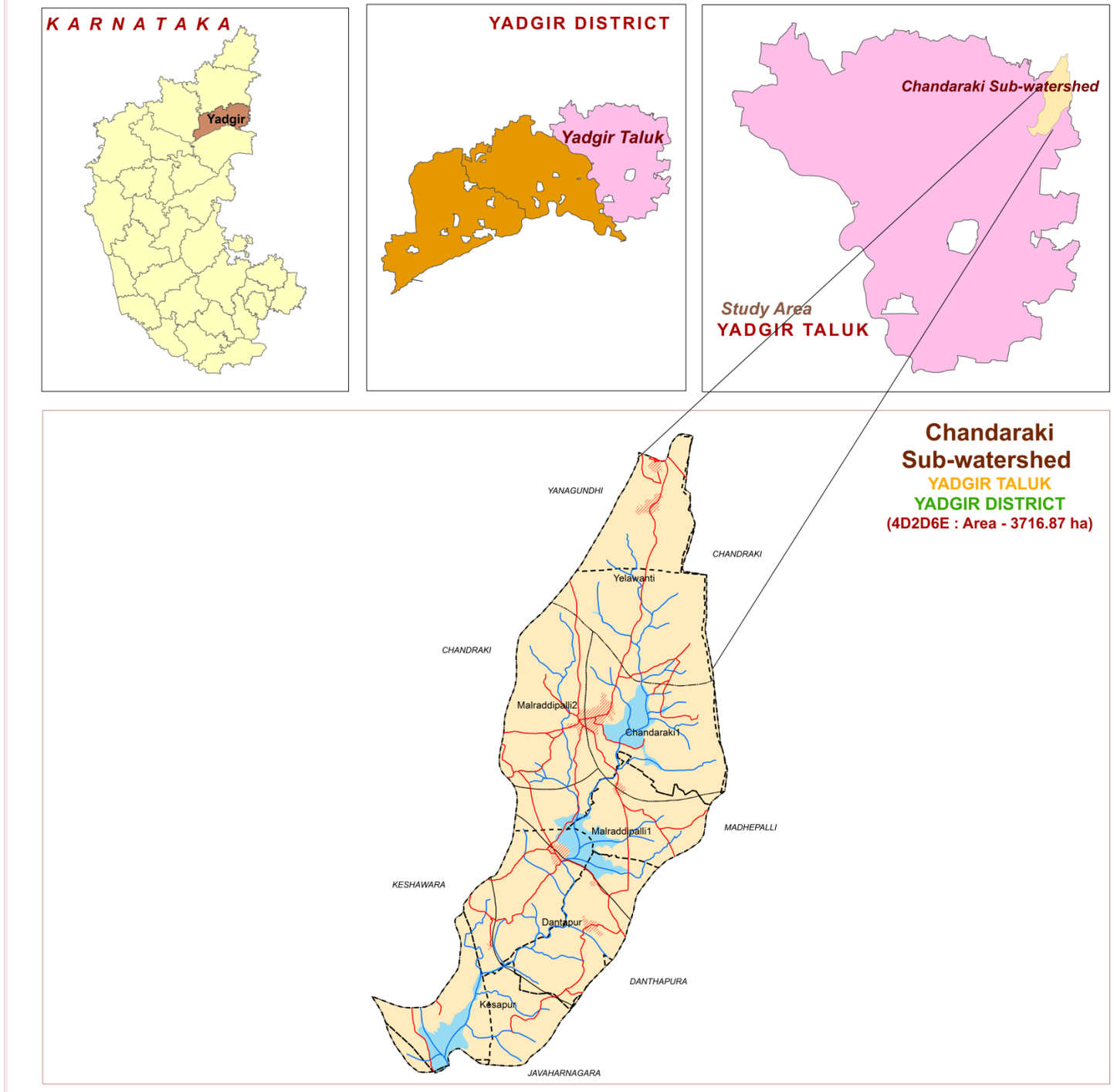
2. General Description of Sub-watershed

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$47’ – $16^0$54’ and east longitudes 77^0 23’ – 77^0 27’. 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 SWs-LRI for the Chandaraki Sub-watershed in Yadgir taluk, Yadgir district. It was selected for data base generation under Sujala III project. Chandaraki Sub-watershed (code– 4D2D6E) is covering an area of 3716.87 ha and spread across Chandraki,Yanagundhi, Madhepalli,Danthapura,keshawara and Javaharnagar Villages.

2.1. Location and Extent

LOCATION MAP OF CHANDARAKI SUB-WATERSHED

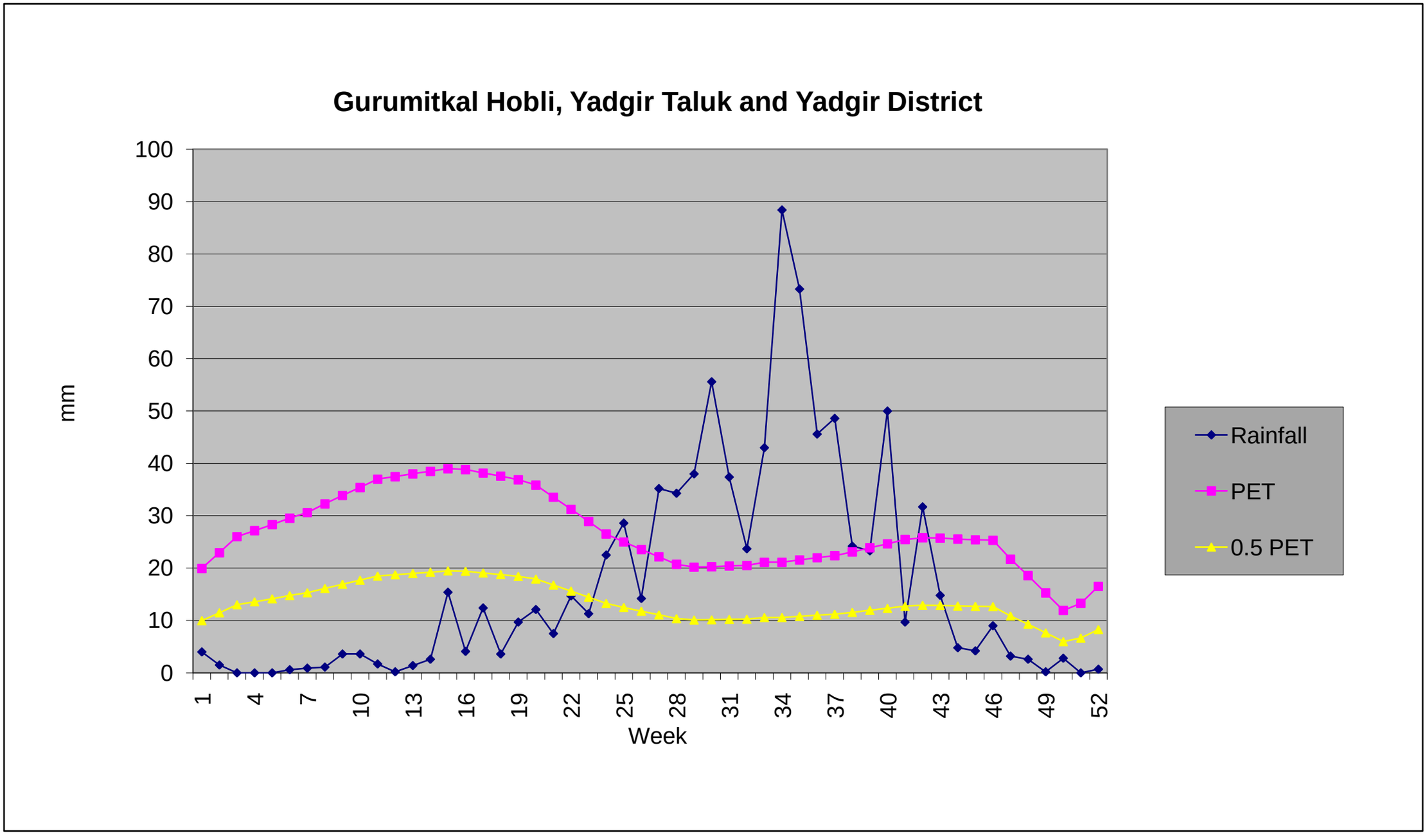


The Chandraki Sub-watershed (Yadgir taluk, Yadgir district) is located in between 16^0 47' – 16^0 54' North latitudes and $77^0$23' – $77^0$27' East longitudes, covering an area of about 3716.87 ha, bounded by Chandraki, Yanagundhi, and Madhepalli Villages.

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

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

Climate

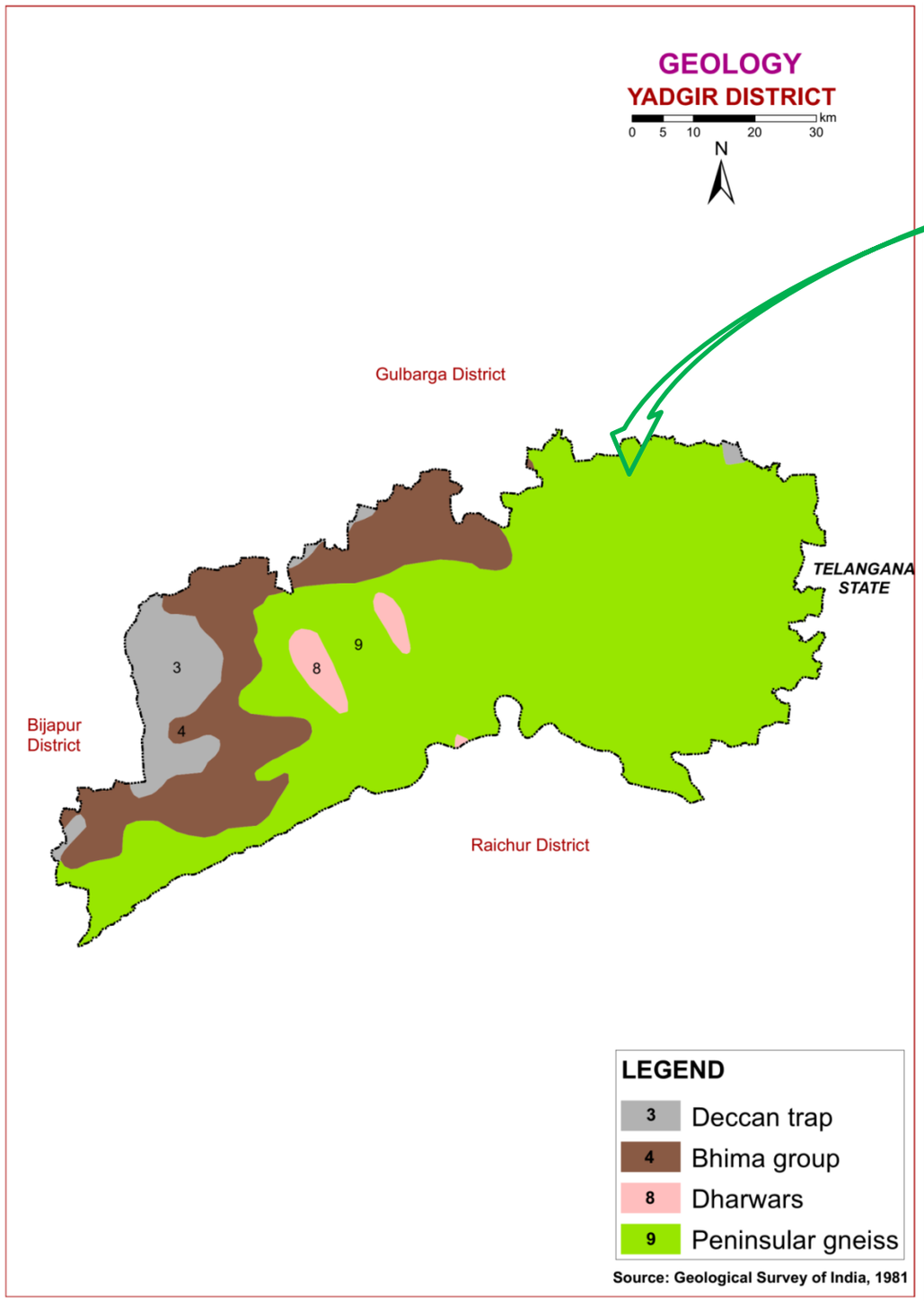


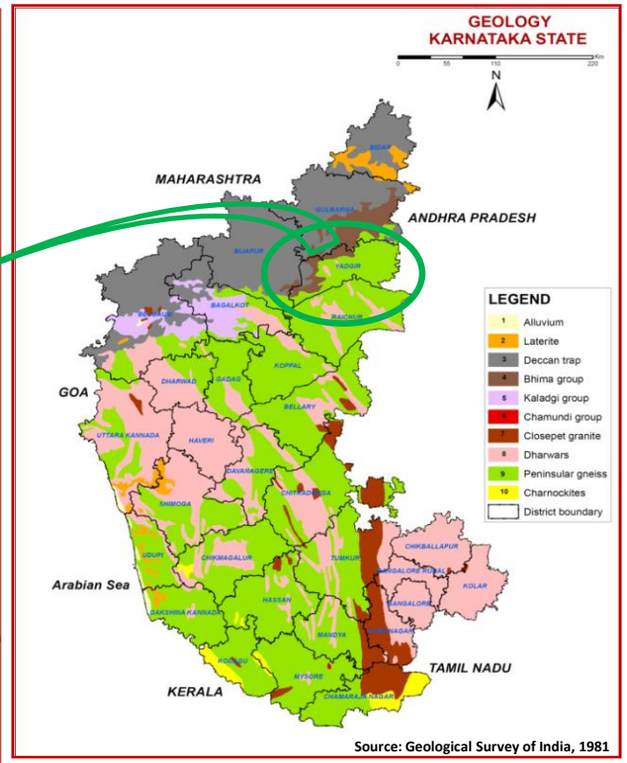
Length of Growing Period (LGP) is varying from June 4th week to 3rd week of October (120 - 150 days)

Annual Rainfall : 882 mm. in the Gurumitkal 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.

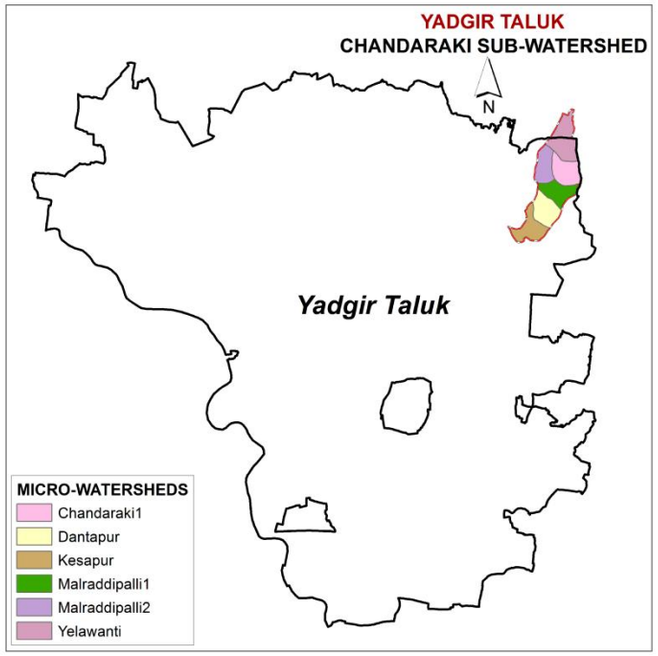
3. Survey Methodology

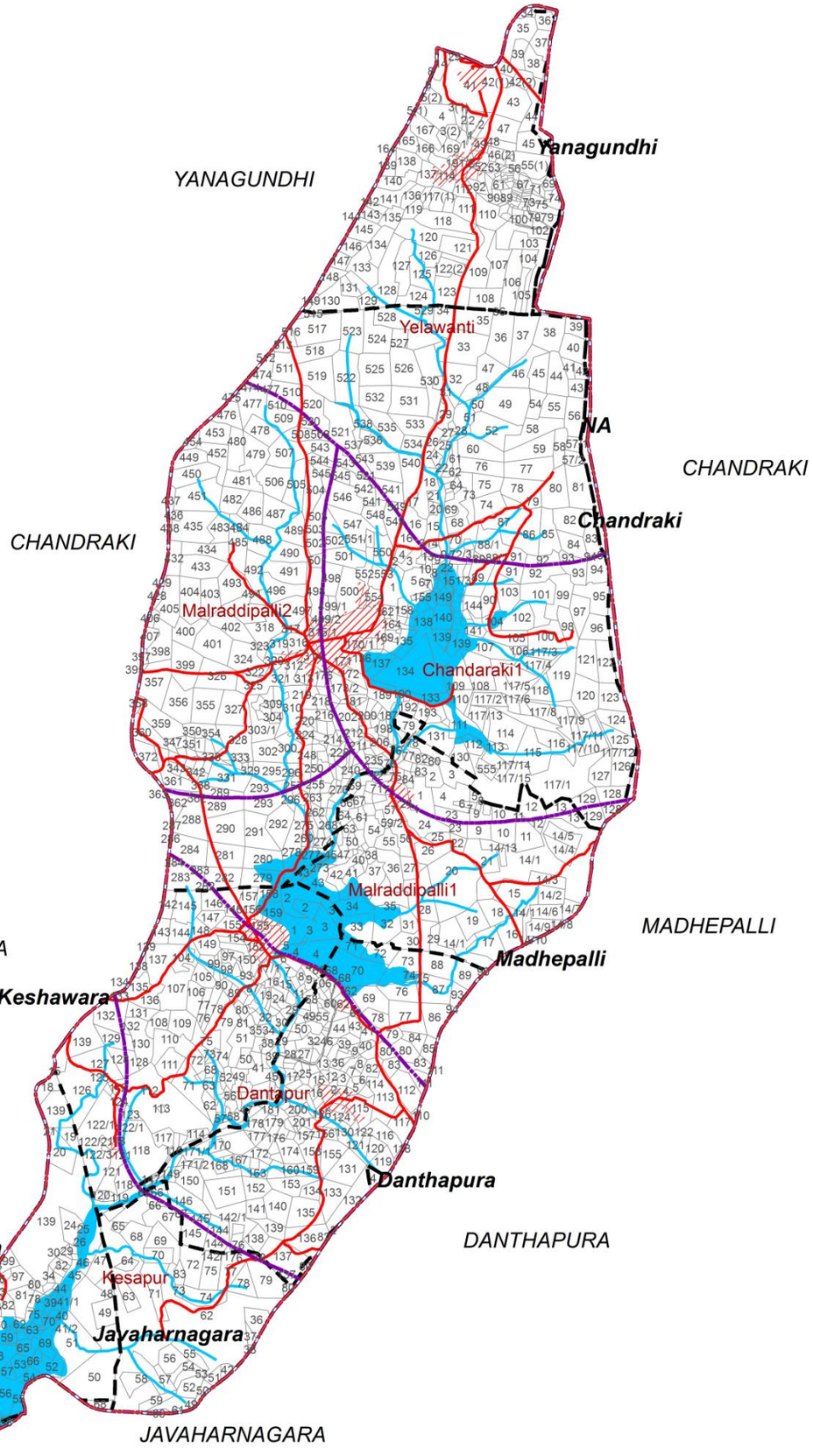
Sequence of activities in generation of LRI

- 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.

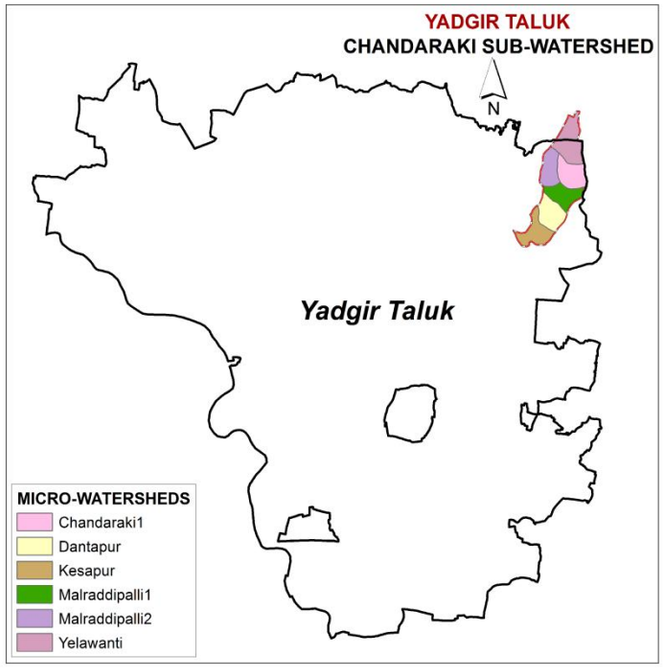
3.1. Database Used - Cadastral map

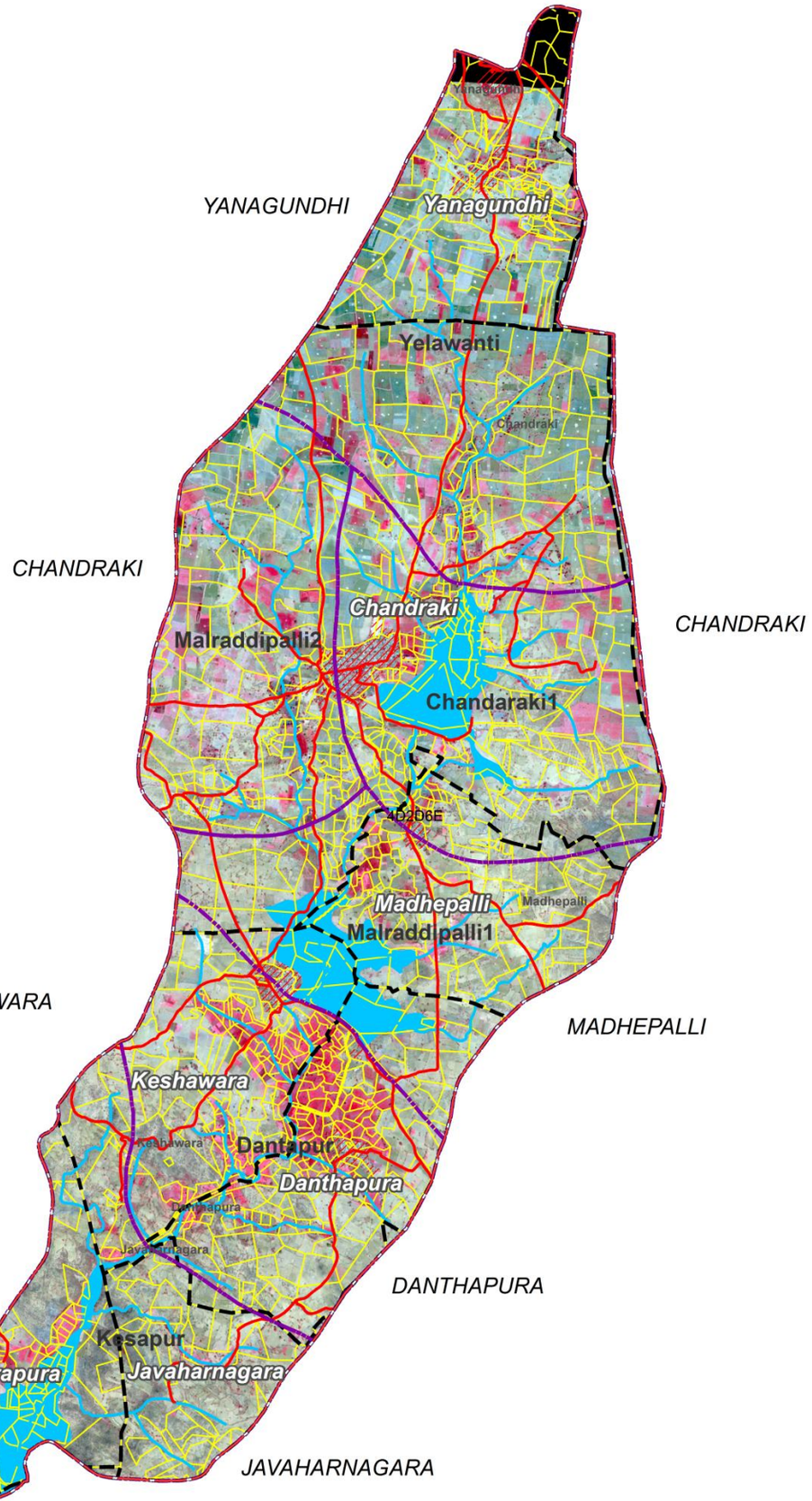




Source: ICAR-NBSS&LUP, Bengaluru

3.2. Database Used - Satellite Image





SATELLITE IMAGE

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

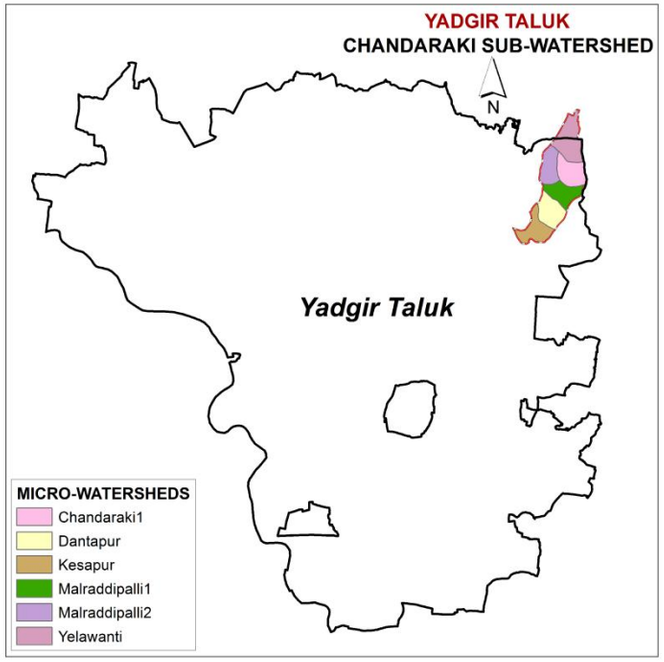
km
0 1 2 4
N

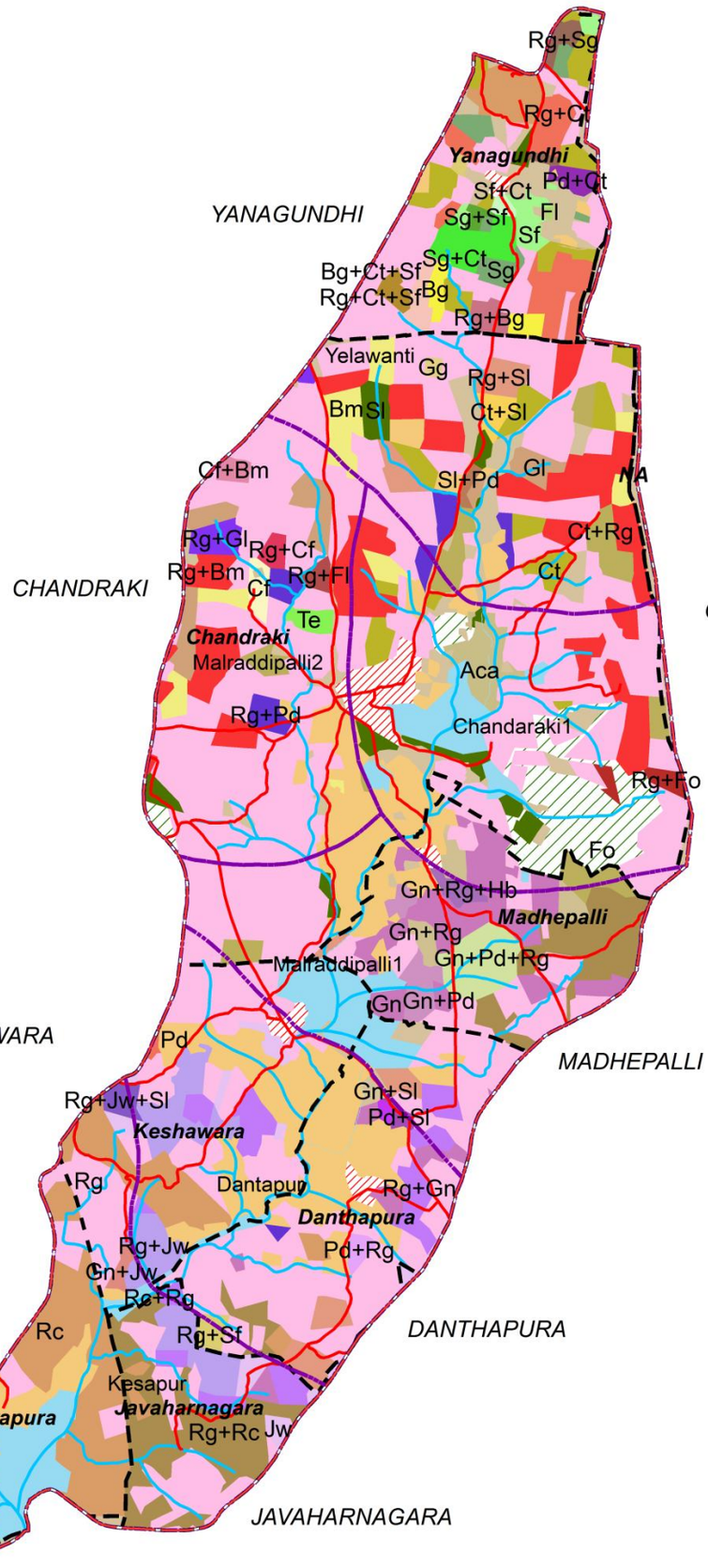
References

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

Source: Cartosat-1, Imagery

3.3. Current Landuse





CURRENT LANDUSE (2018)

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Current LandUse

- Acacia (Aca)
- Bengalgram (Bg)
- Bengalgram+Cotton+Sunflower (Bg+Ct+Sf)
- Blackgram (Bm)
- Cotton (Ct)
- Cotton+Redgram (Ct+Rg)
- Cotton+Scrub land (Ct+Sl)
- Current Fallow (Cf)
- Current Fallow+Black Gram (Cf+Bm)
- Fallow land (Fl)
- Grass land (Gl)
- Greengram (Gg)
- Groundnut (Gn)
- Groundnut+Jowar (Gn+Jw)
- Groundnut+Paddy (Gn+Pd)
- Groundnut+Paddy+Redgram (Gn+Pd+Rg)
- Groundnut+Redgram (Gn+Rg)
- Groundnut+Redgram+Habitation (Gn+Rg+Hb)
- Groundnut+Scrub land (Gn+Sl)
- Jowar (Jw)
- Paddy (Pd)
- Paddy+Cotton (Pd+Ct)
- Paddy+Redgram (Pd+Rg)
- Paddy+Scrub land (Pd+Sl)
- Redgram (Rg)
- Redgram+Bengalgram (Rg+Bg)
- Redgram+Blackgram (Rg+Bm)
- Redgram+Cotton (Rg+Ct)
- Redgram+Cotton+Sunflower(Rg+Ct+Sf)
- Redgram+Current fallow (Rg+Cf)
- Redgram+Fallow land (Rg+Fl)
- Redgram+Forest (Rg+Fo)
- Redgram+Grass land (Rg+Gl)
- Redgram+Groundnut (Rg+Gn)
- Redgram+Jowar (Rg+Jw)
- Redgram+Jowar+Scrub land (Rg+Jw+Sl)
- Redgram+Paddy (Rg+Pd)
- Redgram+Rock outcrops (Rg+Rc)
- Redgram+Scrub land (Rg+Sl)
- Redgram+Sorghum (Rg+Sg)
- Redgram+Sunflower (Rg+Sf)
- Rock outcrops (Rc)
- Rock outcrops+Redgram (Rc+Rg)
- Scrub land+Paddy (Sl+Pd)
- Sorghum (Sg)
- Sorghum+Cotton (Sg+Ct)
- Sorghum+Sunflower (Sg+Sf)
- Sunflower (Sf)
- Sunflower+Cotton (Sf+Ct)
- Teak (Te)
- Scrub land (Sl)
- Forest (Fo)
- Not Available (NA)
- Habitation
- Waterbody

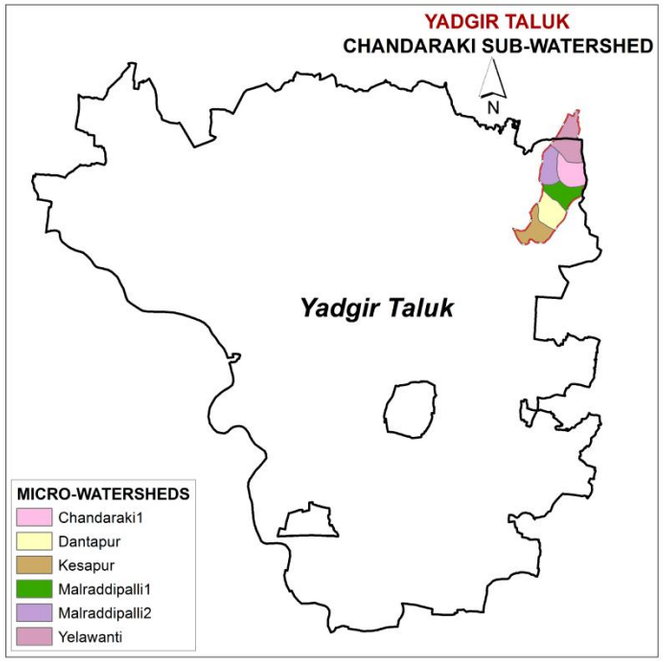
* - Habitation & Waterbody

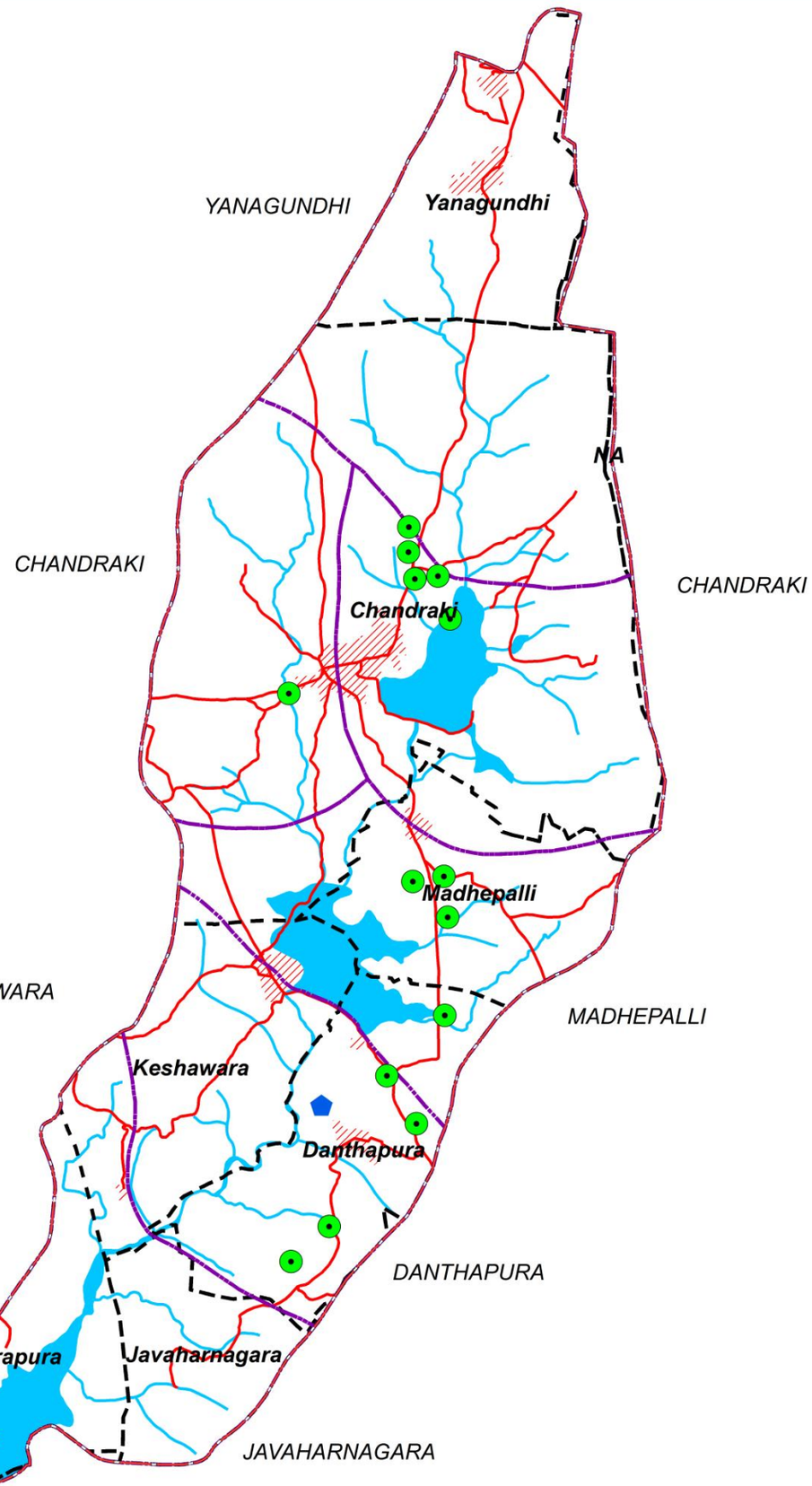
References

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

Source: ICAR-NBSS&LUP, Bengaluru

3.4. Location of Wells





LOCATION OF WELLS
Chandaraki Sub-watershed
(4D2D6E : Area - 3716.87 ha)
YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

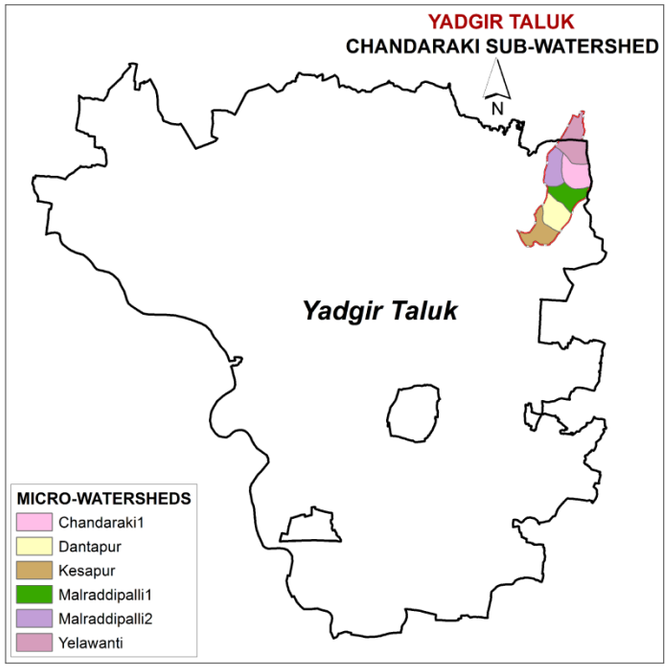
- Road/Cart track
- Streams/Drainage
- Habitation
- Waterbody
- Micro-watershed boundary
- Village boundary
- Sub-watershed boundary

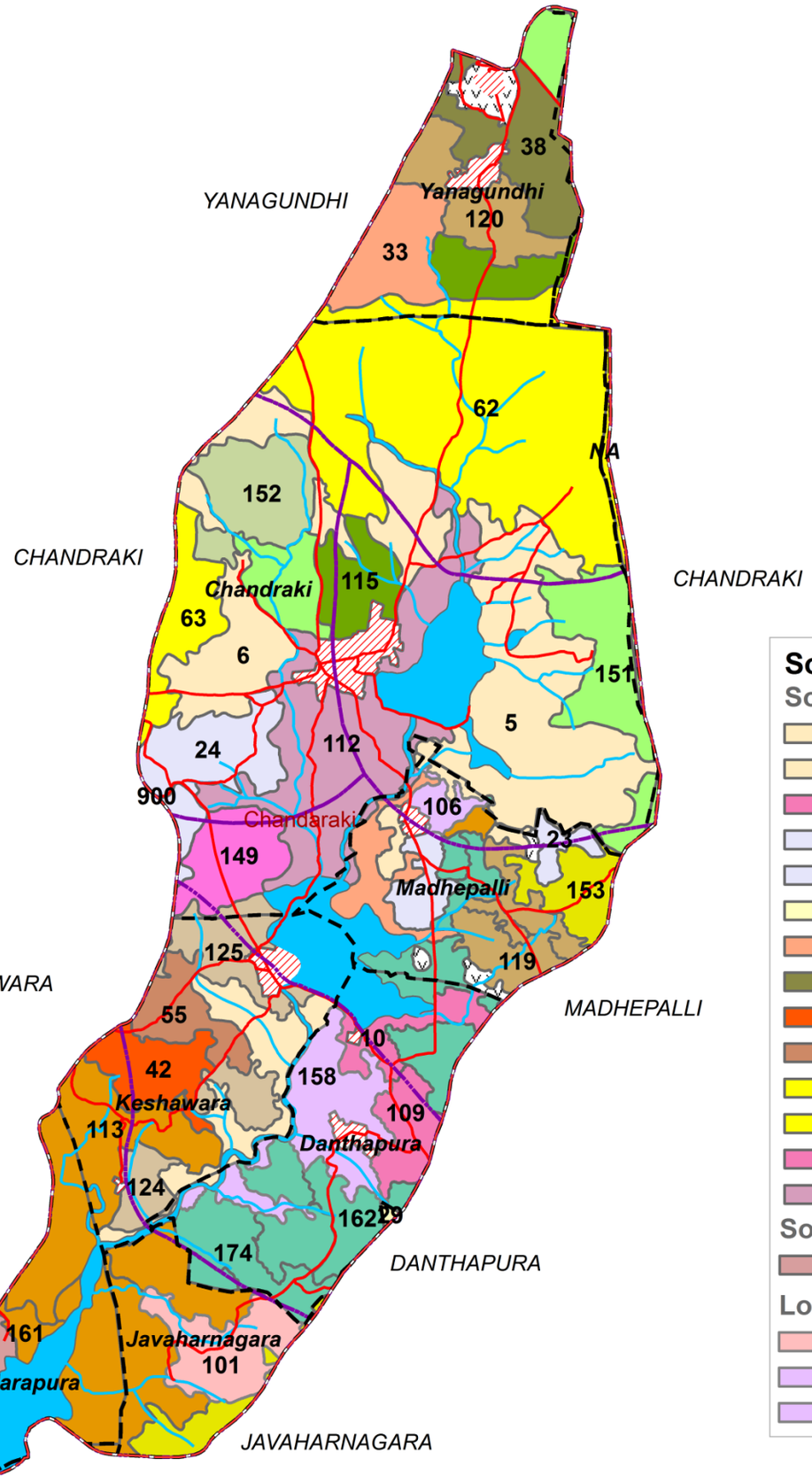
Legend	No's
Wells	
Bore Well	15
Open well	1

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

4. The Soils





SOILS
Chandaraki Sub-watershed
(4D2D6E : Area - 3716.87 ha)
YADGIR TALUK & DISTRICT

0 1 2 4 km

N

KEY

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

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

EROSION
1 - Slight
2 - Moderate
3 – Severe

GRAVELLINESS
g1 – Gravelly (15-35 %)
g2 - Very gravelly (35-60 %)

DEPTH
BDP,KKR - Very shallow (<25 cm)
VNK,HTK,BDL - Shallow (25-50 cm)
YLR,SBR,JNK - Moderately shallow (50-75 cm)
SHT,HSL,BLC- Moderately deep (75-100 cm)
ANR,BGD,MDG,NHL,YDR - Deep (100-150 cm)
BMN,HGN,SGR - Very deep (>150 cm)

Soil Phase Area in ha (%) Soil Phase Area in ha (%)

Soil of Granite and Granite Gneiss Landscape

5. BDLiB2	450 (12.11)	113.HTKcC2g1	311 (8.37)
6. BDLiB3	77 (2.06)	115. BGDmB2	95 (2.55)
10. VNKiB2	36 (0.96)	119. BDPiB3	63 (1.69)
23. JNKiB2g1	29 (0.78)	120. BDPhB2	77 (2.06)
24.JNKiB3g1	103(2.77)	124. SBRbB3	53 (1.43)
29. YLRcB2g1	2 (0.05)	125. SBRhB2	56 (1.51)
33. HSLiB2	109 (2.94)	149. MDGhB2g1	63 (1.7)
38. BLCiB2	86 (2.32)	151. BGDmB2g1	171(4.59)
42. YDRcB2	54 (1.46)	152. JNKmB2	85 (2.3)
55. ANRiB2	46 (1.24)	153. KKRbB2g1	77 (2.08)
62.BMNmB2	463(12.45)	161. HTKbB2g1	20 (0.53)
63.BMNmB2g1	58(1.57)	162. BDLhB2g1	164 (4.41)
109.VNKmB2g1	41(1.1)	174. BDLcB2g2	78 (2.09)
112.SHTmB2	220(5.92)		

Soil of Alluvial Landscape

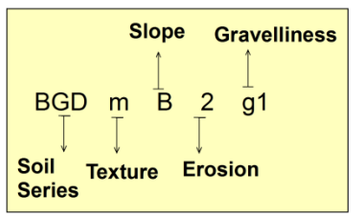
95. HGNmB2	24 (0.64)

Low Land

101. NHLmB1	71 (1.91)	Forest	0.01 (0.0002)
106. SGRmB2	35 (0.94)	Rock outcrops	99 (2.68)
158. SGRiA1	77 (2.07)	Other*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru



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

4.1 Mapping unit description of Chandaraki (4D2D6E) Sub-watershed in Yadgir Taluk, Yadgir district

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss Landscape				
	BMN	Bhimanahalli soils are very deep (>150 cm), moderately well drained, have very dark gray, calcareous cracking clay black soils occurring on very gently sloping uplands under cultivation		**521 (14.02)**
62		BMNmB2	Clay surface, slope 1-3%, moderate erosion	463 (12.45)
63		BMNmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	58 (1.57)
	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		**54 (1.46)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	54 (1.46)
	ANR	Anur soils are deep (100-150 cm), moderately well drained, have dark gray to dark brown, calcareous sodic clay soils occurring on very gently to gently sloping uplands under cultivation		**46 (1.24)**
55		ANRiB2	Sandy clay surface, slope 1-3%, moderate erosion	46 (1.24)
	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		**266 (7.14)**
151		BGDmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	171 (4.59)
115		BGDmB2	Clay surface, slope 1-3%, moderate erosion	95 (2.55)
	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		**63 (1.7)**
149		MDGhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	63 (1.7)
	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		**109 (2.94)**
33		HSLiB2	Sandy clay surface, slope 1-3%, moderate erosion	109 (2.94)
	BLC	Balichakra soils are moderately deep (75-100 cm), well drained, have reddish brown to dark reddish brown, sandy clay loam red soils occurring on very gently sloping uplands under cultivation		**86 (2.32)**
38		BLCiB2	Sandy clay surface, slope 1-3%, moderate erosion	86 (2.32)
	SHT	Shettalli soils are moderately deep (75-100 cm), well drained, have very dark gray, slightly calcareous gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**220 (5.92)**
112		SHTmB2	Clay surface, slope 1-3%, moderate erosion	220 (5.92)

To be continued….

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
	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		**217 (5.85)**
23		JNKiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	29 (0.78)
24		JNKiB3g1	Sandy clay surface, slope 1-3%, severe erosion, gravelly (15-35%)	103 (2.77)
152		JNKmB2	Clay surface, slope 1-3%, moderate erosion	85 (2.3)
	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		**2 (0.05)**
29		YLRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	2 (0.05)
	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		**109 (2.94)**
124		SBRbB3	Loamy sand surface, slope 1-3%, severe erosion	53 (1.43)
125		SBRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	56 (1.51)
	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		**527 (14.17)**
5		BDLiB2	Sandy clay surface, slope 1-3%, moderate erosion	450 (12.11)
6		BDLiB3	Sandy clay surface, slope 1-3%, severe erosion	77 (2.06)
	VNK	Vanakanahalli soils are shallow (25-50 cm), well drained, have dark reddish brown, sandy clay red soils occurring on very gently to moderately sloping uplands under cultivation		**77 (2.06)**
10		VNKiB2	Sandy clay surface, slope 1-3%, moderate erosion	36 (0.96)
109		VNKmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	41 (1.1)
	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		**331 (8.9)**
113		HTKcC2g1	Sandy loam surface, slope 3-5%, moderate erosion, gravelly (15-35%)	311 (8.37)
161		HTKbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	20 (0.53)
	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		**242 (6.5)**
162		BDLhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	164 (4.41)
174		BDLcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	78 (2.09)

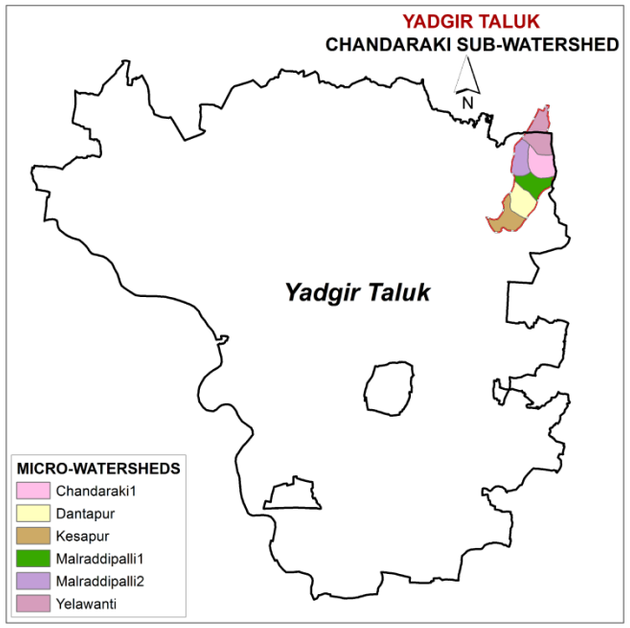
To be continued….

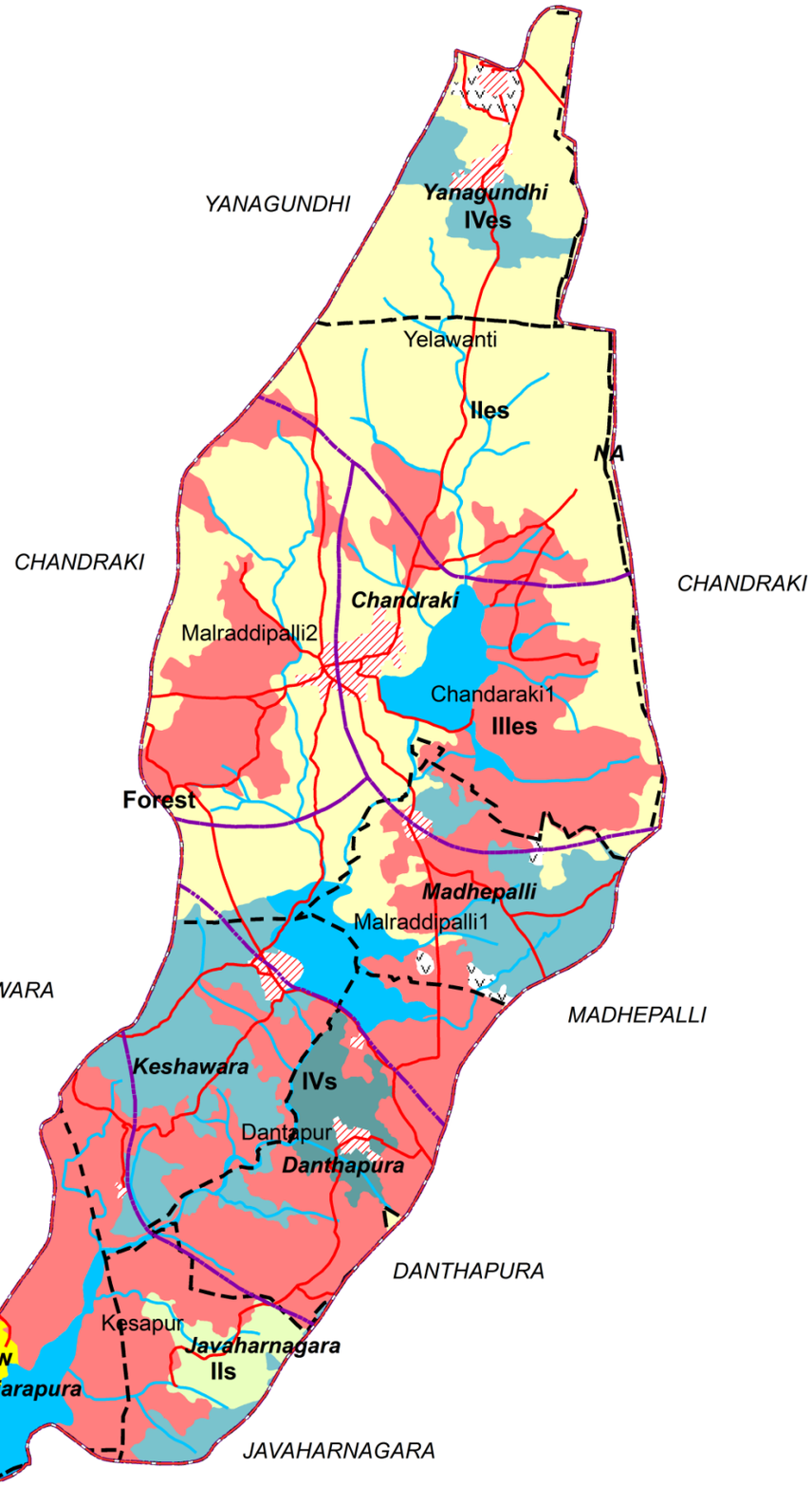
Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
	BDP	Baddeppalli soils are very shallow (<25 cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**140 (3.75)**
119		BDPiB3	Sandy clay surface, slope 1-3%, severe erosion	63 (1.69)
120		BDPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	77 (2.06)
	KKR	Kakalawar soils are very shallow (<25 cm), well drained, have dark brown sandy loam soils occurring on very gently sloping uplands under cultivation		**77 (2.08)**
153		KKRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	77 (2.08)
	SGR	Sangwar soils are very deep (>150 cm), moderately well drained, have dark gray to very dark gray, calcareous sodic cracking clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**112 (3.01)**
106		SGRmB2	Clay surface, slope 1-3%, moderate erosion	35 (0.94)
158		SGRiA1	Sandy clay surface, slope 0-1%, slight erosion	77 (2.07)
	NHL	Neelahalli soils are deep (100-150 cm), well drained, have dark grayish brown to brown sandy loam soils occurring on nearly level to very gently sloping lowlands under cultivation		**71 (1.91)**
101		NHLmB1	Clay surface, slope 1-3%, slight erosion	71 (1.91)
Soils of Alluvial Landscape				
	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		**24 (0.64)**
95		HGNmB2	Clay surface, slope 1-3%, moderate erosion	24 (0.64)
900		Forest	Forest area	**0.001 (0.0002)**
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**99 (2.68)**
1000		Others	Habitation and Waterbody	**324 (8.73)**

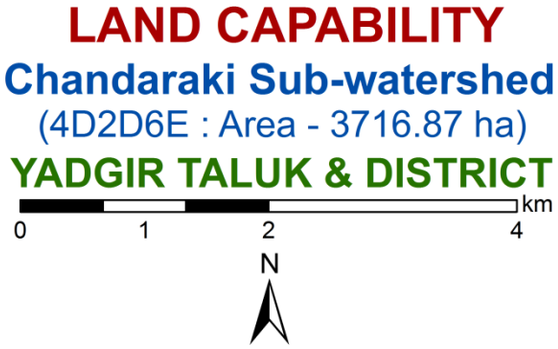
* Soil map unit numbers are continuous for the taluk, not for the sub-watershed

5. Soil Survey Interpretations

5.1. Land Capability Classification







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)
w - Excess of water
(wetness high water table, drainage) limitation.

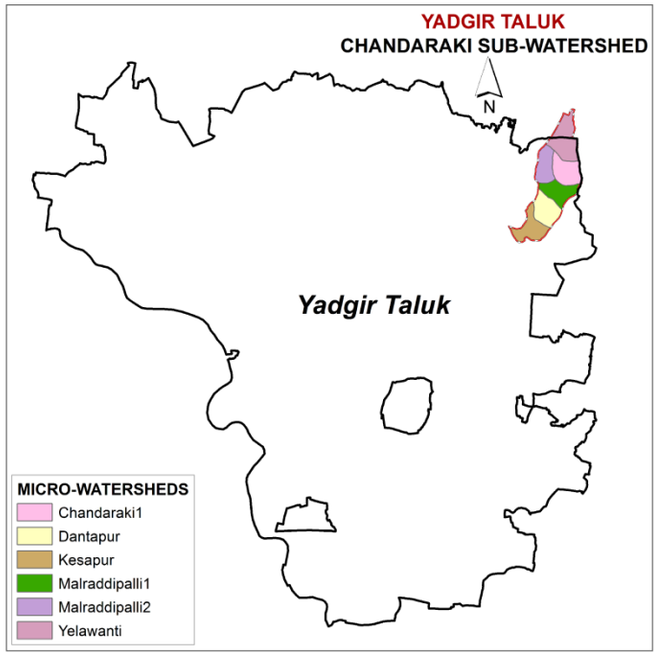
Capability Subclass	Area in ha (%)
IIs	71 (1.91)
IIes	1382 (37.18)
IIsw	24 (0.64)
IIIes	1278 (34.39)
IVes	461 (12.41)
IVs	77 (2.07)
Forest	0.01 (0.0002)
Rock outcrops	99 (2.68)
Others*	324 (8.73)

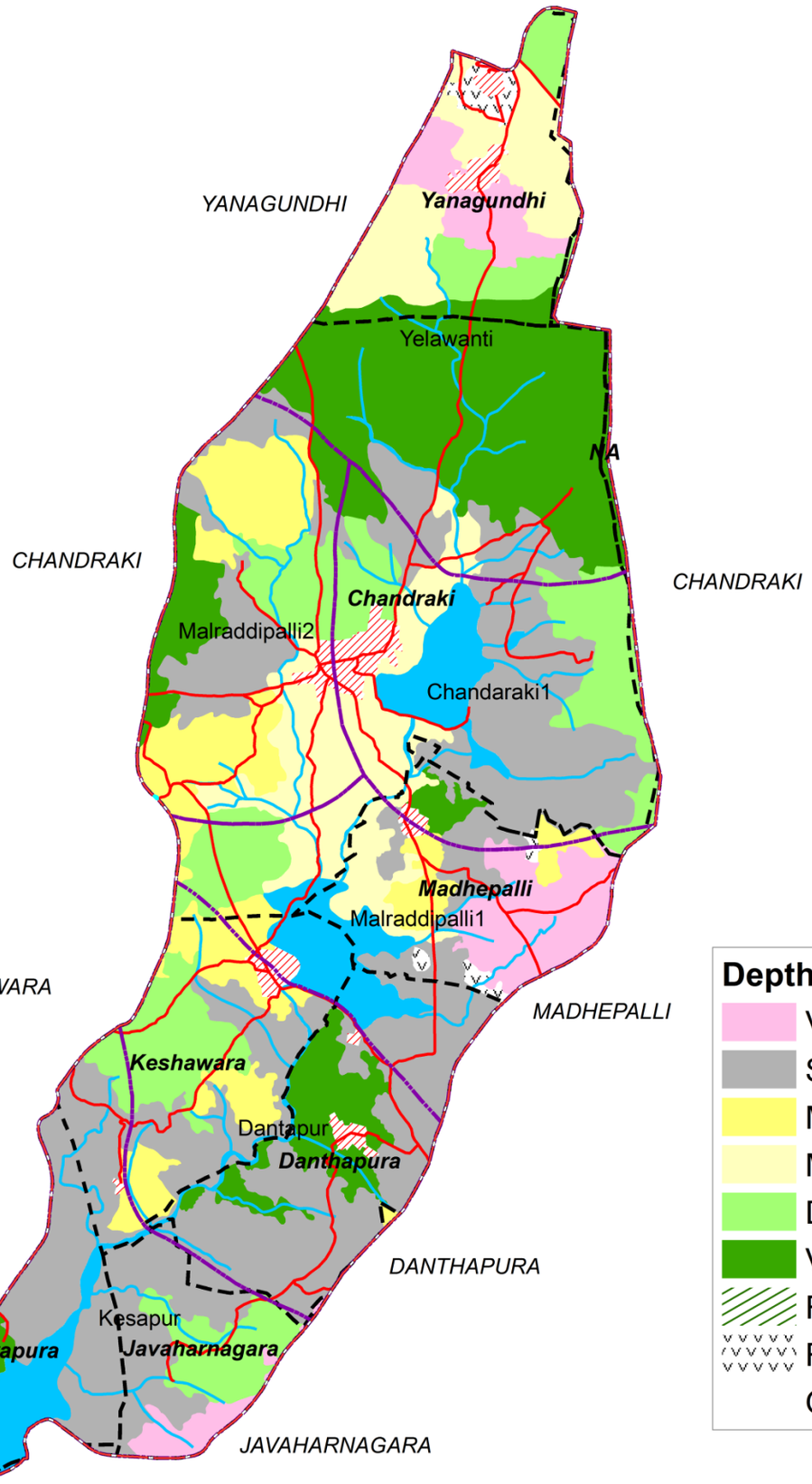
* - Habitation & Waterbody

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

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

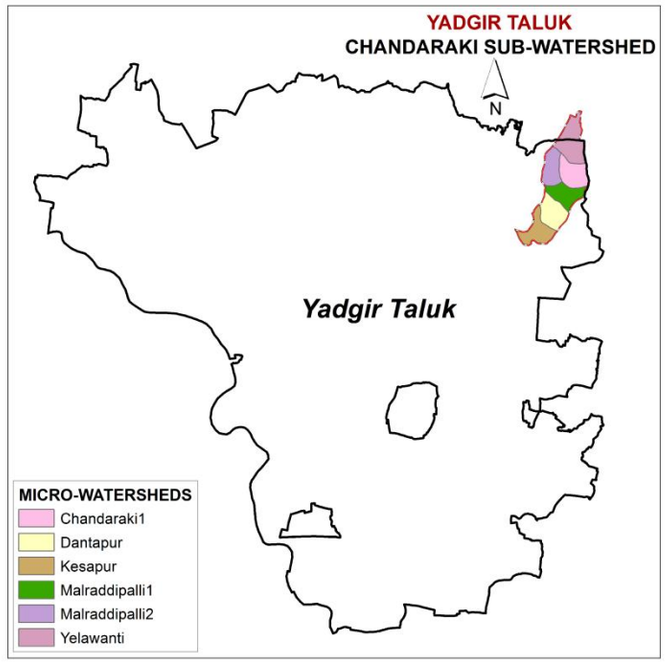
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

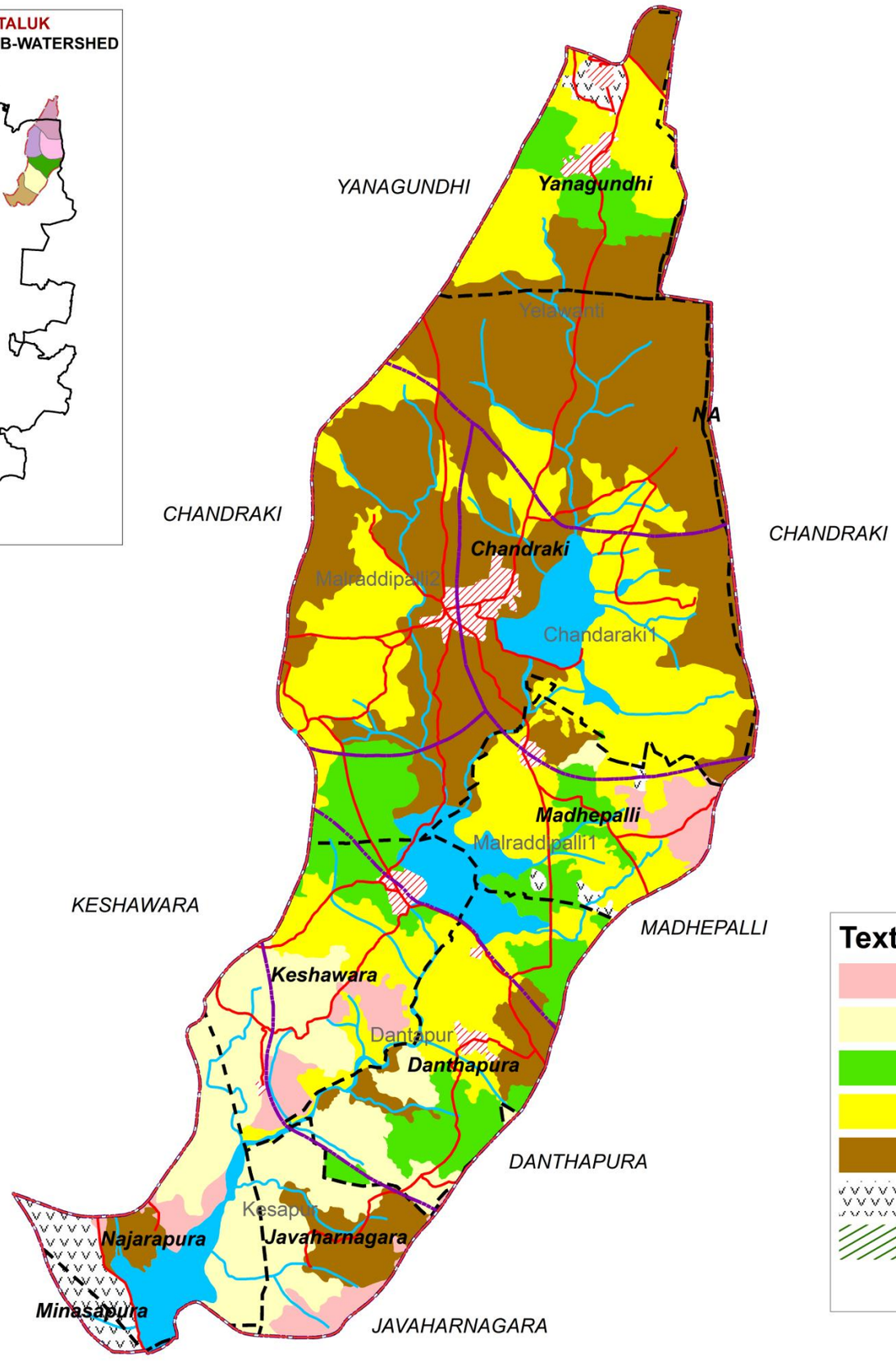
Depth Class	Area in ha (%)
Very shallow (<25 cm)	217 (5.83)
Shallow (25-50 cm)	1175 (31.62)
Moderately shallow (50-75 cm)	329 (8.84)
Moderately deep (75-100 cm)	416 (11.18)
Deep (100-150 cm)	500 (13.45)
Very deep (>150 cm)	656 (17.66)
Forest	0.01 (0.0002)
Rock outcrops	99 (2.68)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.3. Surface Soil Texture





SURFACE SOIL TEXTURE

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

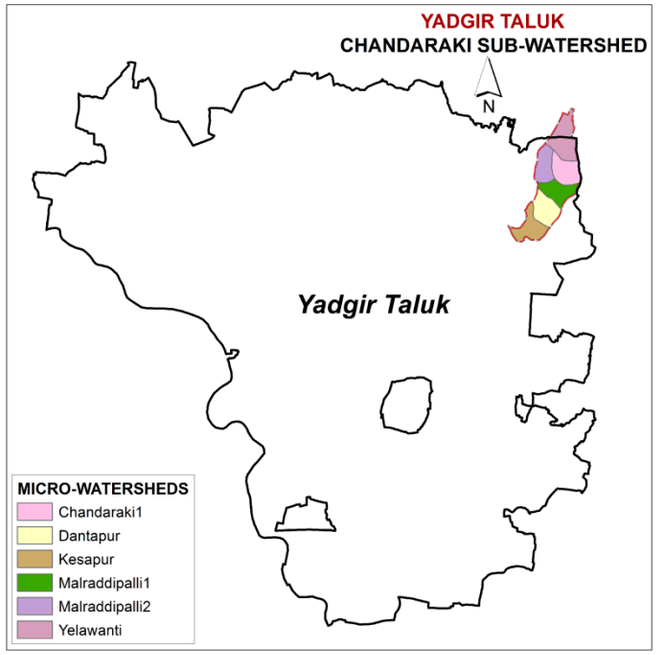
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

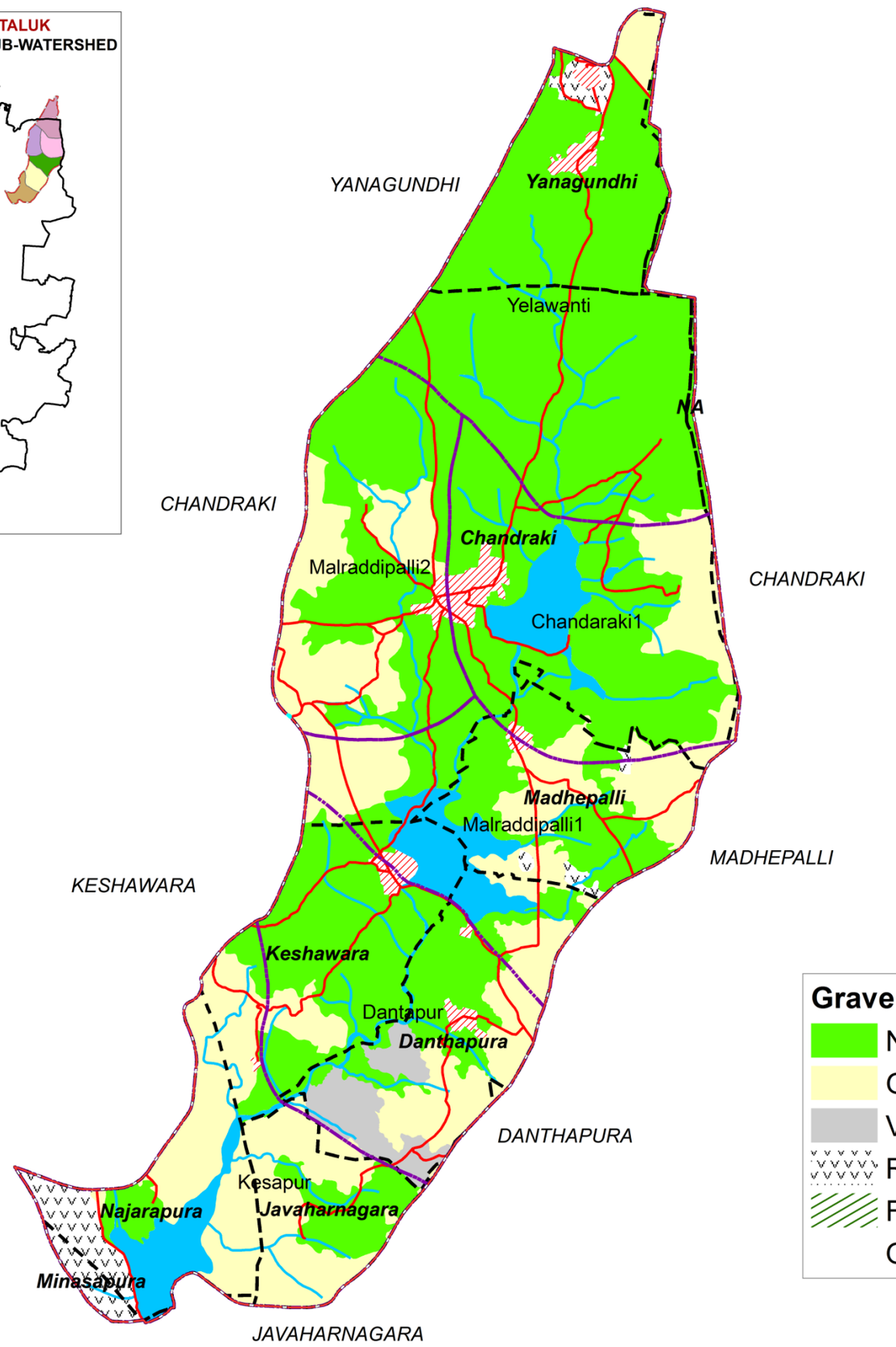
Texture Class	Area in ha(%)
Loamy sand	150 (4.05)
Sandy loam	445 (11.97)
Sandy clay loam	360 (9.68)
Sandy clay	1076 (28.94)
Clay	1263 (33.97)
Rock outcrops	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.4. Surface Soil Gravelliness





SOIL GRAVELLINESS
Chandaraki Sub-watershed
(4D2D6E : Area - 3716.87 ha)
YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

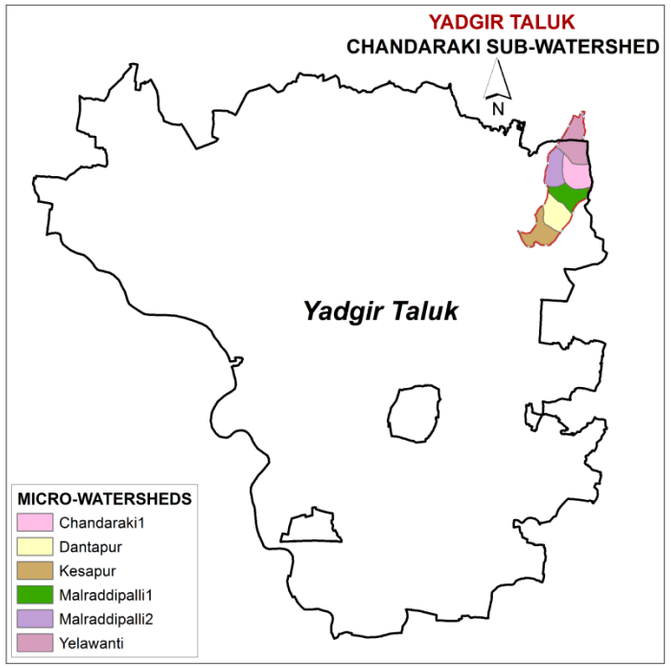
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

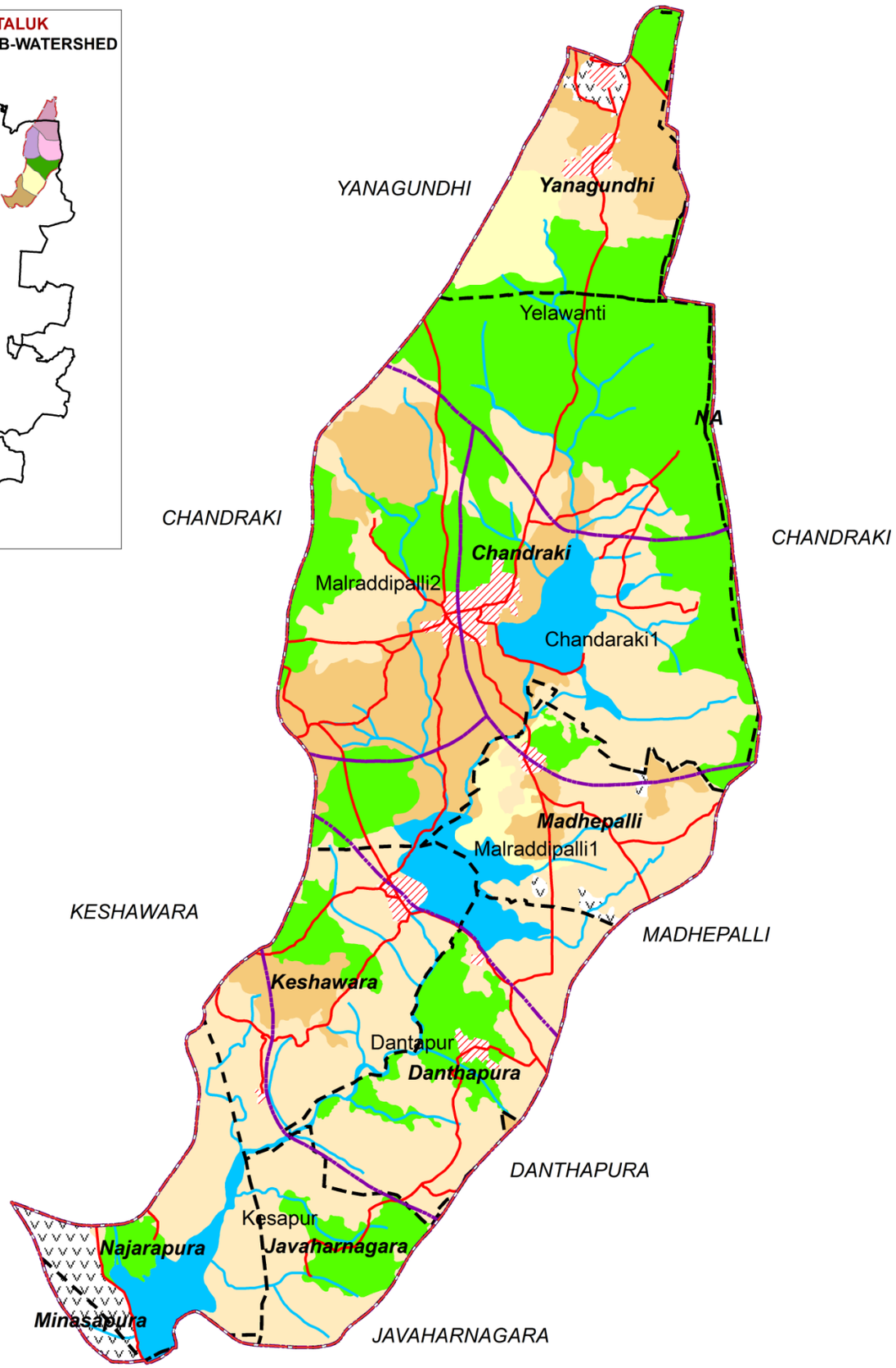
Gravelly Class	Area in ha (%)
Non gravelly (<15%)	2177 (58.56)
Gravelly (15-35%)	1039 (27.95)
Very gravelly (35-60%)	78 (2.09)
Rock outcrops	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.5. Available Water Capacity





AVAILABLE WATER CAPACITY

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

km
0 1 2 4
N

References

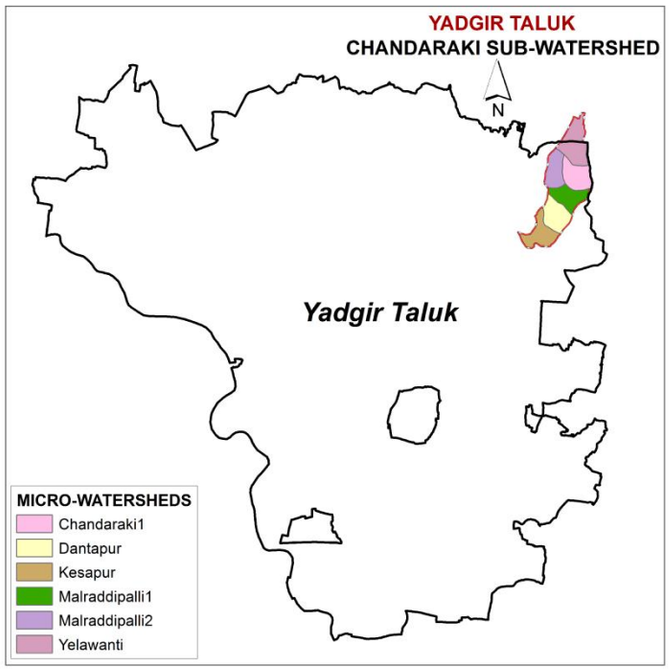
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

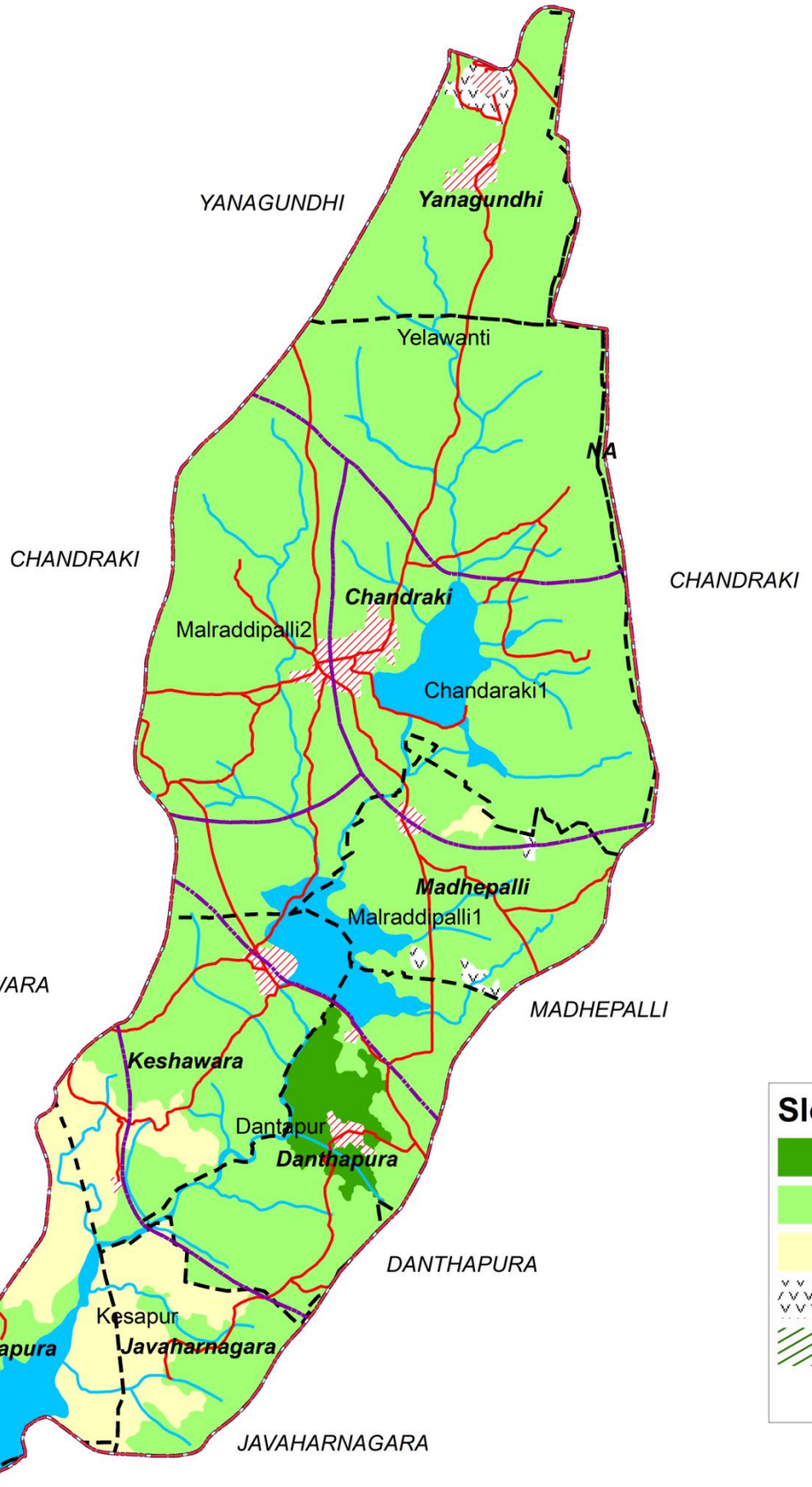
Available Water Capacity	Area in ha (%)
Very low (<50 mm/m)	1501 (40.4)
Low (51-100 mm/m)	580 (15.61)
Medium (101-150 mm/m)	109 (2.94)
Very high (>200 mm/m)	1102 (29.66)
Rock outcrops	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.6.Slope





SLOPE
Chandaraki Sub-watershed
(4D2D6E : Area - 3716.87 ha)
YADGIR TALUK & DISTRICT

0 1 2 4 km

N

References

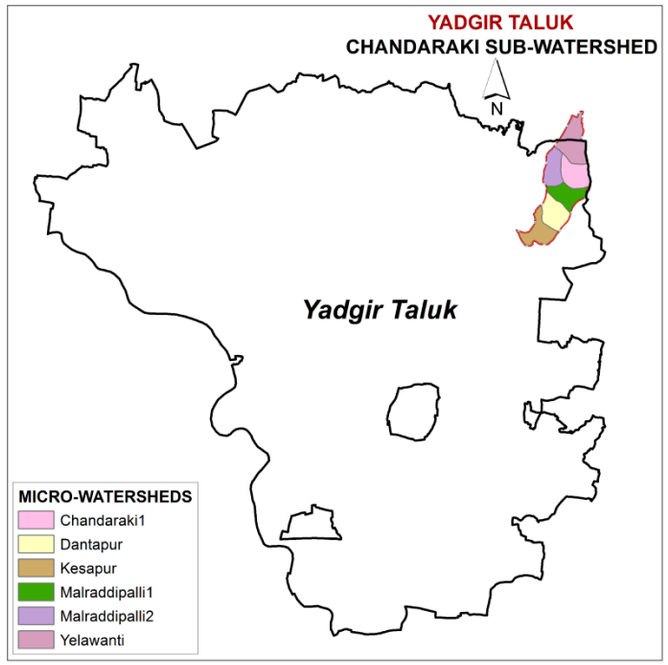
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

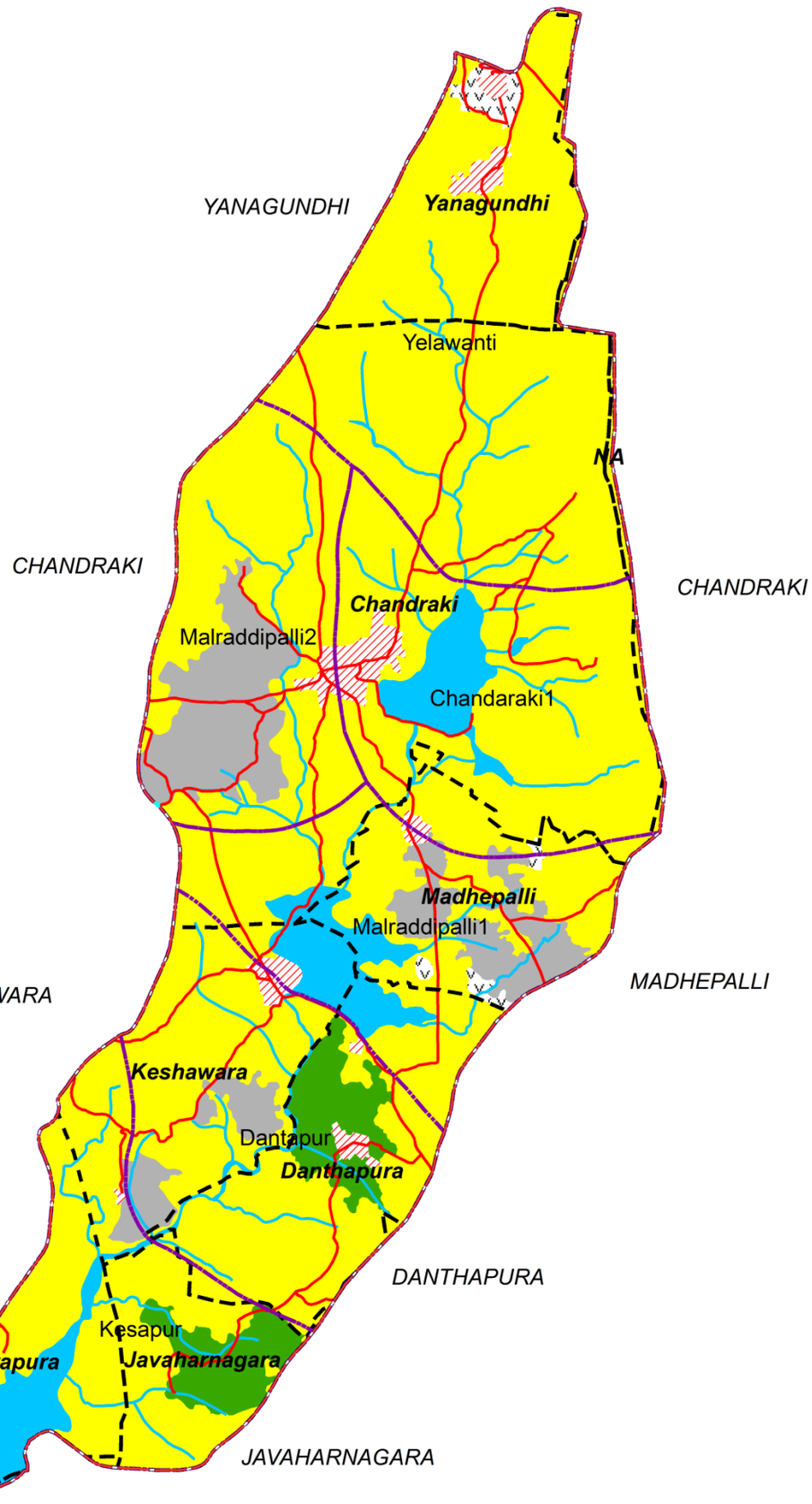
Slope Class	Area in ha (%)
Nearly level (0-1%)	77 (2.07)
Very gently sloping (1-3%)	2905 (78.16)
Gently sloping (3-5%)	311 (8.37)
Rock outcrops	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.7.Soil Erosion





SOIL EROSION

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

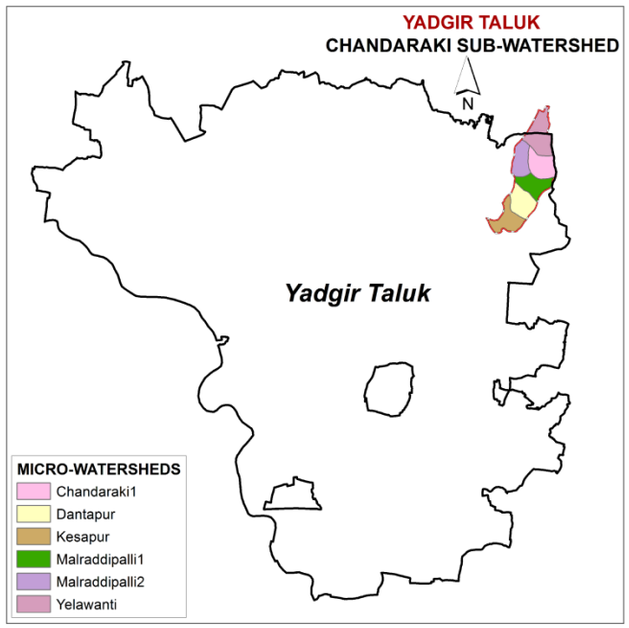
Erosion Class	Area in ha (%)
Slight	148 (3.98)
Moderate	2849 (76.66)
Severe	296 (7.95)
Rock outcrops	99 (2.68)
Forest	0.01 (0.002)
Others*	324 (8.73)

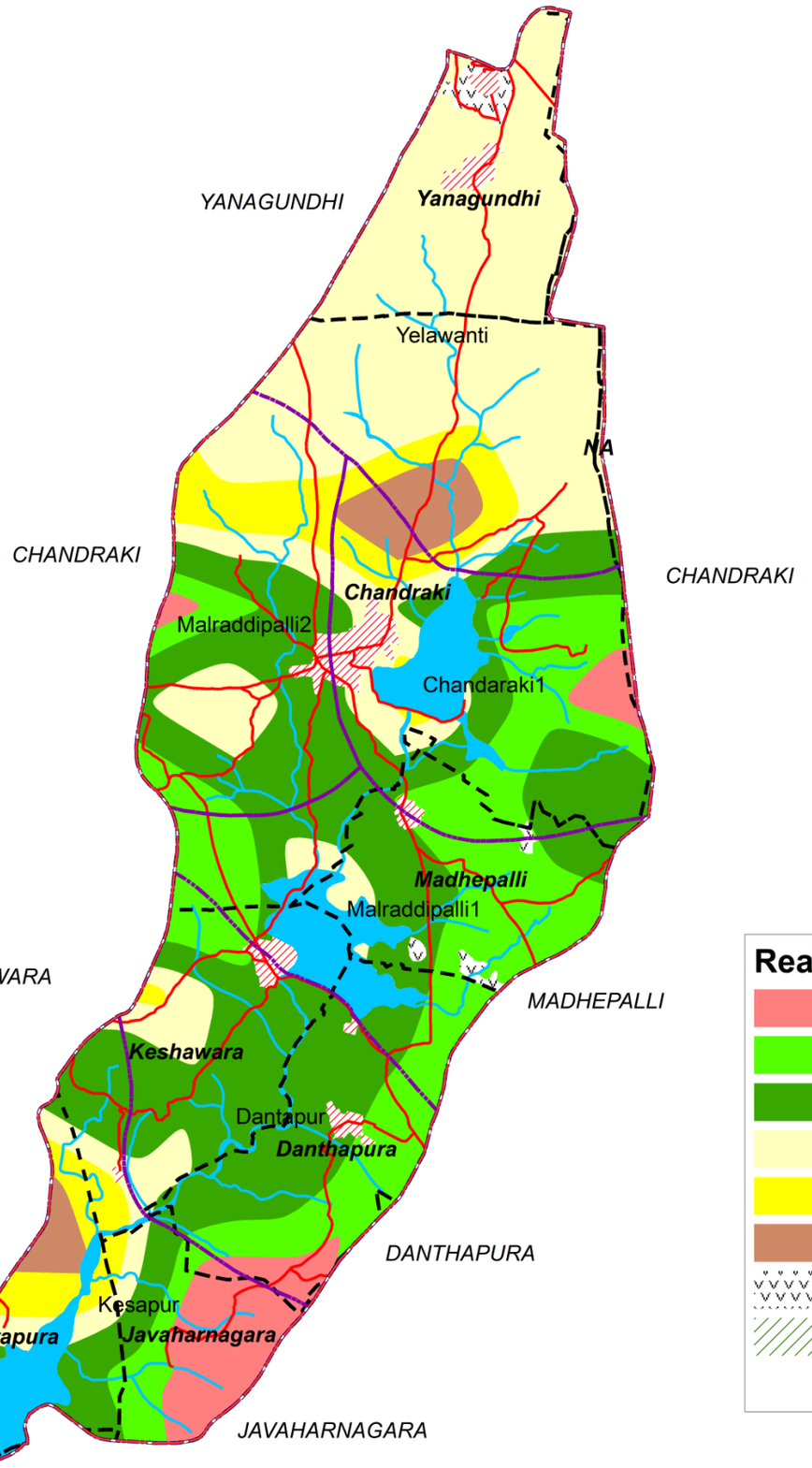
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6. Soil Fertility Status

6.1. Soil Reaction (pH)





SOIL REACTION (pH) (2019)
Chandaraki Sub-watershed
(4D2D6E : Area - 3716.87 ha)
YADGIR TALUK & DISTRICT

0 1 2 4 km
N

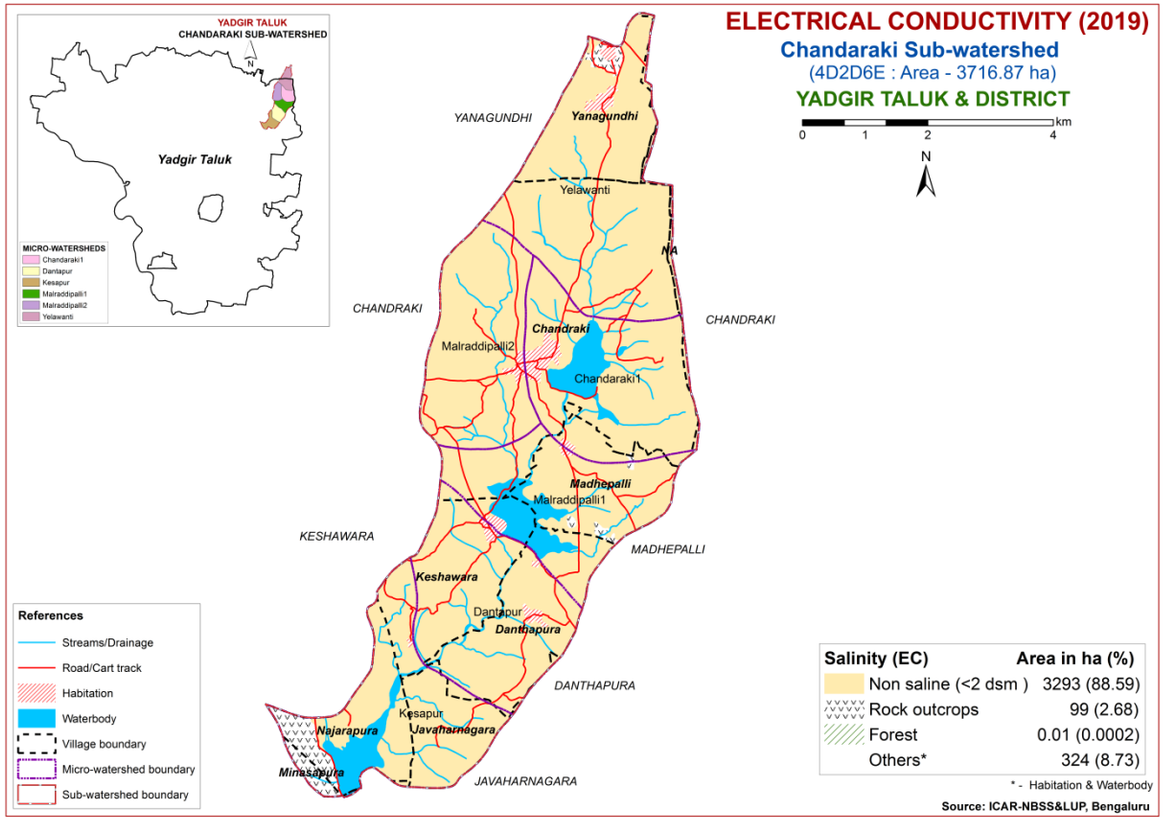
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Reaction Class	Area in ha (%)
Moderately acid (pH 5.5 – 6.0)	172 (4.62)
Slightly acid (pH 6.0 – 6.5)	653 (17.57)
Neutral (pH 6.5 – 7.3)	1089 (29.3)
Slightly alkaline (pH 7.3 – 7.8)	1053 (28.33)
Moderately alkaline (pH 7.8 – 8.4)	232(6.24)
Strongly alkaline (pH 8.4 – 9.0)	94 (2.52)
Rock outcrops	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

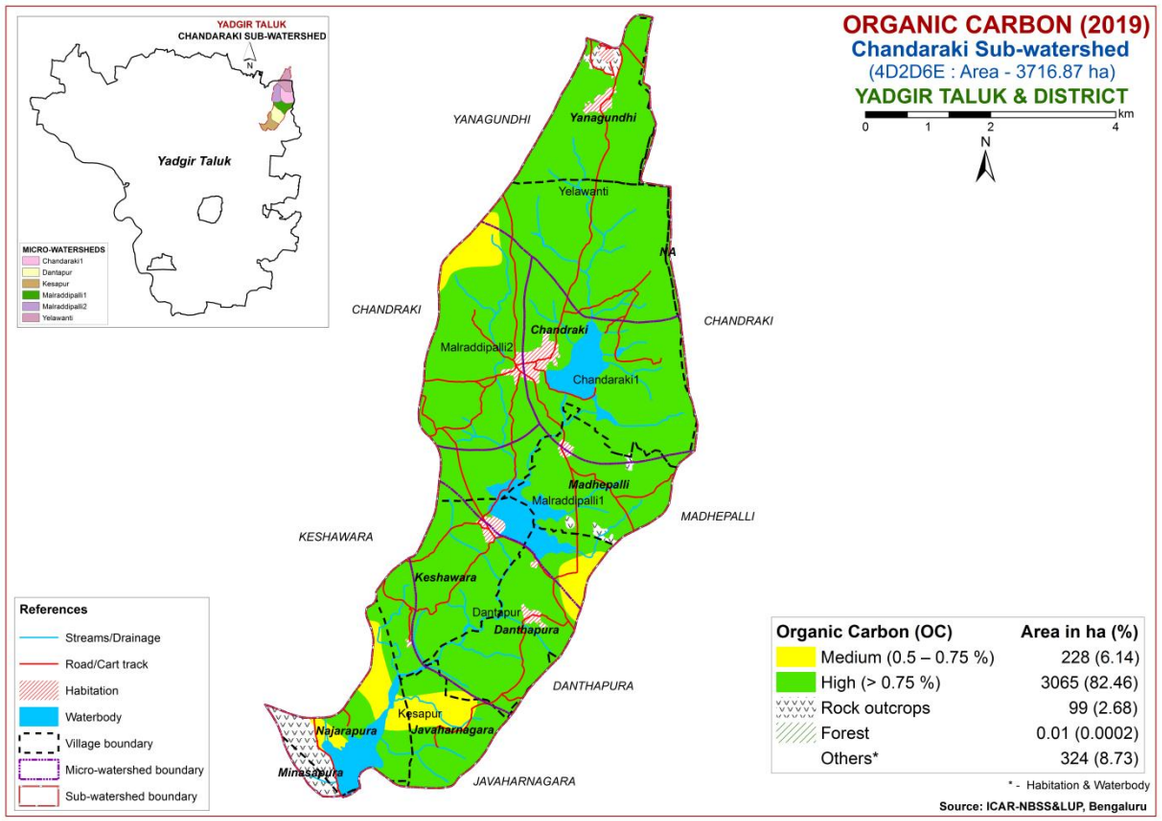
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

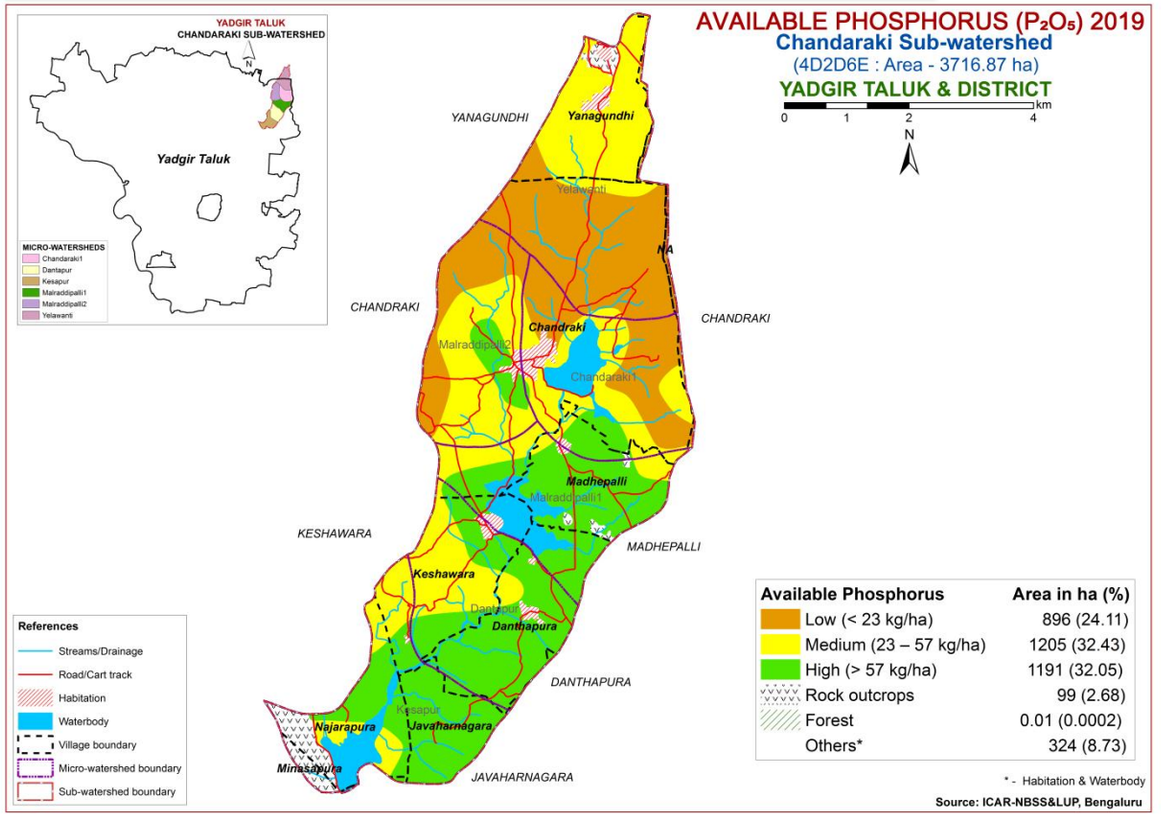
6.2. Electrical Conductivity (EC)



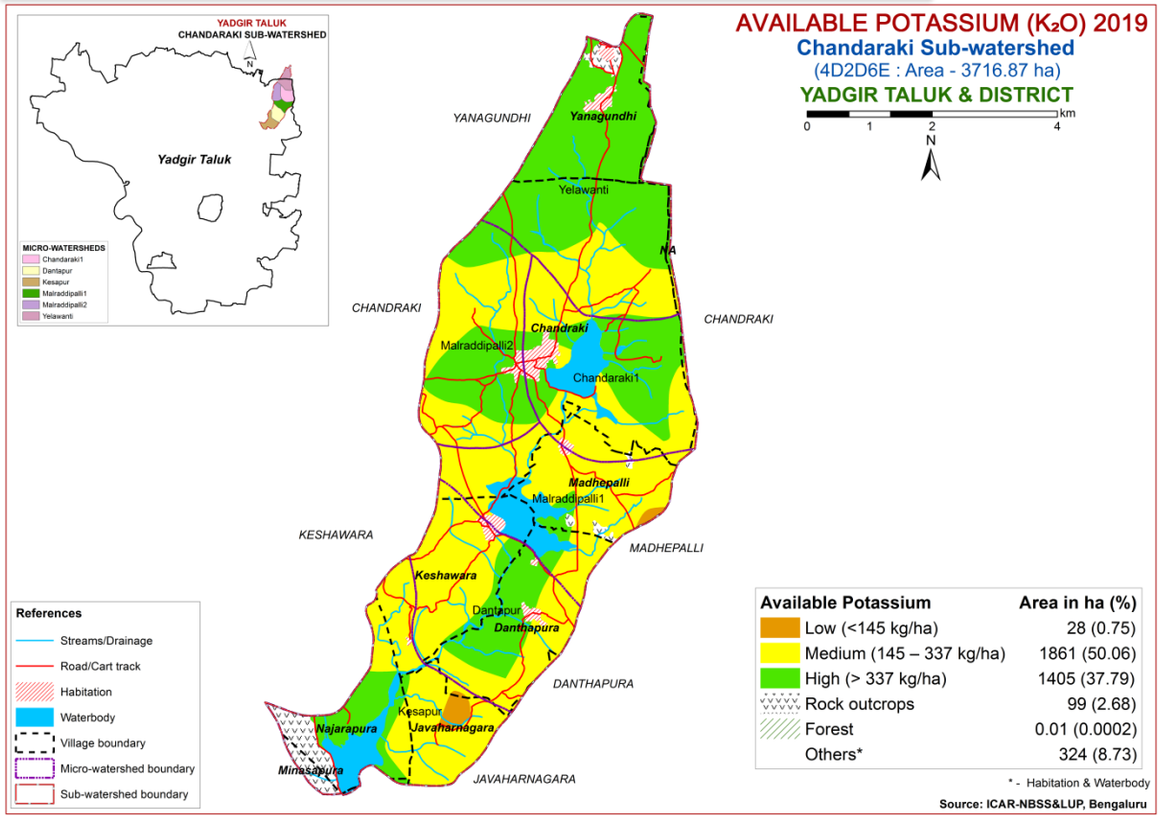
6.3. Organic Carbon



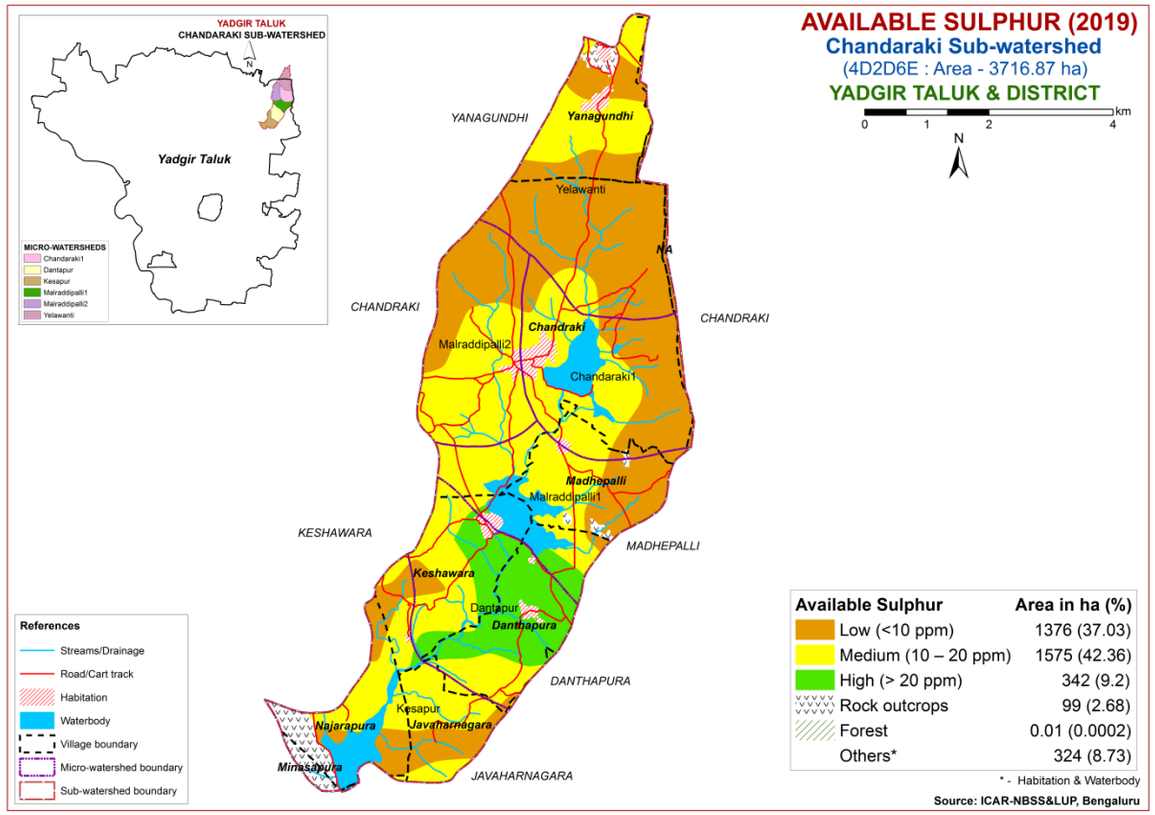
6.4. Available Phosphorus (P_2O_5)



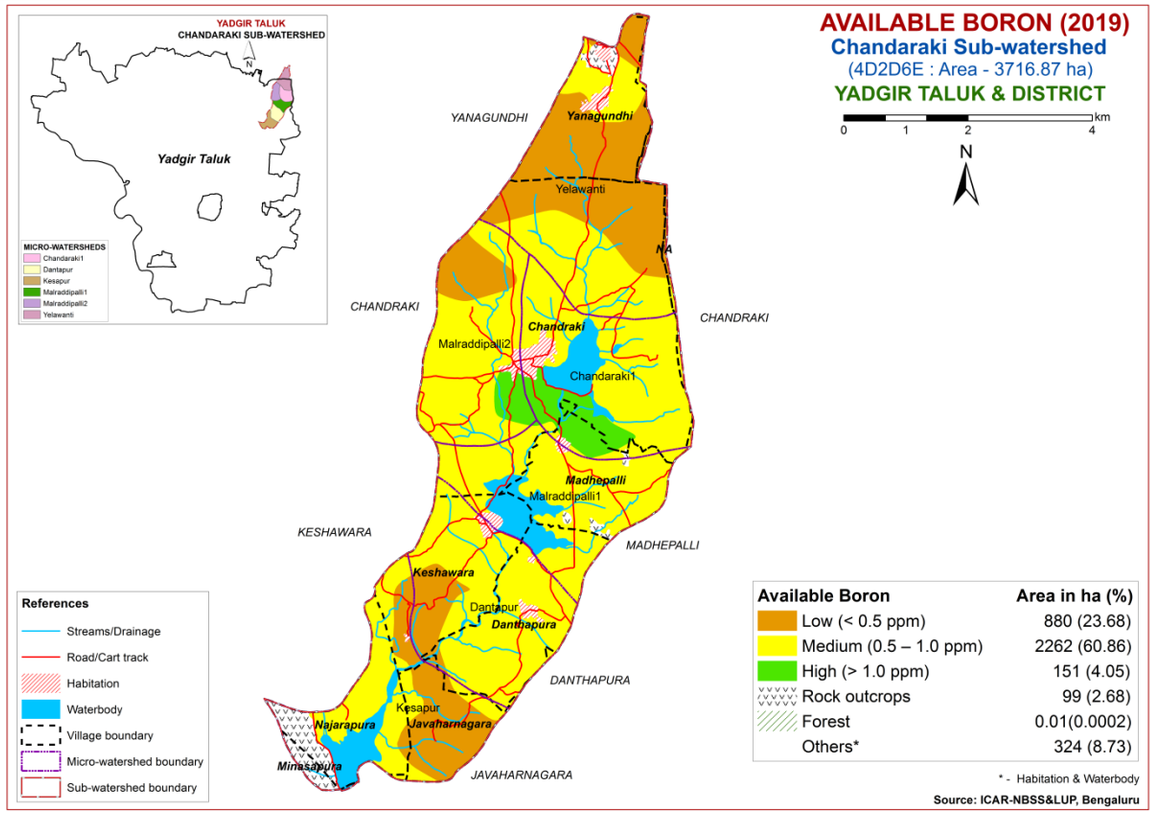
6.5. Available Potassium (K_2O)



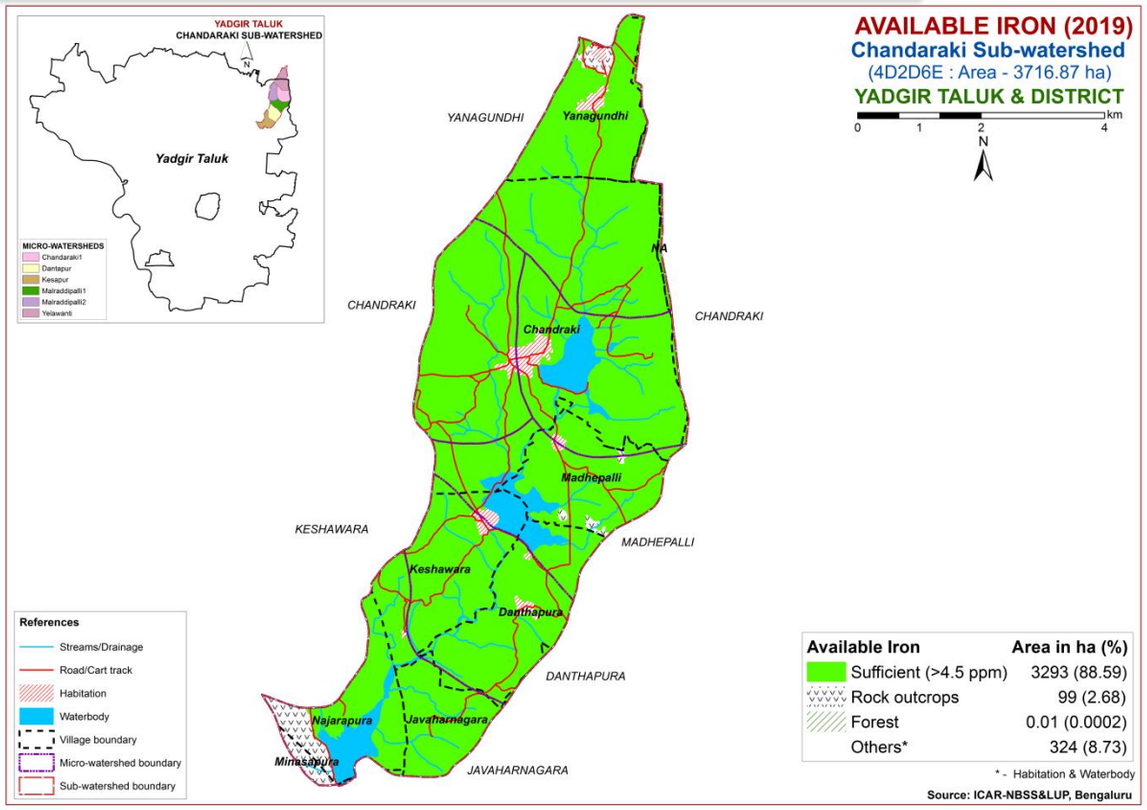
6.6. Available Sulphur



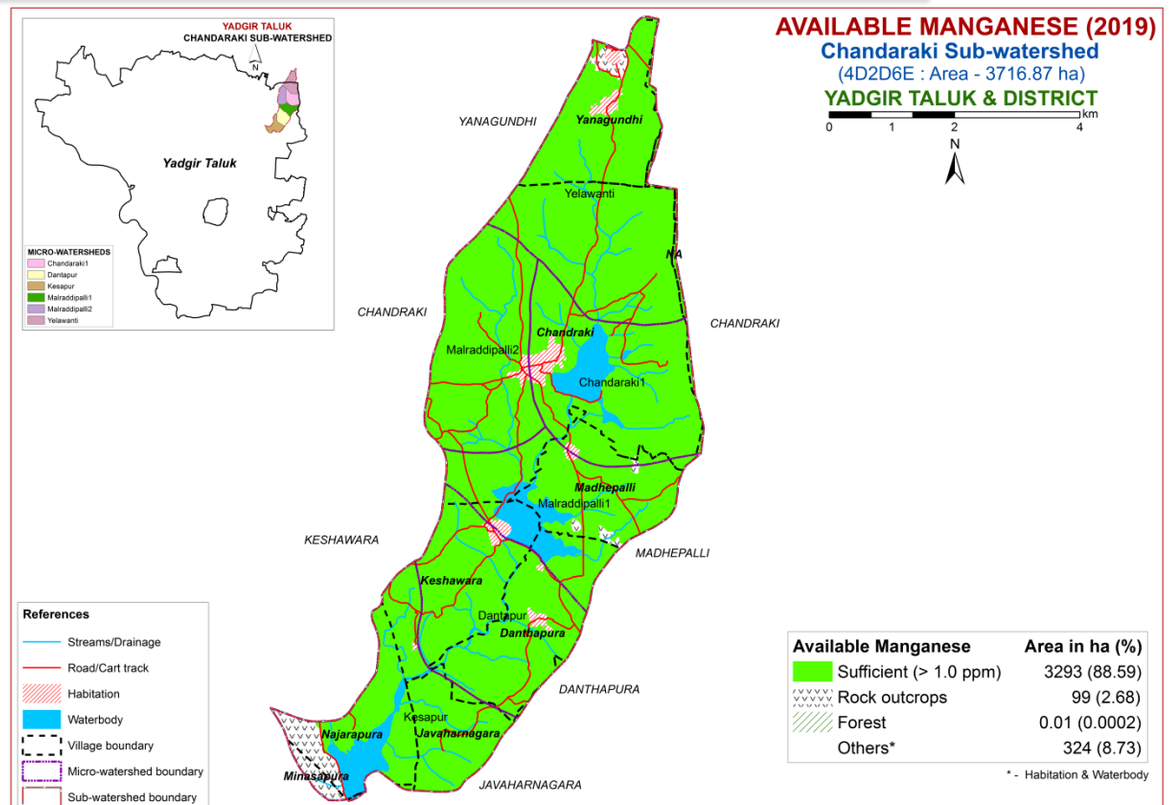
6.7. Available Boron



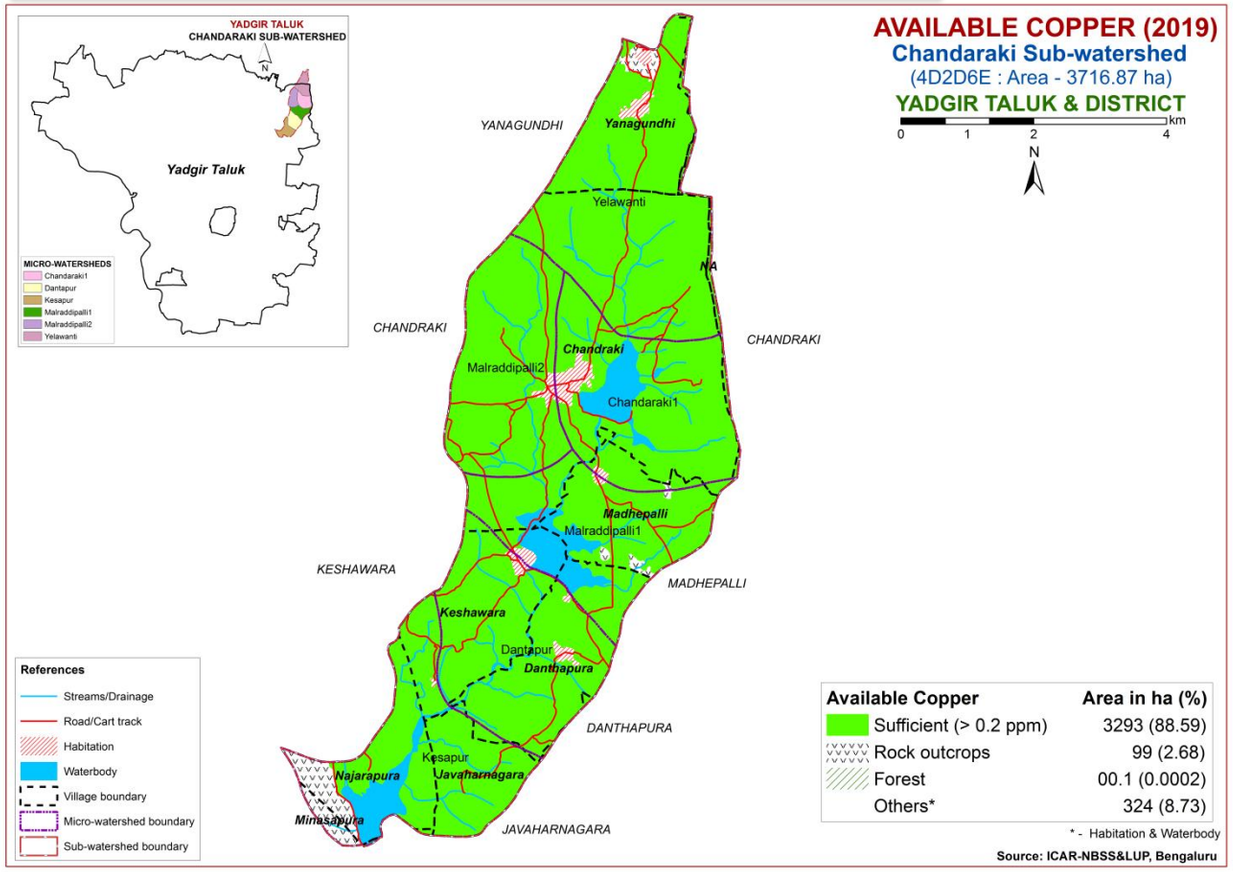
6.8. Available Iron



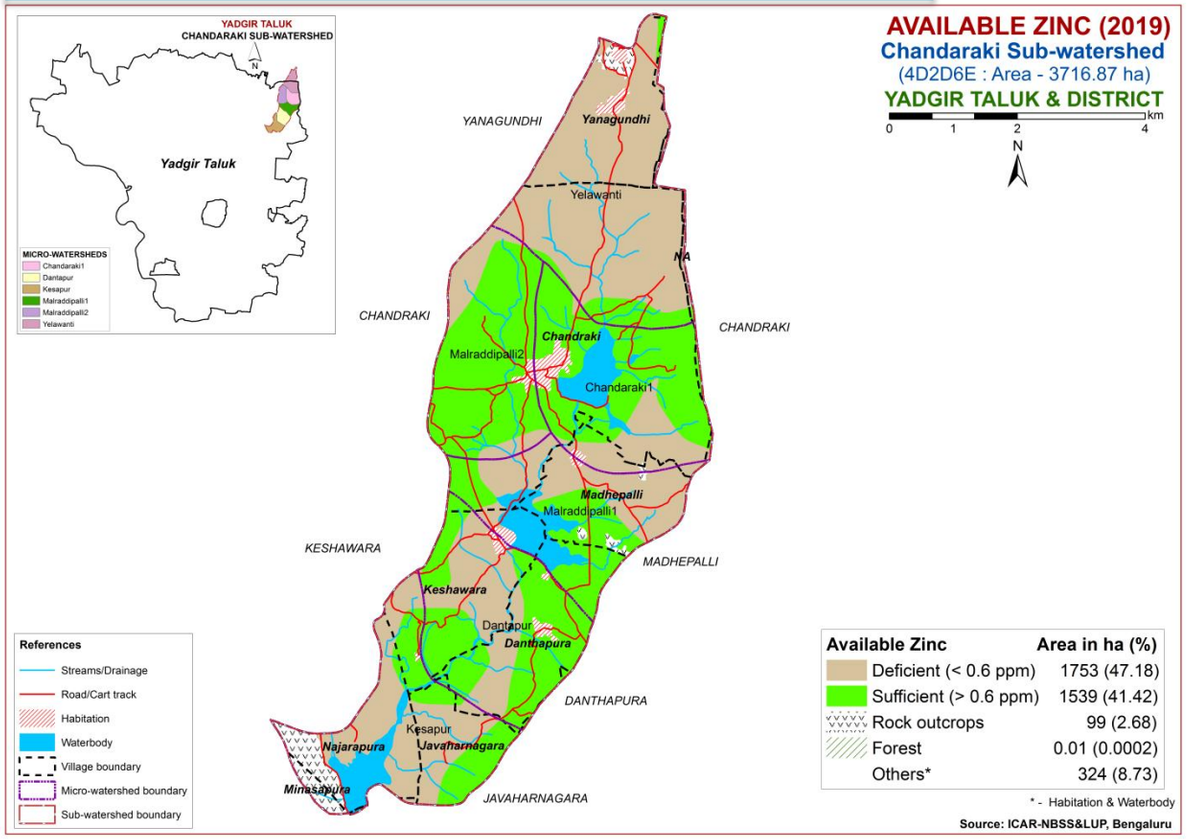
6.9. Available Manganese



6.10. Available Copper



6.11. Available Zinc



6.12. Correcting the Soil Nutrient Deficiencies

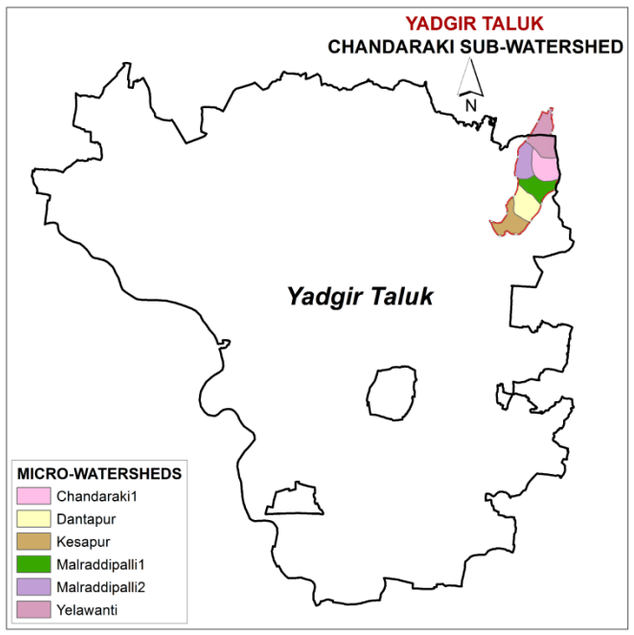
1. Reclamation of Salt affected soils
   a) When the soil is having neutral pH (6.5-7.5), no need of adding amendments (lime or gypsum)
   b) If the soil pH is <6.5, apply burnt lime to soil as per specifically recommended dosage and again after 2 years proper change has to be made based on soil test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

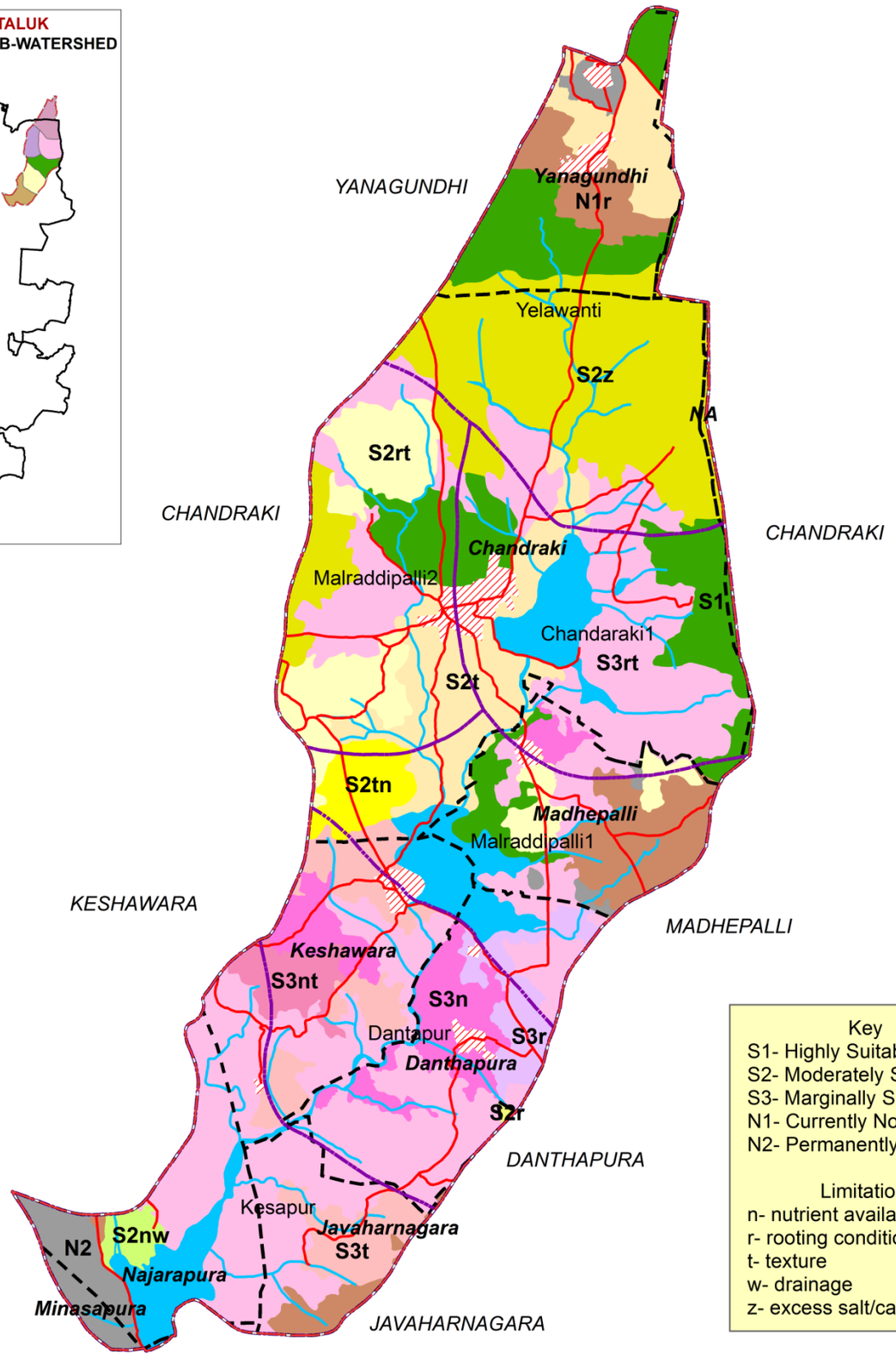
2. In case of low & high content of major nutrients in the soil, follow the modifications as given bellow:
   - N: P: K (N: P_2O_5: K_2O) **For low N content**, add 25 % extra to the Recommended Dose of Fertilisers (RDF).
     For high N content, reduce 25% from the RDF and apply to soil.
     Eg:- if 100kg N, then we have to apply
     100+25% for deficient soil.
     100% for medium available N content soil.
     100-25% for higher N content soil.
   - Follow the same in case of P & K.

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

7. Land Suitability for Major Crops

7.1. Land Suitability for Sorghum





LAND SUITABILITY FOR SORGHUM

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	374 (10.07)
S2r	2 (0.05)
S2t	306 (8.24)
S2z	521 (14.02)
S2nw	24 (0.64)
S2rt	218 (5.85)
S2tn	63 (1.7)
S3n	158 (4.24)
S3r	77 (2.06)
S3t	180 (4.85)
S3nt	54 (1.46)
S3rt	1099 (29.56)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

References

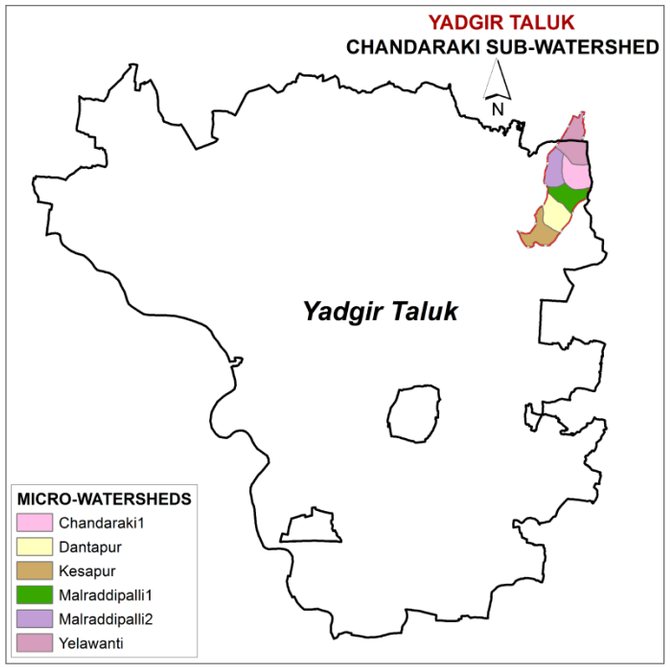
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

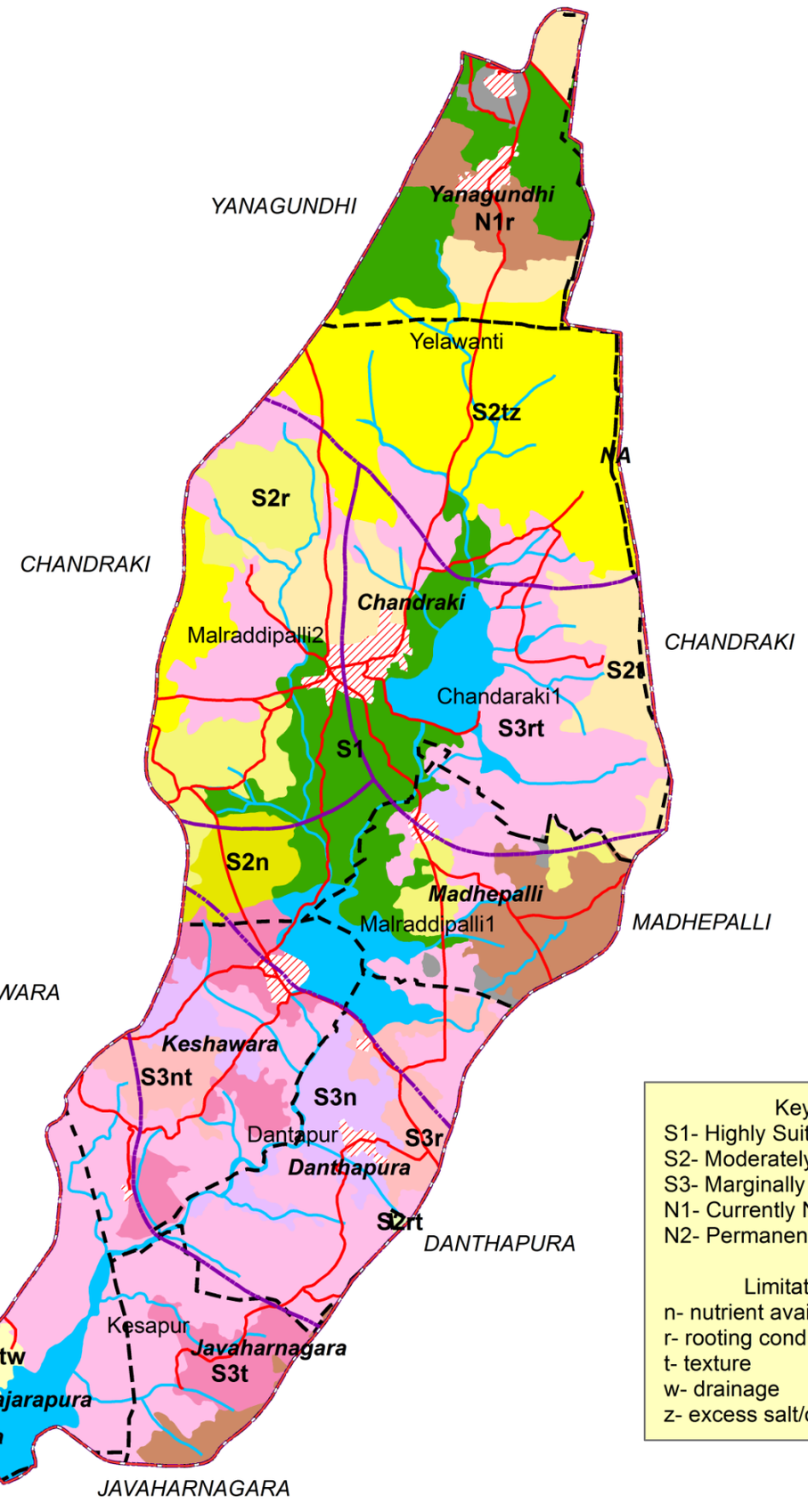
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

7.2. Land Suitability for Maize





LAND SUITABILITY FOR MAIZE

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	416 (11.18)
S2n	63 (1.7)
S2r	218 (5.85)
S2t	265 (7.14)
S2rt	2 (0.05)
S2tw	24 (0.64)
S2tz	521 (14.02)
S3n	158 (4.24)
S3r	77 (2.06)
S3t	180 (4.85)
S3nt	54 (1.46)
S3rt	1099 (29.56)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

References

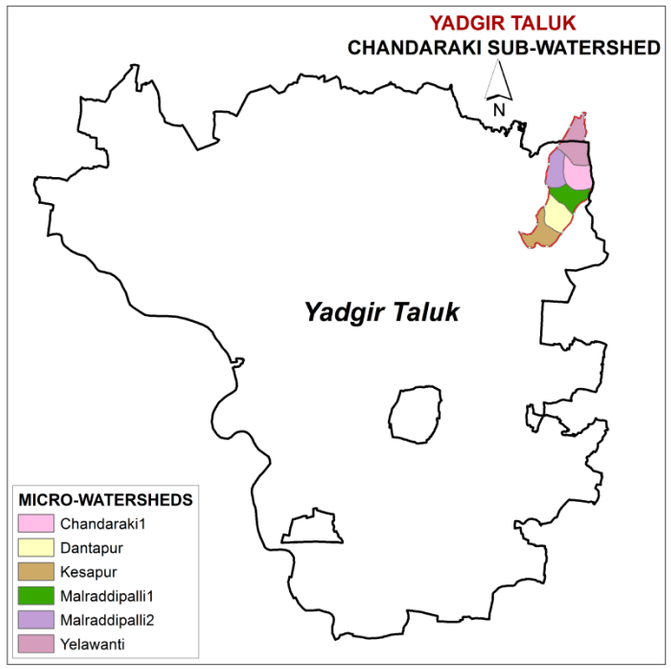
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

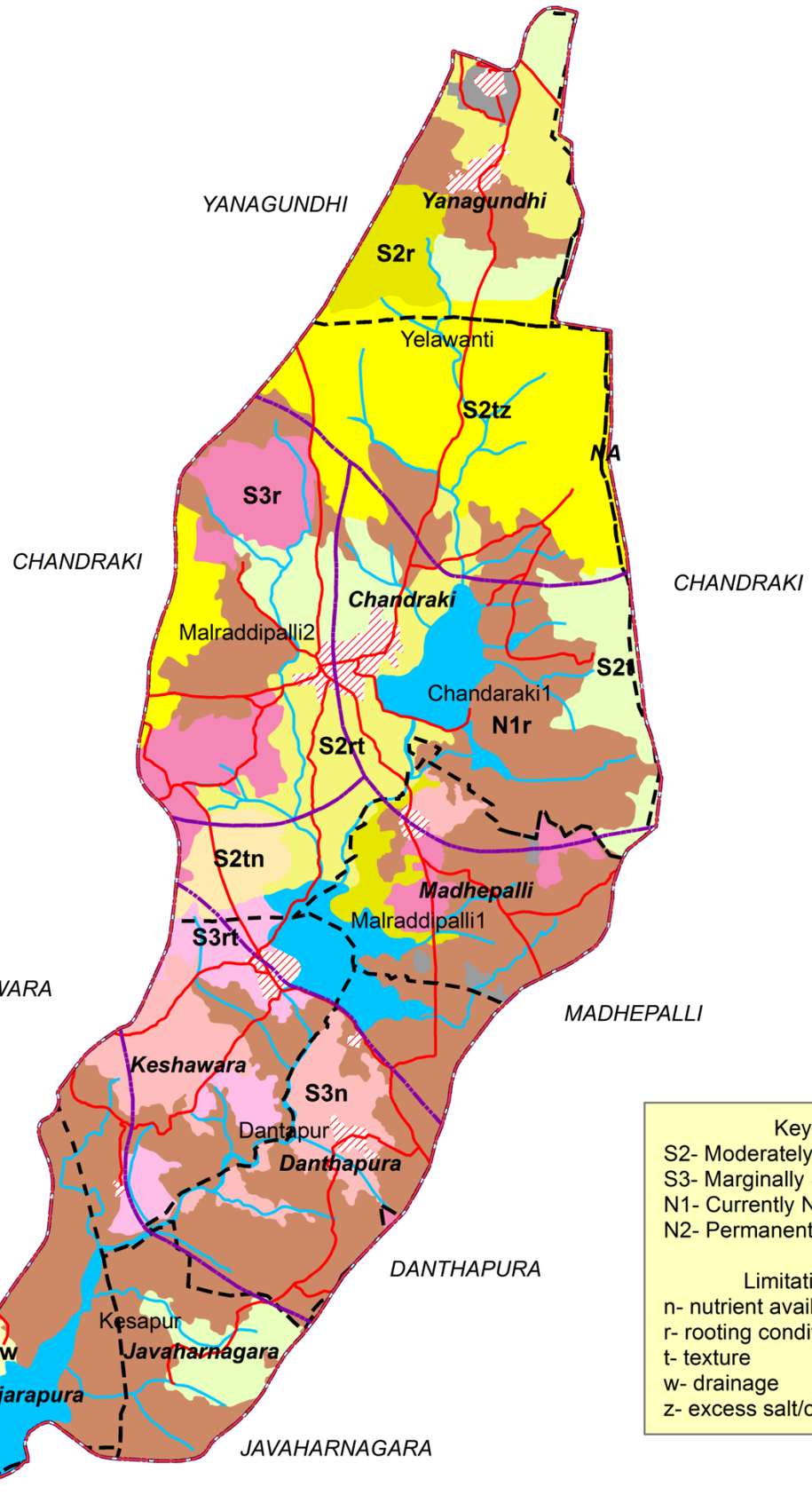
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

7.3. Land Suitability for Redgram





LAND SUITABILITY FOR REDGRAM

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

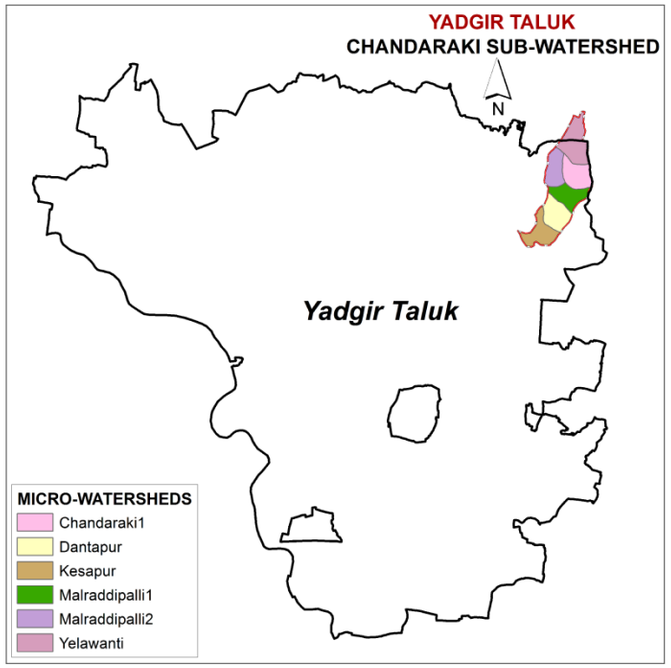
Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

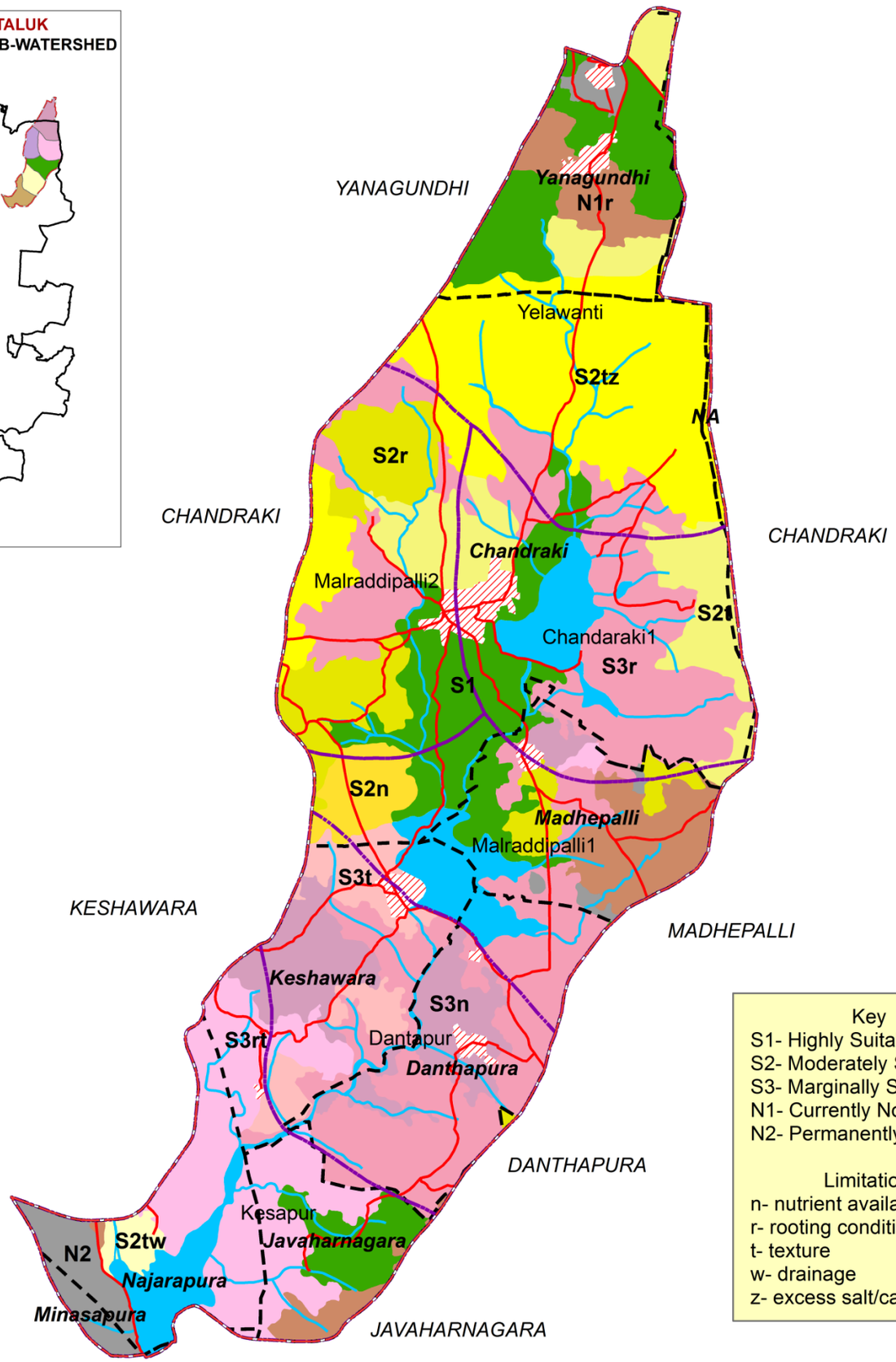
Suitability subclass	Area in ha (%)
S2r	109 (2.94)
S2t	336 (9.05)
S2rt	306 (8.24)
S2tn	63 (1.7)
S2tw	24 (0.64)
S2tz	521 (14.02)
S3n	212 (5.7)
S3r	219 (5.9)
S3rt	109 (2.94)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.4. Land Suitability for Bajra





LAND SUITABILITY FOR BAJRA

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

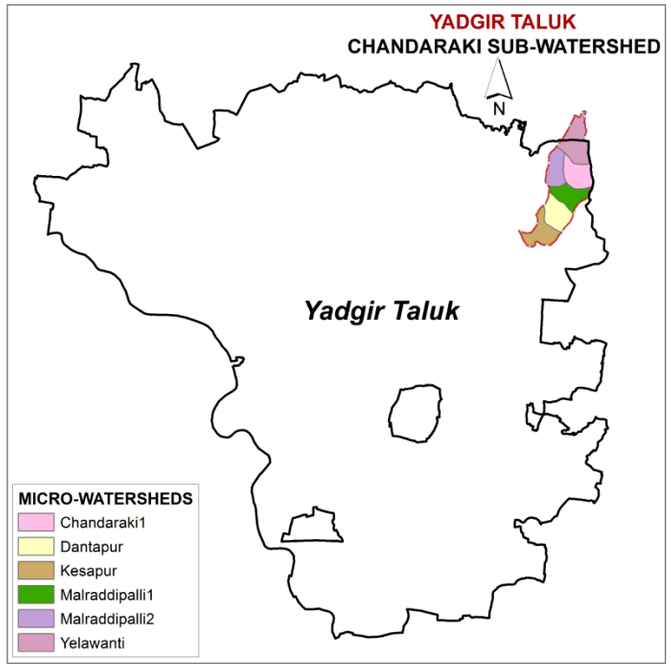
Limitations
n- nutrient availability
r- rooting condition
t- texture
w- drainage
z- excess salt/calcareousness

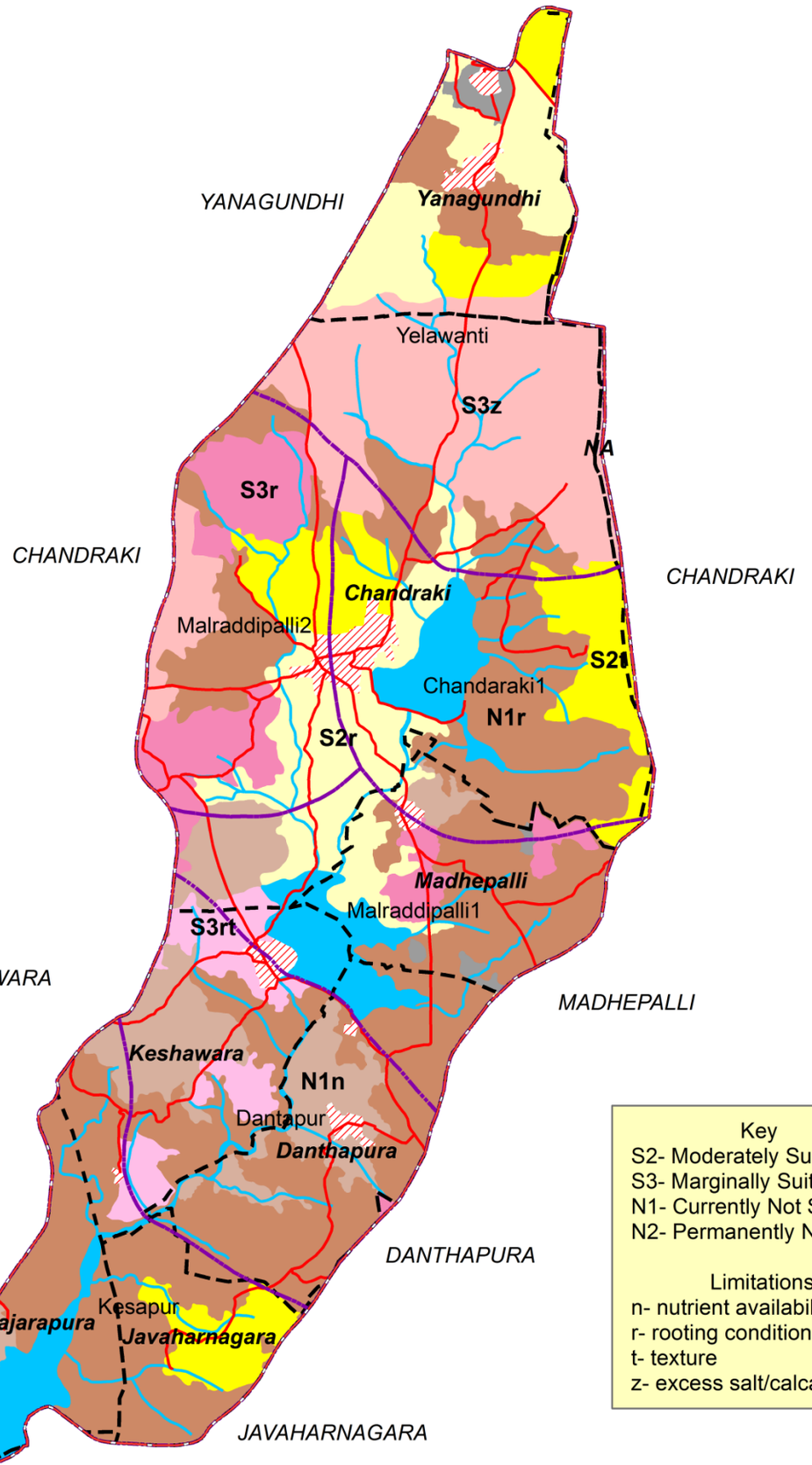
Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2n	63 (1.7)
S2r	219 (5.9)
S2t	265 (7.14)
S2tw	24 (0.64)
S2tz	521 (14.02)
S3n	212 (5.7)
S3r	844 (22.72)
S3t	109 (2.94)
S3rt	331 (8.9)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.5. Land Suitability for Drumstick





LAND SUITABILITY FOR DRUMSTICK

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

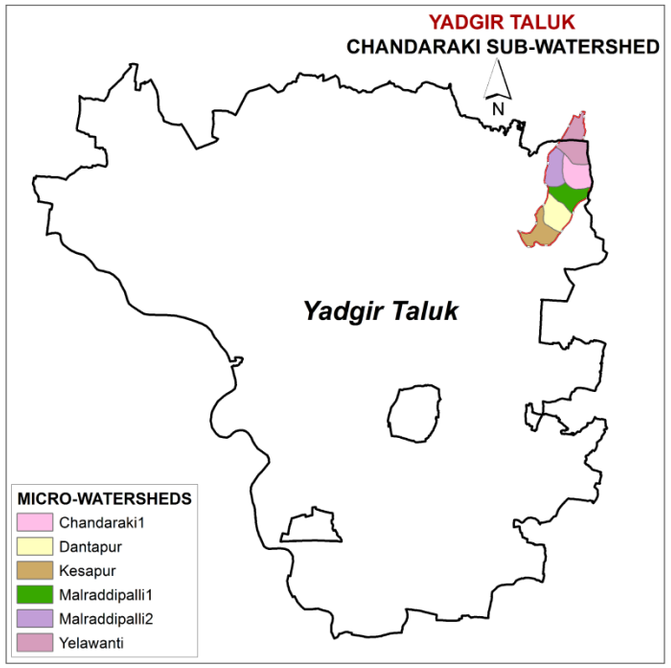
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

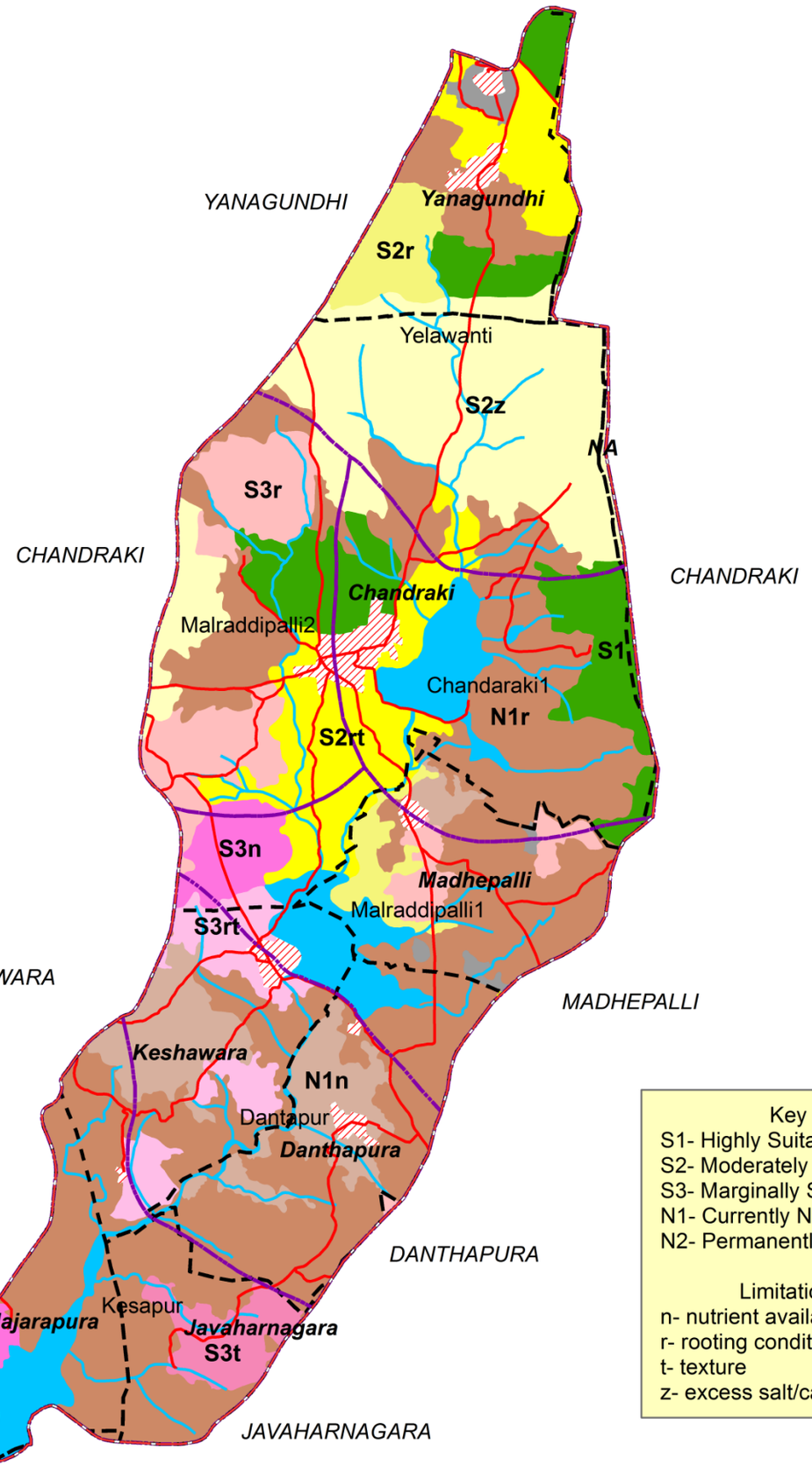
Suitability subclass	Area in ha (%)
S2r	416 (11.18)
S2t	336 (9.05)
S3r	219 (5.9)
S3z	521 (14.02)
S3rt	109 (2.94)
N1n	299 (8.05)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.6. Land Suitability for Sunflower





LAND SUITABILITY FOR SUNFLOWER

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	265 (7.14)
S2r	109 (2.94)
S2z	521 (14.02)
S2rt	306 (8.24)
S3n	87 (2.34)
S3r	219 (5.9)
S3t	71 (1.91)
S3rt	109 (2.94)
N1n	212 (5.7)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

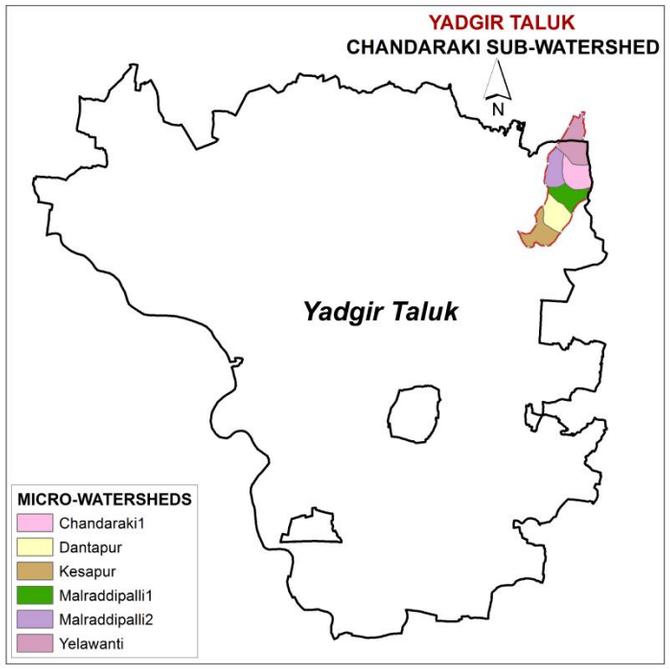
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

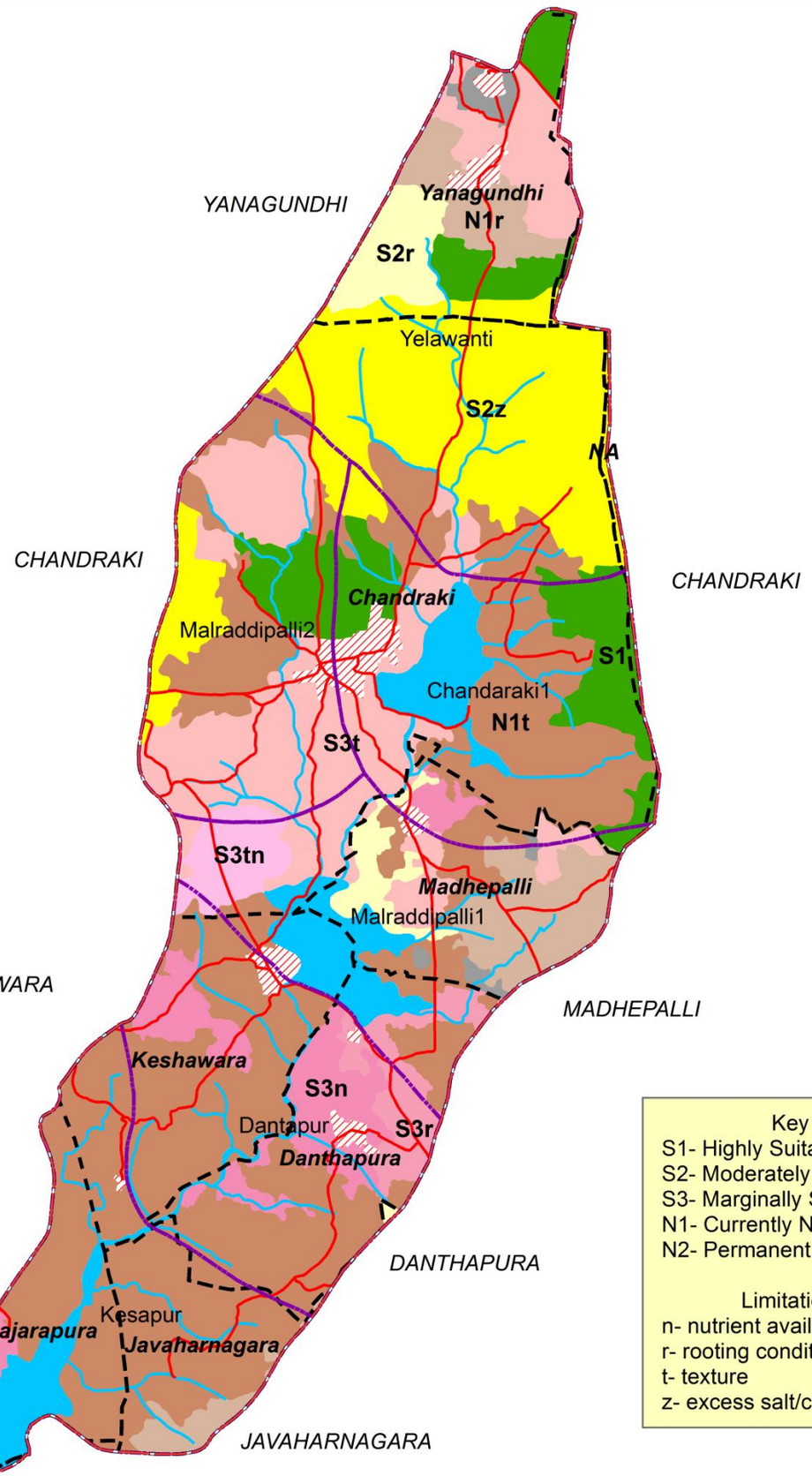
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

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

Source: ICAR-NBSS&LUP, Bengaluru

7.7. Land Suitability for Cotton





LAND SUITABILITY FOR COTTON

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

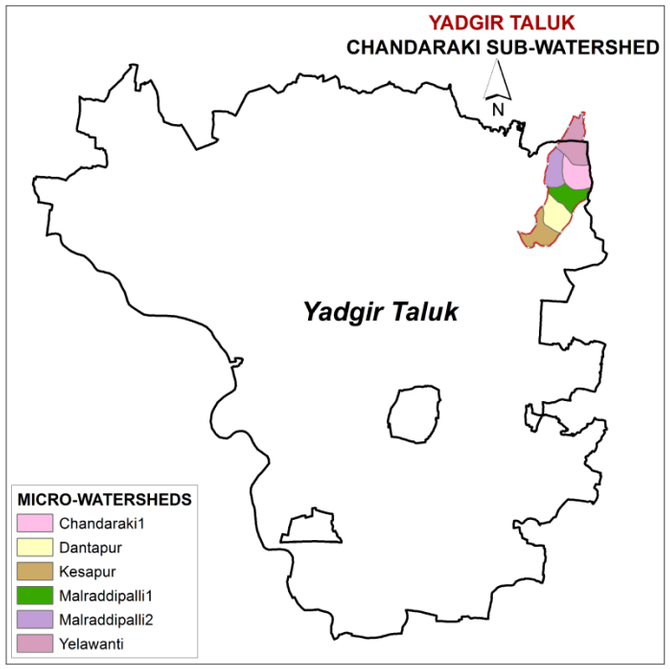
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

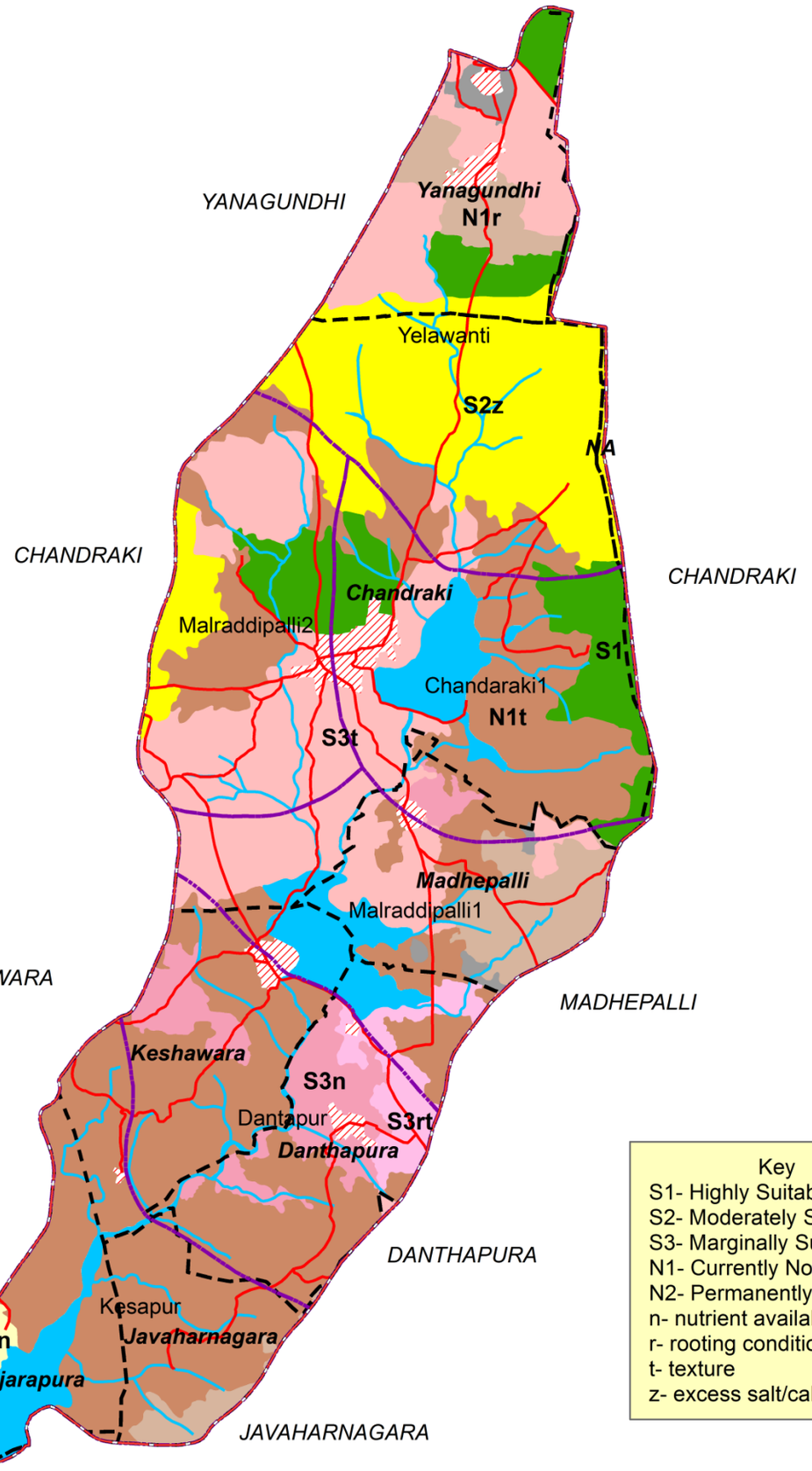
Suitability subclass	Area in ha (%)
S1	265 (7.14)
S2r	111 (2.99)
S2z	521 (14.02)
S3n	182 (4.88)
S3r	77 (2.06)
S3t	524 (14.1)
S3tn	63 (1.7)
N1r	217 (5.83)
N1t	1333 (35.87)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.8. Land Suitability for Bengalgram





LAND SUITABILITY FOR BENGALGRAM

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

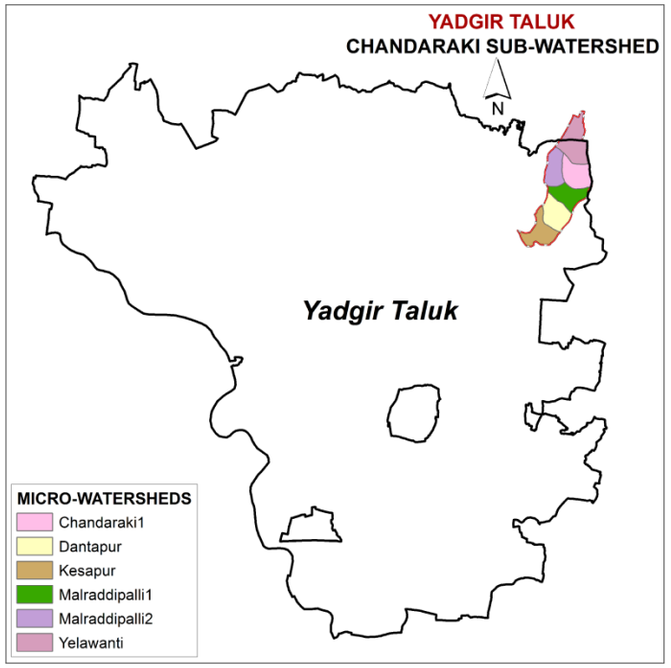
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

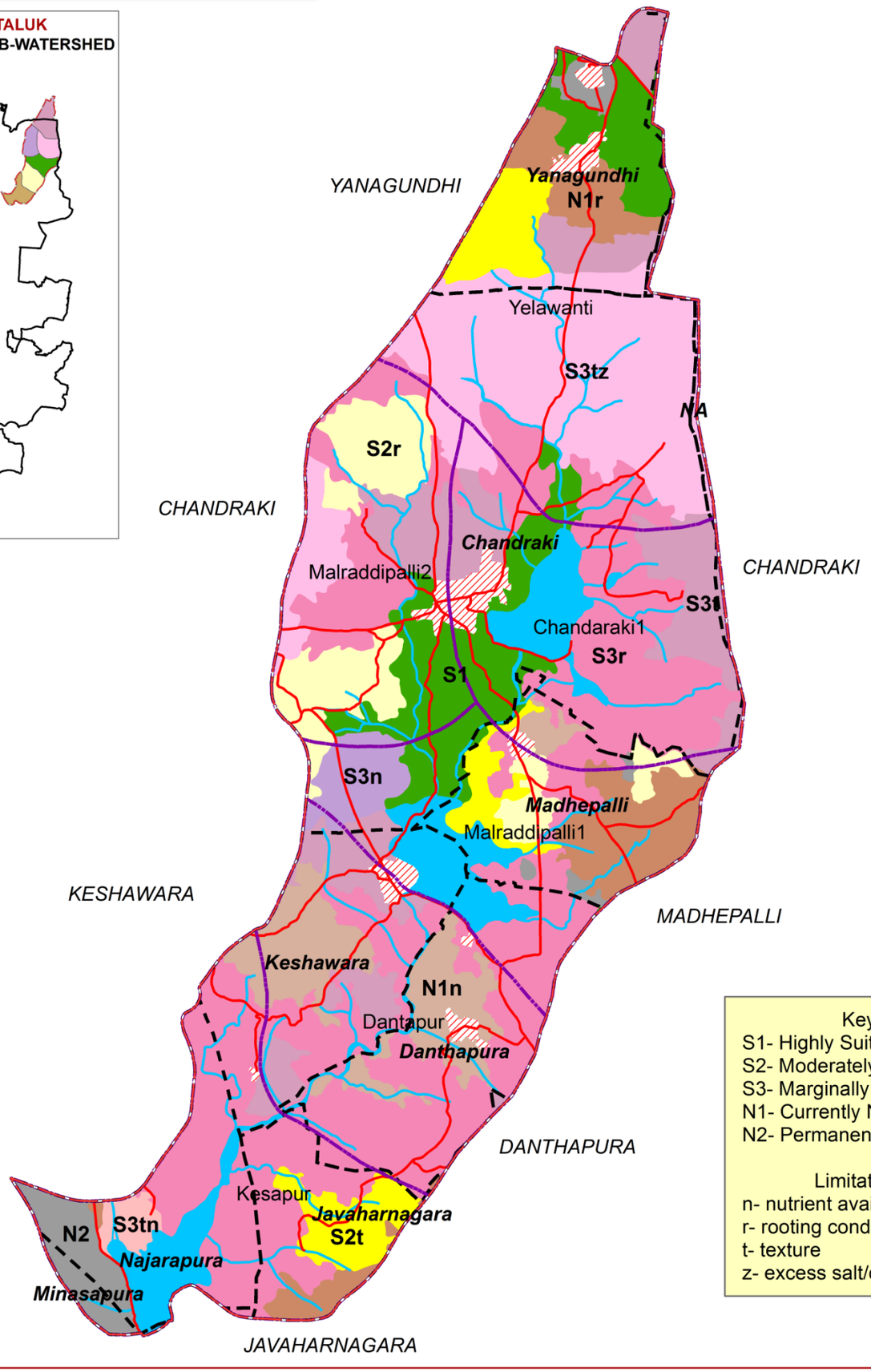
Suitability subclass	Area in ha (%)
S1	265 (7.14)
S2n	24 (0.64)
S2z	521 (14.02)
S3n	158 (4.24)
S3t	698 (18.79)
S3rt	77 (2.06)
N1r	217 (5.83)
N1t	1333 (35.87)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.9. Land Suitability for Groundnut





LAND SUITABILITY FOR GROUNDNUT

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

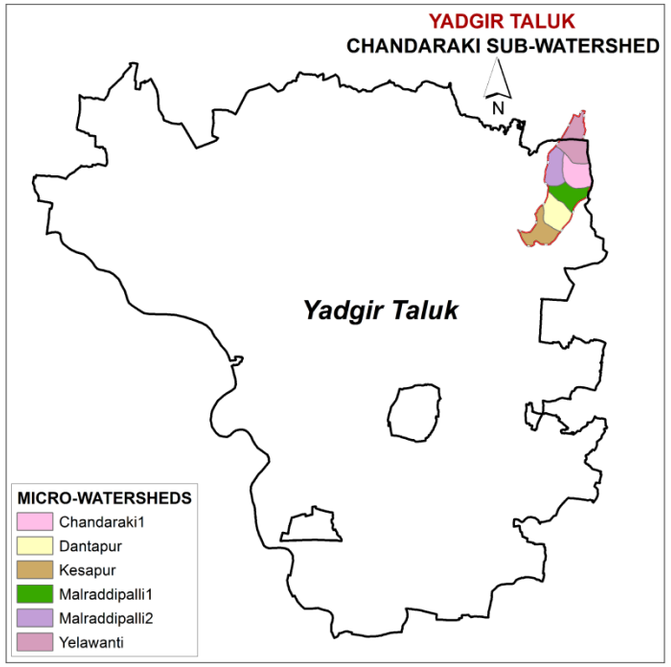
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

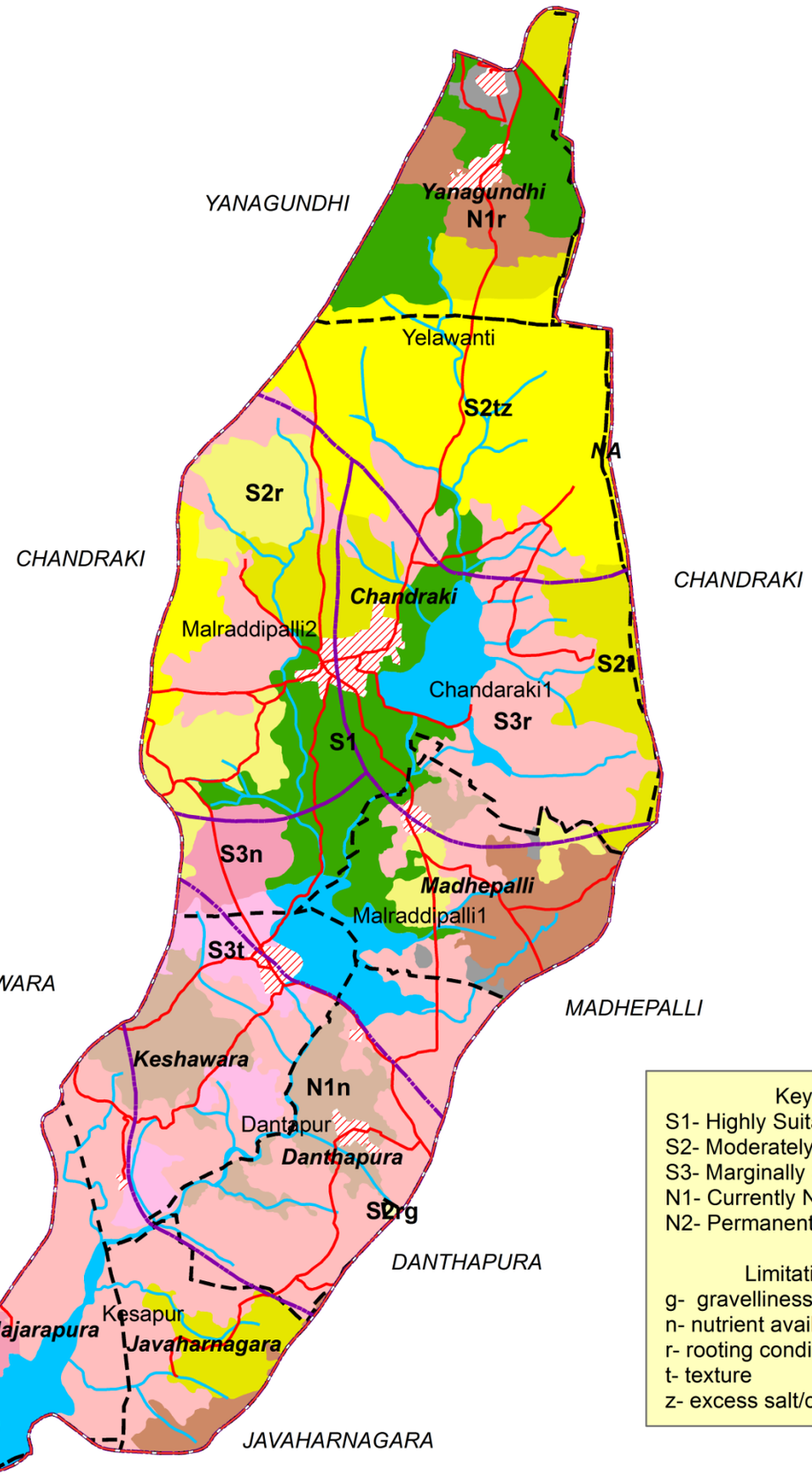
Suitability subclass	Area in ha (%)
S1	306 (8.24)
S2r	218 (5.85)
S2t	180 (4.85)
S3n	63 (1.7)
S3r	1175 (31.62)
S3t	377 (10.13)
S3tn	24 (0.64)
S3tz	521 (14.02)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.10. Land Suitability for Chilli





LAND SUITABILITY FOR CHILLI

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	416 (11.18)
S2r	218 (5.85)
S2t	336 (9.05)
S2rg	2 (0.05)
S2tz	521 (14.02)
S3n	87 (2.34)
S3r	1175 (31.62)
S3t	109 (2.94)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

References

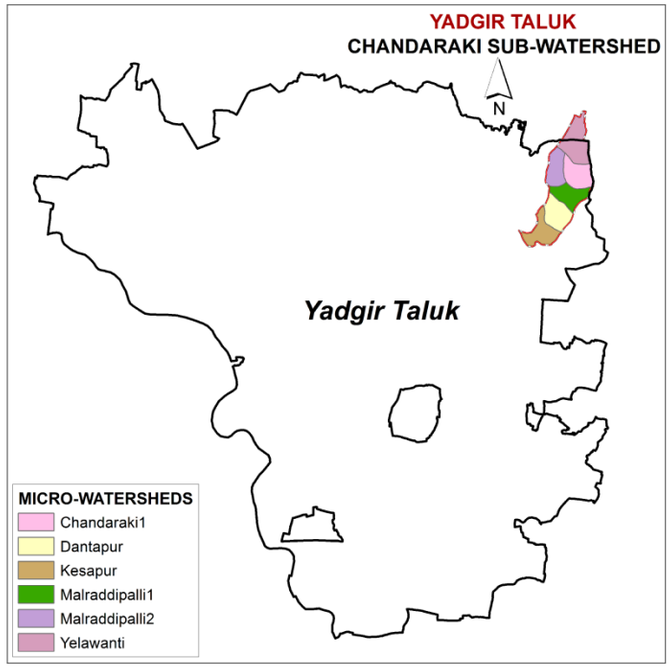
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

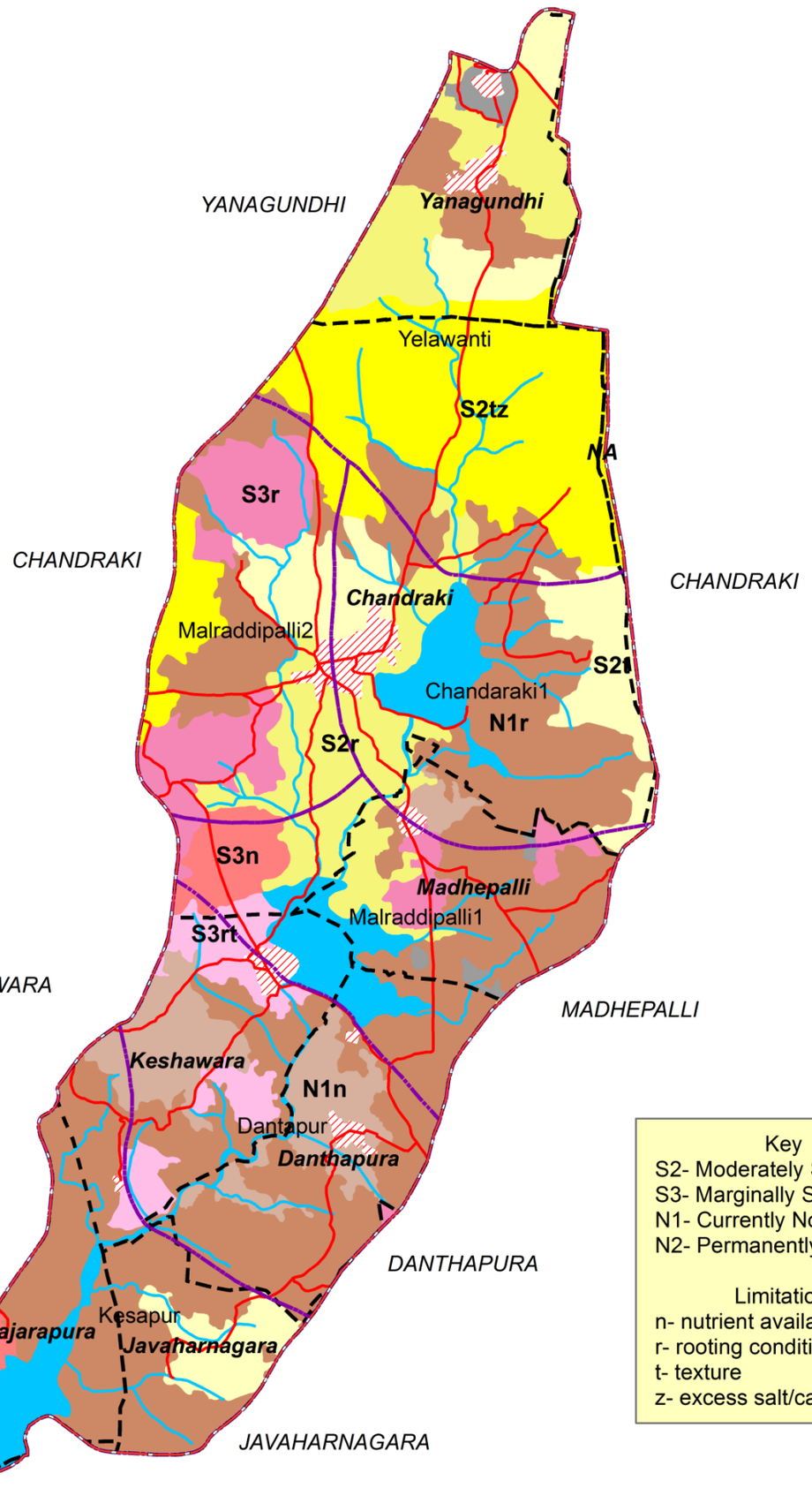
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

7.11. Land Suitability for Pomegranate





LAND SUITABILITY FOR POMEGRANATE

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

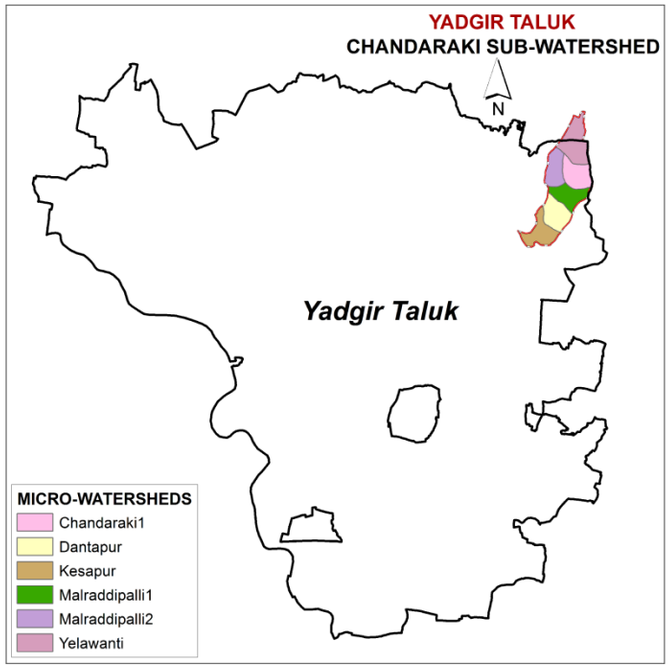
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

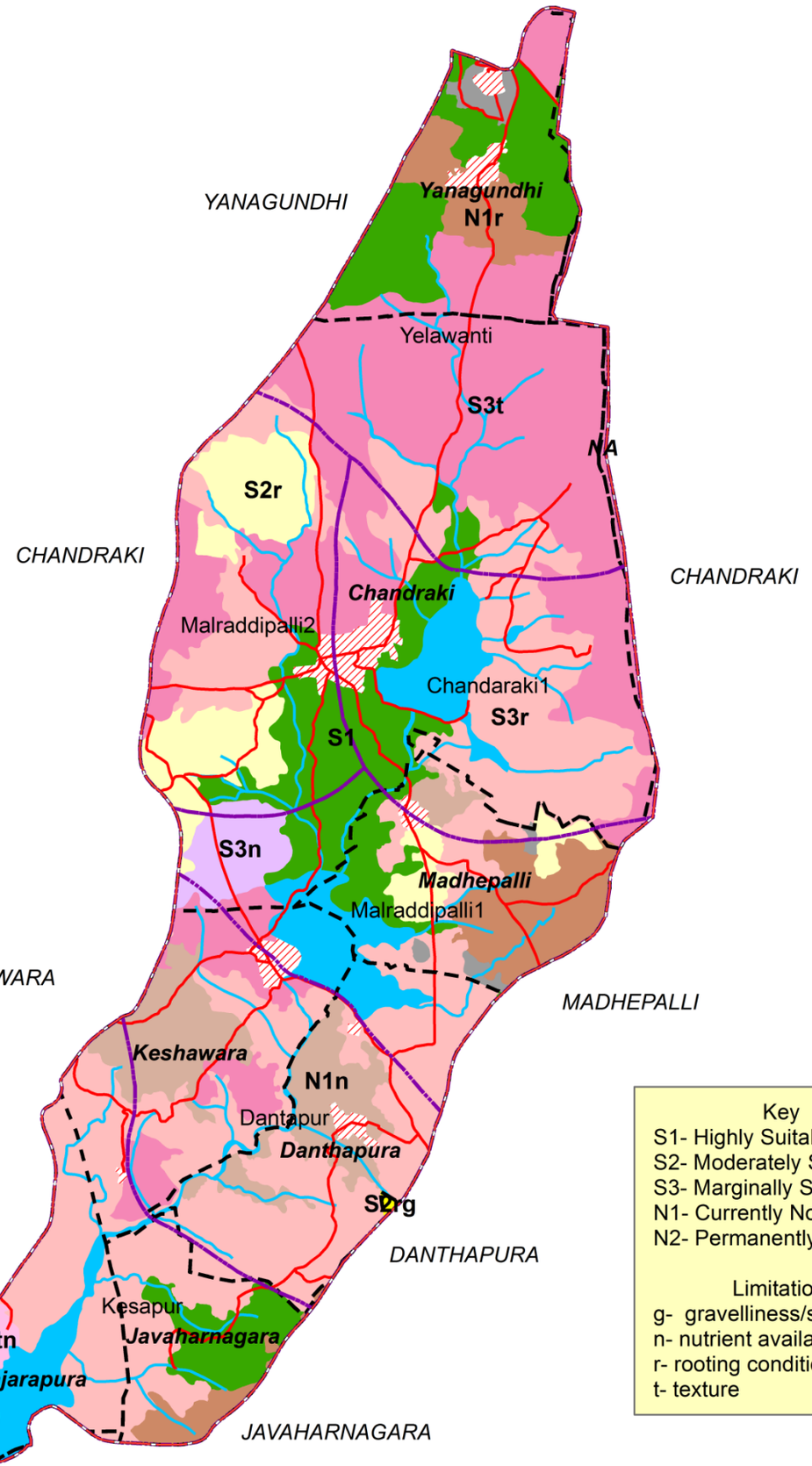
Suitability subclass	Area in ha (%)
S2r	416 (11.18)
S2t	336 (9.05)
S2tz	521 (14.02)
S3n	87 (2.34)
S3r	219 (5.9)
S3rt	109 (2.94)
N1n	212 (5.7)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.12. Land Suitability for Tomato





LAND SUITABILITY FOR TOMATO

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

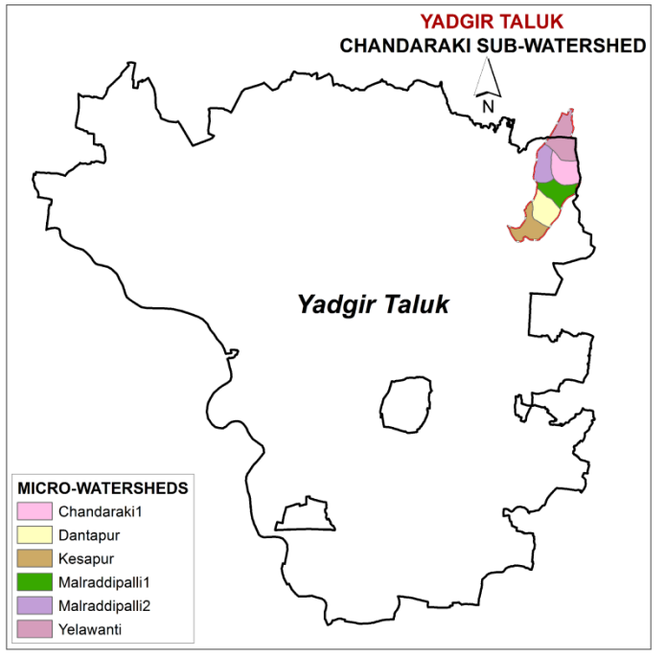
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

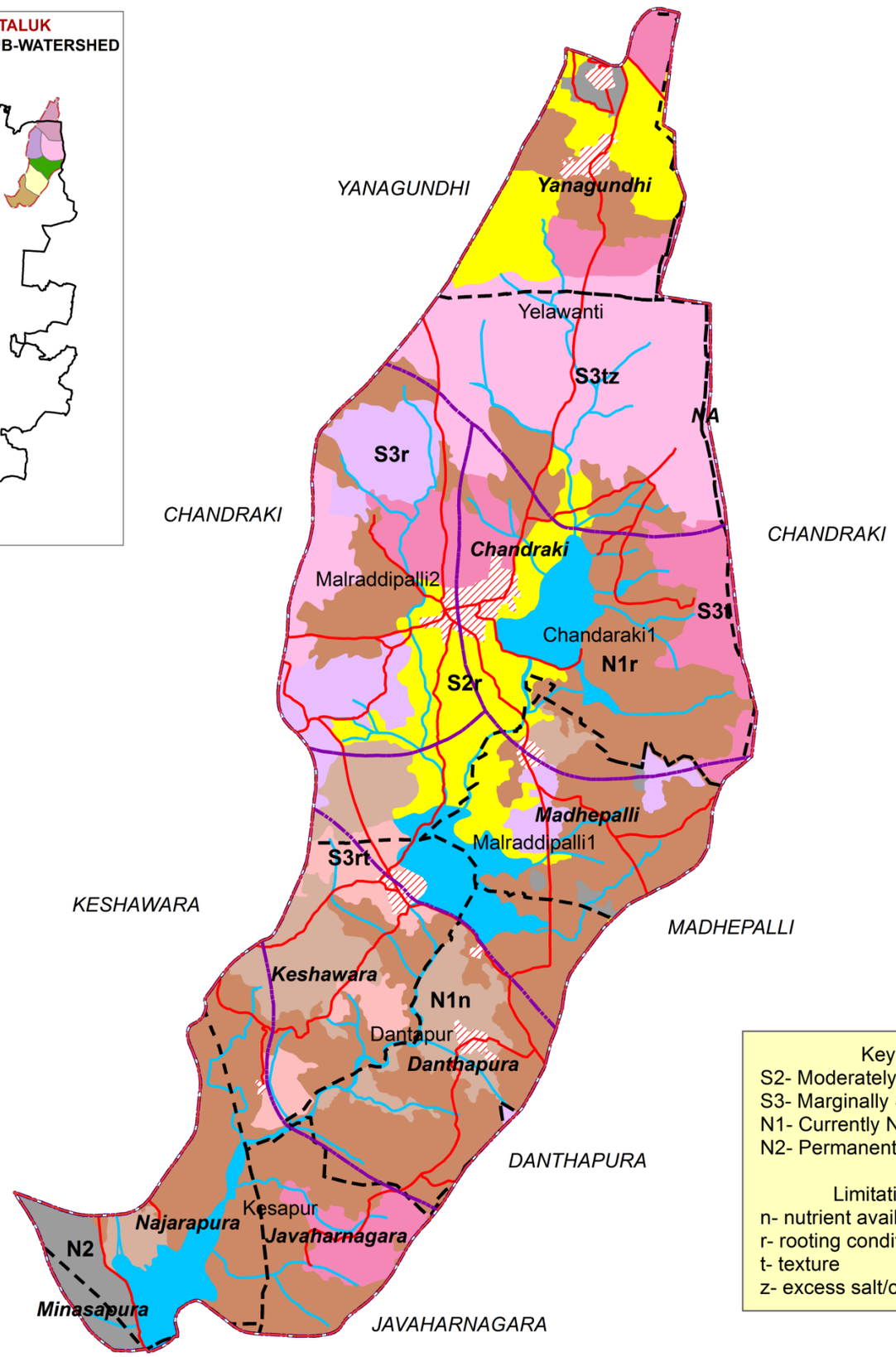
Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2r	218 (5.85)
S2rg	2 (0.05)
S3n	63 (1.7)
S3r	1175 (31.62)
S3t	896 (24.1)
S3tn	24 (0.64)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.13. Land Suitability for Mulberry





LAND SUITABILITY FOR MULBERRY

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

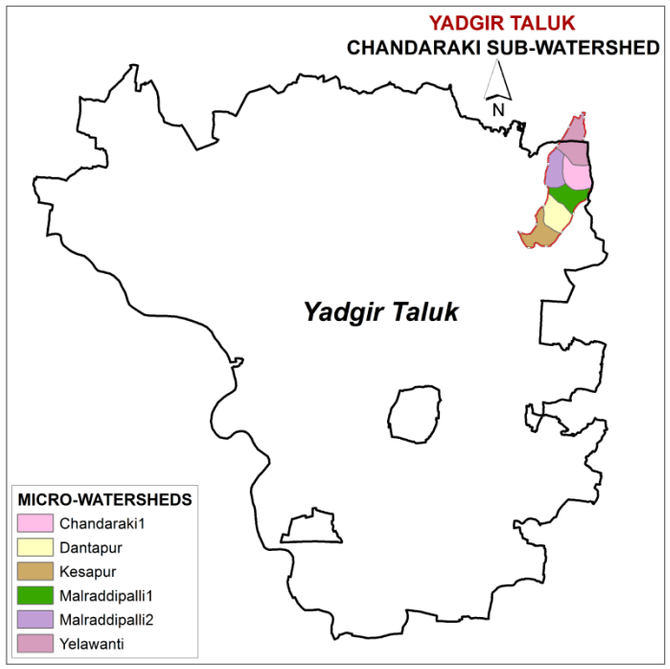
Suitability subclass	Area in ha (%)
S2r	416 (11.18)
S3r	219 (5.9)
S3t	336 (9.05)
S3rt	109 (2.94)
S3tz	521 (14.02)
N1n	299 (8.05)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

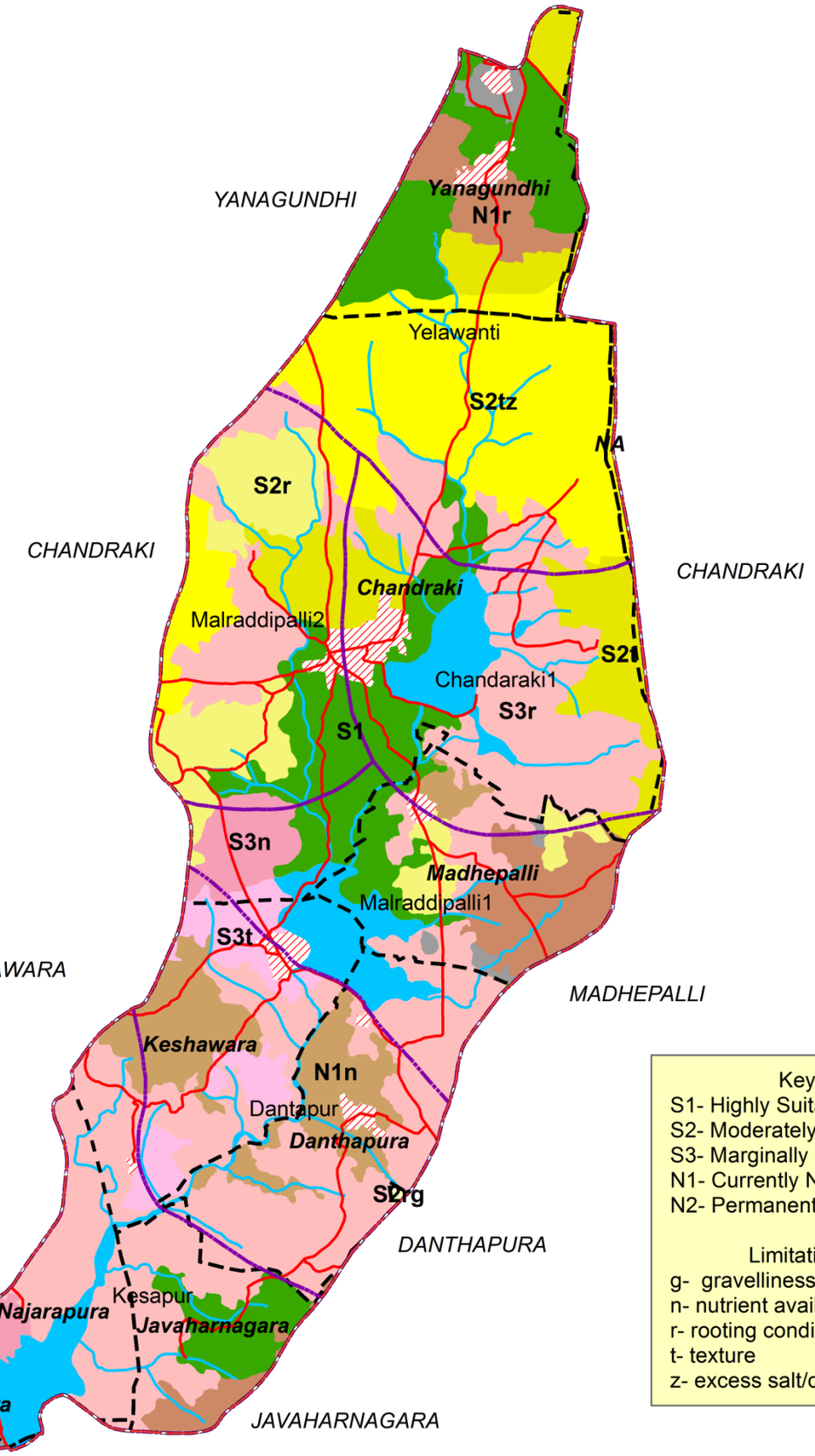
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

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

7.14. Land Suitability for Bhendi





LAND SUITABILITY FOR BHENDI

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

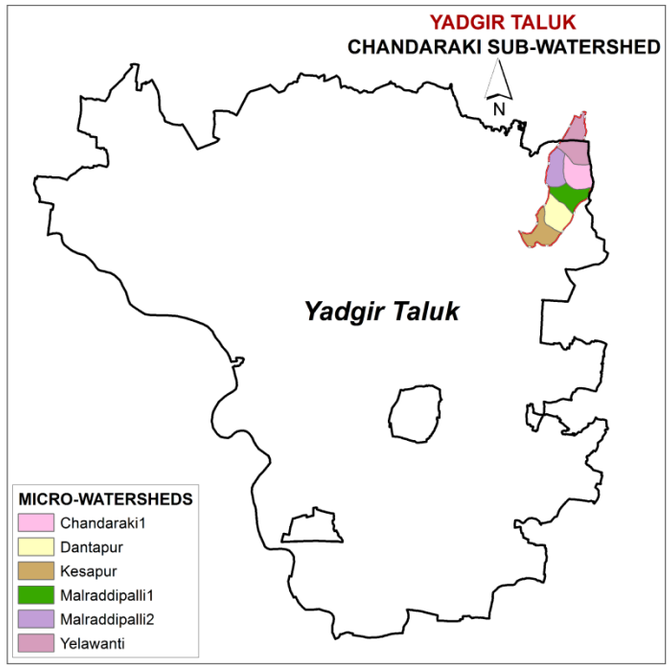
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

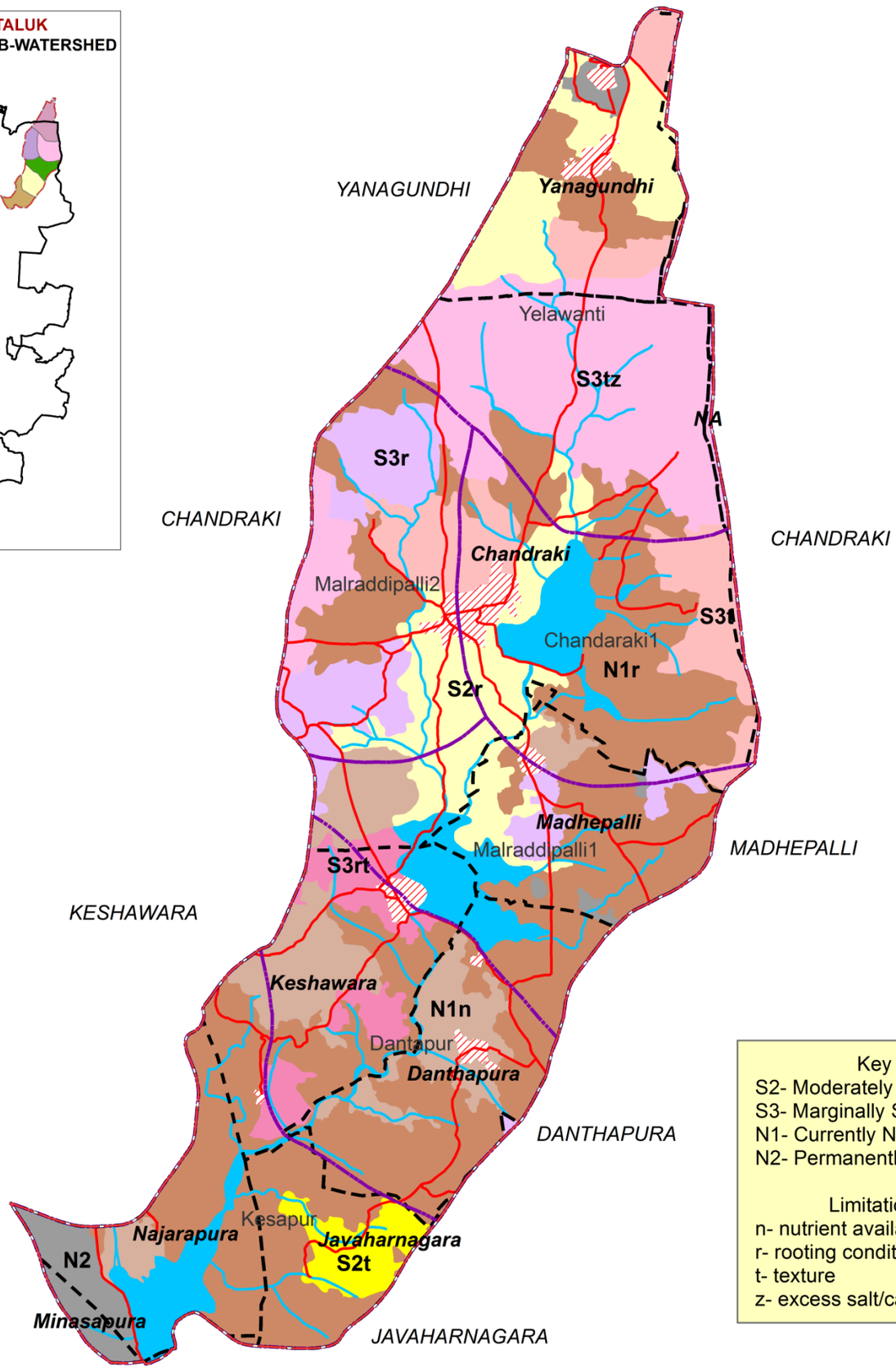
Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2r	218 (5.85)
S2t	265 (7.14)
S2rg	2 (0.05)
S2tz	521 (14.02)
S3n	87 (2.34)
S3r	1175 (31.62)
S3t	109 (2.94)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.15. Land Suitability for Guava





LAND SUITABILITY FOR GUAVA

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

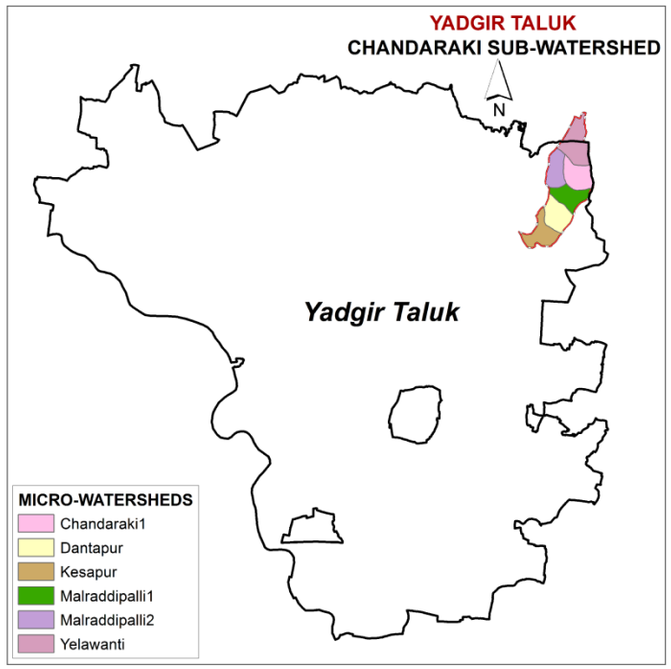
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

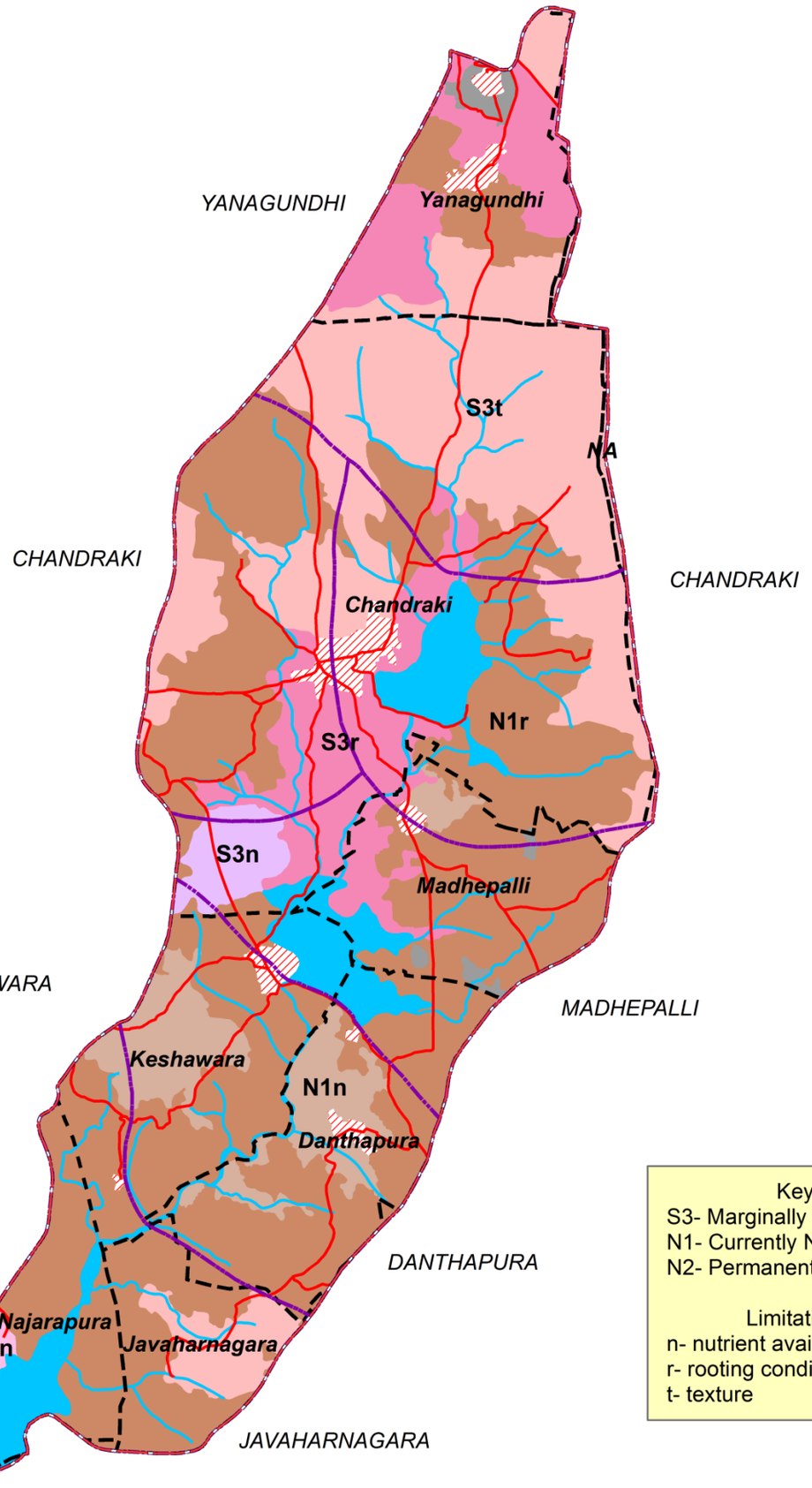
Suitability subclass	Area in ha (%)
S2r	416 (11.18)
S2t	71 (1.91)
S3r	219 (5.9)
S3t	265 (7.14)
S3rt	109 (2.94)
S3tz	521 (14.02)
N1n	299 (8.05)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.16. Land Suitability for Mango





LAND SUITABILITY FOR MANGO

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

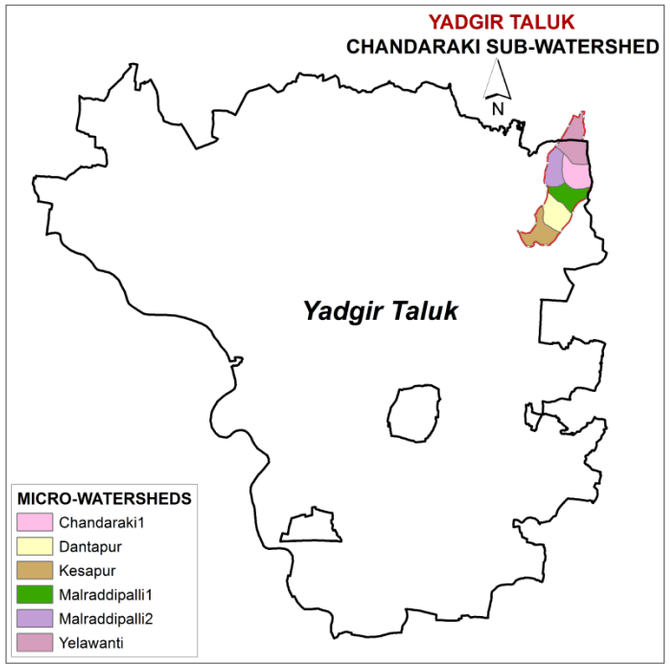
Limitations
n- nutrient availability
r- rooting condition
t- texture

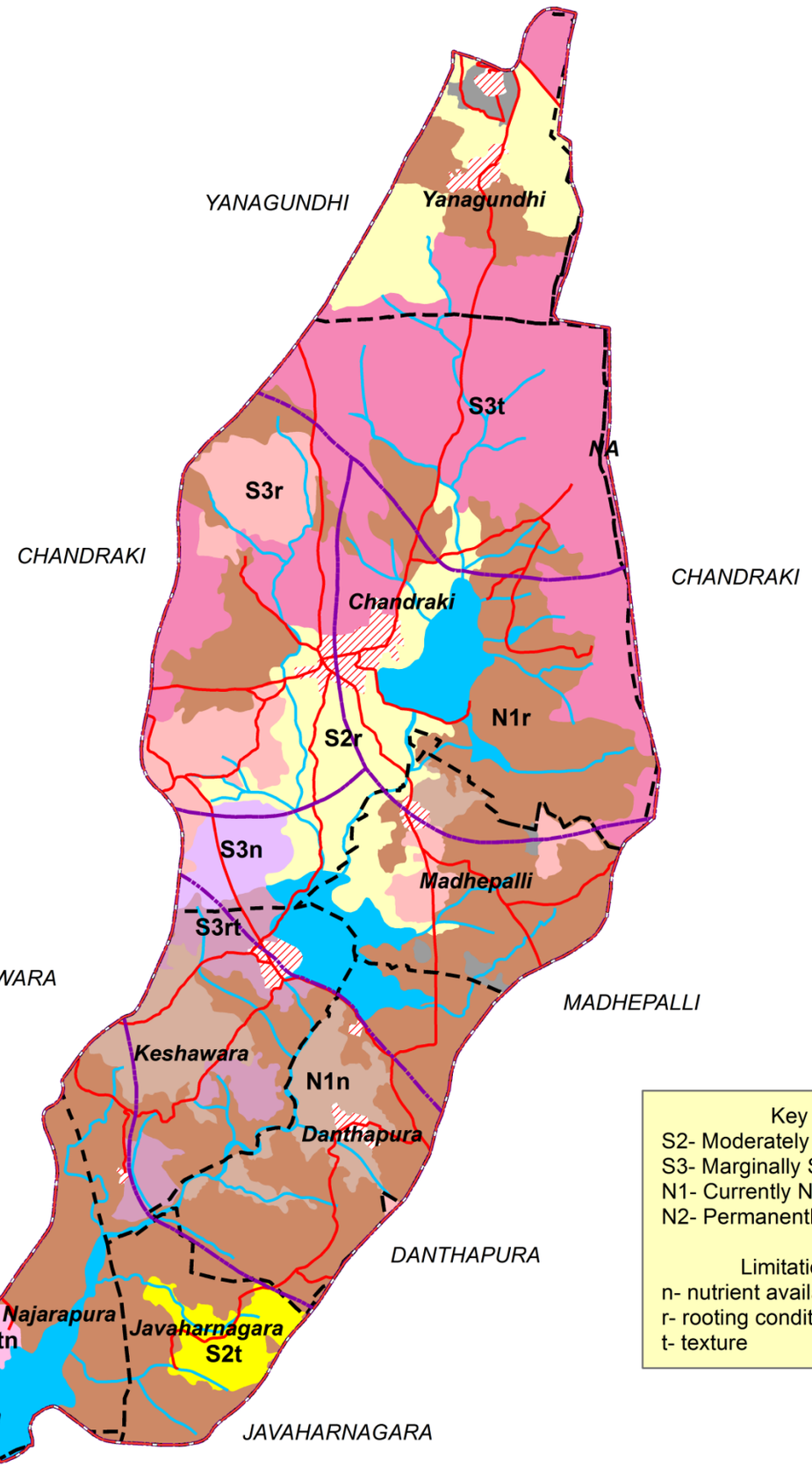
Suitability subclass	Area in ha (%)
S3n	63 (1.7)
S3r	416 (11.18)
S3t	857 (23.07)
S3tn	24 (0.64)
N1n	212 (5.7)
N1r	1721 (46.3)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.17. Land Suitability for Sapota





LAND SUITABILITY FOR SAPOTA

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

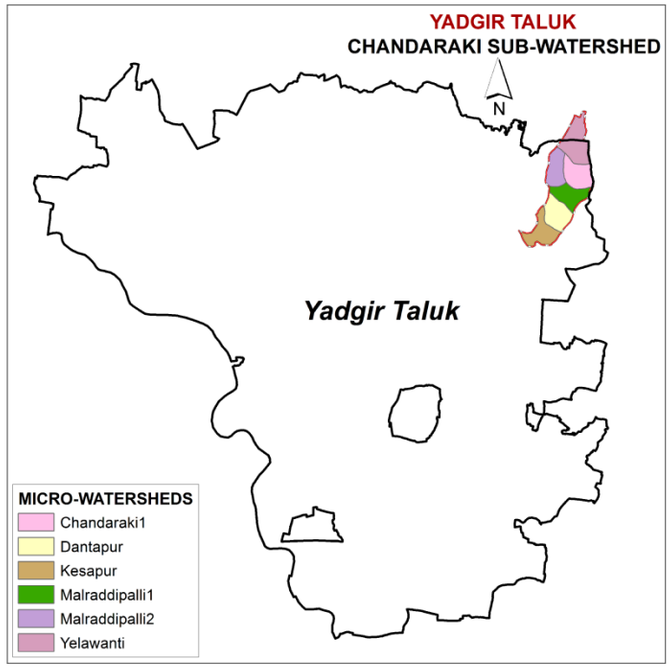
Limitations
n- nutrient availability
r- rooting condition
t- texture

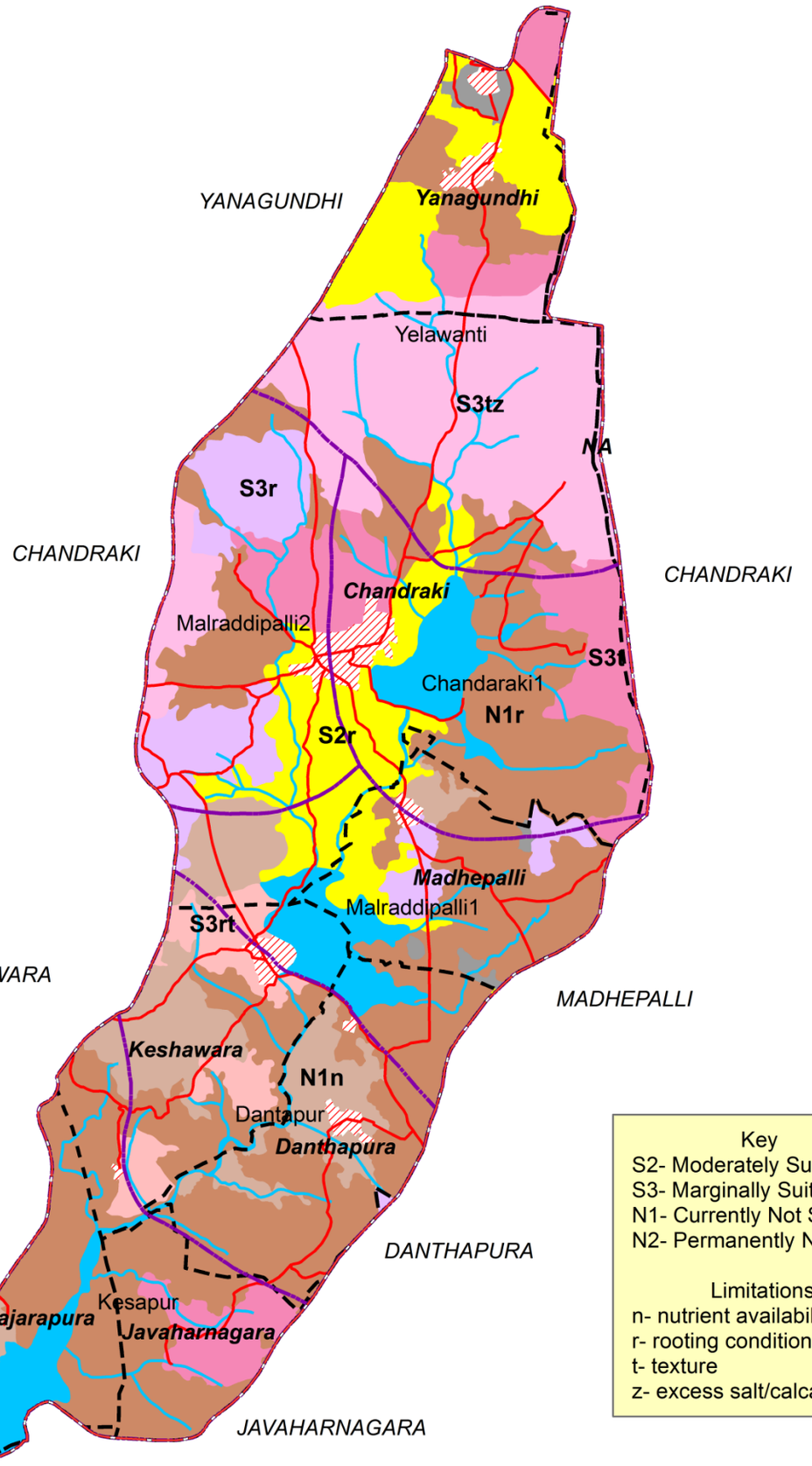
Suitability subclass	Area in ha (%)
S2r	416 (11.18)
S2t	71 (1.91)
S3n	63 (1.7)
S3r	219 (5.9)
S3t	786 (21.16)
S3rt	109 (2.94)
S3tn	24 (0.64)
N1n	212 (5.7)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.18. Land Suitability for Jackfruit





LAND SUITABILITY FOR JACKFRUIT

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

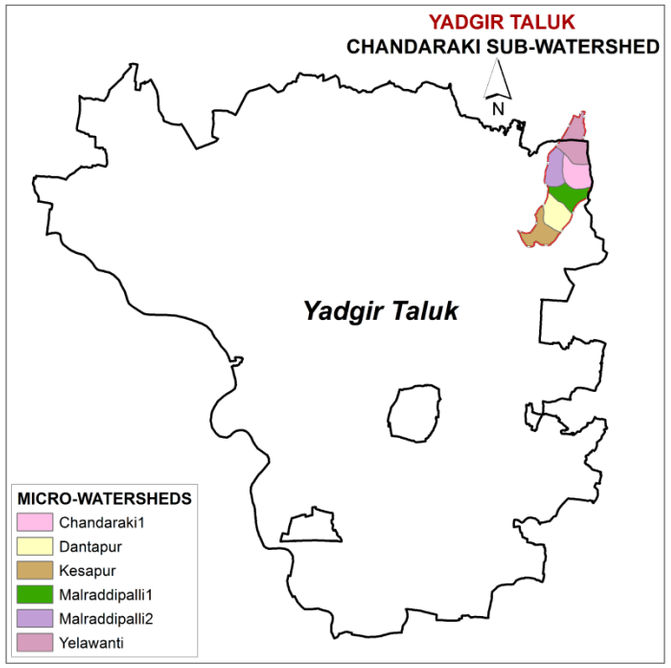
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

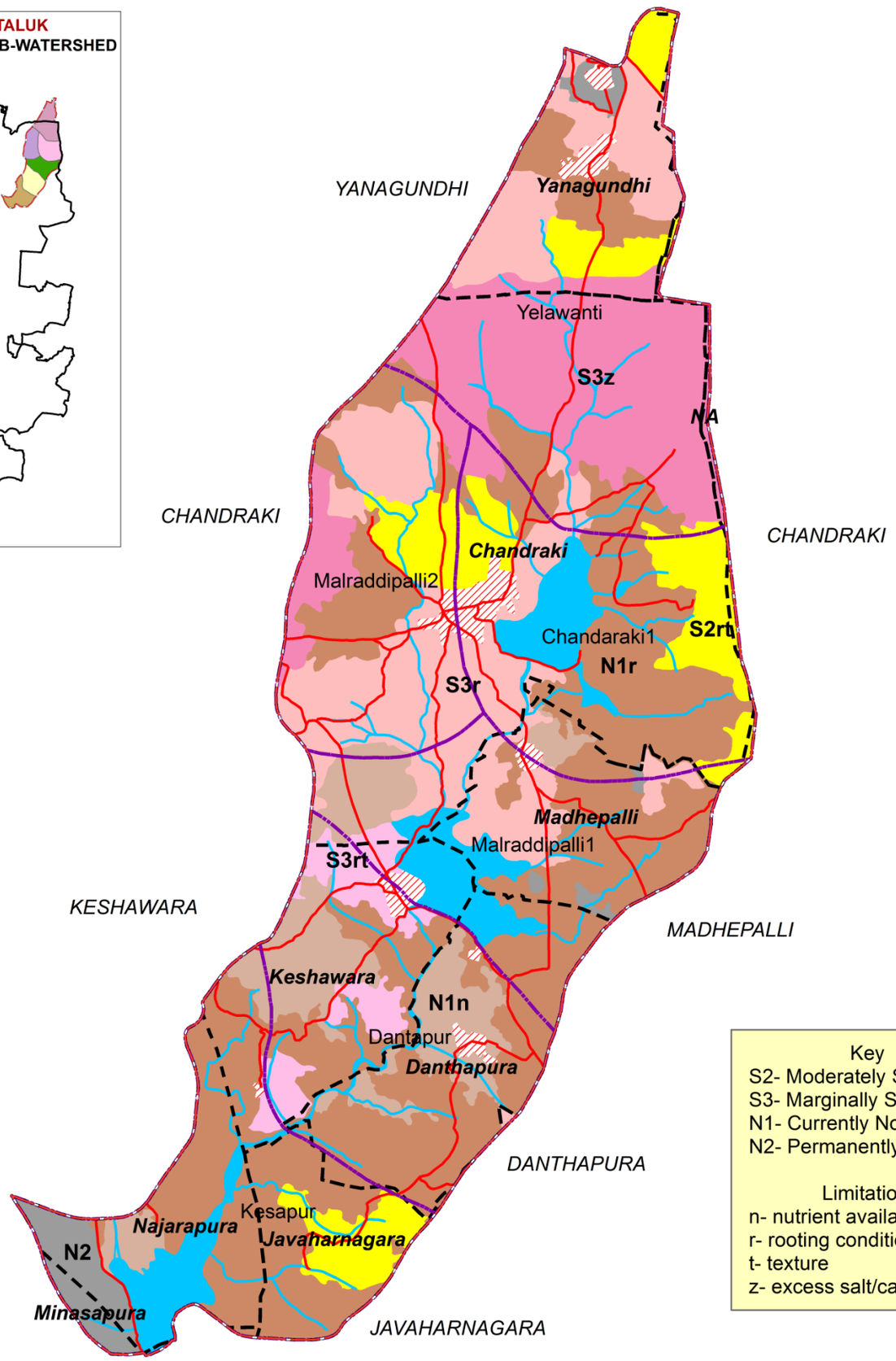
Suitability subclass	Area in ha (%)
S2r	416 (11.18)
S3r	219 (5.9)
S3t	336 (9.05)
S3rt	109 (2.94)
S3tz	521 (14.02)
N1n	299 (8.05)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.19. Land Suitability for Jamun





LAND SUITABILITY FOR JAMUN

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

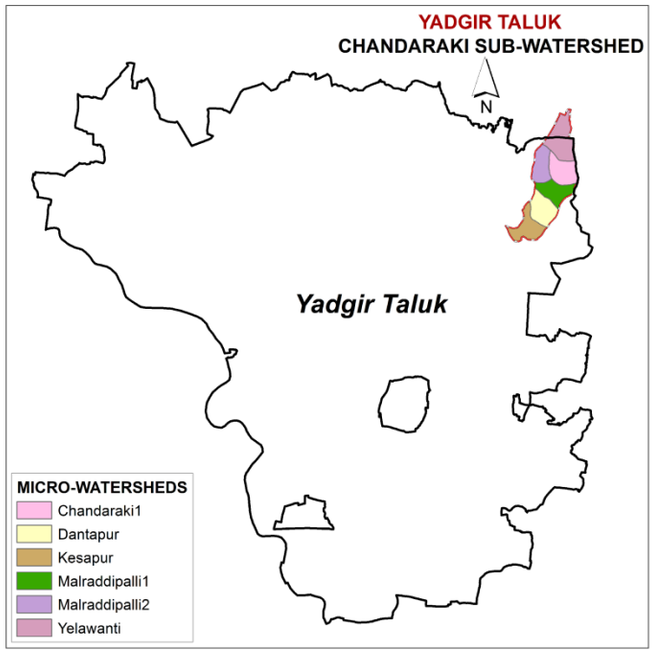
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

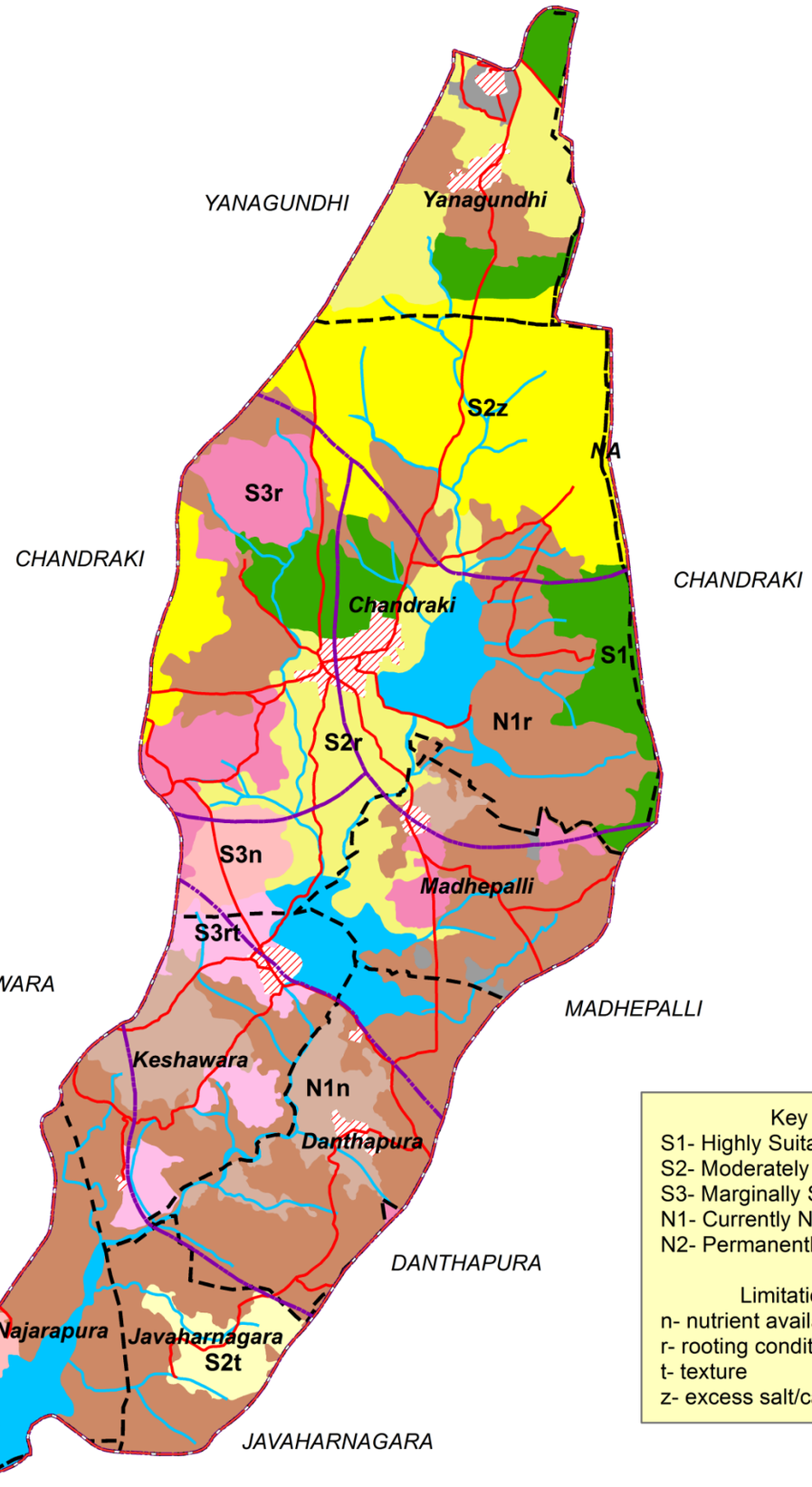
Suitability subclass	Area in ha (%)
S2rt	336 (9.05)
S3r	635 (17.08)
S3z	521 (14.02)
S3rt	109 (2.94)
N1n	299 (8.05)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	00.1 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.20. Land Suitability for Musambi





LAND SUITABILITY FOR MUSAMBI

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

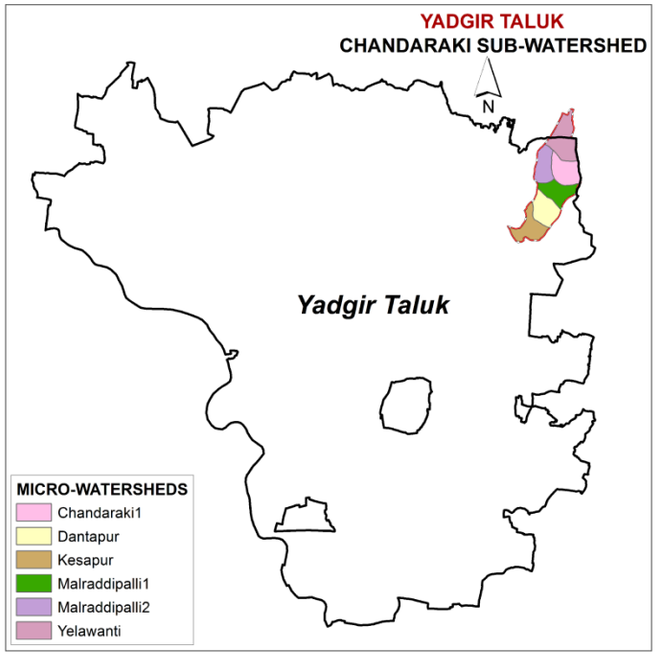
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

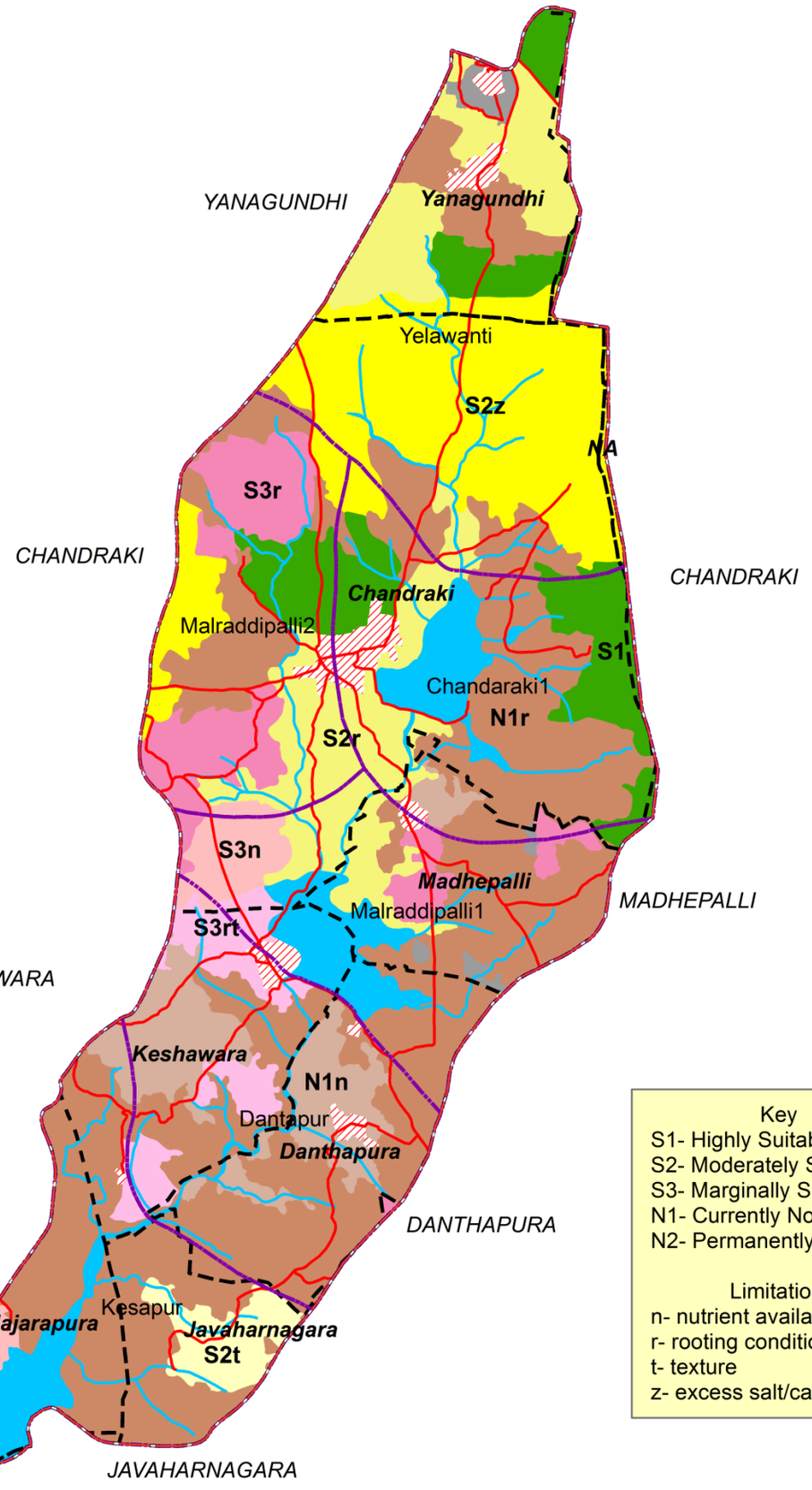
Suitability subclass	Area in ha (%)
S1	265 (7.14)
S2r	416 (11.18)
S2t	71 (1.91)
S2z	521 (14.02)
S3n	87 (2.34)
S3r	219 (5.9)
S3rt	109 (2.94)
N1n	212 (5.7)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.21. Land Suitability for Lime





LAND SUITABILITY FOR LIME

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

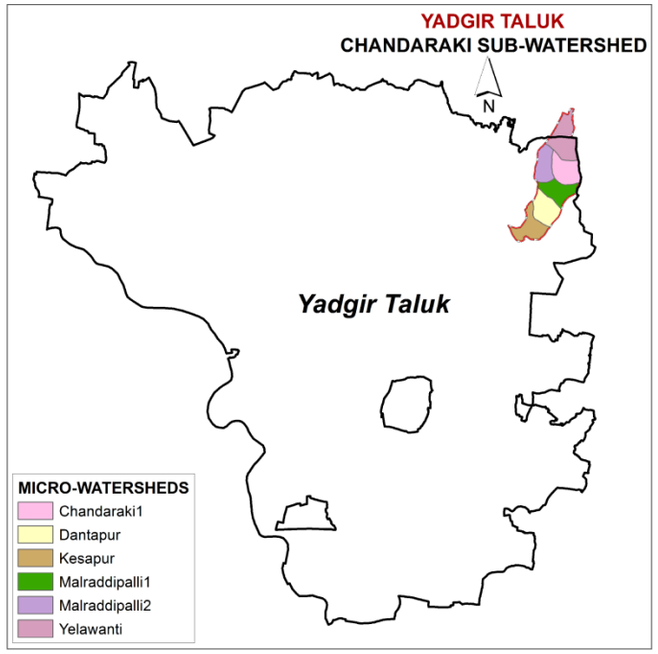
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

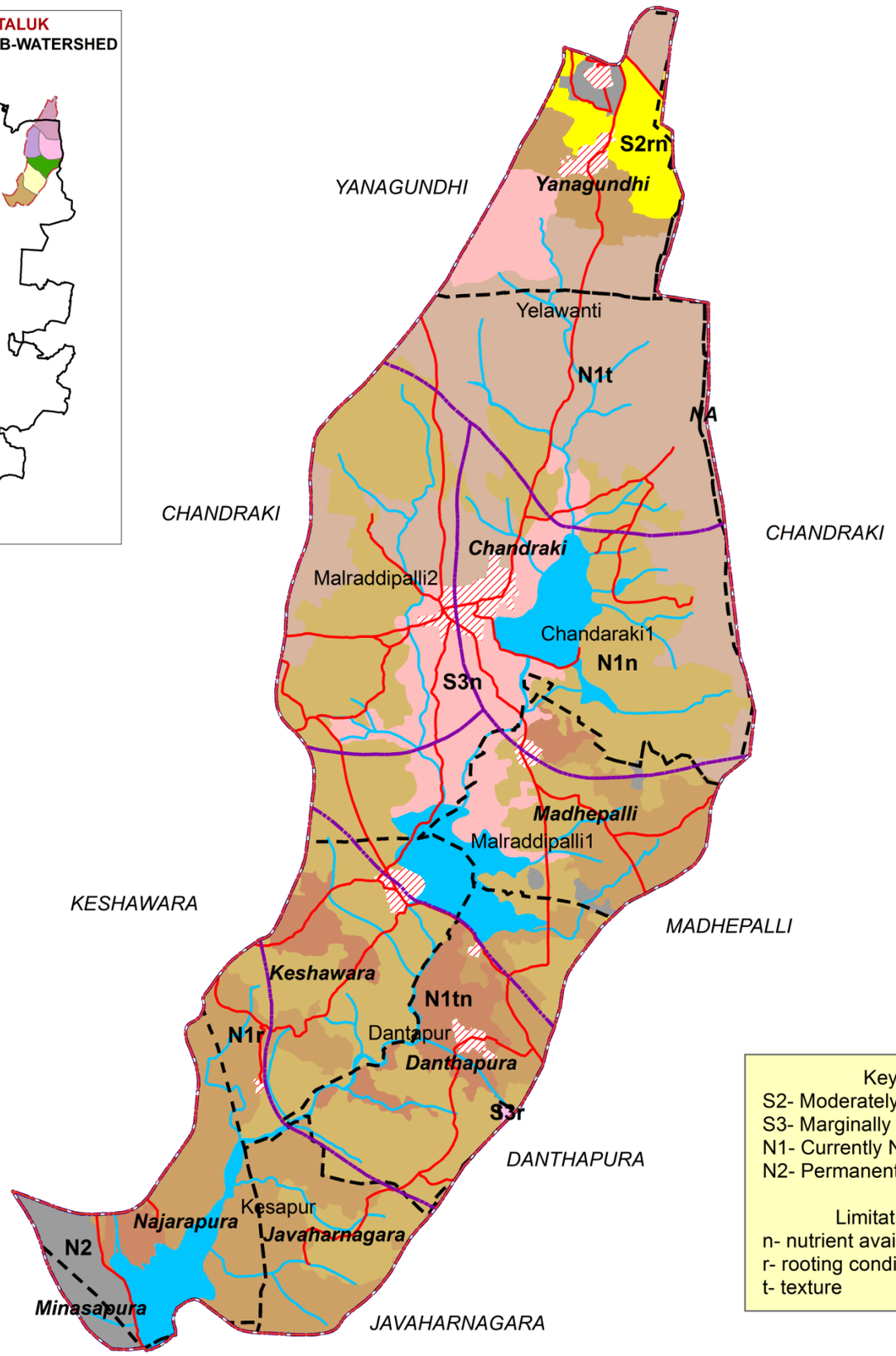
Suitability subclass	Area in ha (%)
S1	265 (7.14)
S2r	416 (11.18)
S2t	71 (1.91)
S2z	521 (14.02)
S3n	87 (2.34)
S3r	219 (5.9)
S3rt	109 (2.94)
N1n	212 (5.7)
N1r	1392 (37.45)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.22. Land Suitability for Cashew





LAND SUITABILITY FOR CASHEW

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

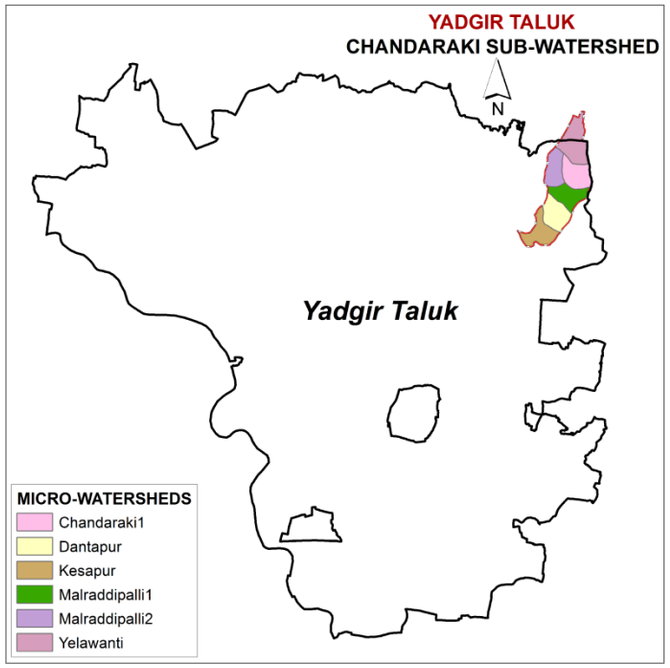
Limitations
n- nutrient availability
r- rooting condition
t- texture

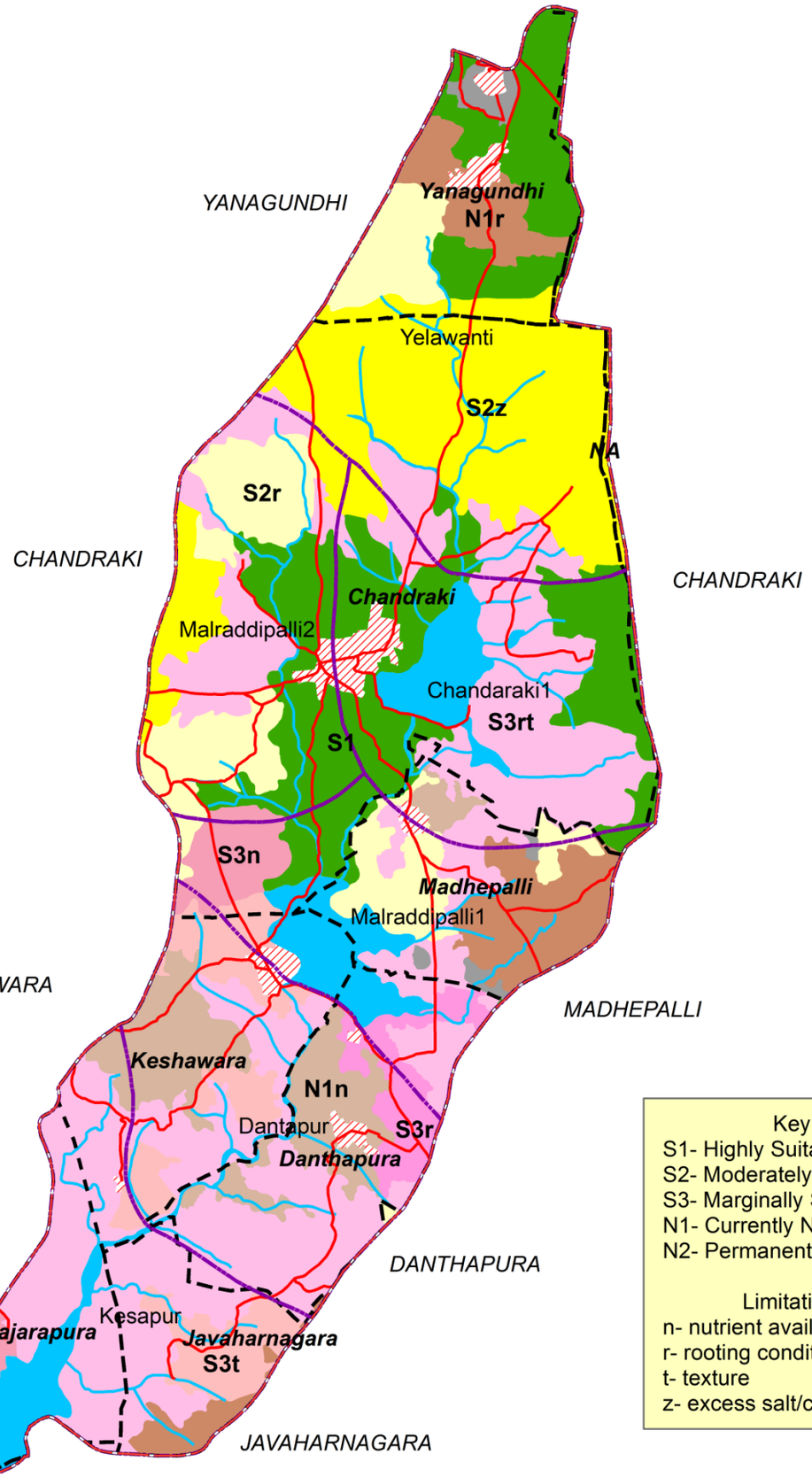
Suitability subclass	Area in ha (%)
S2rn	86 (2.32)
S3n	329 (8.86)
S3r	2 (0.05)
N1n	1283 (34.53)
N1r	624 (16.79)
N1t	786 (21.16)
N1tn	182 (4.88)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.23. Land Suitability for Custard Apple





LAND SUITABILITY FOR CUSTARD APPLE

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

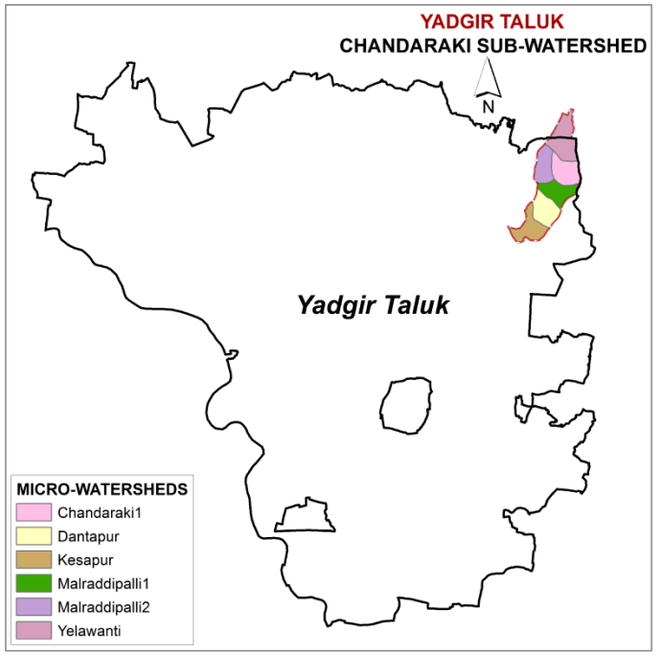
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

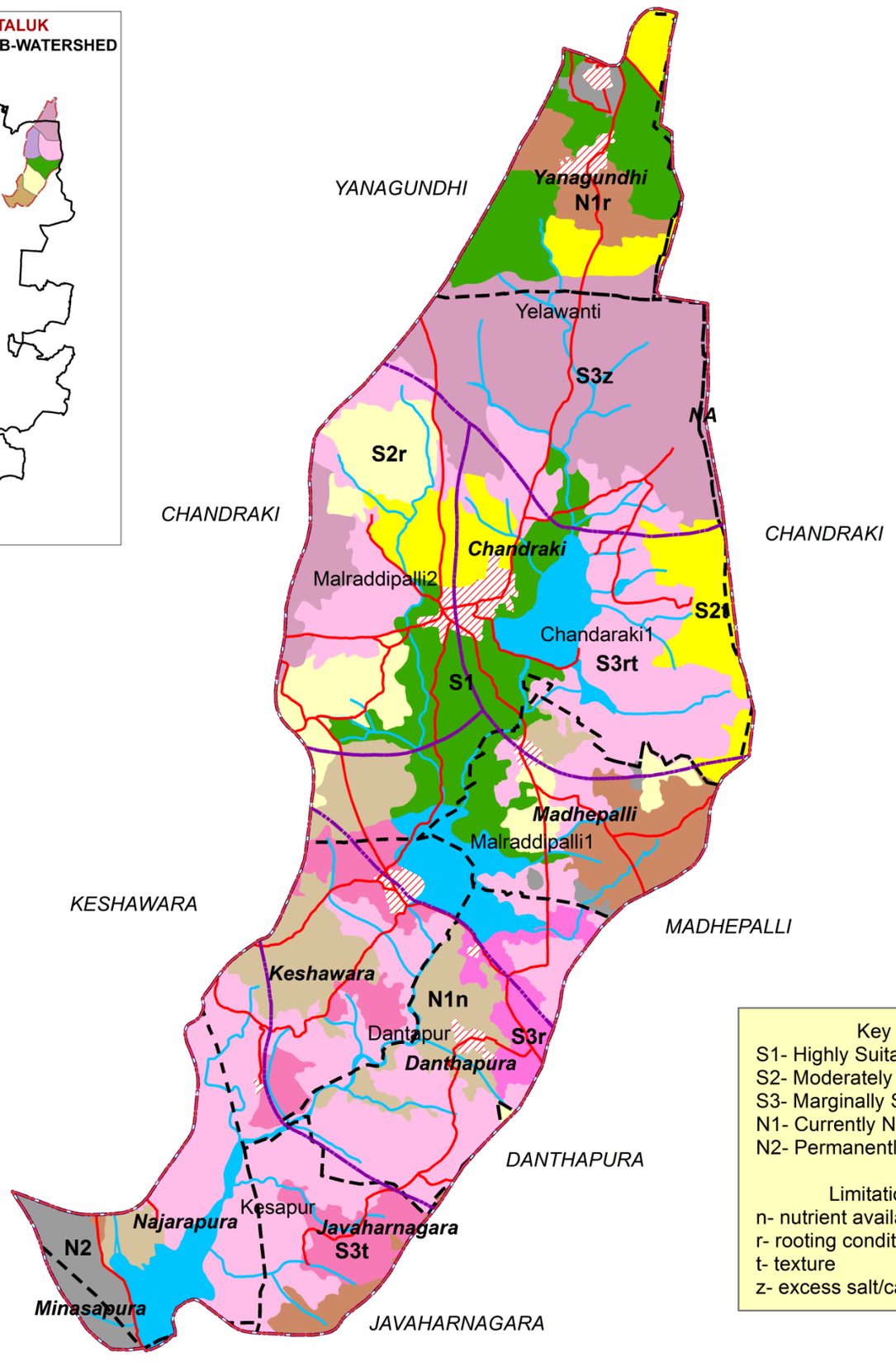
Suitability subclass	Area in ha (%)
S1	572 (15.38)
S2r	329 (8.84)
S2z	521 (14.02)
S3n	87 (2.34)
S3r	77 (2.06)
S3t	180 (4.85)
S3rt	1099 (29.56)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.24. Land Suitability for Amla





LAND SUITABILITY FOR AMLA

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

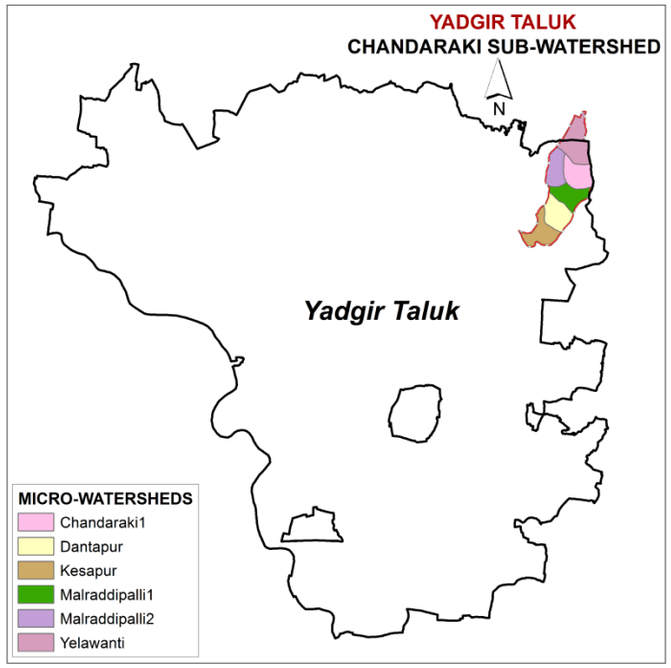
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

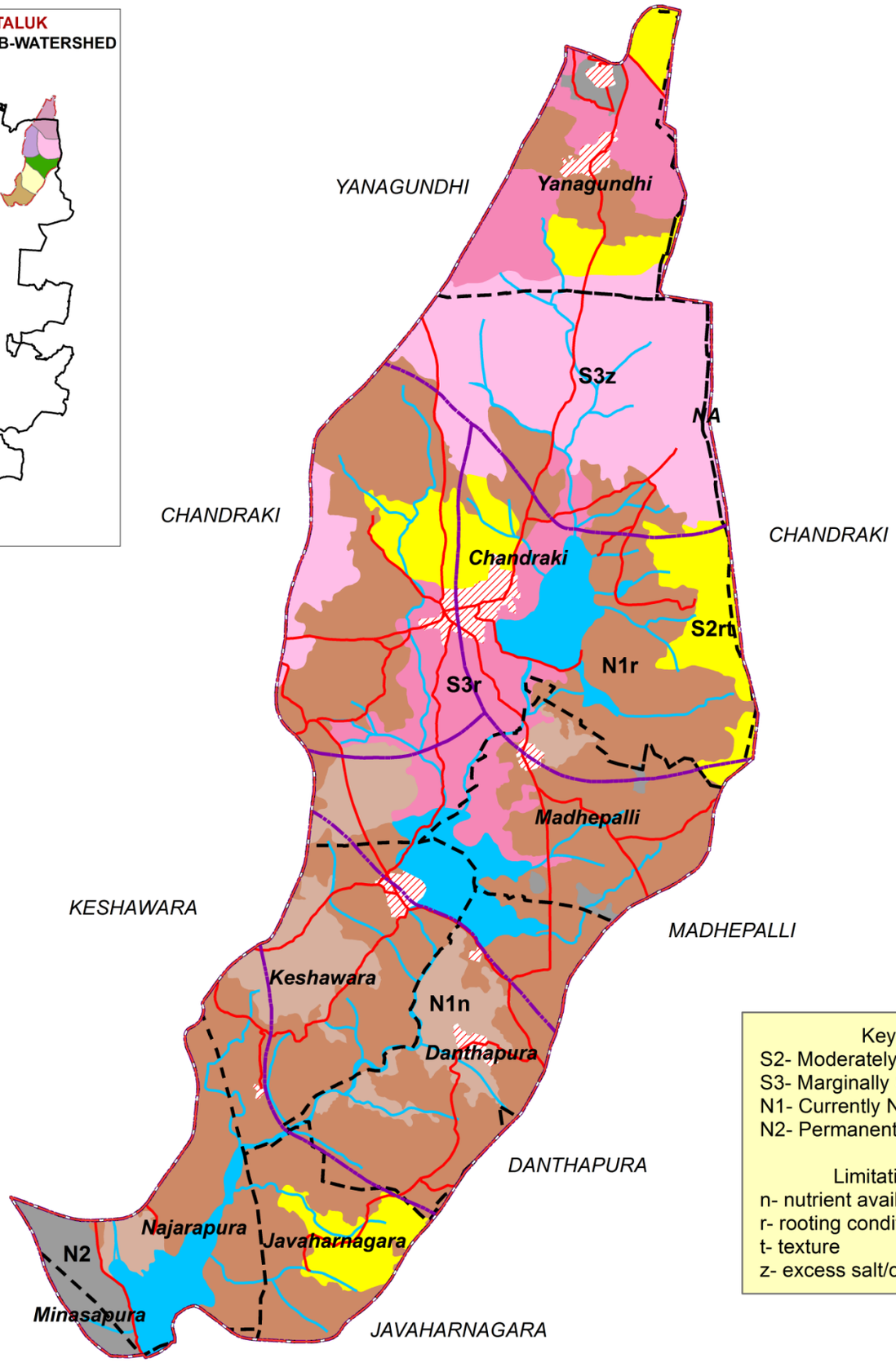
Suitability subclass	Area in ha (%)
S1	416 (11.18)
S2r	219 (5.9)
S2t	265 (7.14)
S3r	77 (2.06)
S3t	180 (4.85)
S3z	521 (14.02)
S3rt	1099 (29.56)
N1n	299 (8.05)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.25. Land Suitability for Tamarind





LAND SUITABILITY FOR TAMARIND

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

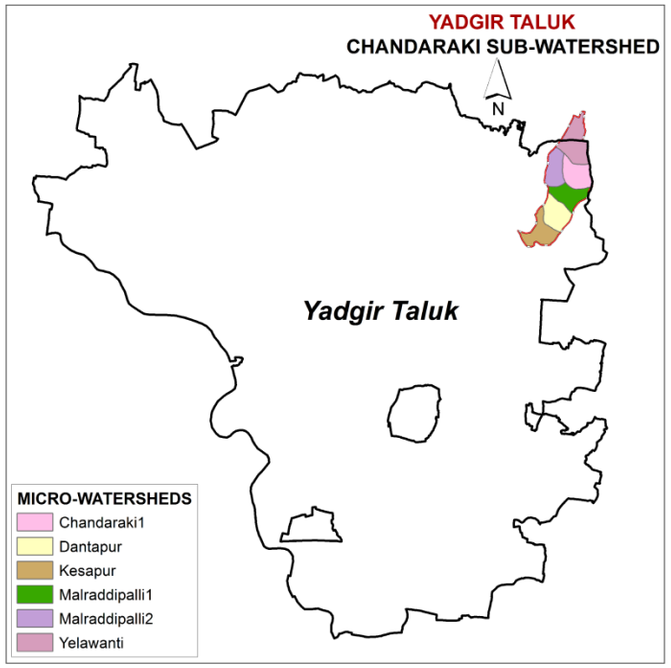
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

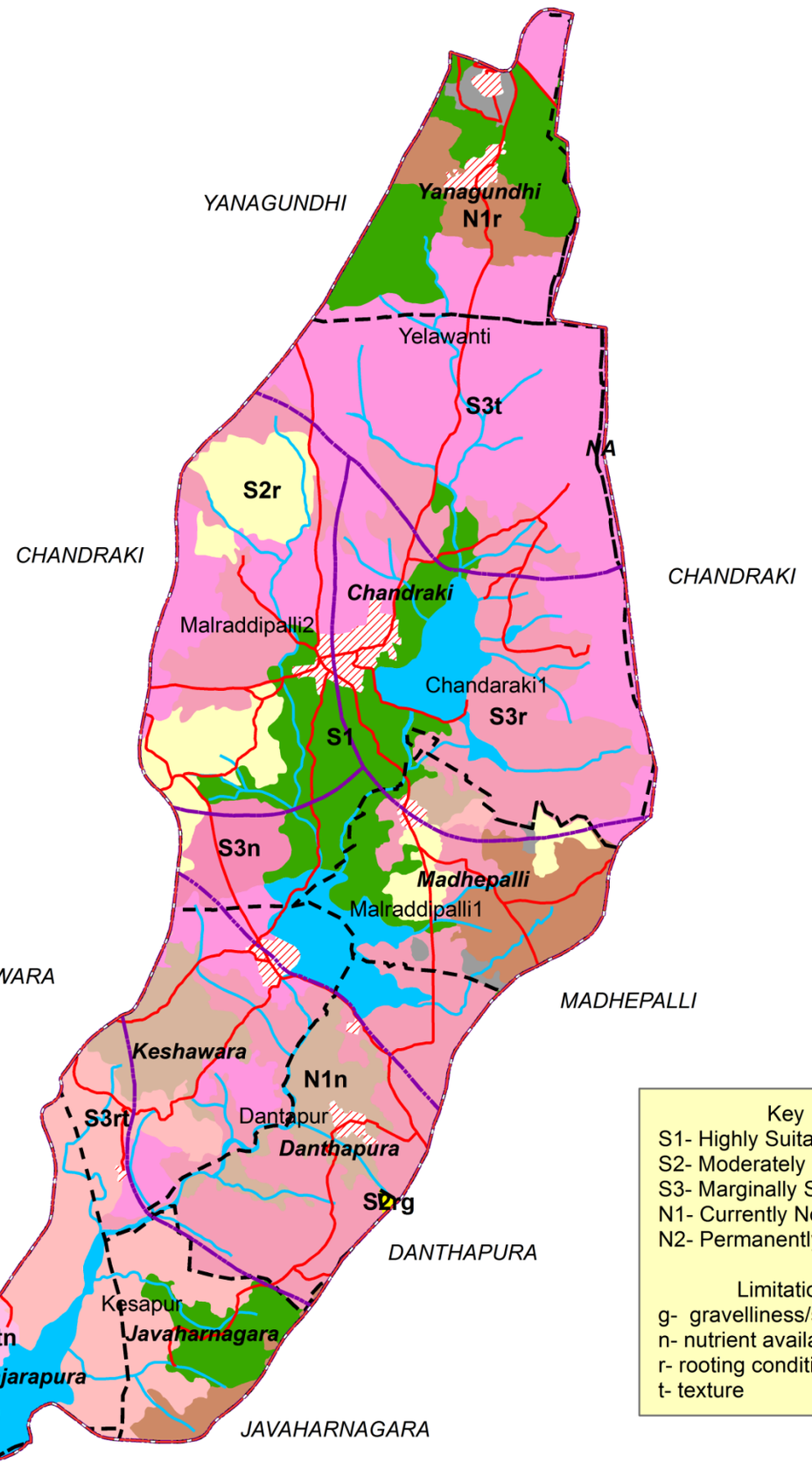
Suitability subclass	Area in ha (%)
S2rt	336 (9.05)
S3r	416 (11.18)
S3z	521 (14.02)
N1n	299 (8.05)
N1r	1721 (46.3)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.26. Land Suitability for Brinjal





LAND SUITABILITY FOR BRINJAL

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2r	218 (5.85)
S2rg	2 (0.05)
S3n	63 (1.7)
S3r	844 (22.72)
S3t	896 (24.1)
S3rt	331 (8.9)
S3tn	24 (0.64)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

References

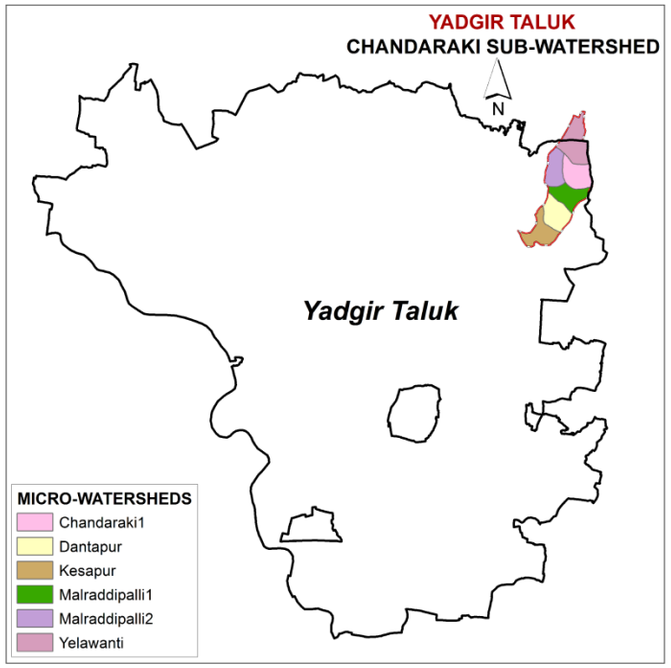
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

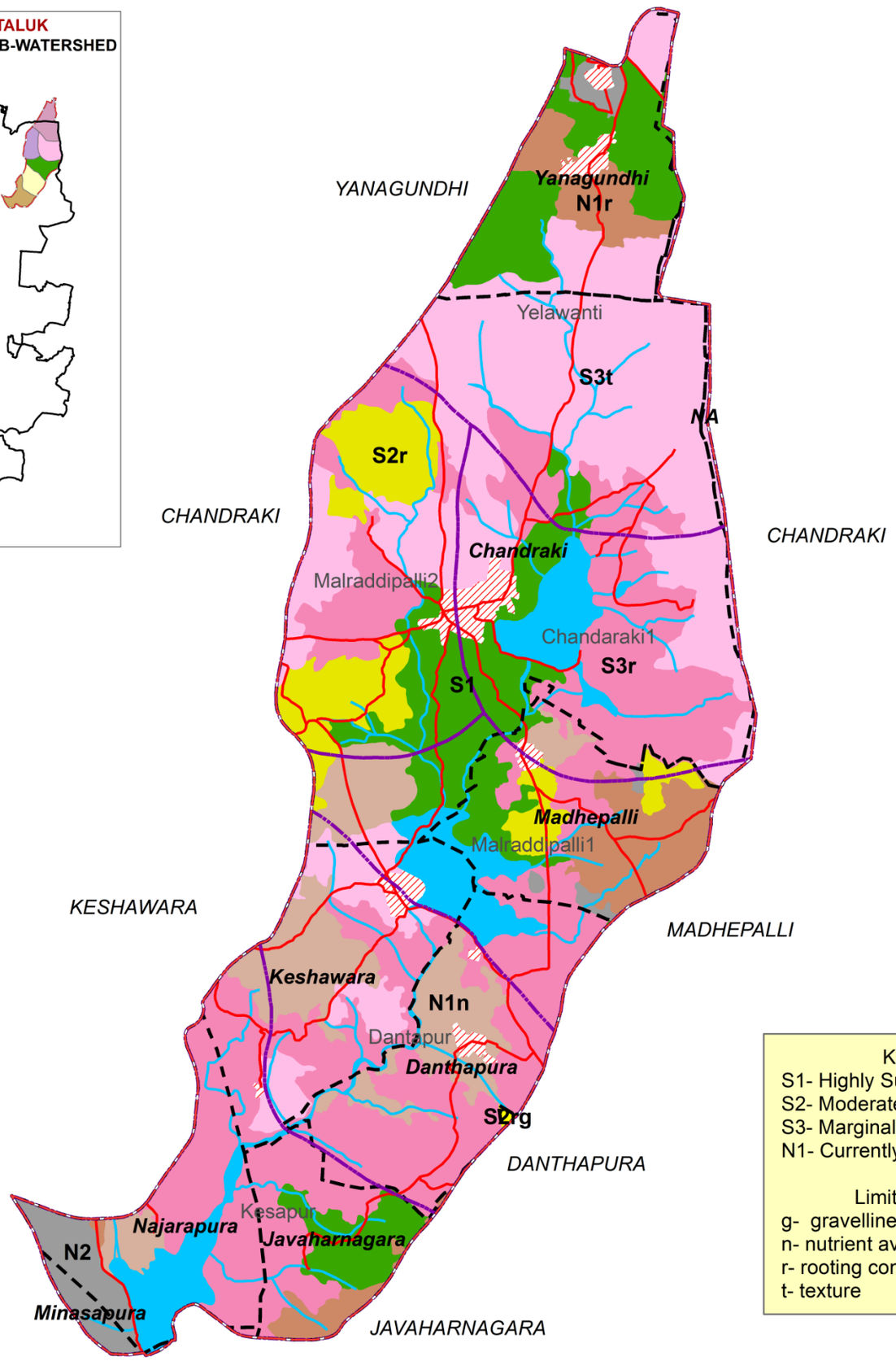
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Source: ICAR-NBSS&LUP, Bengaluru

7.27. Land Suitability for Onion





LAND SUITABILITY FOR ONION

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

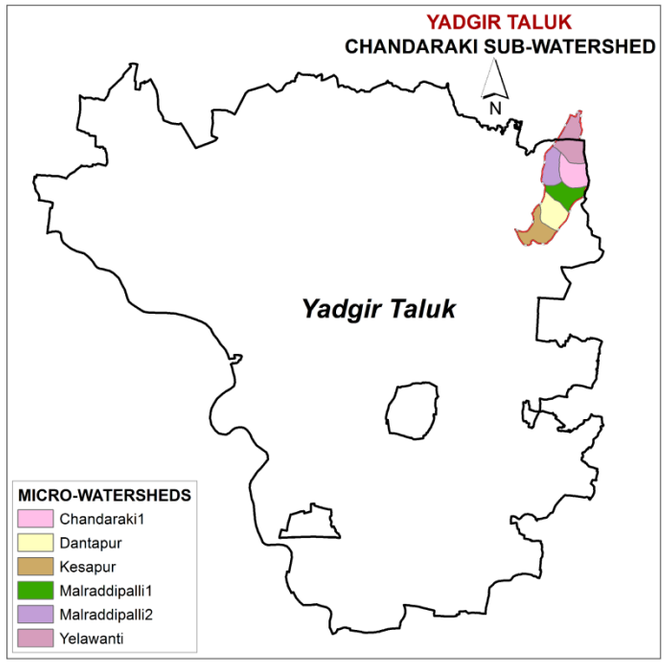
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture

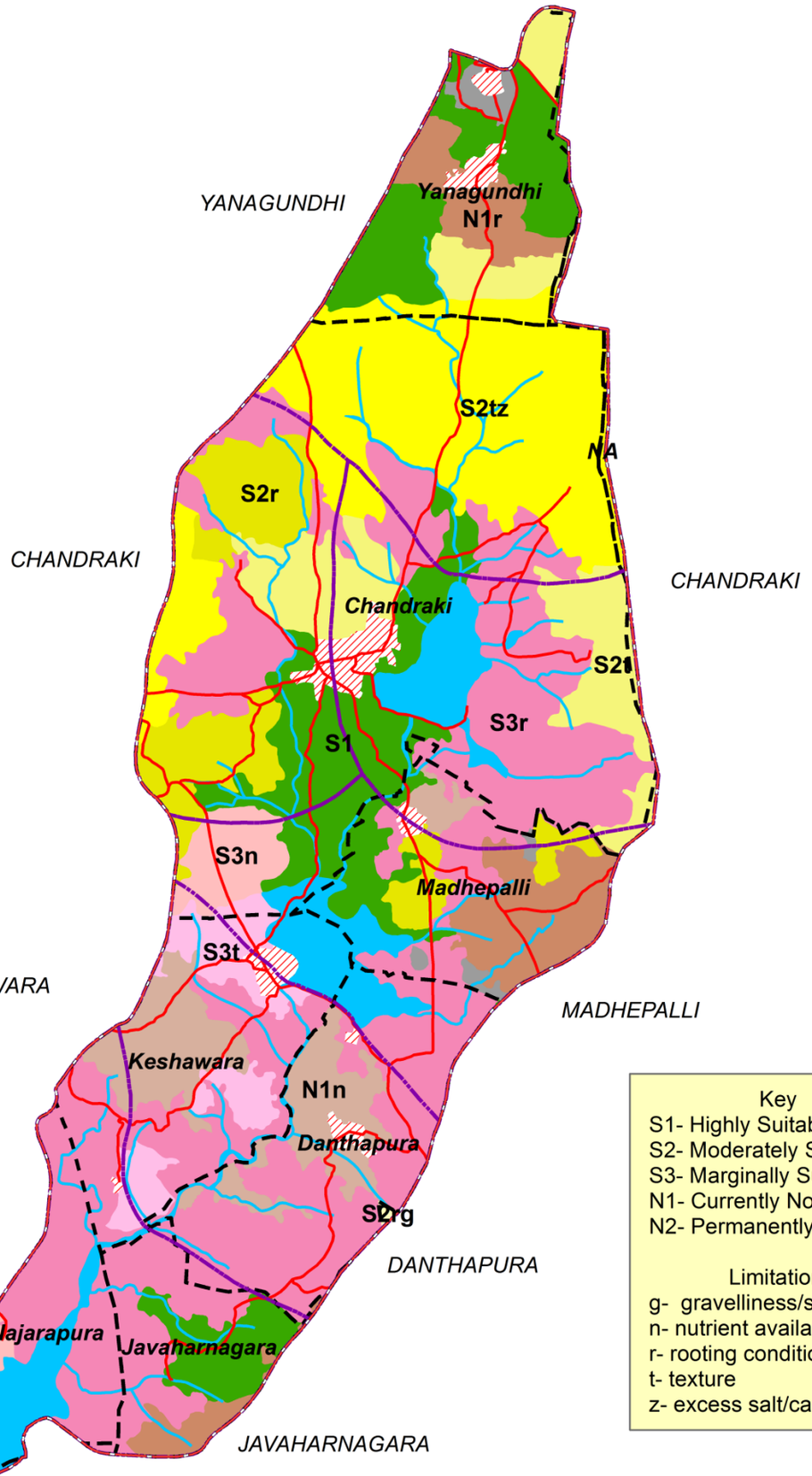
Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2r	218 (5.85)
S2rg	2 (0.05)
S3r	1175 (31.62)
S3t	896 (24.1)
N1n	299 (8.05)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.28. Land Suitability for Marigold





LAND SUITABILITY FOR MARIGOLD

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

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

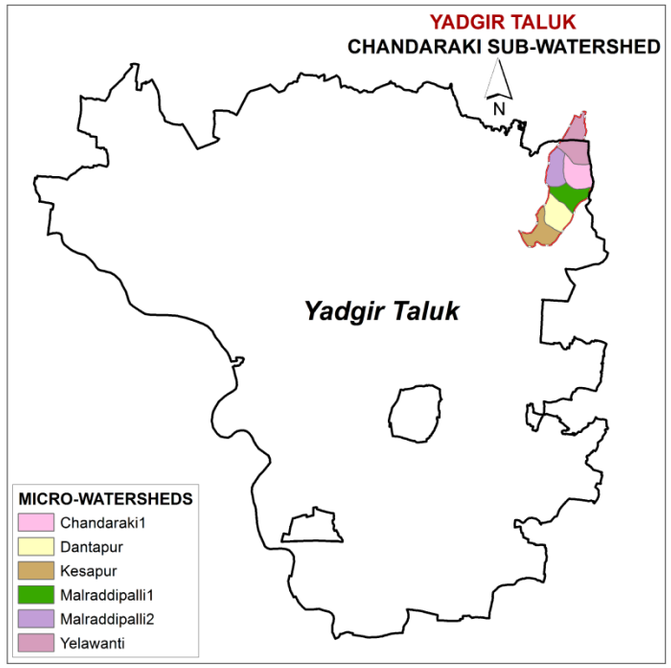
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

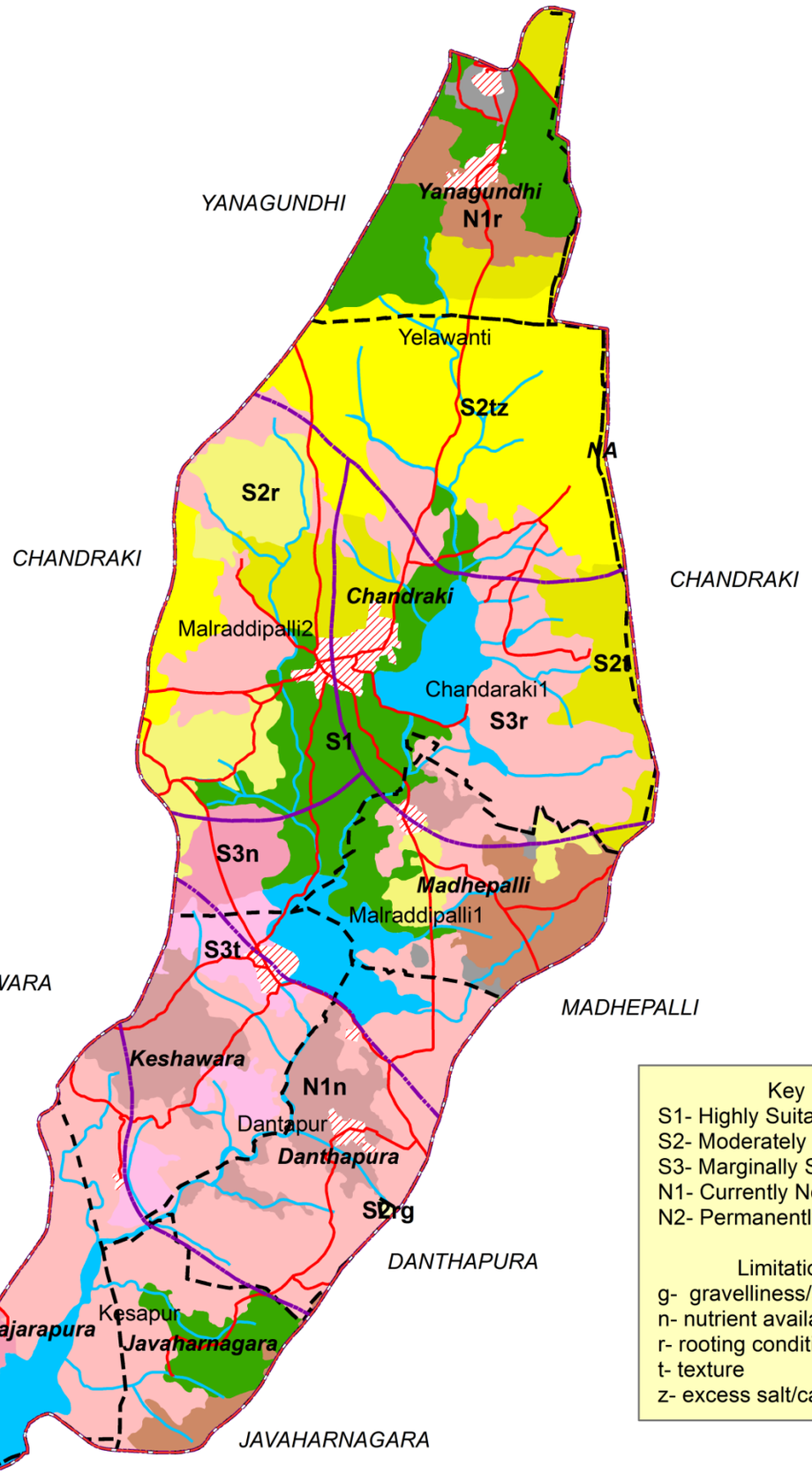
Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2r	218 (5.85)
S2t	265 (7.14)
S2rg	2 (0.05)
S2tz	521 (14.02)
S3n	87 (2.34)
S3r	1175 (31.62)
S3t	109 (2.94)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.29. Land Suitability for Chrysanthemum





LAND SUITABILITY FOR CHRYSANTHEMUM

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 ha)

YADGIR TALUK & DISTRICT

0 1 2 4 km

N

Suitability subclass	Area in ha (%)
S1	487 (13.09)
S2r	218 (5.85)
S2t	265 (7.14)
S2rg	2 (0.05)
S2tz	521 (14.02)
S3n	87 (2.34)
S3r	1175 (31.62)
S3t	109 (2.94)
N1n	212 (5.7)
N1r	217 (5.83)
N2	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

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

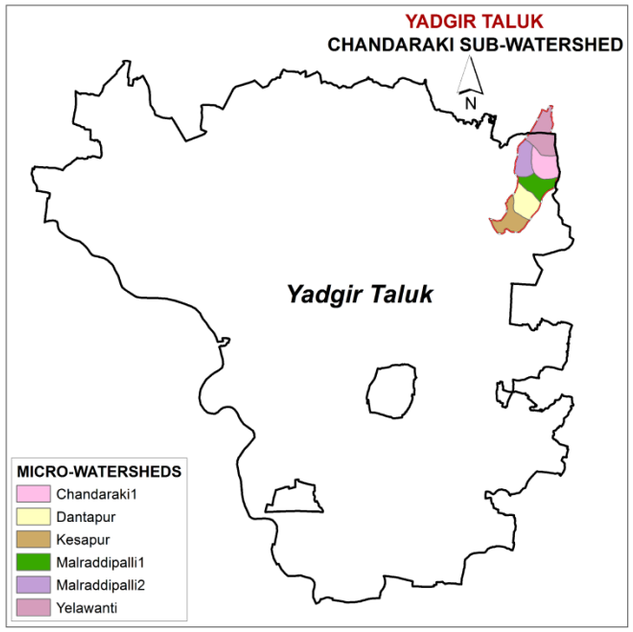
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

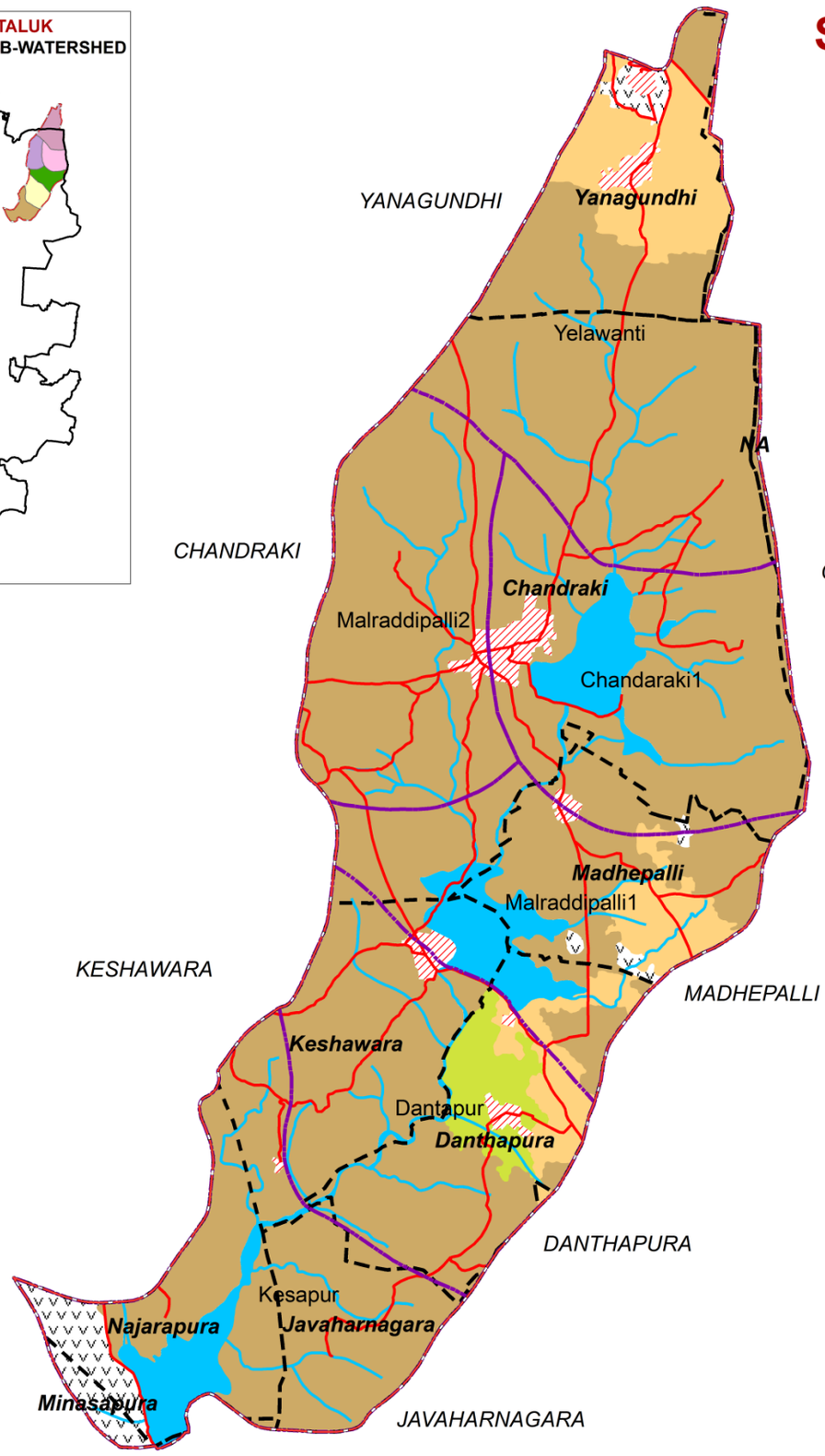
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

8. Soil and Water Conservation Measures

8.1. Soil & Water Conservation Plan





SOIL & WATER CONSERVATION PLAN

Chandaraki Sub-watershed

(4D2D6E : Area - 3716.87 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

Legend	Area in ha (%)
Trench cum bunding	304 (8.18)
Graded bunding	2912 (78.34)
Strengthening of existing bunds	77 (2.07)
Rock outcrops	99 (2.68)
Forest	0.01 (0.0002)
Others*	324 (8.73)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

9. Table. Proposed Crop Plan for Chandraki Sub-watershed, 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	115.BGDmB2, 151.BGDmB2g1 62.BMNmB2, 63.BMNmB2g1 33.HSLiB2, 112.SHTmB2 (Moderately deep to very 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
2	95.HGNmB2 149.MDGhB2g1 (Deep to very deep, black 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	55.ANRiB2, 42.YDRcB2 158.SGRiA1, 106.SGRmB2 (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
4	101.NHLmB1 (Deep, lowland sandy loam soils)	Red gram, Groundnut, Bajra, Horse gram, Field bean, Soybean	**Fruit crops:** Sapota, Jamun, Guava, Tamarind, lime, Musambi, Pomegranate **Vegetables:** Onion, Chilli, Brinjal, Tomato, Bhendi, Drumstick, Coriander **Flowers:**Marigold, Chrysanthemum	Application of FYM, Bio-fertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
5	38.BLCiB2 (Moderately deep, red loamy soils)	Sunflower, Sorghum, Maize, Groundnut, Red gram, Bajra	**Fruit crops:** Mango, Musambi, Sapota, Tamarind, Pomegranate, Amla, Custard apple, Guava, Jackfruit, Jamun, Lime **Vegetables:** Tomato, Onion**,** Bhendi, Chilli, Brinjal, Drumstick, Coriander **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
6	124.SBRbB3, 125.SBRhB2 (Moderately shallow, loamy sand soils)	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
7	23.JNKiB2g1, 24.JNKiB3g1 152.JNKmB2 (Moderately shallow, sandy clay loam soils)	Maize, sorghum Groundnut, Bajra	**Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:**Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
8	174.BDLcB2g2, 162.BDLhB2g1 5.BDLiB2, 6.BDLiB3 10.VNKiB2, 109.VNKmB2g1 161.HTKbB2g1, 113.HTKcC2g1 29.YLRcB2g1 (Shallow soils)	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, Glyricidia, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers
9	120.BDPhB2, 119.BDPiB3 153.KKRbB2g1 (Very shallow, soils)	-	*Styloxanthes hamata*, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope

PART-B

Hydrological Inventory of Chandaraki 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 Chandaraki 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**

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

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Dr. S. Srinivas	Principal Scientist
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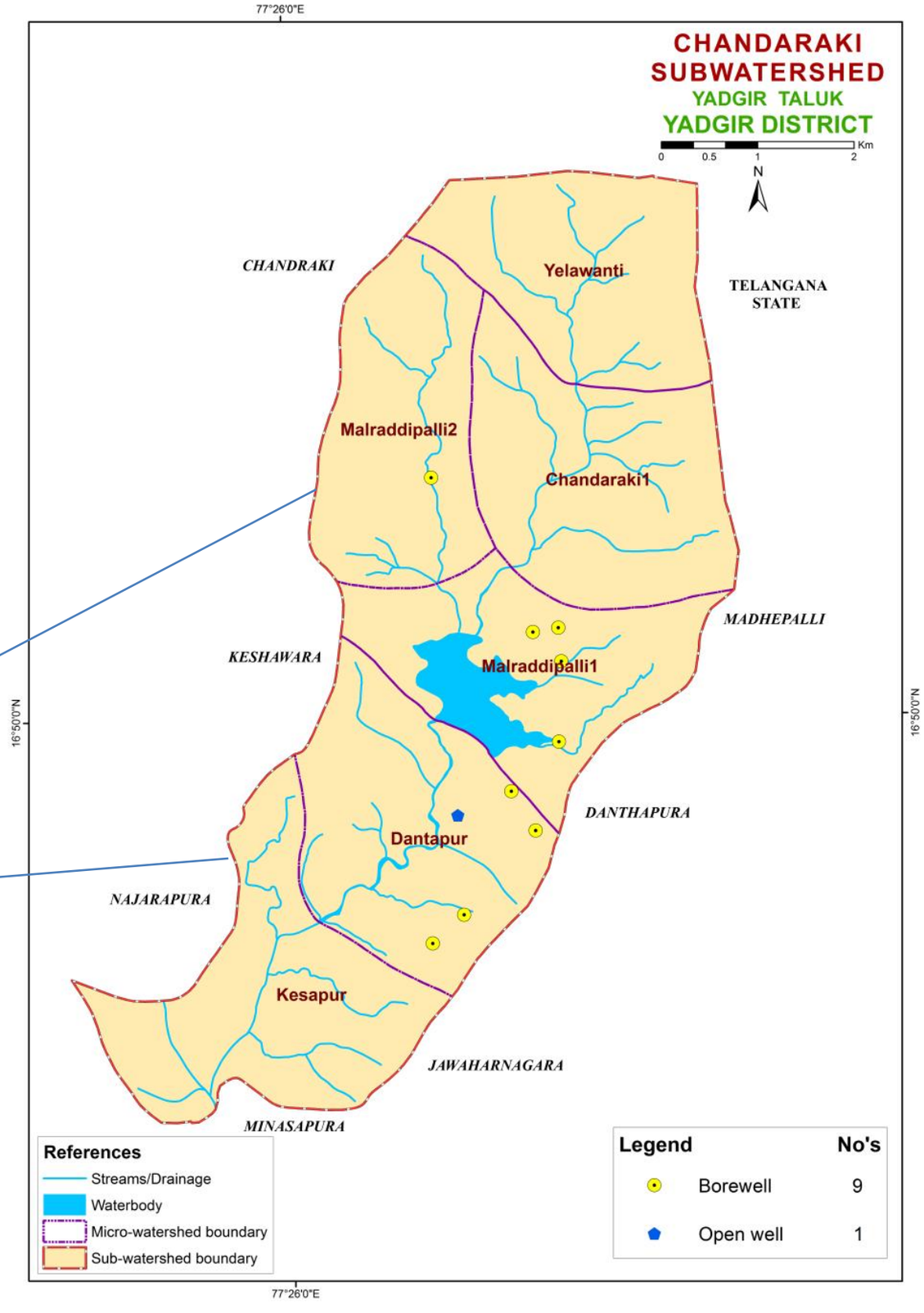
Sh. R.S.Reddy	Consultant
Sh. A.G.Devendra Prasad	Consultant
Smt. K.Karunya Lakshmi	Research Associate
Ms. Seema, K.V.	Senior Research Fellow
Dr. Sekhar Muddu (Reviewed and approved)	Professor & Lead Scientist, Dept. of Civil Engineering & ICWaR, IISc, Bangalore
	Email: hd_rcb.nbsslup@icar.gov.in nbssrcb@gmail.com **Phone: Office:** 080-23412242,23410993 **Fax:** 080-23510350

INTRODUCTION

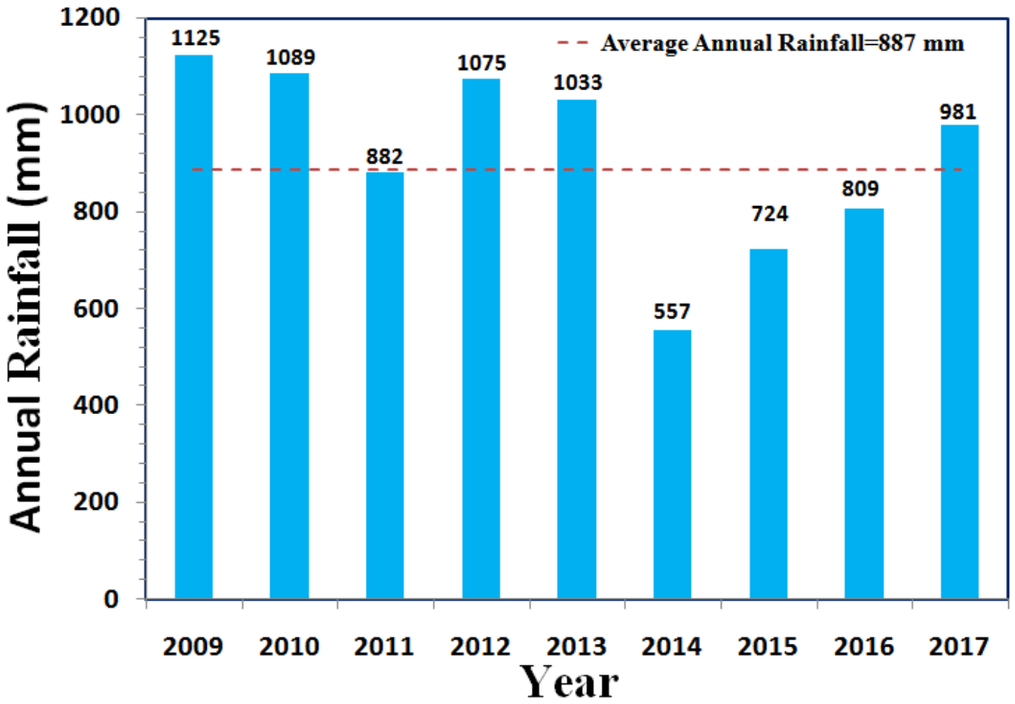
- The inventory and documentation of spatial and temporal changes in hydrological components of Chandaraki sub-watershed (4D2D6E) in Yadgir Taluk, Yadgir District, has been undertaken for integrated planning, development and management.
- Chandaraki sub-watershed (Yadgir Taluk, Yadgir District) is located between $16^0$47'50''-$16^0$53' 12'' North latitudes and 77^0 23'52''- 77^0 27'52'' East longitudes, covering an area of about 3350 ha.
- This sub-watershed encompasses of 6 MWs namely Chandaraki-1 (4D2D6E1b), Dantapur (4D2D6E2a), Kesapur (4D2D6E2b), Malraddipalli-1 (4D2D6E1d), Malraddipalli-2 (4D2D6E1c) and Yelawanti (4D2D6E1a). Land Resource Inventory (LRI) was generated for three among six 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 CHANDARAKI SUB-WATERSHED



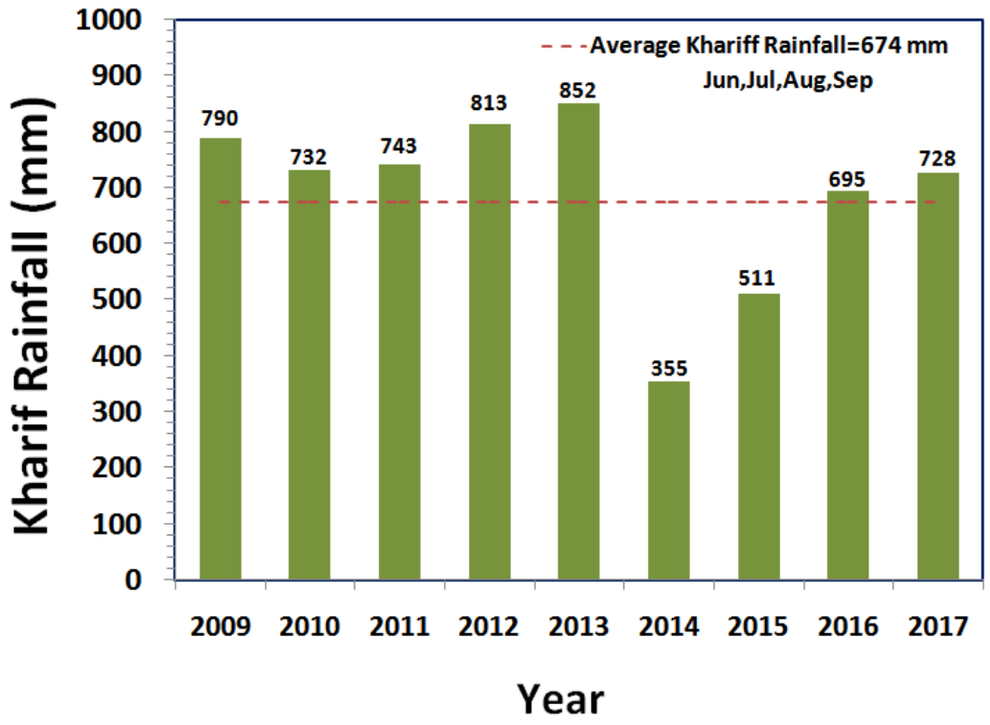
Soil & Water Conservation Structures in Chandaraki sub-watershed, Yadgir taluk, Yadgir district

RAINFALL INDEX

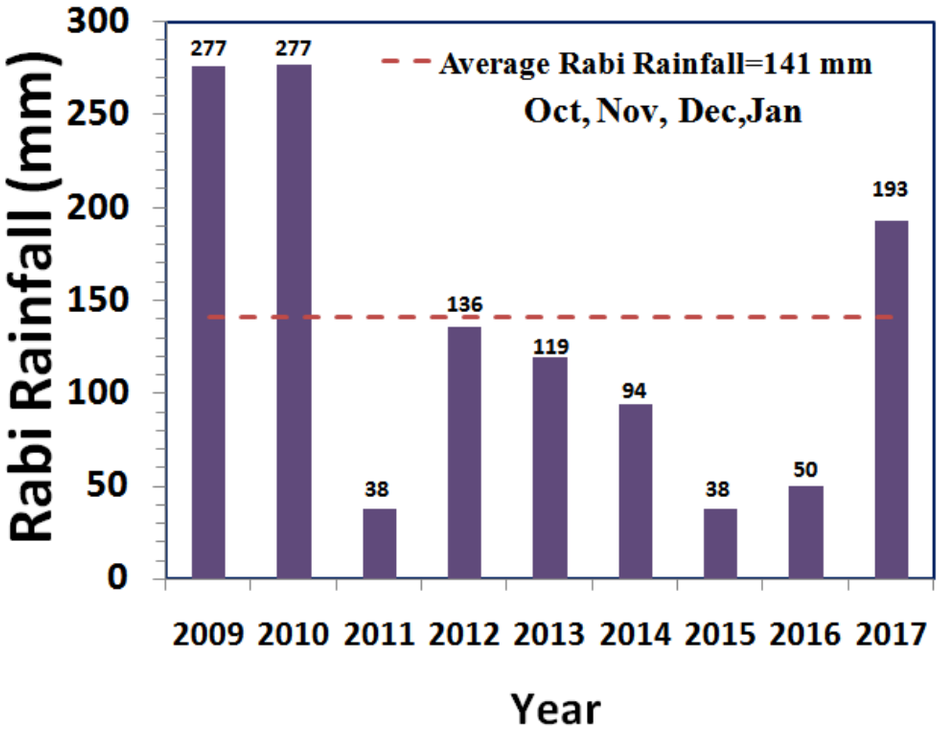


The average annual rainfall (1960-2014) recorded at the Yadgir station in Yadgir taluk of Yadgir district is 887 mm. The annual rainfall at Gurmatkal station (Hobli H.Q.) is presented. During the years 2011, 2014, 2015 and 2016 the annual rainfall was deficient by 1%, 37%, 18% and 9% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 75% of the annual rainfall and it typically follows the annual rainfall patterns.

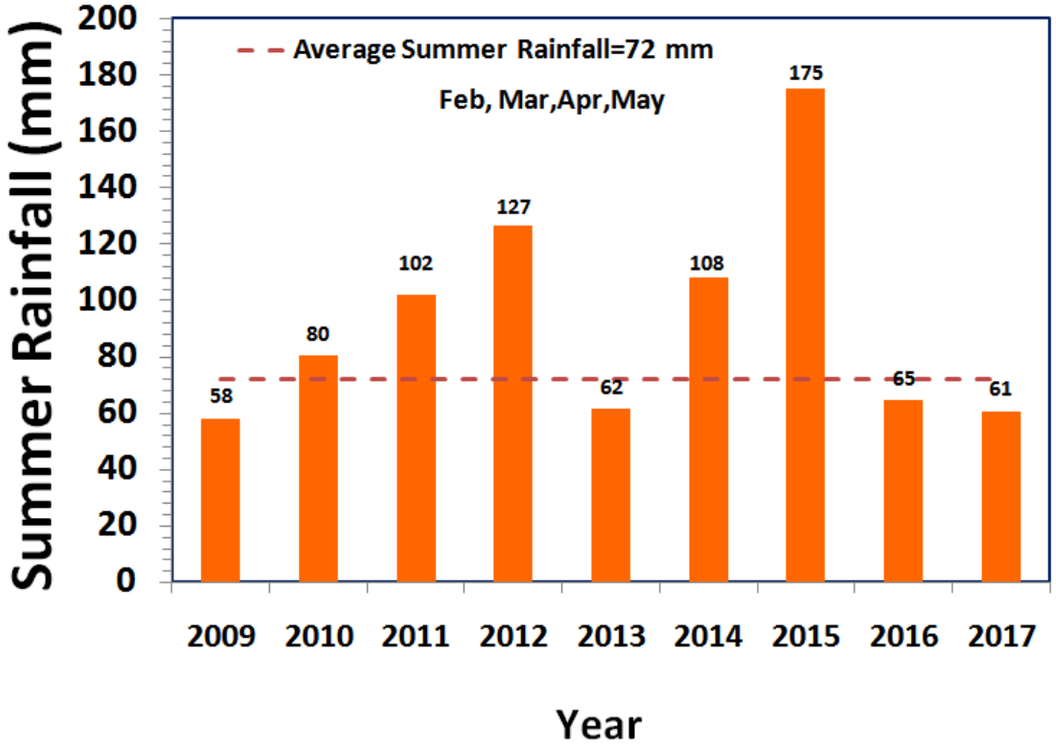


RAINFALL INDEX

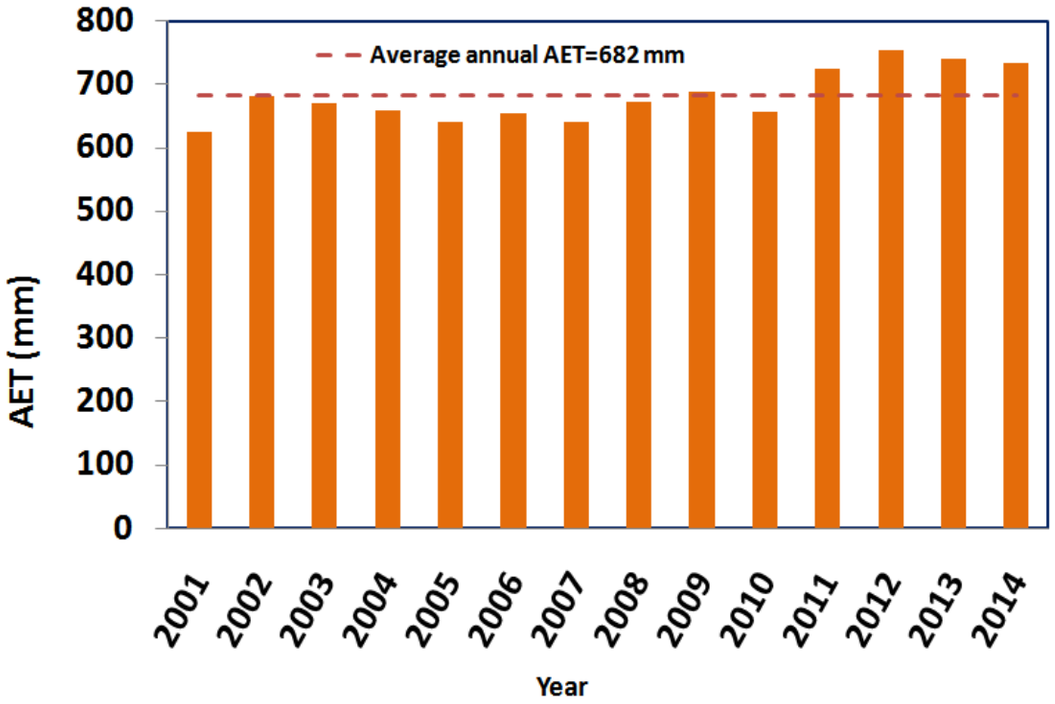


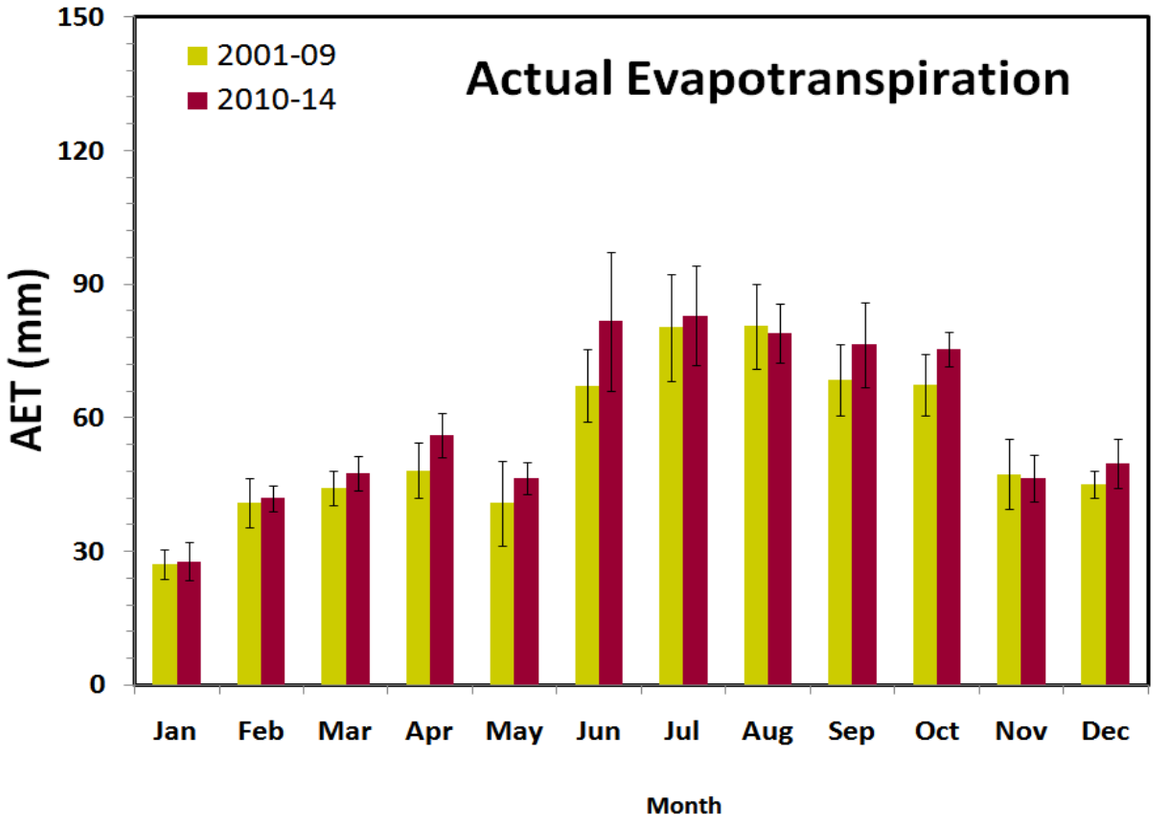
The average *rabi* rainfall (Oct-Jan) is about 14% of the Average annual rainfall. During the years 2009-2010 and 2017 high *rabi* rainfall was received, where as other years showed deficient rainfall.

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



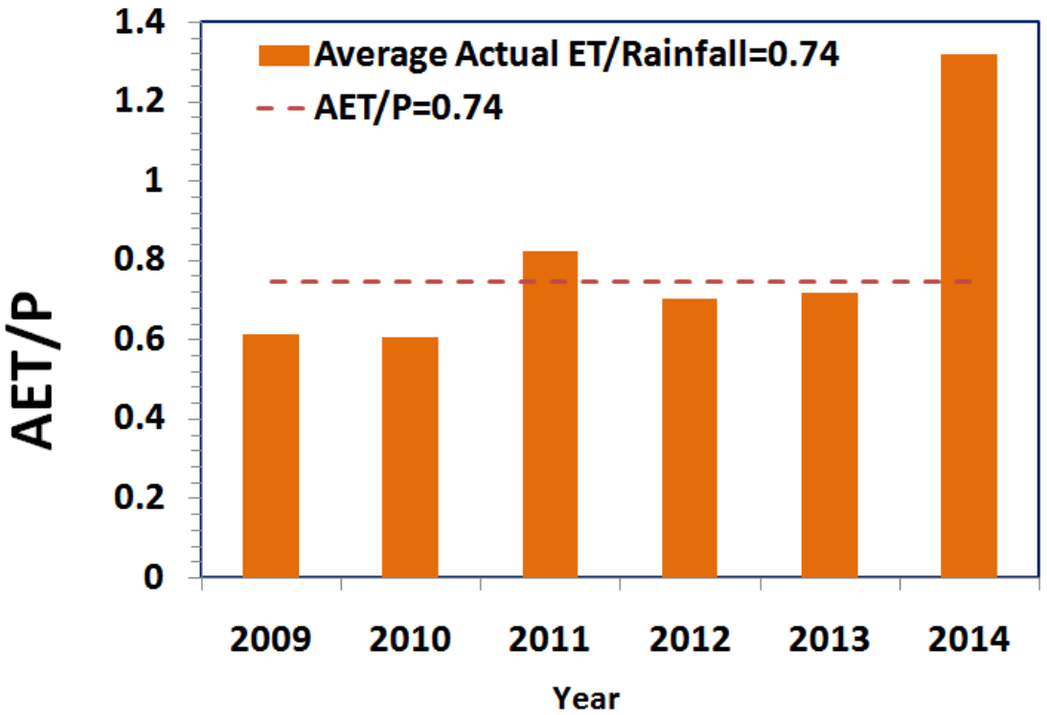
EVAPOTRANSPIRATION

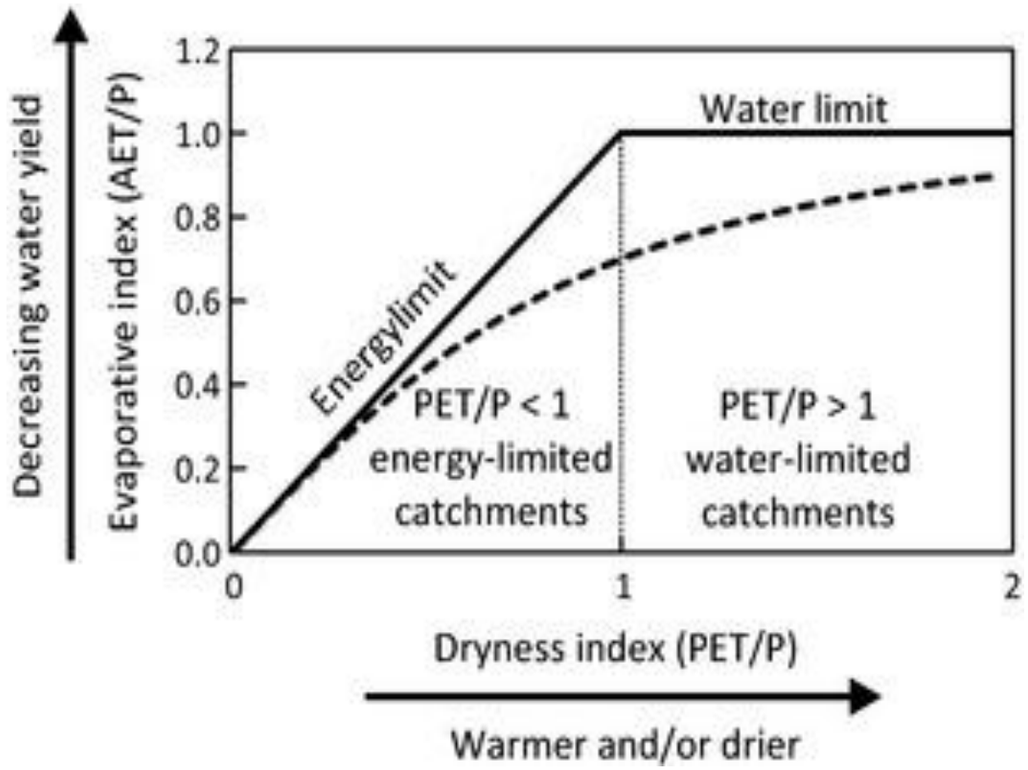




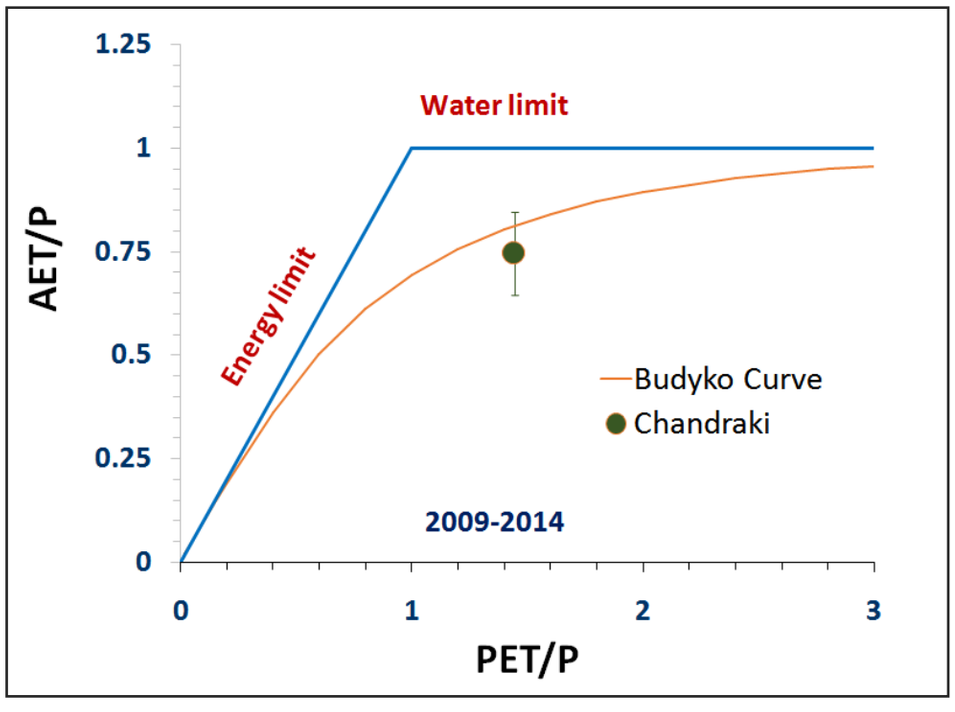
The average annual actual ET is lower than the average rainfall. During *kharif*, average rainfall and AET was found to be 674 mm and 329 mm respectively, whereas in *rabi* it was about 141 mm and 199 mm. The annual ET increased by 9% during 2010-2014 compared to 2001-2009 .

EVAPOTRANSPIRATION INDEX

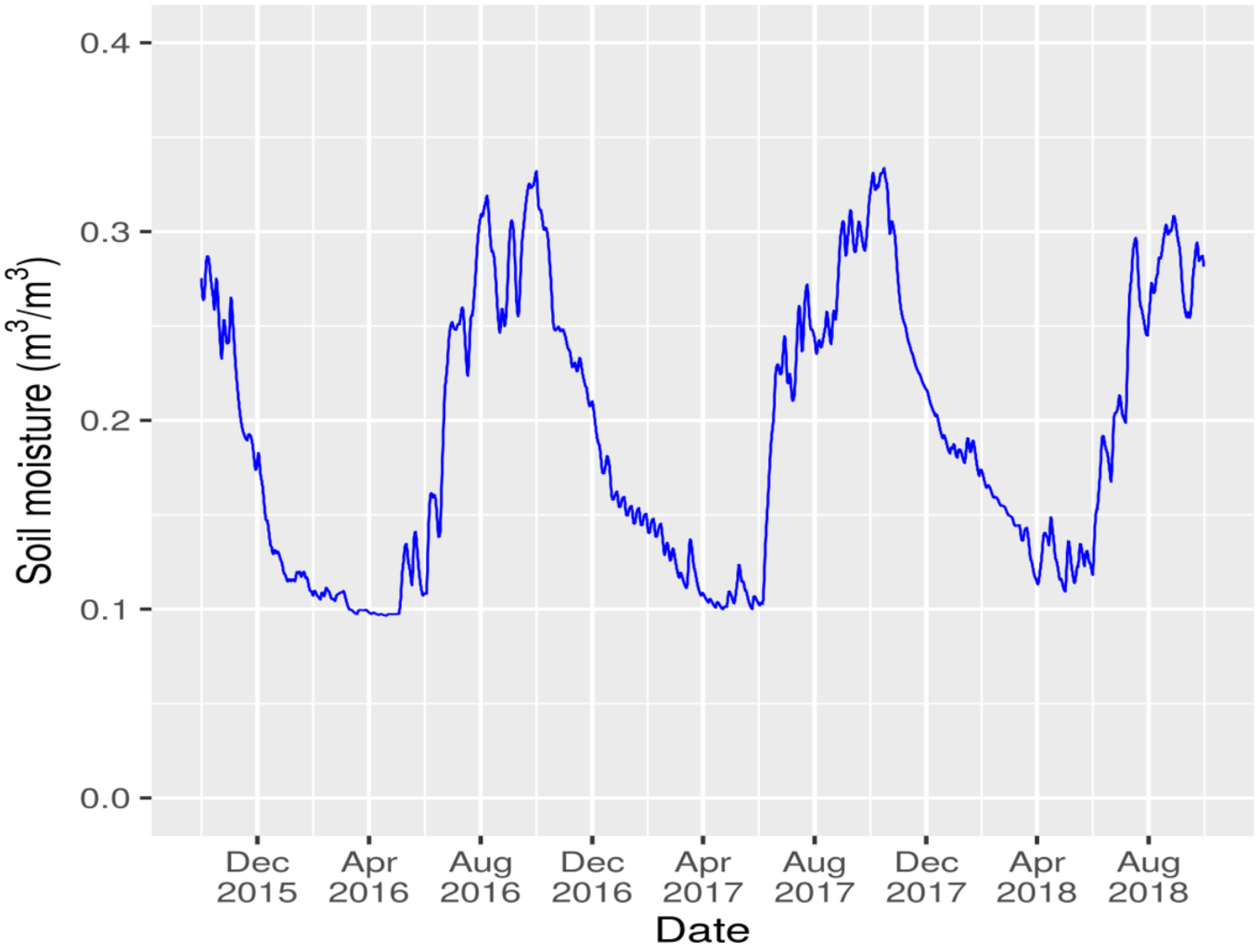


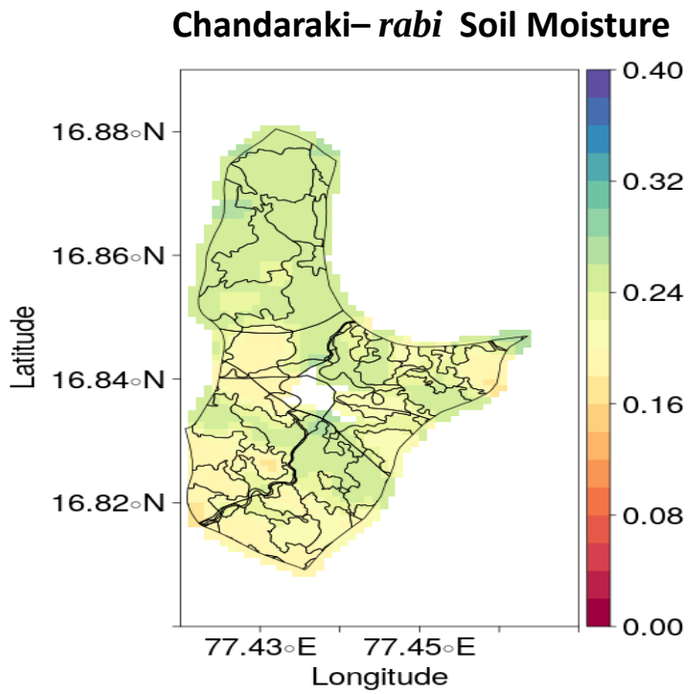


The average AET/P ratio was about 74%, which is lower than the sustainable limit of about 80%. Watershed water balance is sustainable due to higher rainfall during the *kharif* season.

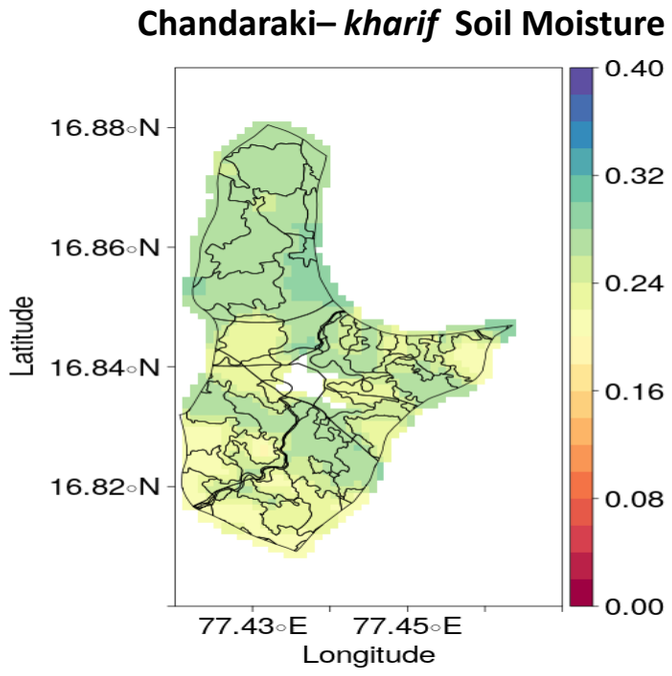


SATELLITE RETRIEVED SOIL MOISTURE





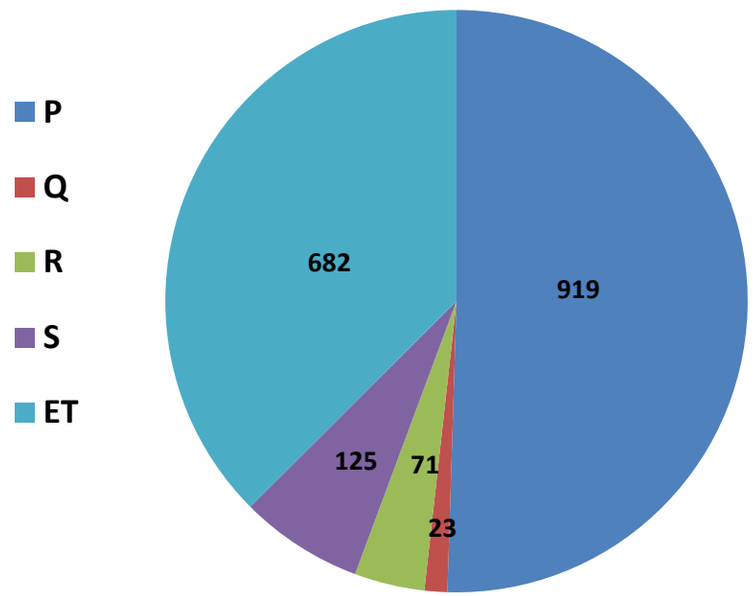
The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 16-31 % in *kharif* and 12-33% in *rabi* seasons of 2016 and 10-31% in *kharif* and 15-33% in *rabi* seasons of 2017.



WATER BALANCE

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

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

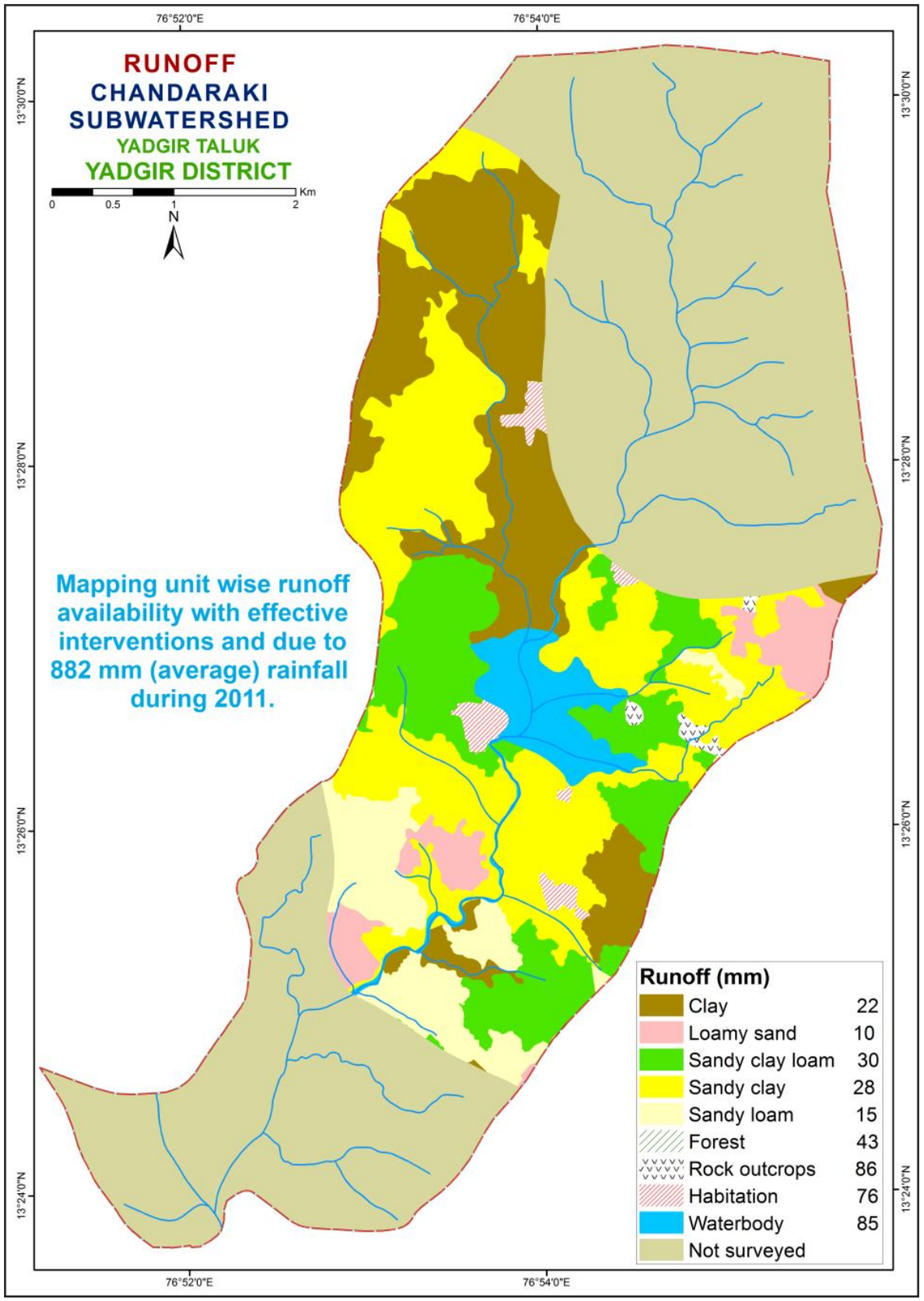


During July-Oct months, Precipitation is higher than Evapotranspiration, hence Runoff is less in the watershed.

P = 919 mm (average of 2009-2017) ET = 682 mm R = 71 mm S = 125 mm Q =23 mm

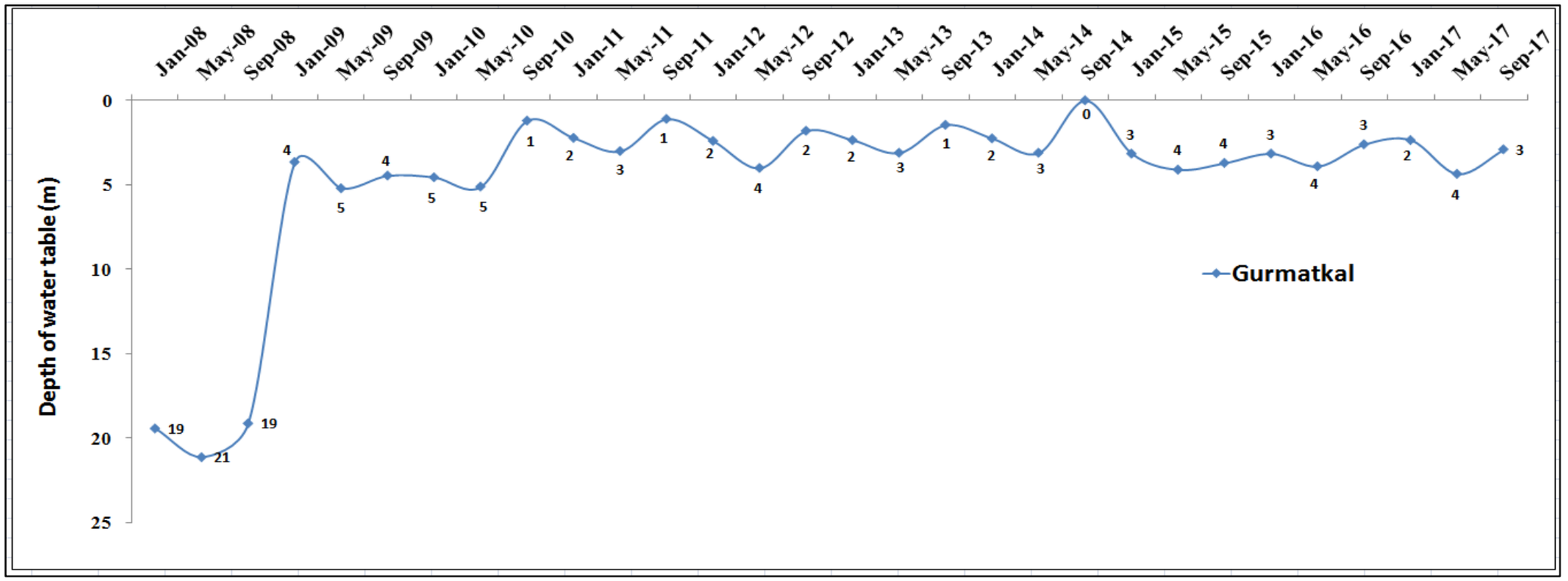
Sl. No.	Parameters	Average_ 2011 (mm)
1.	Rainfall	882
2.	Runoff availability with existing conditions	49
3.	Runoff availability with effective interventions	29
4.	Runoff allowed as environmental flow at the outlet	6
5.	Runoff excess for harvesting by construction of structures	23

RUNOFF


RUNOFF
CHANDARAKI
SUBWATERSHED
YADGIR TALUK
YADGIR DISTRICT
0 0.5 1 2 Km
N
Mapping unit wise runoff availability with effective interventions and due to 882 mm (average) rainfall during 2011.
76°52'0"E
76°54'0"E
13°30'0"N
13°28'0"N
13°26'0"N
13°24'0"N
Runoff (mm)
Clay 22
Loamy sand 10
Sandy clay loam 30
Sandy clay 28
Sandy loam 15
Forest 43
Rock outcrops 86
Habitation 76
Waterbody 85
Not surveyed

GROUND WATER STATUS

GURMATKAL STATION



The total number of wells present in Chandaraki Sub-watershed as per LRI data is 10 (9-Borewells and 1-Open wells). The groundwater level shown above is from the data obtained from Dept. of Mines & Geology for the nearest station Gurmatkal. The graph depicts the groundwater levels during the years 2009-2017 were slightly varying, where as during the 2014 was found constant. Deepest level was found in 2008 year.

x

SUMMARY

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

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

- The evapotranspiration estimation tool developed indicates that the watershed water balance is in sustainable condition. The cropping & irrigation choices are not appropriate and need to be altered to shift the deficit water balance.

- The estimated runoff available to use is 23 mm for an average annual rainfall of 919 mm (2009-2017). The utilizable groundwater is 49.7 mm (70% of 71 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (125 mm) and utilizable runoff plus recharge is 198 (=23+125+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 528 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 660 mm (i.e. 125% of AET). This demand for the two seasons is higher by 462 mm, i.e. (660-198). The AET in June-Sept months is only 46% of rainfall. Hence, there is a good opportunity to harvest the excess water through watershed management practices for utilizing during rabi season.

- The total number of wells present in Chandaraki Sub-watershed as per LRI data is 10 (9-Borewells and 1-Open wells). The groundwater level is data obtained from Dept. of Mines & Geology for the nearest station Gurmatkal.