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

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

ICAR - NBSS & LUP

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

About ICAR - NBSS&LUP

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

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

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PART - A

Land Resource Inventory of Turkmadhawar 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 Turkmadhawar 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.

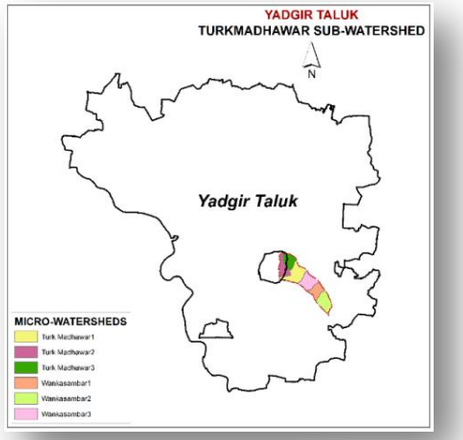
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

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.

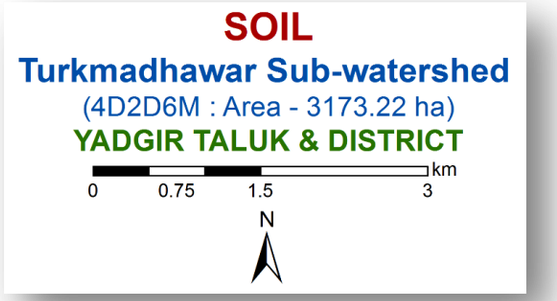
Inset map

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



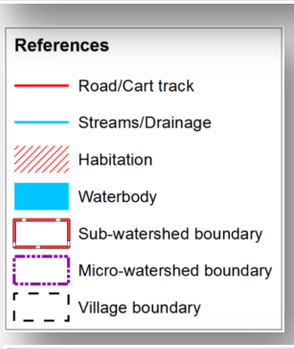
Map title

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



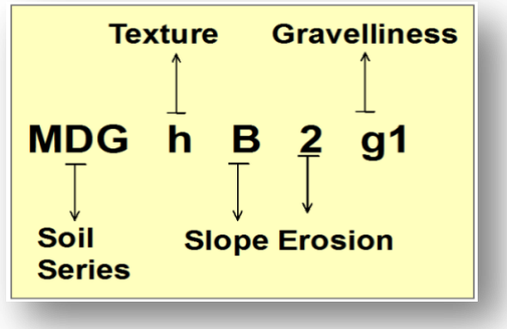
Legends and symbols

*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.*



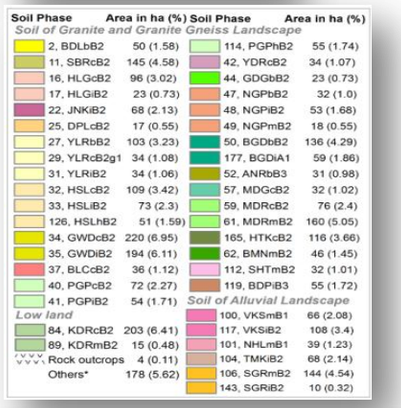
Soil Units

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.



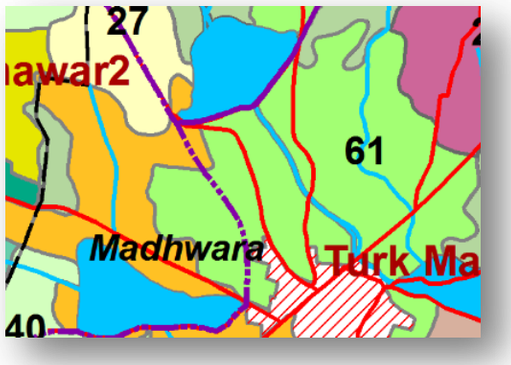
Map colours

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



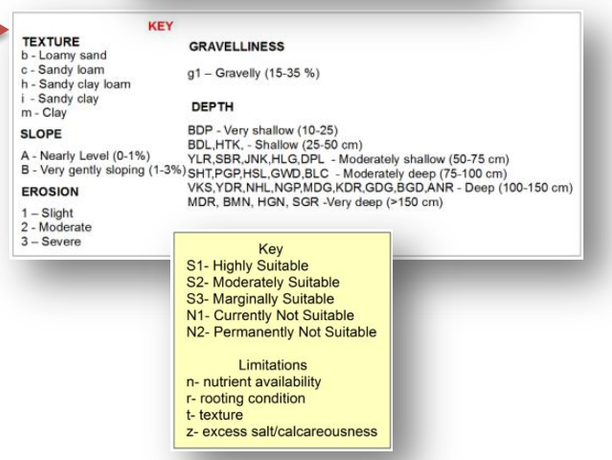
Soil and plot boundaries

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 Turkmadhawar Sub-watershed covering an area of 3173.22 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.

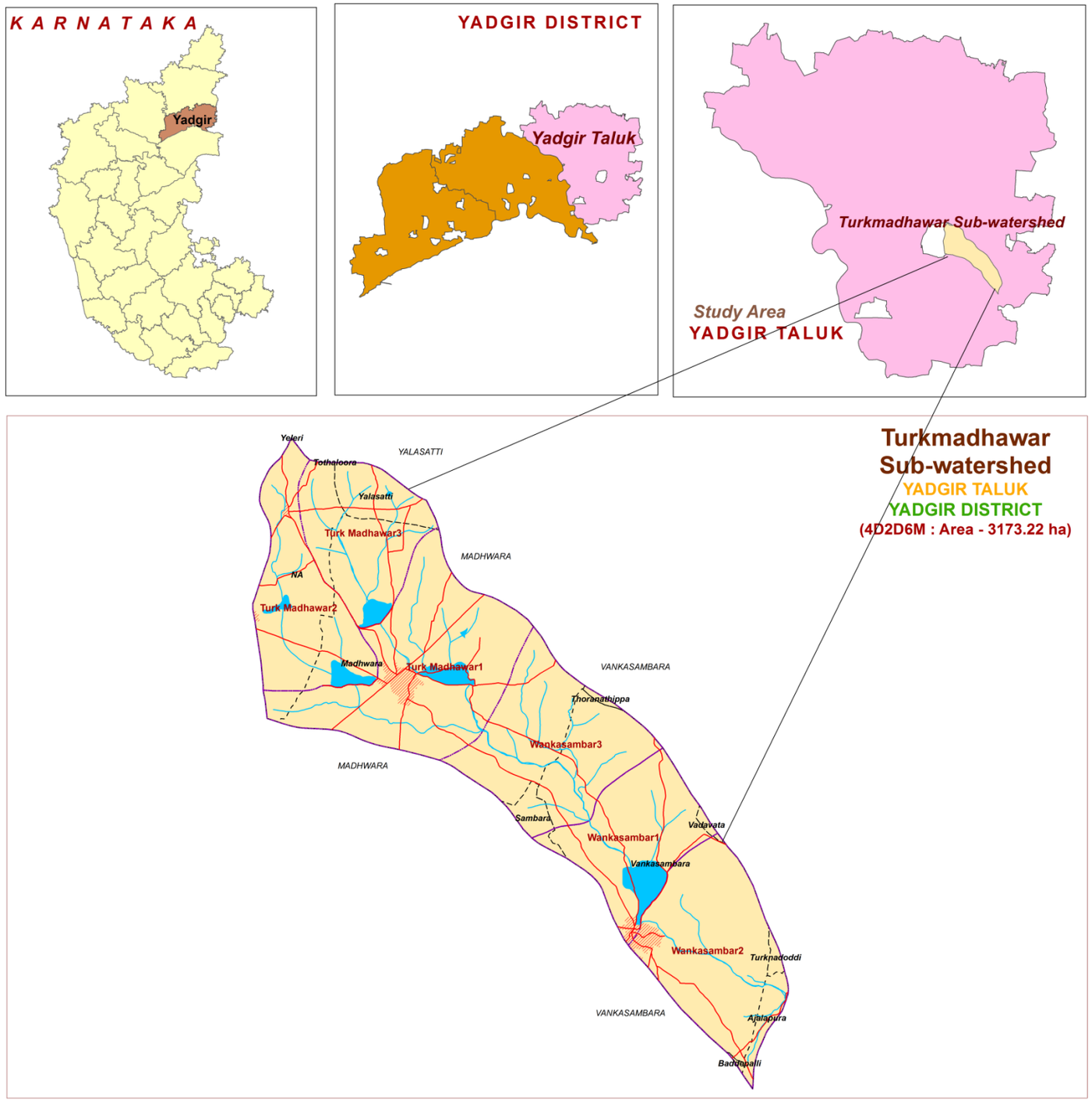
2. General Description of Sub-watershed

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’ $17^0$0’ – $16^0$55’ and east longitudes 77^0 7’ – 77^0 0’. The climate of the district is very hot and dry. The district has an average annual rainfall of 636 mm. Soils are well drained red sandy loam to medium deep black soils. This may be the weathering product of gneissic and granite terrain. Agriculture in Yadgir district is dependent upon rainfall, irrigation tanks, wells, streams etc. The major agricultural crops grown are Jowar, Groundnut, Cotton, Red gram, Bengal gram etc.

As a pilot study, **ICAR-NBSS&LUP, Bangalore** carried out the generation of Sub-watershed (SWs) - LRI for the Turkmadhawar SWs in Yadgir taluk, Yadgir district. It was selected for data base generation under Sujala III project. Turkmadhawar Sub-watershed (code– 4D2D6M) is covering an area of 3173.22 ha and spread across Mudhanala, Yadgiri.B, Chamanhalli and Bandhalli villages. This sub-watershed encompasses of 6 MWs namely Turk Madhawar-1 (4D2D6M1c), Turk Madhawar-2 (4D2D6M1b), Turk Madhawar-3 (4D2D6M1a), Wankasambar-1 (4D2D6M2b), Wankasambar-2 (4D2D6M2c) and Wankasambar-3 (4D2D6M2a). Land Resource Inventory (LRI) was generated for all the six micro-watersheds.

2.1. Location and Extent

LOCATION MAP OF TURKMADHAWAR SUB-WATERSHED

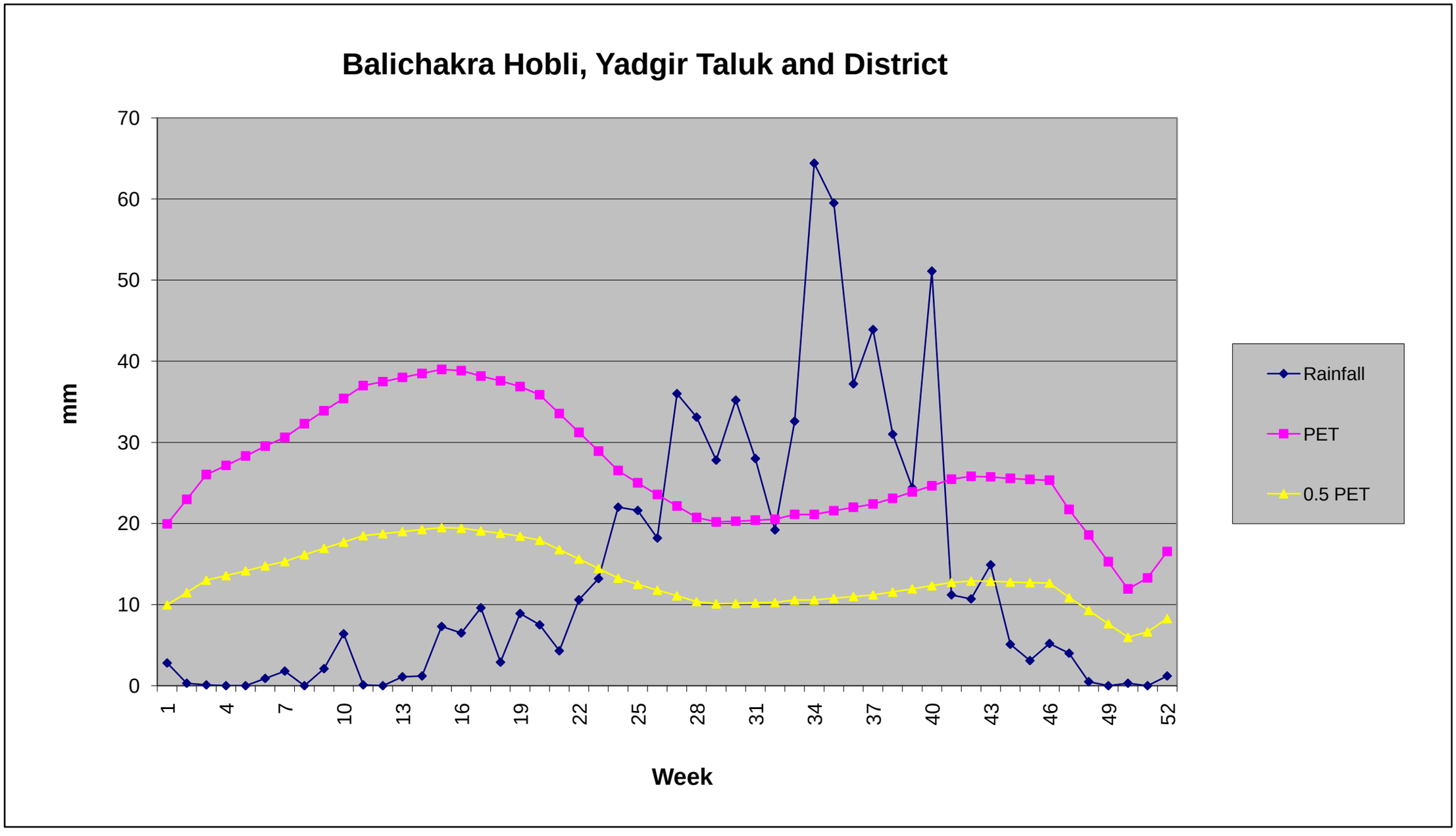


Turk Madhawar sub-watershed (Yadgir Taluk, Yadgir District) is located between $16^0$35'5''-$16^0$40'53'' North latitudes and $77^0$18'53''-$77^0$23'55'' East longitudes, covering an area of about 3173.22 ha, bounded by Vankasambara, Yalasatti, Madhwara, Madhwara and Vankasambara villages.

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

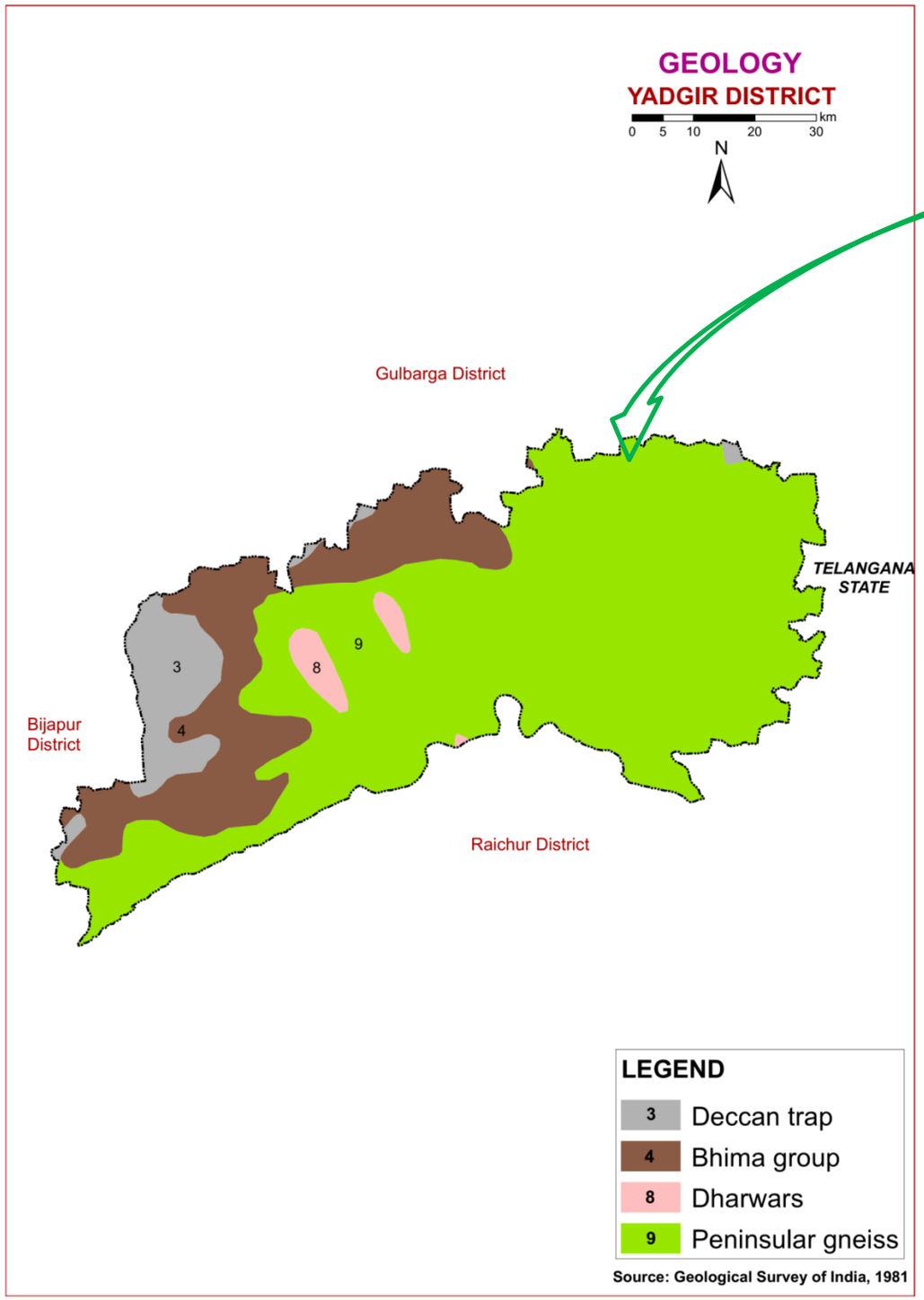


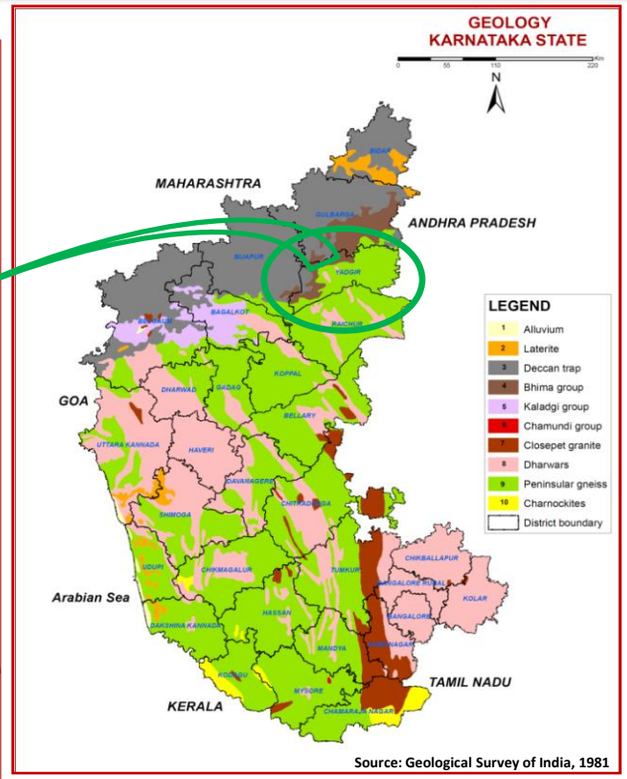
Length of Growing Period (LGP) is varying from June 2nd week to Last week of October (120 - 150 days)

Annual Rainfall : 729 mm. in the Balichakra Hobli, Yadgir Taluk & District

Source: KSNMDC (1980-2011)

2.3. Geology





GEOLOGY - KARNATAKA STATE

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

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

GEOLOGY - YADGIR DISTRICT

Mesozoic Group

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

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

Upper Proterozoic Group

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

Bhima series

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

Dharwar schists

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

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

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

Peninsular Gneiss

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

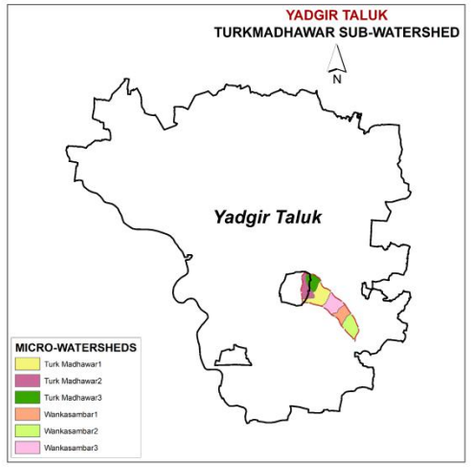
3. Survey Methodology

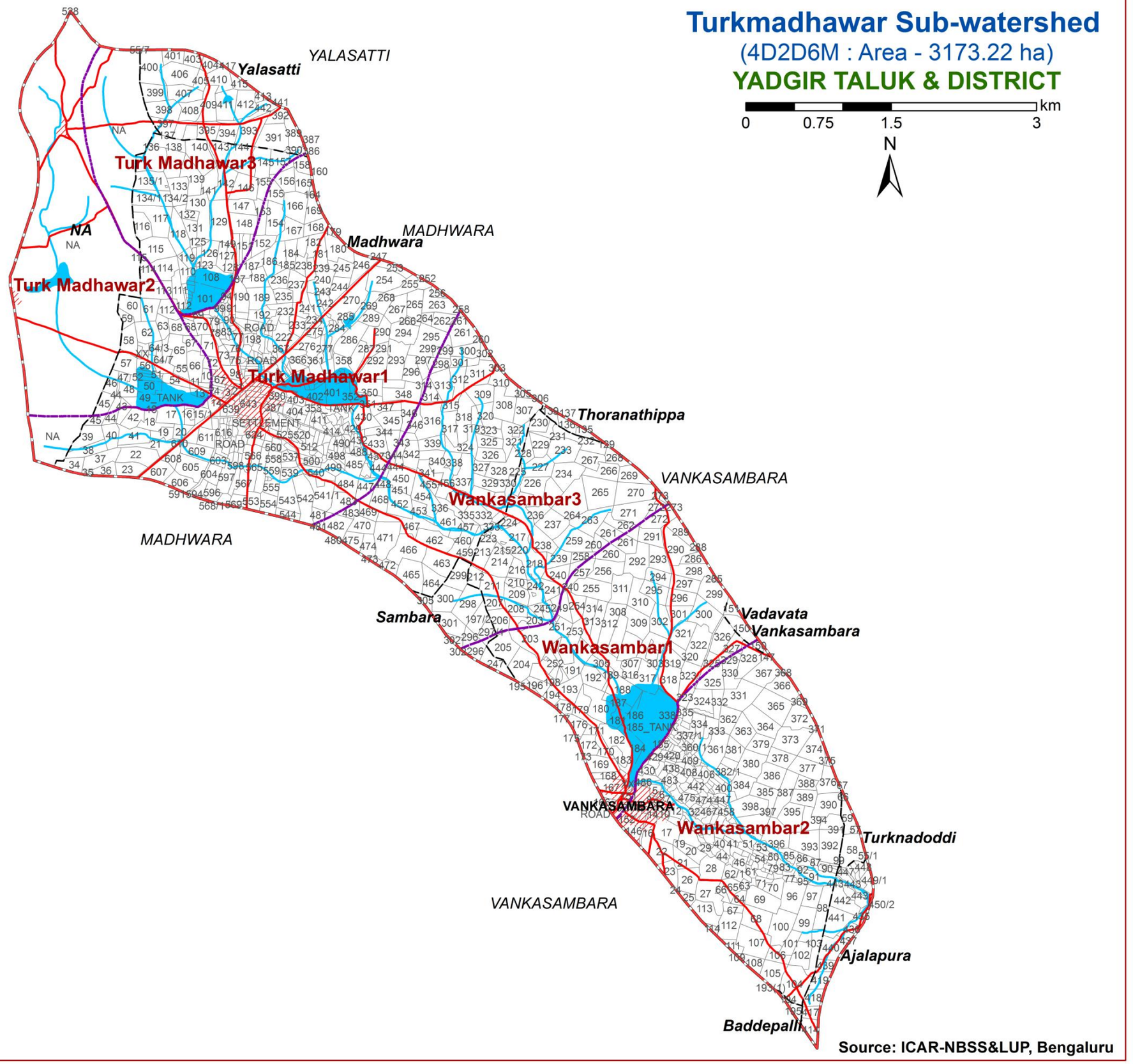
Sequence of activities in generation of LRI

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

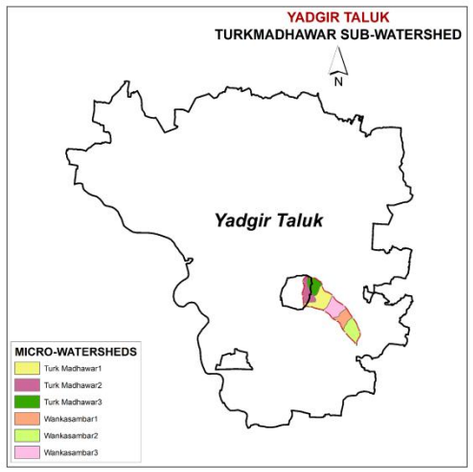
The required site and soil characteristics are described and recorded on a standard proforma by following the protocols and guidelines given in the soil survey manual and field guide. Collection of soil samples from representative pedons for laboratory characterization and collection of surface soil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

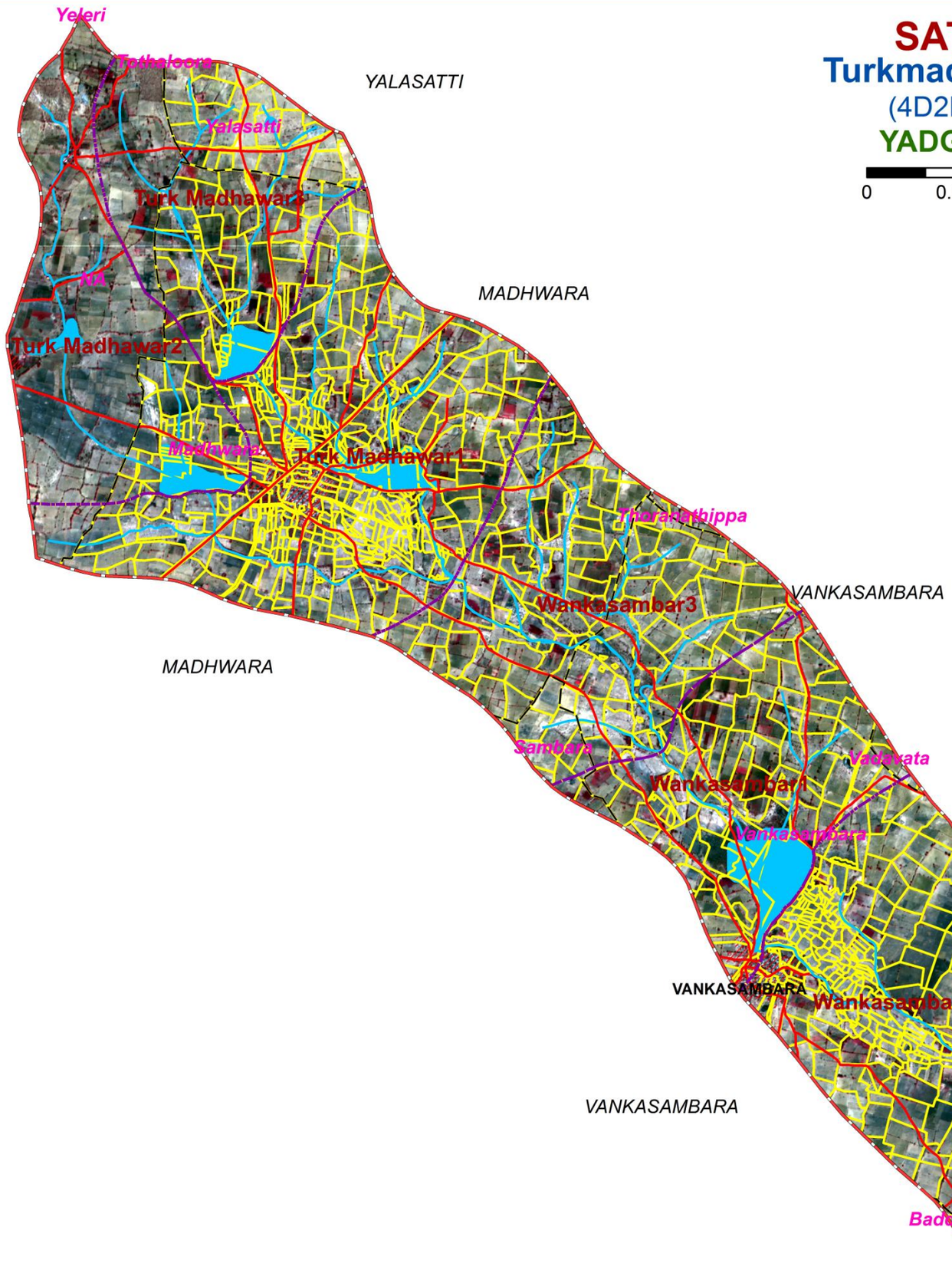
3.1. Database Used - Cadastral map





3.2. Database Used - Satellite Image





SATELLITE IMAGE
Turkmadhawar Sub-watershed
(4D2D6M : Area - 3173.22 ha)
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

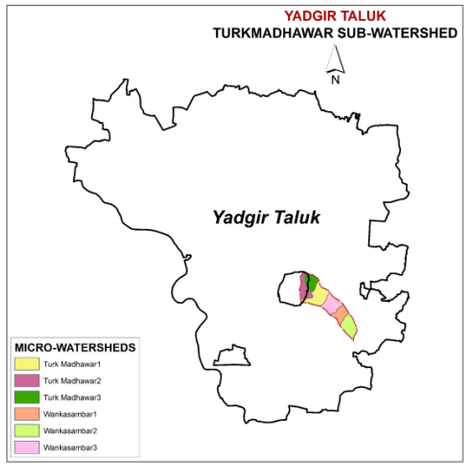
N

References

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

Source: Cartosat 1 Imagery, 2011

3.3. Location of Wells



LOCATION OF WELLS
Turkmadhawar Sub-watershed
(4D2D6M : Area - 3173.22 ha)
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
Tothaloora
YALASATTI
Yalasatti
Turk Madhawar3
NA
MADHWARA
Turk Madhawar2
Madhwara
Turk Madhawar1
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
Vadavata
Wankasambar1
Vankasambara
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
Baddepalli

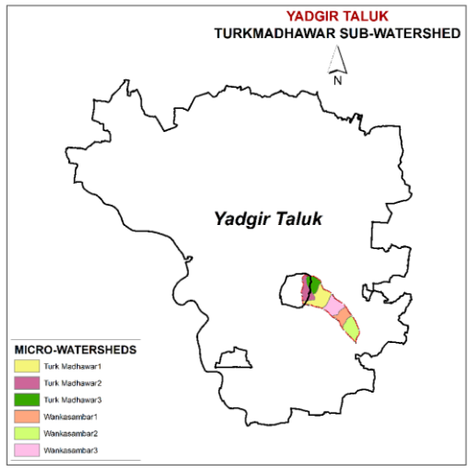
References

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

Legend	No's
Bore Well	15

Source: ICAR-NBSS&LUP, Bengaluru

4. The Soils



SOIL
Turkmadhawar Sub-watershed
(4D2D6M : Area - 3173.22 ha)
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Soil Phase	Area in ha (%)	Soil Phase	Area in ha (%)
Soil of Granite and Granite Gneiss Landscape			
2, BDLbB2	50 (1.58)	114, PGPhB2	55 (1.74)
11, SBRcB2	145 (4.58)	42, YDRcB2	34 (1.07)
16, HLGcB2	96 (3.02)	44, GDGbB2	23 (0.73)
17, HLGiB2	23 (0.73)	47, NGPbB2	32 (1.0)
22, JNKiB2	68 (2.13)	48, NGPiB2	53 (1.68)
25, DPLcB2	17 (0.55)	49, NGPmB2	18 (0.55)
27, YLRbB2	103 (3.23)	50, BGDbB2	136 (4.29)
29, YLRcB2g1	34 (1.08)	177, BGDiA1	59 (1.86)
31, YLRiB2	34 (1.06)	52, ANRbB3	31 (0.98)
32, HSLcB2	109 (3.42)	57, MDGcB2	32 (1.02)
33, HSLiB2	73 (2.3)	59, MDRcB2	76 (2.4)
126, HSLhB2	51 (1.59)	61, MDRmB2	160 (5.05)
34, GWDcB2	220 (6.95)	165, HTKcB2	116 (3.66)
35, GWDiB2	194 (6.11)	62, BMNmB2	46 (1.45)
37, BLCcB2	36 (1.12)	112, SHTmB2	32 (1.01)
40, PGPcB2	72 (2.27)	119, BDPiB3	55 (1.72)
41, PGPiB2	54 (1.71)	*Soil of Alluvial Landscape*	
Low land		100, VKSmB1	66 (2.08)
84, KDRcB2	203 (6.41)	117, VKSiB2	108 (3.4)
89, KDRmB2	15 (0.48)	101, NHLmB1	39 (1.23)
Rock outcrops	4 (0.11)	104, TMKiB2	68 (2.14)
Others*	178 (5.62)	106, SGRmB2	144 (4.54)
		143, SGRiB2	10 (0.32)

Texture Gravelliness

MDG h B 2 g1

Soil Series Slope Erosion

References

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

KEY

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

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

EROSION
1 – Slight
2 - Moderate
3 – Severe

GRAVELLINESS
g1 – Gravelly (15-35 %)

DEPTH
BDP - Very shallow (10-25)
BDL,HTK, - Shallow (25-50 cm)
YLR,SBR,JNK,HLG,DPL - Moderately shallow (50-75 cm)
SHT,PGP,HSL,GWD,BLC - Moderately deep (75-100 cm)
VKS,YDR,NHL,NGP,MDG,KDR,GDG,BGD,ANR - Deep (100-150 cm)
MDR, BMN, HGN, SGR -Very deep (>150 cm)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

4.1 Mapping unit description of Turkmadhawar (4D2D6M) 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		**46 (1.45)**
62		BMNmB2	Clay surface, slope 1-3%, moderate erosion	46 (1.45)
	MDR	Madhwara soils are very deep (>150 cm), well drained, have very dark gray to very dark brown, slightly calcareous sandy clay loam soils occurring on nearly level to very gently sloping uplands under cultivation		**236 (7.45)**
59		MDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	76 (2.4)
61		MDRmB2	Clay surface, slope 1-3%, moderate erosion	160 (5.05)
	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		**31 (0.98)**
52		ANRbB3	Loamy sand surface, slope 1-3%, severe erosion	31 (0.98)
	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		**195 (6.15)**
50		BGDbB2	Loamy sand surface, slope 1-3%, moderate erosion	136 (4.29)
177		BGDiA1	Sandy clay surface, slope 0-1%, slight erosion	59 (1.86)
	GDG	Gondedagi soils are deep (100-150 cm), well drained, have dark reddish gray to dark brown, sandy clay loam soils occurring on very gently to gently sloping uplands under cultivation		**23 (0.73)**
44		GDGbB2	Loamy sand surface, slope 1-3%, moderate erosion	23 (0.73)
	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		**32 (1.02)**
57		MDGcB2	Sandy loam surface, slope 1-3%, moderate erosion	32 (1.02)
	NGP	Nagalapur soils are deep (100-150 cm), moderately well drained, have very dark gray to very dark grayish brown, black calcareous cracking clay soils occurring on very gently sloping uplands under cultivation		**103 (3.23)**
47		NGPbB2	Loamy sand surface, slope 1-3%, moderate erosion	32 (1.0)
48		NGPiB2	Sandy clay surface, slope 1-3%, moderate erosion	53 (1.68)
49		NGPmB2	Clay surface, slope 1-3%, moderate erosion	18 (0.55)
	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		**34 (1.07)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	34 (1.07)

To be continued….

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss Landscape				
	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		**36 (1.12)**
37		BLCcB2	Sandy loam surface, slope 1-3%, moderate erosion	36 (1.12)
	GWD	Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown, calcareous sodic sandy clay loam soils occurring on very gently sloping uplands under cultivation		**414 (13.06)**
34		GWDcB2	Sandy loam surface, slope 1-3%, moderate erosion	220 (6.95)
35		GWDiB2	Sandy clay surface, slope 1-3%, moderate erosion	194 (6.11)
	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		**233 (7.31)**
32		HSLcB2	Sandy loam surface, slope 1-3%, moderate erosion	109 (3.42)
126		HSLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	51 (1.59)
33		HSLiB2	Sandy clay surface, slope 1-3%, moderate erosion	73 (2.3)
	PGP	Poglapur soils are moderately deep (75-100 cm), well drained, have dark brown, dark reddish brown to yellowish red sandy clay soils occurring on very gently sloping uplands under cultivation		**181 (5.72)**
40		PGPcB2	Sandy loam surface, slope 1-3%, moderate erosion	72 (2.27)
114		PGPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	55 (1.74)
41		PGPiB2	Sandy clay surface, slope 1-3%, moderate erosion	54 (1.71)
	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		**32 (1.01)**
112		SHTmB2	Clay surface, slope 1-3%, moderate erosion	32 (1.01)
	DPL	Duppali soils are moderately shallow (50-75 cm), well drained, have dark brown to dark reddish brown, sandy clay soils occurring on very gently to gently sloping uplands under cultivation		**17 (0.55)**
25		DPLcB2	Sandy loam surface, slope 1-3%, moderate erosion	17 (0.55)
	HLG	Halagera soils are moderately shallow (50-75 cm), well drained, have very dark grayish brown to dark yellowish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation.		**119 (3.75)**
16		HLGcB2	Sandy loam surface, slope 1-3%, moderate erosion	96 (3.02)
17		HLGiB2	Sandy clay surface, slope 1-3%, moderate erosion	23 (0.73)

To be continued….

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss Landscape				
	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		**68 (2.13)**
22		JNKiB2	Sandy clay surface, slope 1-3%, moderate erosion	68 (2.13)
	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		**145 (4.58)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	145 (4.58)
	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		**171 (5.37)**
27		YLRbB2	Loamy sand surface, slope 1-3%, moderate erosion	103 (3.23)
29		YLRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	34 (1.08)
31		YLRiB2	Sandy clay surface, slope 1-3%, moderate erosion	34 (1.06)
	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		**50 (1.58)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion	50 (1.58)
	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		**116 (3.66)**
165		HTKcB2	Sandy loam surface, slope 1-3%, moderate erosion	116 (3.66)
	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		**55 (1.72)**
119		BDPiB3	Sandy clay surface, slope 1-3%, severe erosion	55 (1.72)
	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		**154 (4.86)**
143		SGRiB2	Sandy clay surface, slope 1-3%, moderate erosion	10 (0.32)
106		SGRmB2	Clay surface, slope 1-3%, moderate erosion	144 (4.54)
	TMK	Thumakur soils are very deep (>150 cm), moderately well drained, have very dark gray to dark brown, slightly calcareous sodic clay soils occurring on nearly level to very gently sloping low lands under cultivation		**68 (2.14)**
104		TMKiB2	Sandy clay surface, slope 1-3%, moderate erosion	68 (2.14)

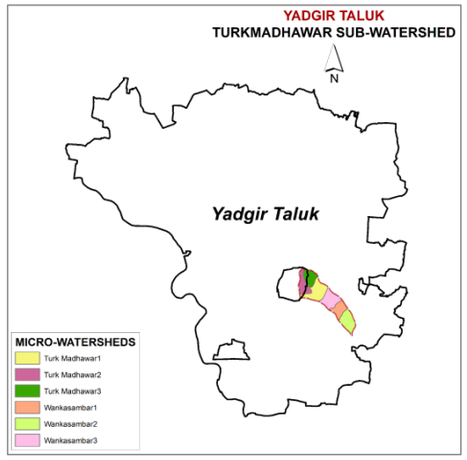
To be continued….

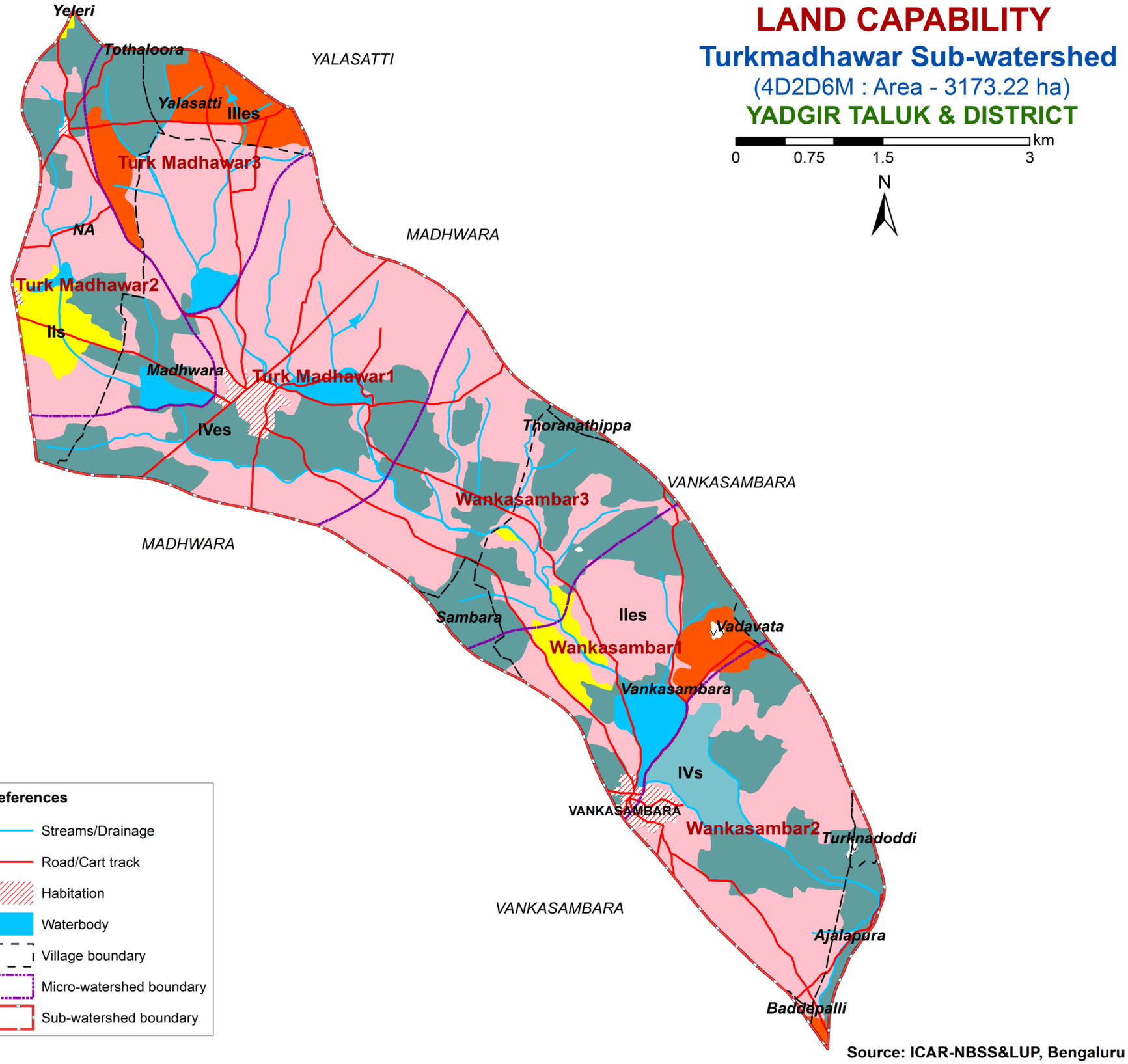
Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss Landscape				
	NHL	Neelahalli soils are deep (100-150 cm), well drained, have dark grayish brown to brown sandy loam soils occurring on nearly level to very gently sloping lowlands under cultivation		**39 (1.23)**
101		NHLmB1	Clay surface, slope 1-3%, slight erosion	39 (1.23)
	VKS	Vankasambar soils are deep (100-150 cm), well drained, very dark brown to brown, sodic calcareous sandy clay loam soils occurring on very gently to gently sloping lowlands under cultivation		**174 (5.48)**
117		VKSiB2	Sandy clay surface, slope 1-3%, moderate erosion	108 (3.4)
100		VKSmB1	Clay surface, slope 1-3%, slight erosion	66 (2.08)
Soils of Alluvial landscape				
	KDR	Kudlura soils are deep (100-150 cm), moderately well drained, have very dark gray to grayish brown, calcareous cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**218 (6.89)**
84		KDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	203 (6.41)
89		KDRmB2	Clay surface, slope 1-3%, moderate erosion	15 (0.48)
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**4 (0.11)**
1000		Others	Habitation and waterbody	**178 (5.62)**

* 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)

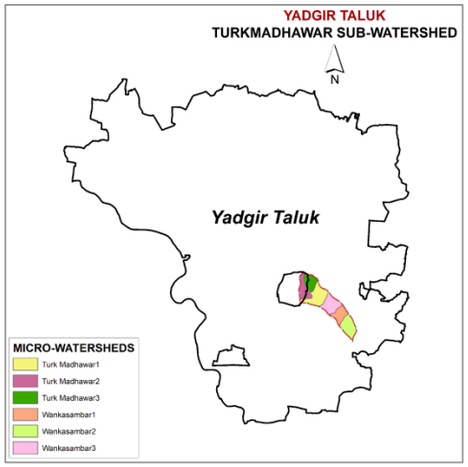
Capability subclass	Area in ha (%)
IIs	98 (3.1)
IIes	1651 (52.04)
IIIes	166 (5.24)
IVs	66 (2.08)
IVes	1009 (31.8)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

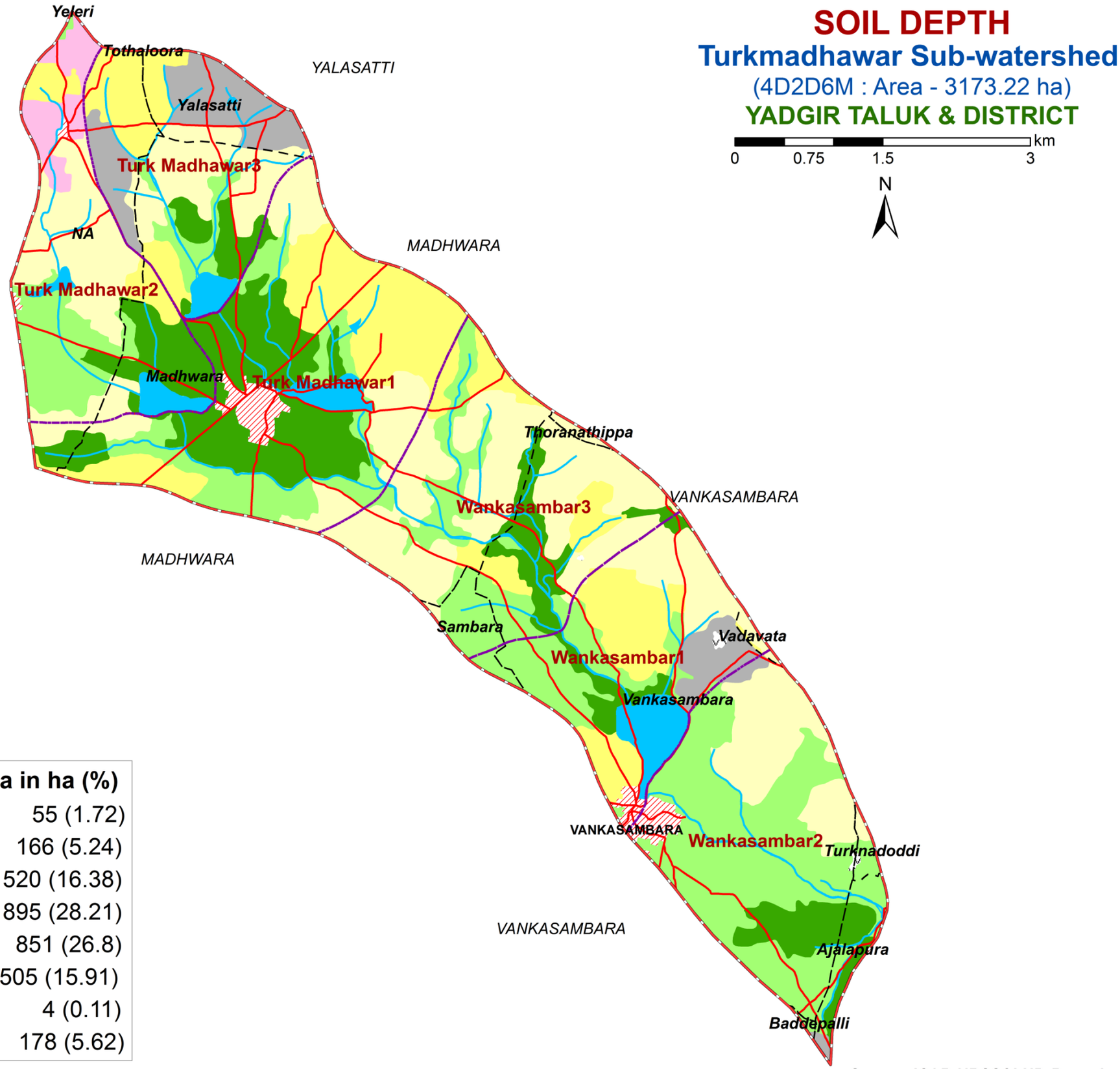
* - Habitation & Waterbody

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





References

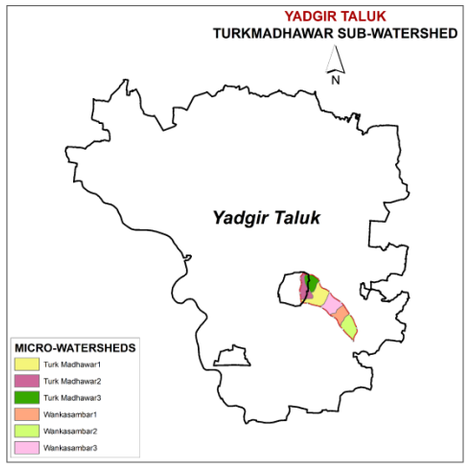
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Depth Class	Area in ha (%)
Very shallow (<25 cm)	55 (1.72)
Shallow (25-50 cm)	166 (5.24)
Moderately shallow (50-75 cm)	520 (16.38)
Moderately deep (75-100 cm)	895 (28.21)
Deep (100-150 cm)	851 (26.8)
Very deep (>150 cm)	505 (15.91)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.3. Surface Soil Texture



SURFACE SOIL TEXTURE

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3

N

Yeleri
Tothaloora
YALASATTI
Yalasatti
Turk Madhawar3
NA
MADHWARA
Turk Madhawar2
Madhwara
Turk Madhawar1
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
Vadavata
Wankasambar1
Vankasambara
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
Baddepalli

References

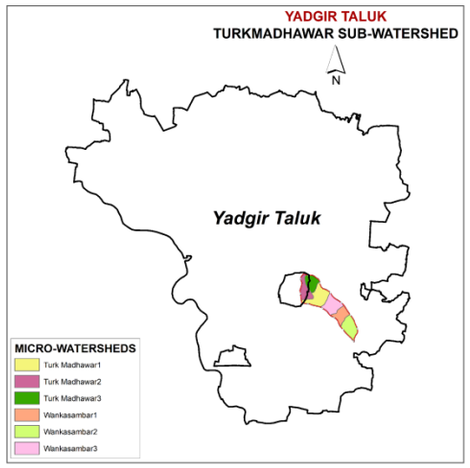
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Texture Class	Area in ha(%)
Loamy sand	375 (11.81)
Sandy loam	1192 (37.55)
Sandy clay loam	106 (3.33)
Sandy clay	798 (25.16)
Clay	521 (16.42)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.4. Surface Soil Gravelliness



SOIL GRAVELLINESS
Turkmadhawar Sub-watershed
(4D2D6M : Area - 3173.22 ha)
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
Tothaloora
YALASATTI
Yalasatti
Turk Madhawar3
NA
MADHWARA
Turk Madhawar2
Madhwara
Turk Madhawar1
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
Vadavata
Wankasambar1
Vankasambara
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
Baddepalli

References

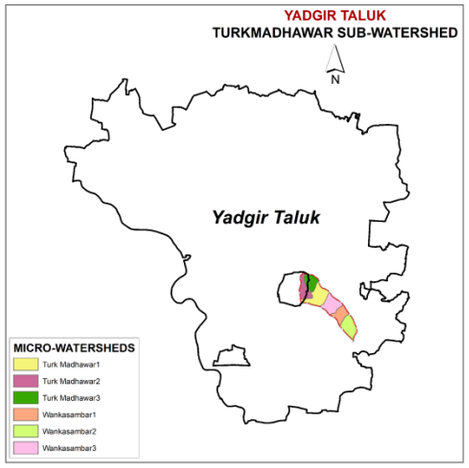
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Gravelly Class	Area in ha (%)
Non gravelly (<15%)	2957 (93.18)
Gravelly (15-35%)	34 (1.08)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.5. Available Water Capacity



AVAILABLE WATER CAPACITY

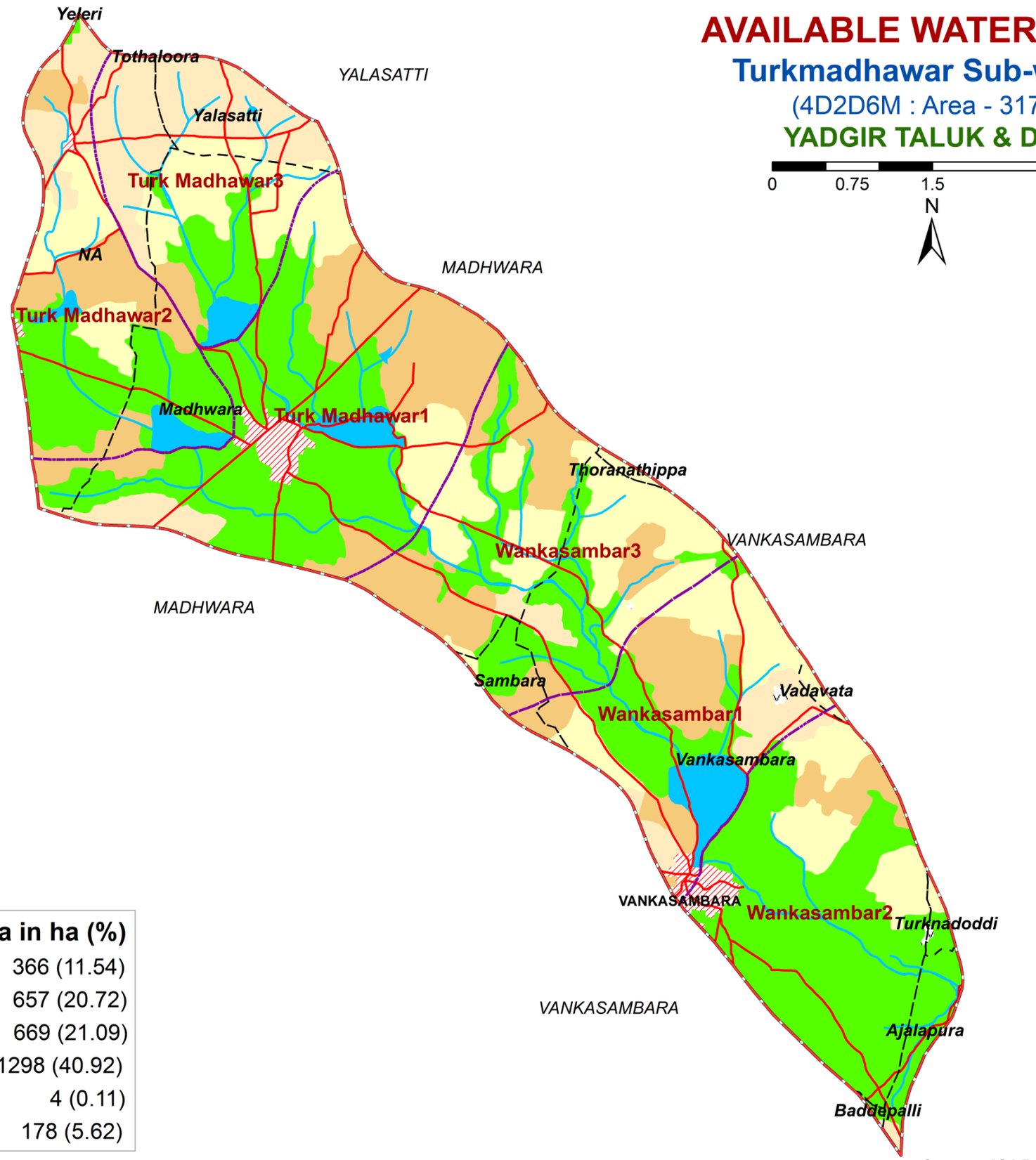
Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N



References

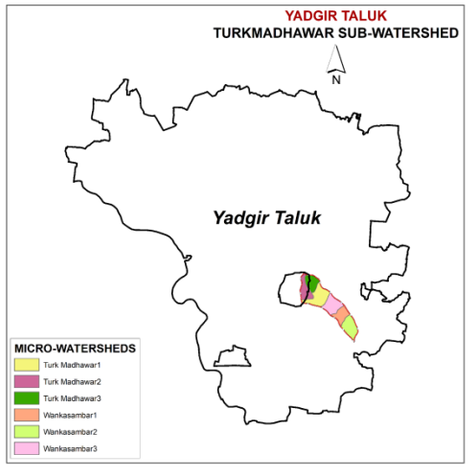
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

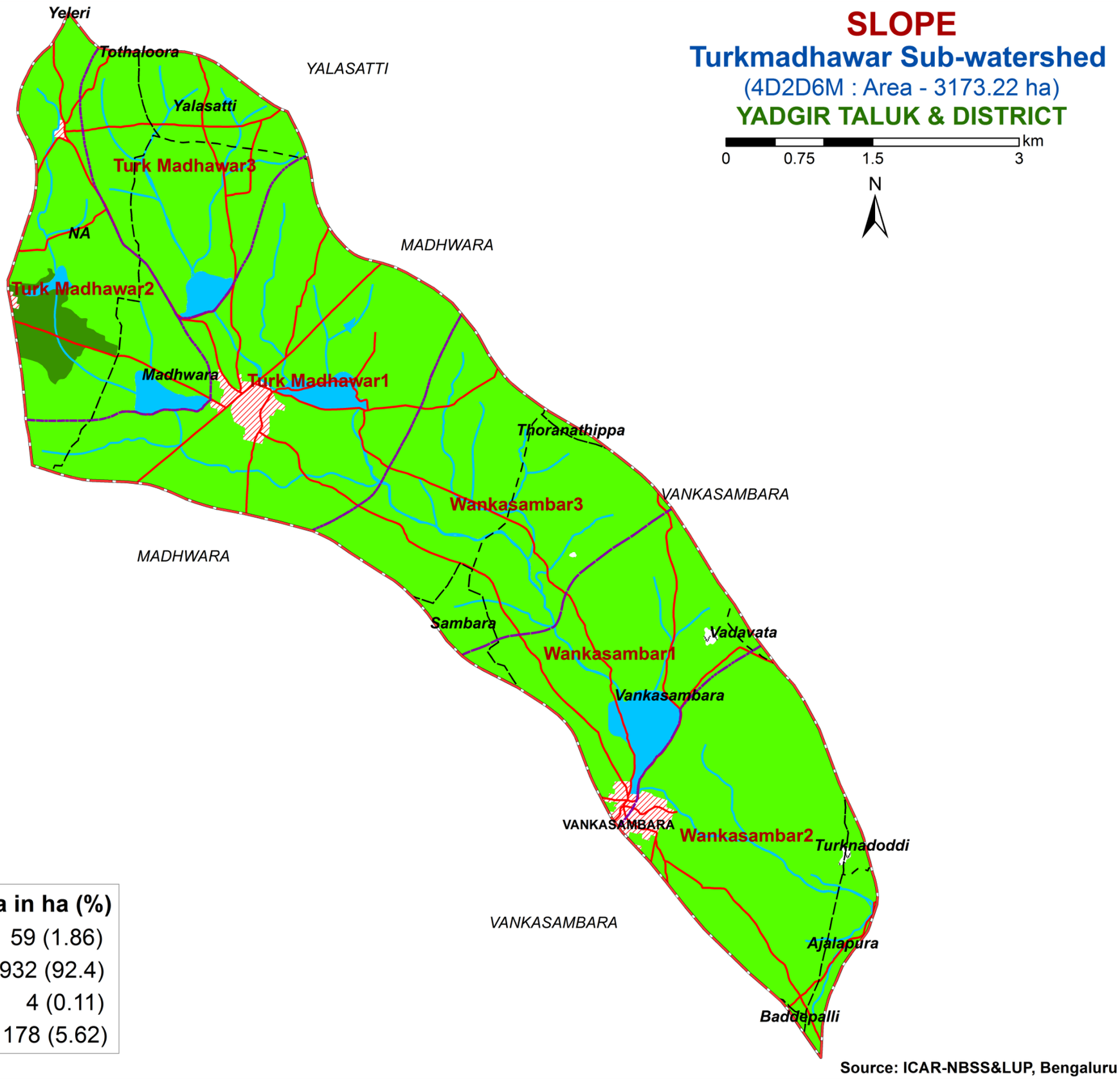
Available Water Capacity	Area in ha (%)
Very low (<50 mm/m)	366 (11.54)
Low (51-100 mm/m)	657 (20.72)
Medium (101-150 mm/m)	669 (21.09)
Very high (>200 mm/m)	1298 (40.92)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.6.Slope





References

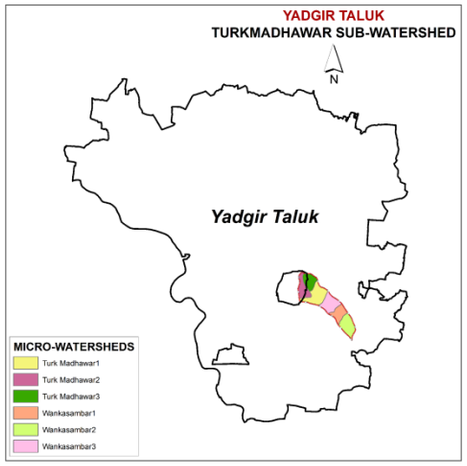
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

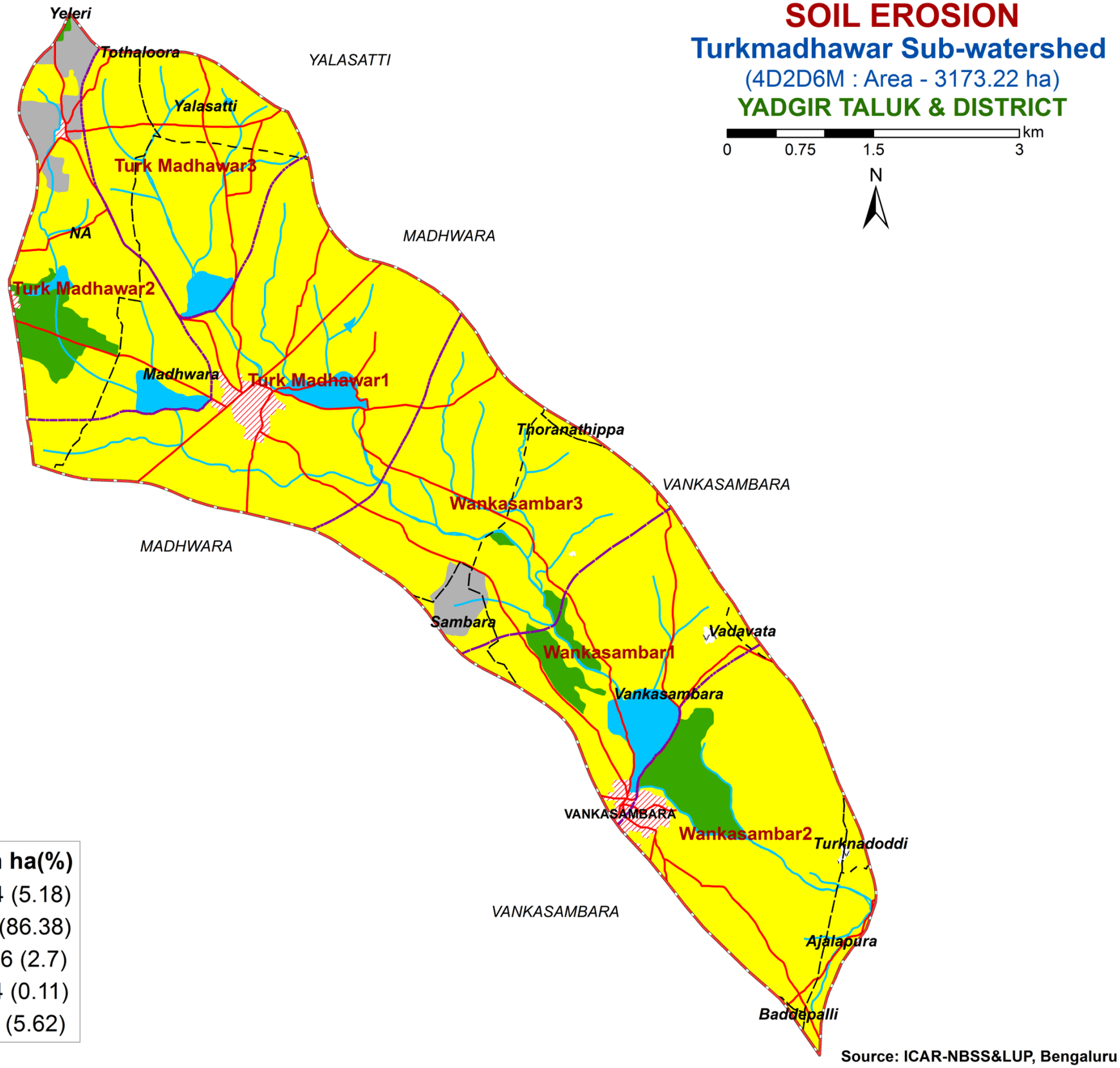
Slope Class	Area in ha (%)
Nearly level (0-1%)	59 (1.86)
Very gently sloping (1-3%)	2932 (92.4)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.7.Soil Erosion





References

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

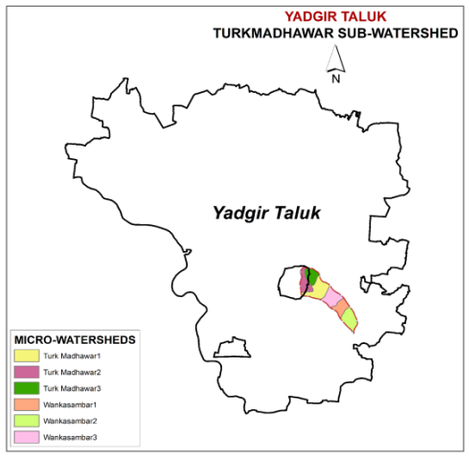
Erosion Class	Area in ha(%)
Slight	164 (5.18)
Moderate	2741 (86.38)
Severe	86 (2.7)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

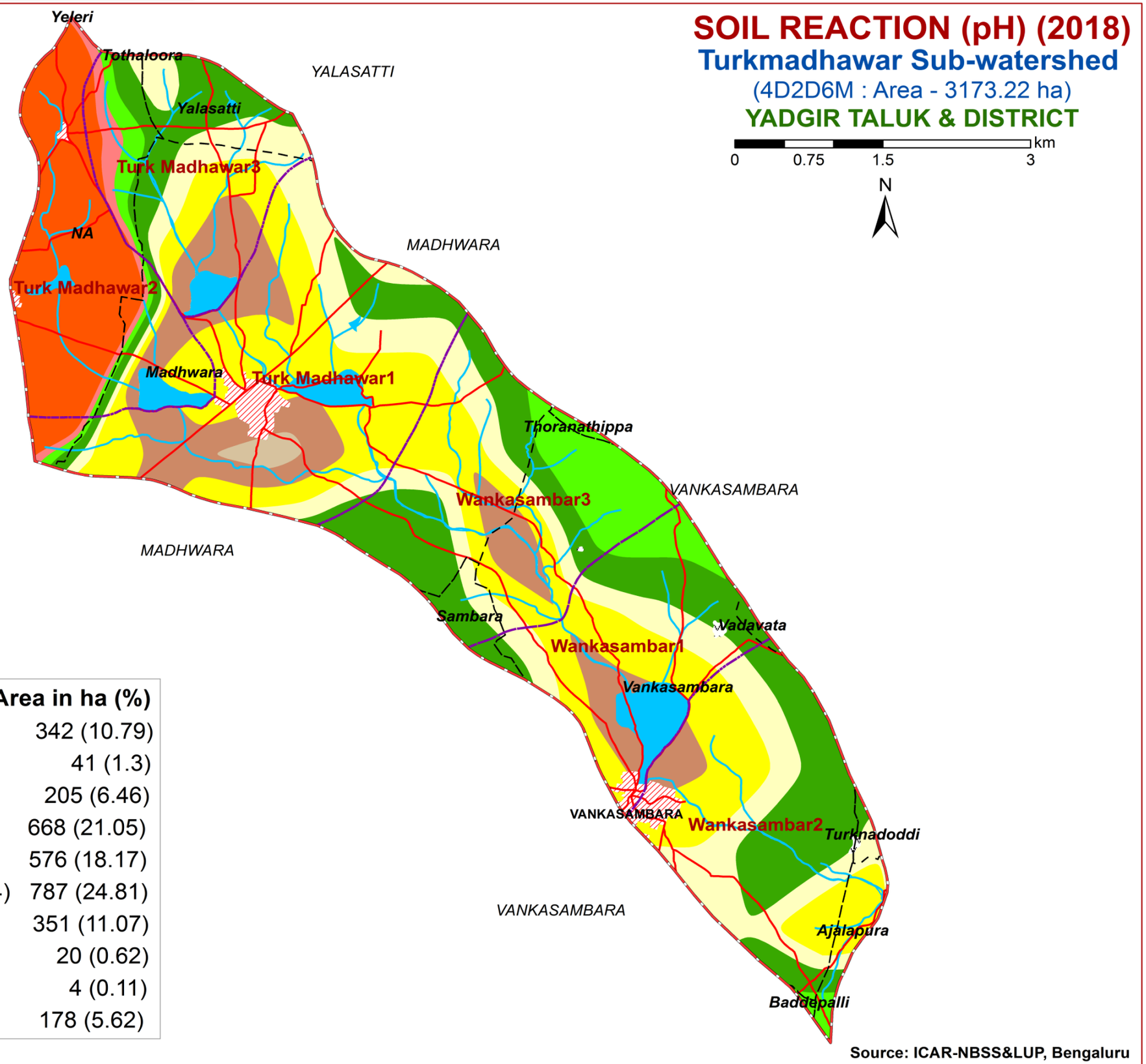
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

6. Soil Fertility Status

6.1. Soil Reaction (pH)





References

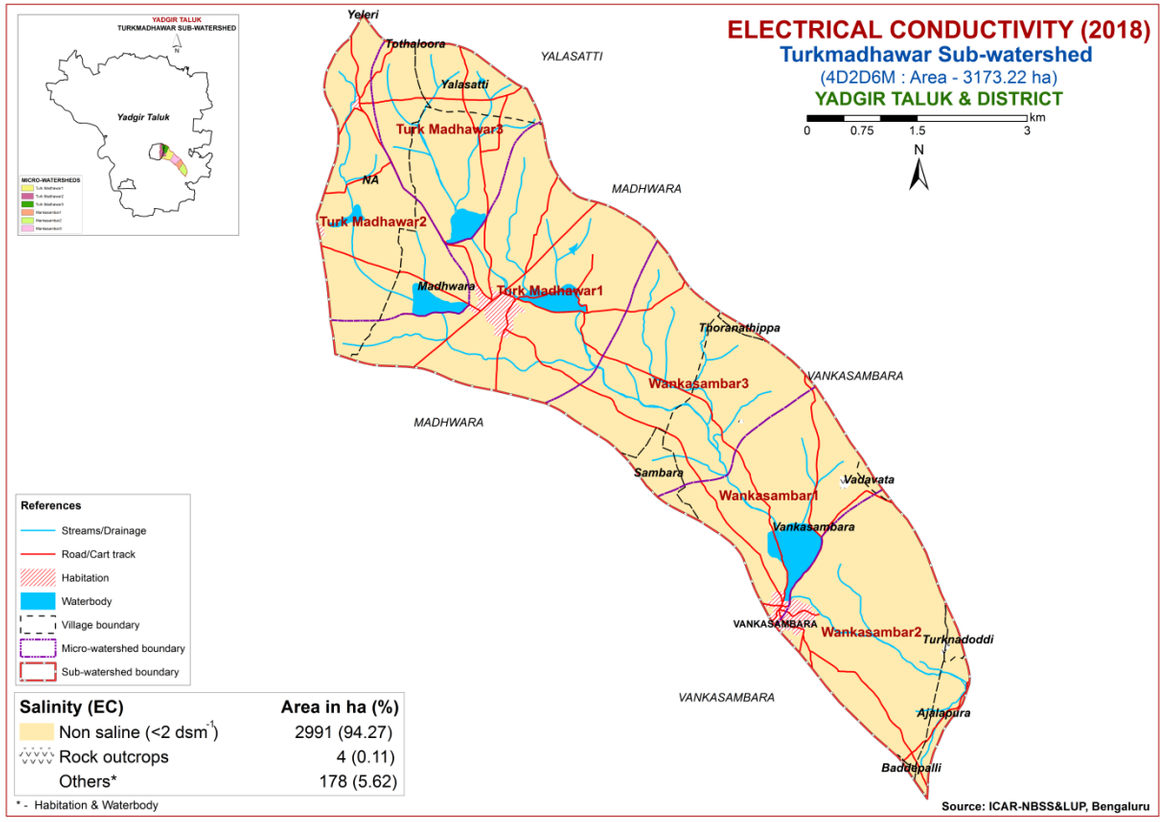
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Reaction Class	Area in ha (%)
Strongly acid (pH 5.0 – 5.5)	342 (10.79)
Moderately acid (pH 5.5 – 6.0)	41 (1.3)
Slightly acid (pH 6.0 – 6.5)	205 (6.46)
Neutral (pH 6.5 – 7.3)	668 (21.05)
Slightly alkaline (pH 7.3 – 7.8)	576 (18.17)
Moderately alkaline (pH 7.8 – 8.4)	787 (24.81)
Strongly alkaline (pH 8.4 – 9.0)	351 (11.07)
Very strongly alkaline (pH > 9.0)	20 (0.62)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

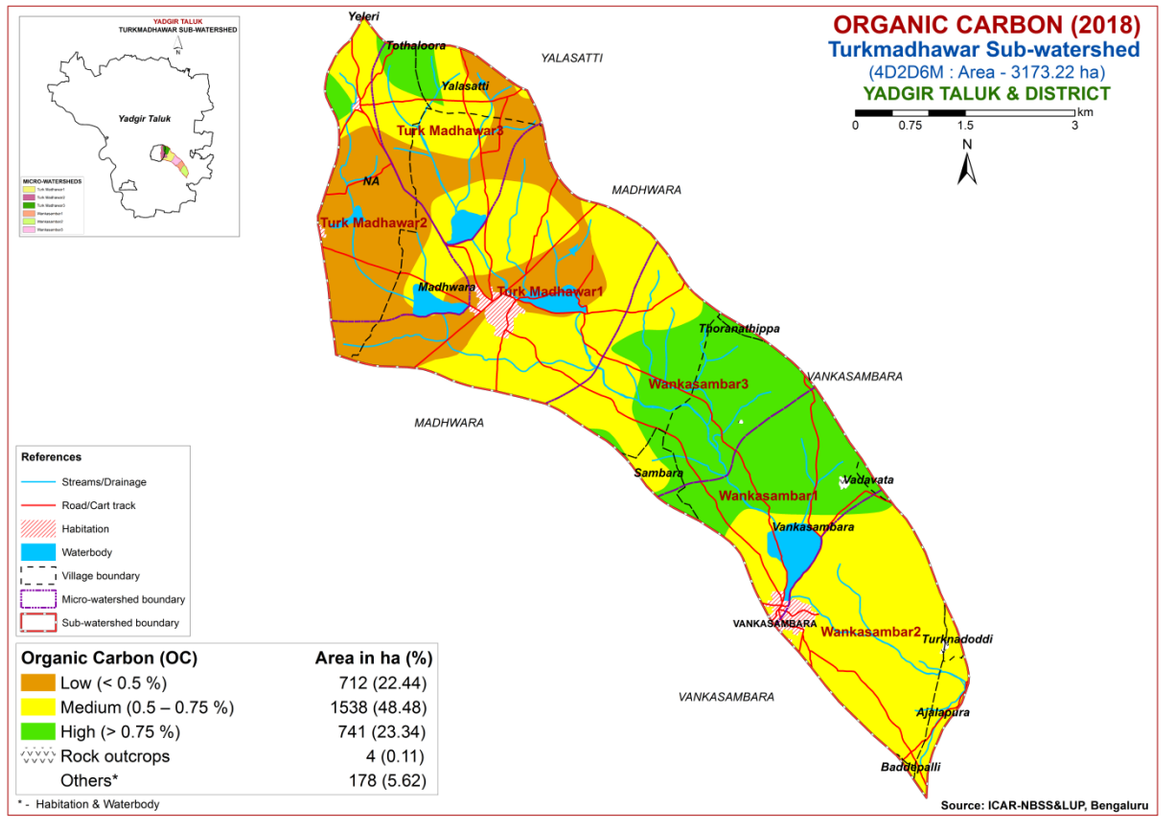
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

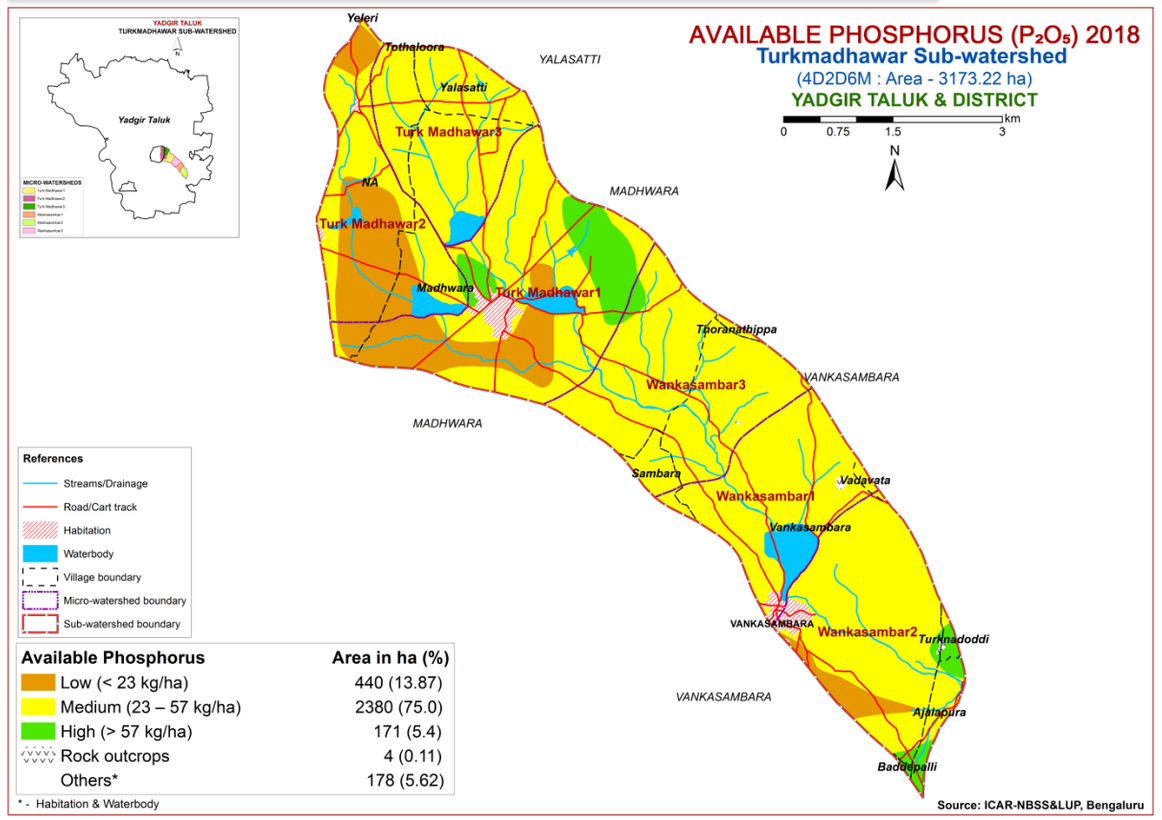
6.2 Electrical Conductivity (EC)



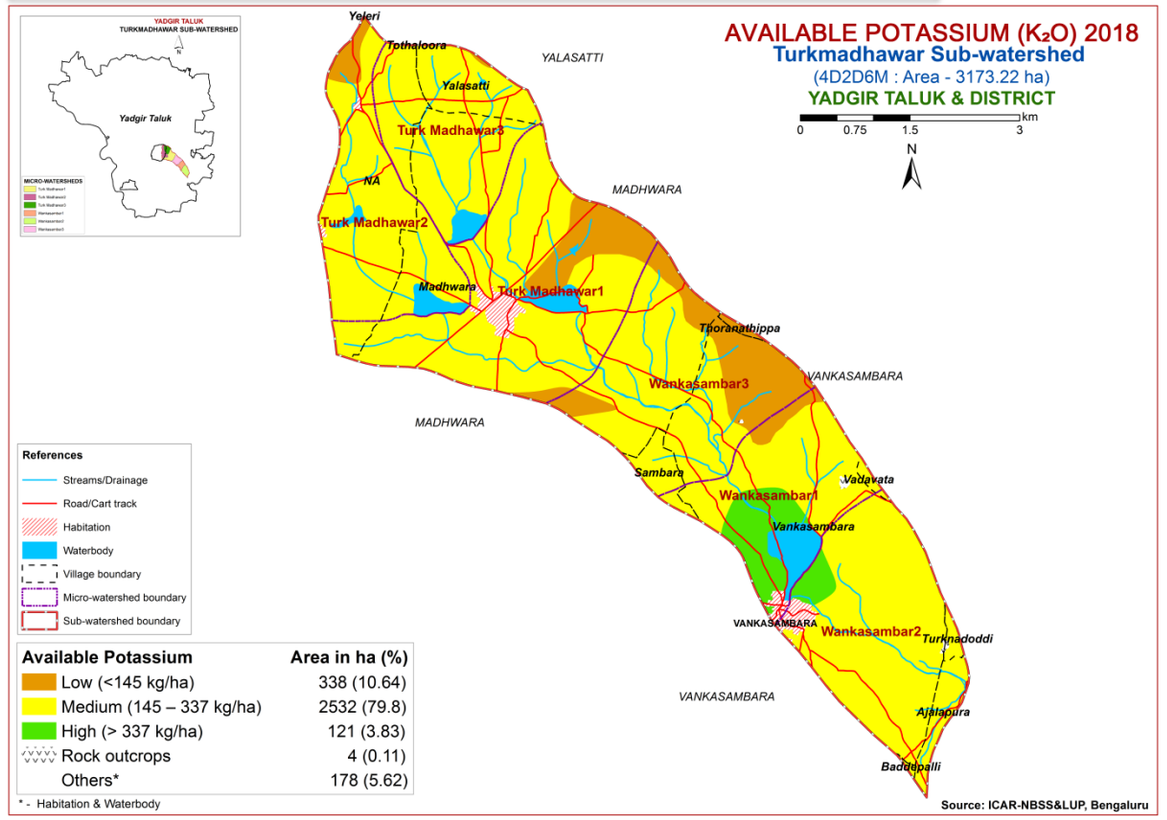
6.3. Organic Carbon



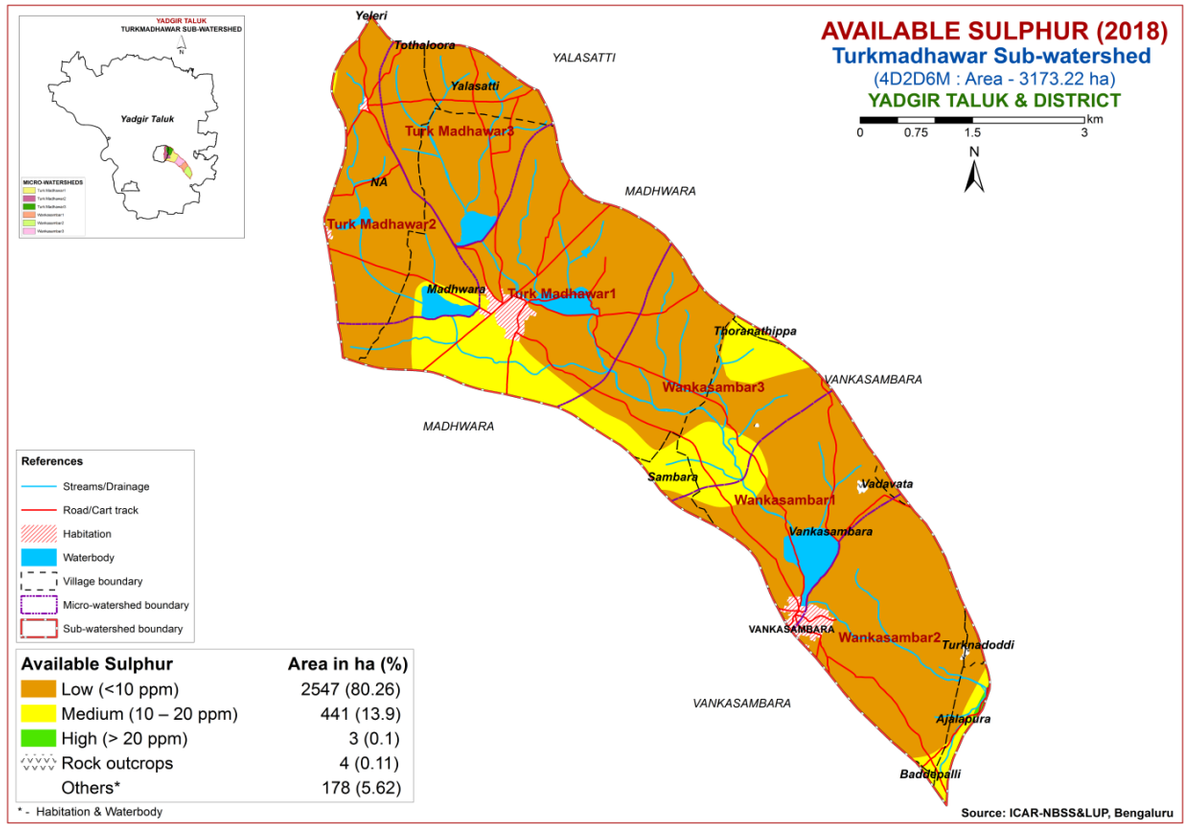
6.4. Available Phosphorus (P_2O_5)



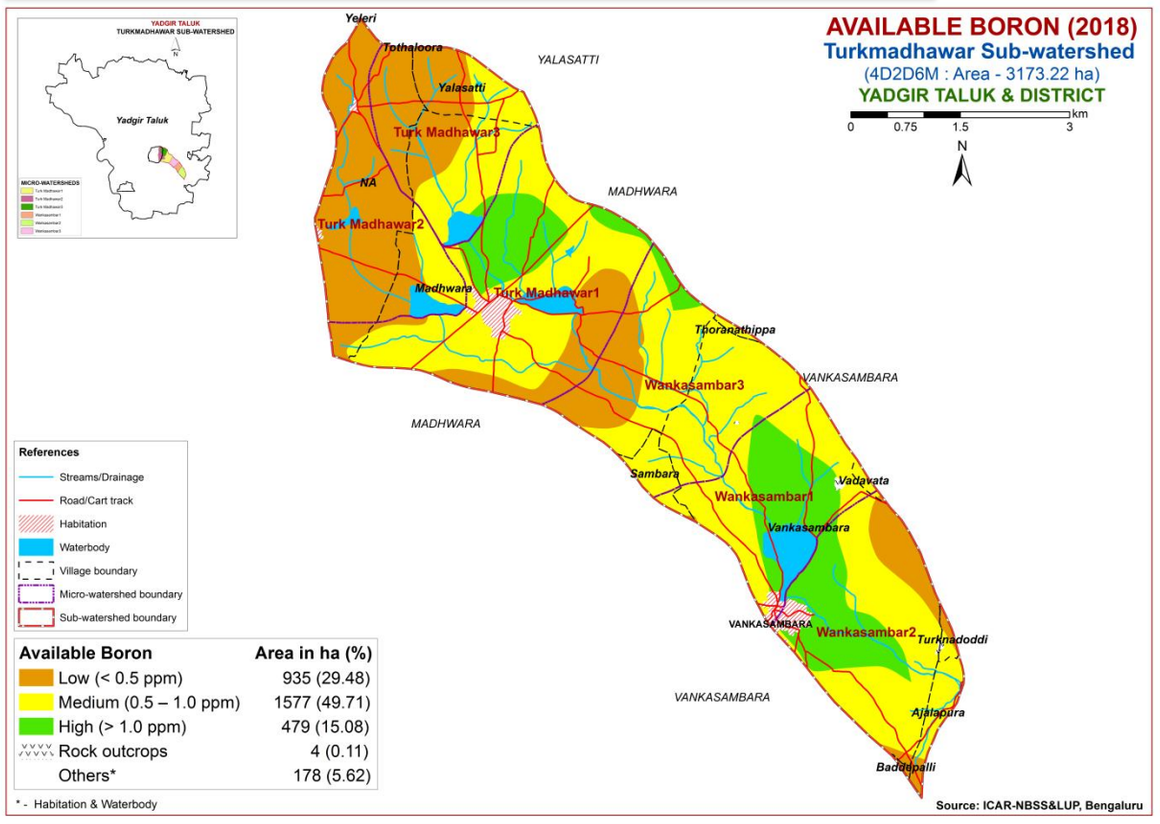
6.5. Available Potassium (K_2O)



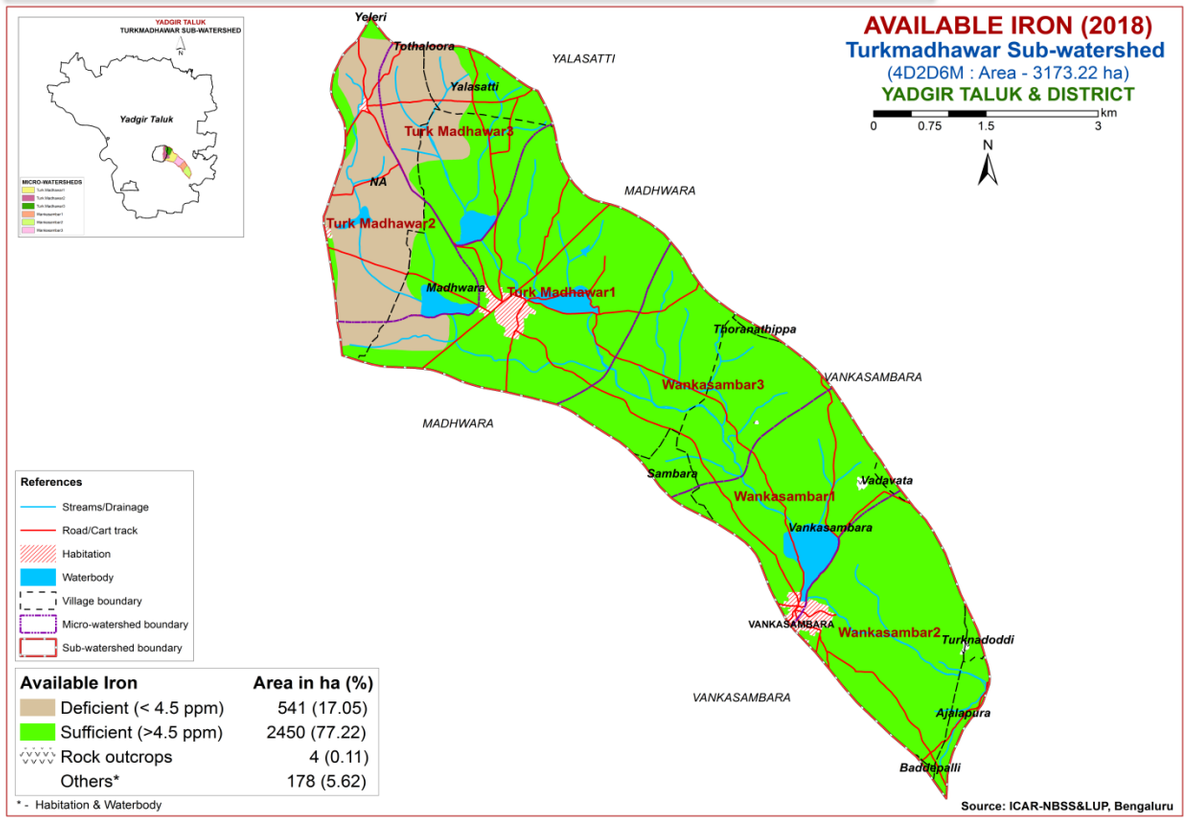
6.6. Available Sulphur



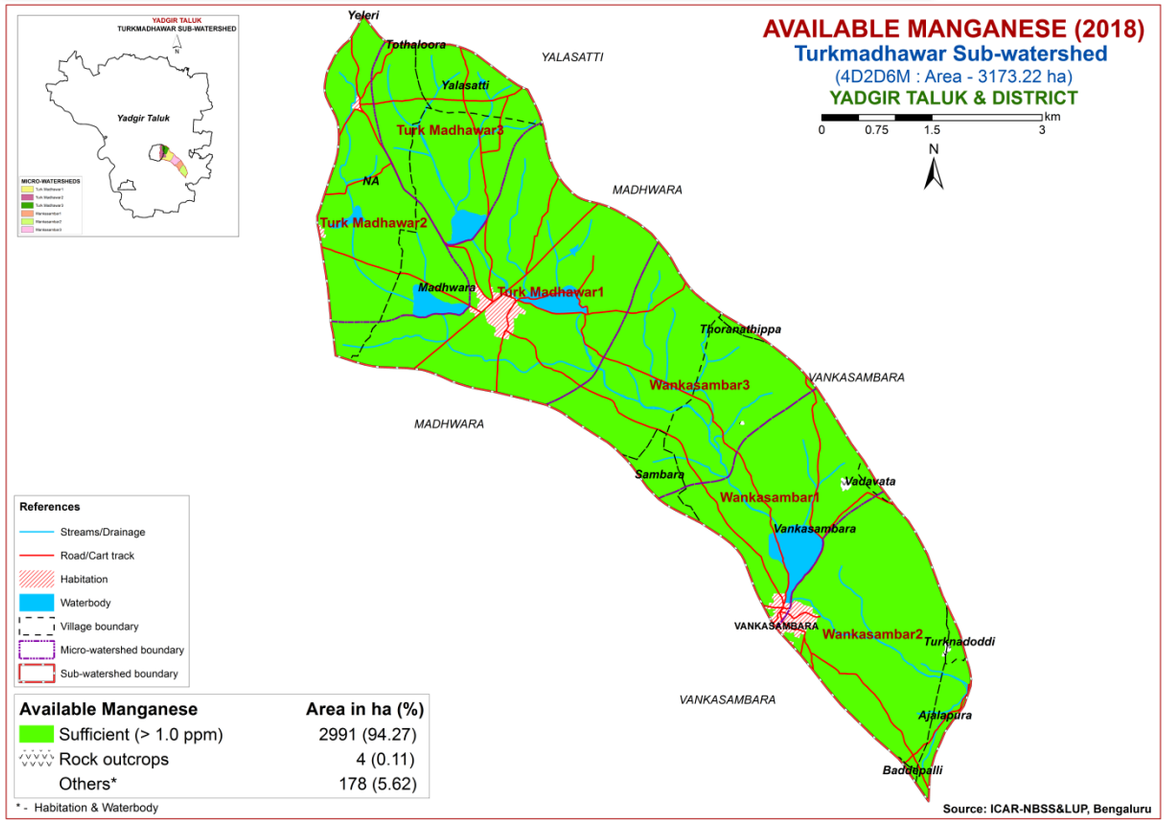
6.7. Available Boron



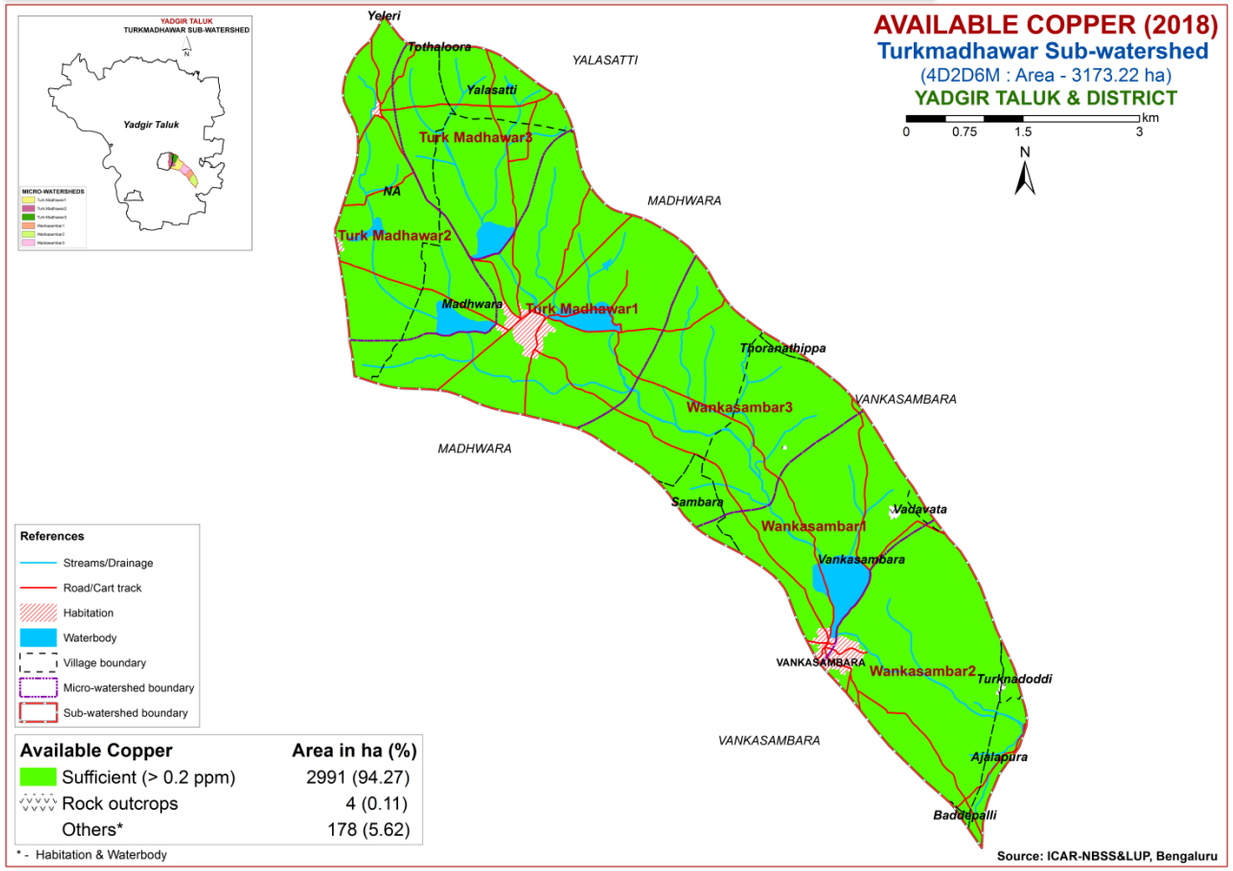
6.8. Available Iron



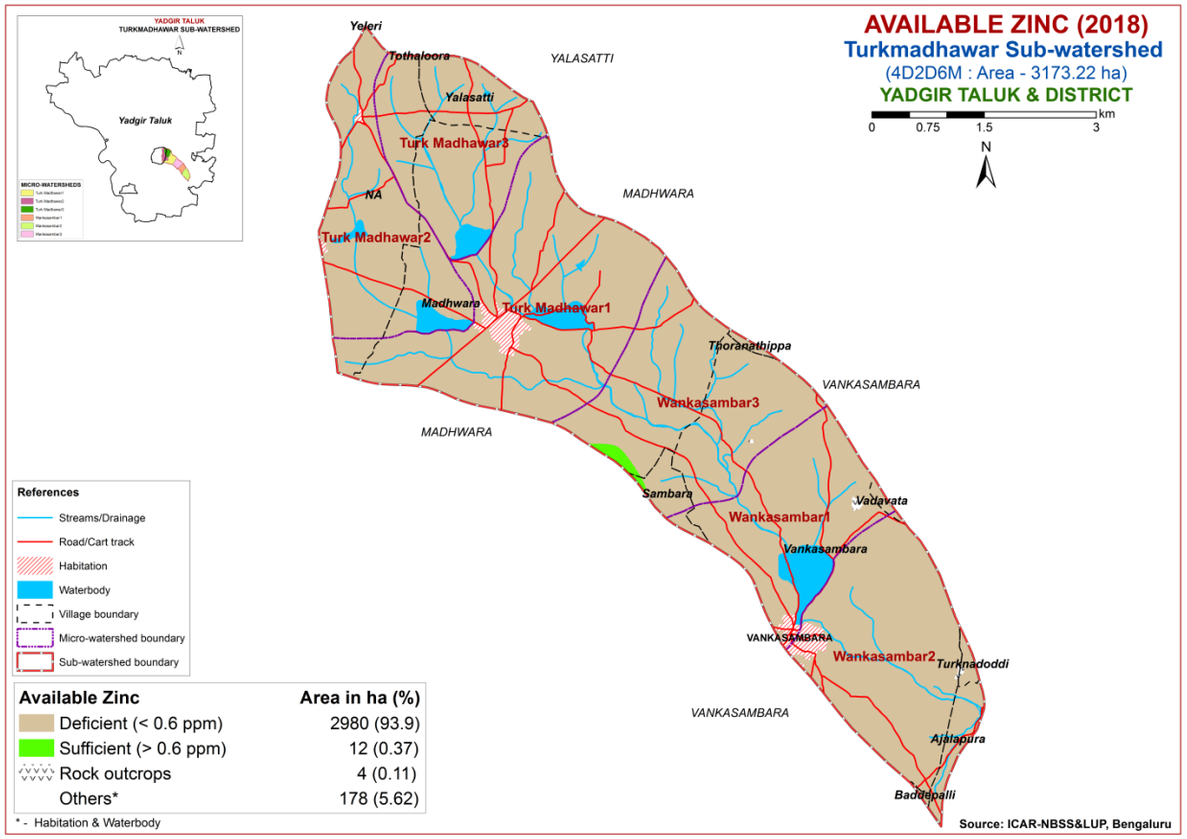
6.9. Available Manganese



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

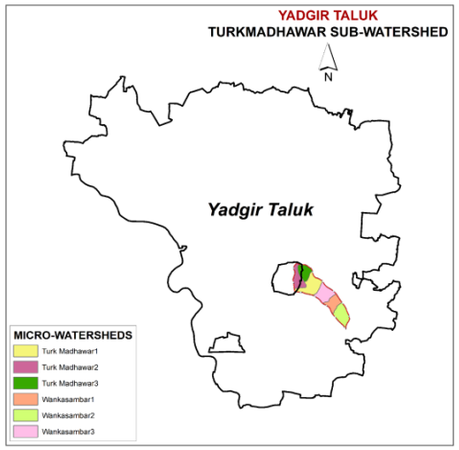
     100+25% for deficient soil.
     100% for medium available N content soil.
     100-25% for higher N content soil.

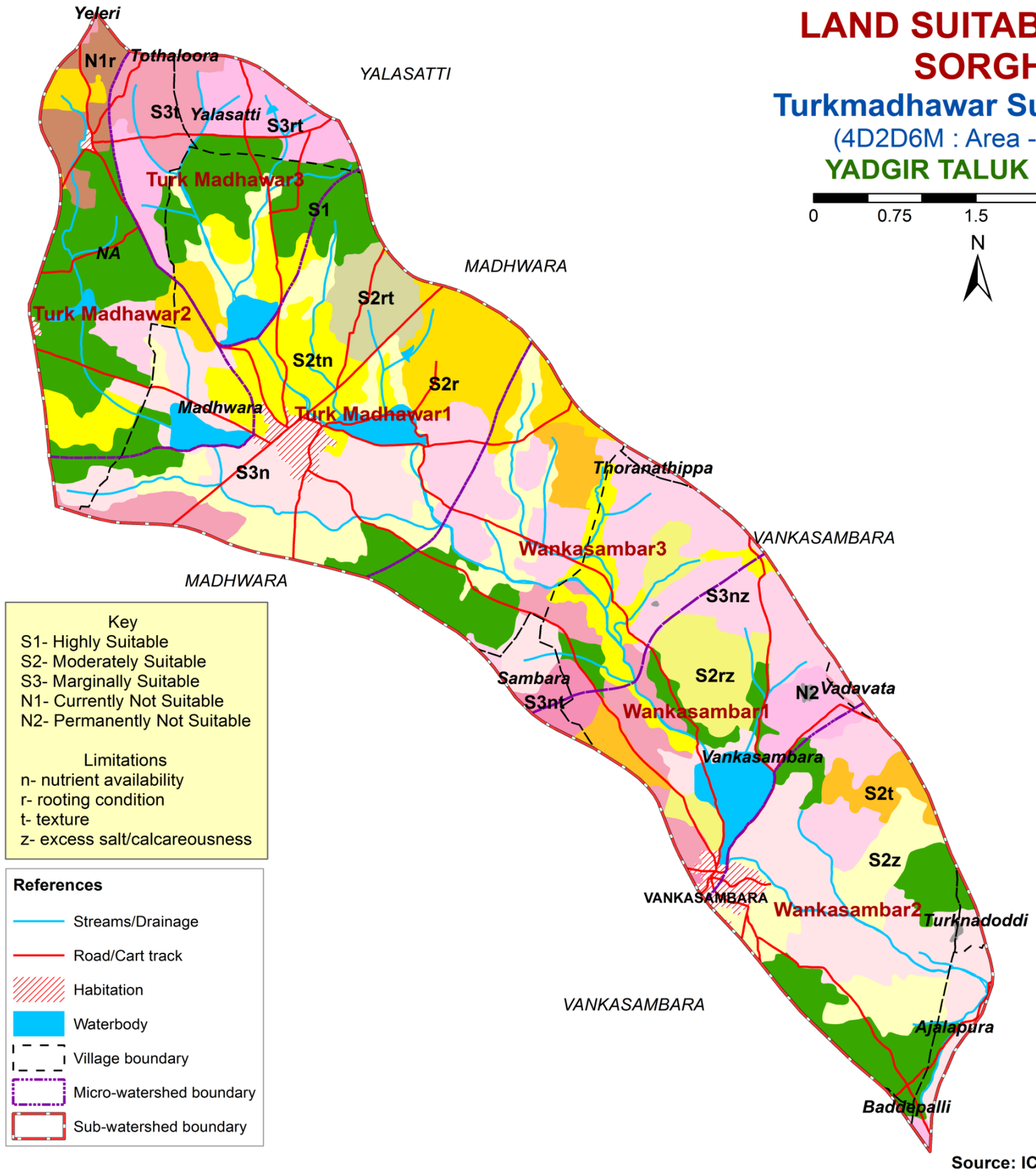
   - Follow the same in case of P & K.

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

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Suitability subclass	Area in ha (%)
S1	609 (19.18)
S2r	188 (5.92)
S2t	91 (2.86)
S2z	367 (11.58)
S2rt	68 (2.13)
S2rz	119 (3.75)
S2tn	269 (8.48)
S3n	427 (13.47)
S3t	184 (5.81)
S3nt	34 (1.07)
S3nz	414 (13.05)
S3rt	166 (5.24)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

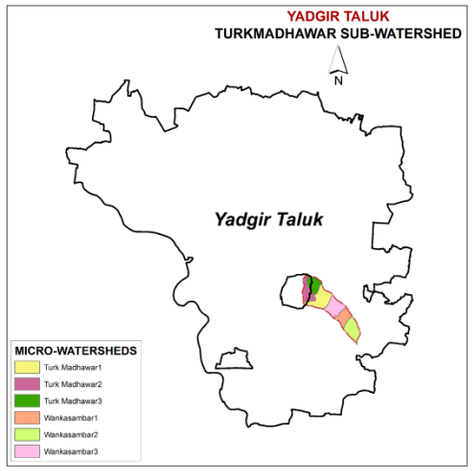
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

7.2. Land Suitability for Maize



LAND SUITABILITY FOR MAIZE

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Suitability subclass	Area in ha (%)
S1	504 (15.89)
S2n	269 (8.48)
S2r	85 (2.68)
S2t	195 (6.16)
S2rt	170 (5.37)
S2rz	119 (3.75)
S2tz	367 (11.58)
S3n	427 (13.47)
S3t	184 (5.81)
S3nt	34 (1.07)
S3nz	414 (13.05)
S3rt	166 (5.24)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

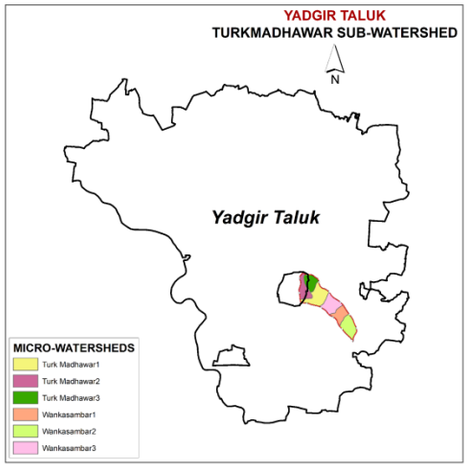
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

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

Yeleri
N1r
Tothaloora
YALASATTI
S3t
Yalasatti
S3rt
Turk Madhawar3
S1
NA
MADHWARA
S2r
Turk Madhawar2
S2n
S2rt
Madhwara
Turk Madhawar1
S3n
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
S3nz
Sambara
S2rz
N2
Vadavata
S3nt
Wankasambar1
Vankasambara
S2tz
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S2t
Baddepalli

Source: ICAR-NBSS&LUP, Bengaluru

7.3. Land Suitability for Redgram



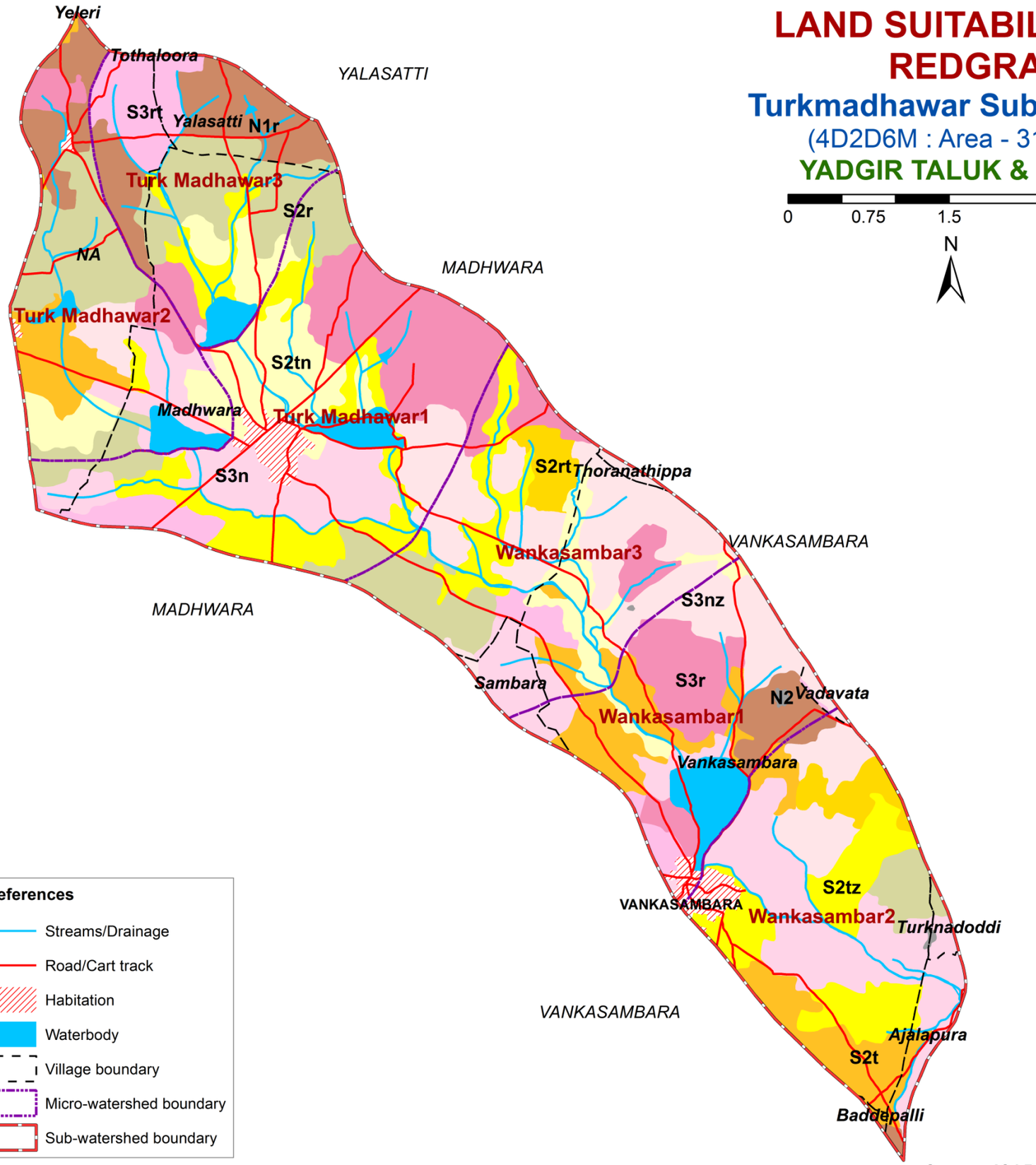
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S2r	413 (13.03)
S2t	258 (8.12)
S2rt	68 (2.13)
S2tn	269 (8.48)
S2tz	367 (11.58)
S3n	461 (14.54)
S3r	374 (11.8)
S3nz	414 (13.05)
S3rt	145 (4.58)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

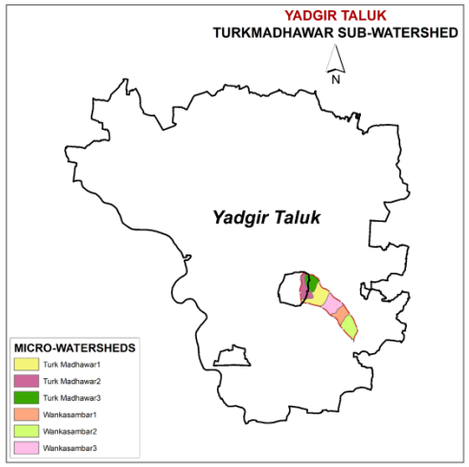
* - Habitation & Waterbody

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



Source: ICAR-NBSS&LUP, Bengaluru

7.4. Land Suitability for Bajra



LAND SUITABILITY FOR BAJRA

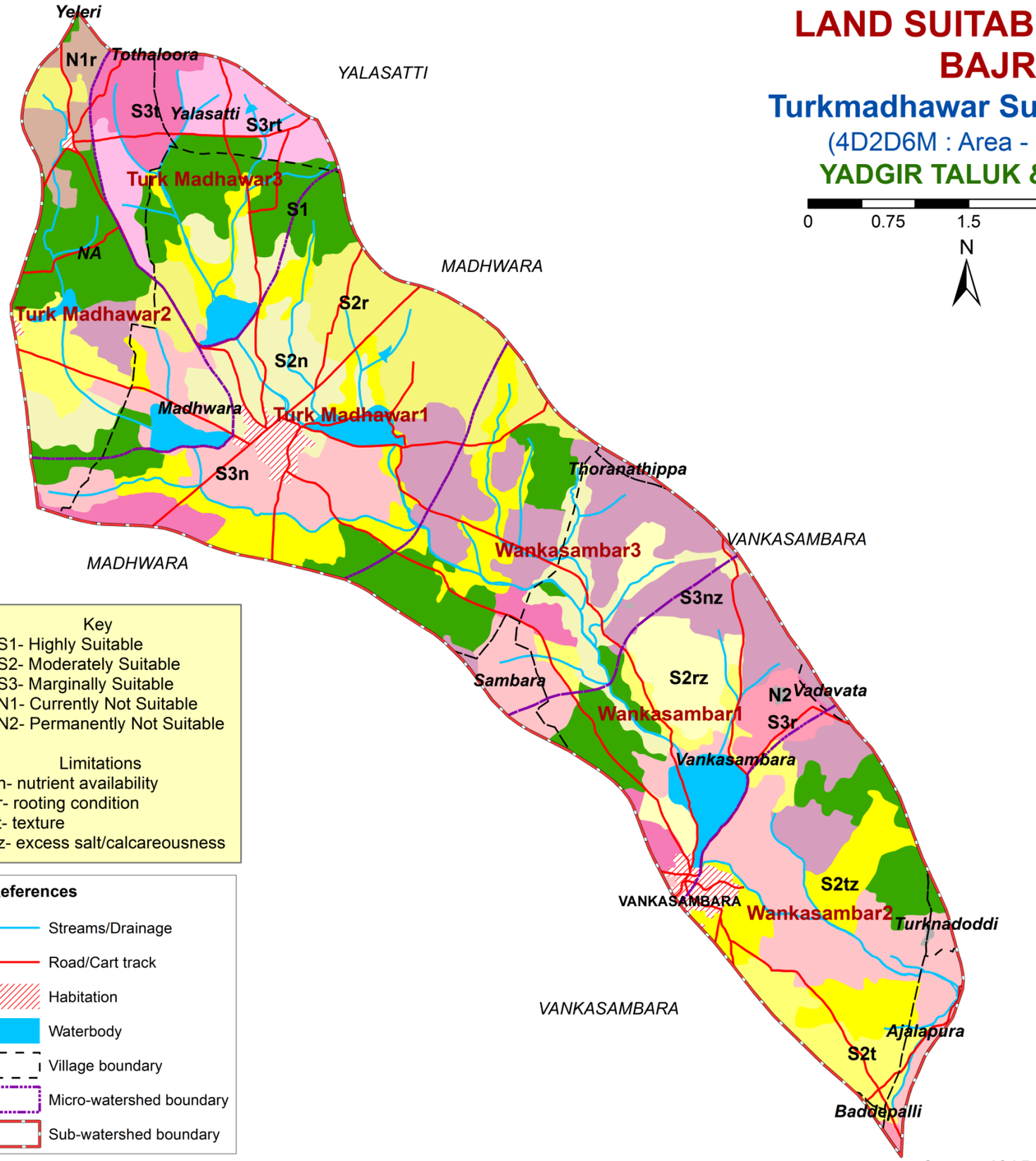
Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N



Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2n	269 (8.48)
S2r	256 (8.05)
S2t	195 (6.16)
S2rz	119 (3.75)
S2tz	367 (11.58)
S3n	461 (14.54)
S3r	50 (1.58)
S3t	145 (4.58)
S3nz	414 (13.05)
S3rt	116 (3.66)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

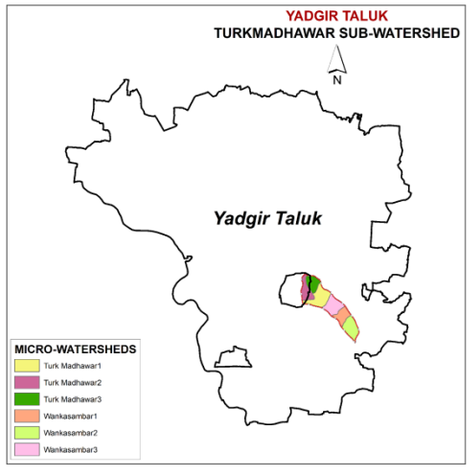
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

References

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

Source: ICAR-NBSS&LUP, Bengaluru

7.5. Land Suitability for Drumstick



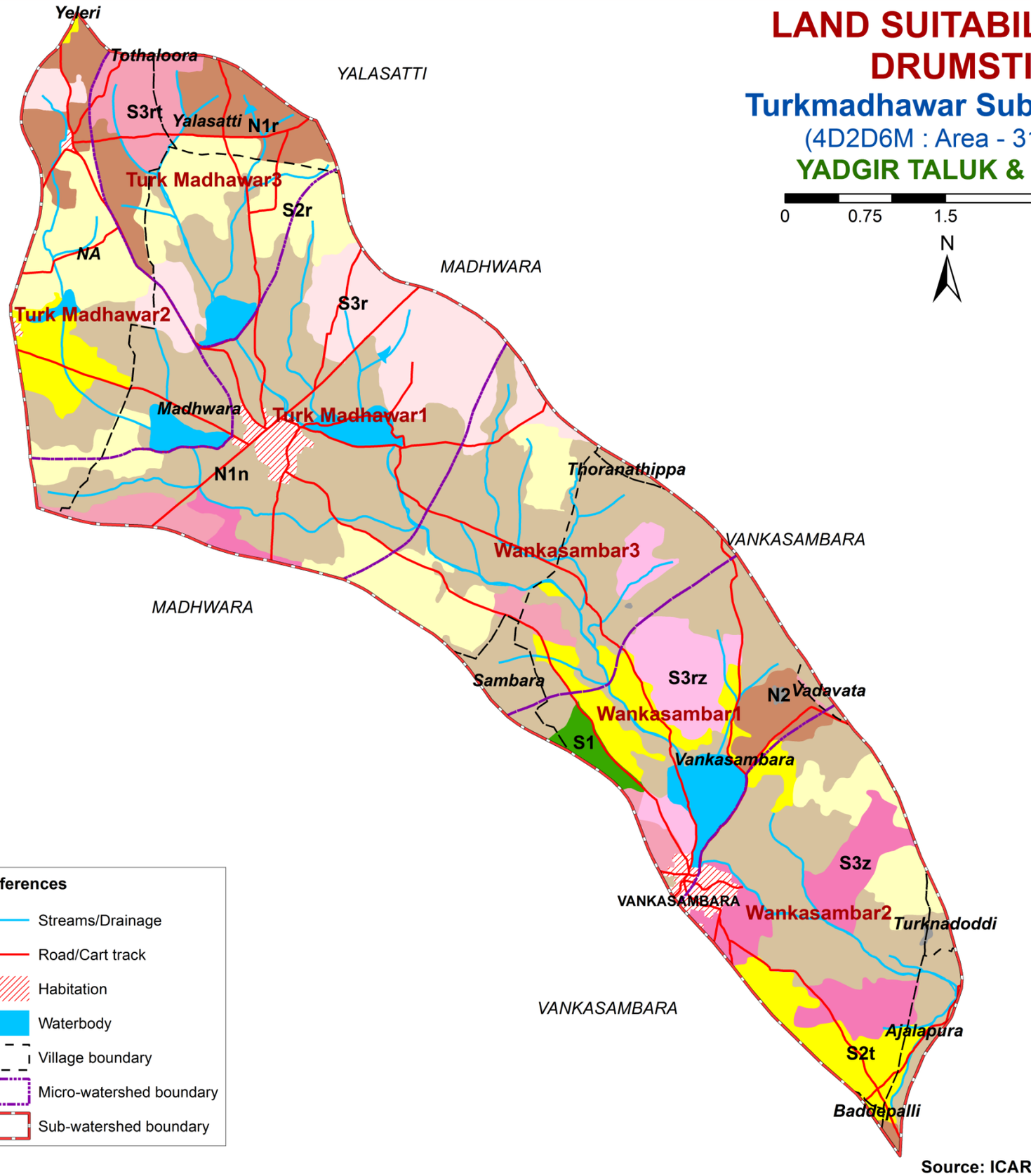
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	23 (0.73)
S2r	481 (15.16)
S2t	234 (7.39)
S3r	256 (8.05)
S3z	149 (4.68)
S3rt	145 (4.58)
S3rz	119 (3.75)
N1n	1363 (42.97)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

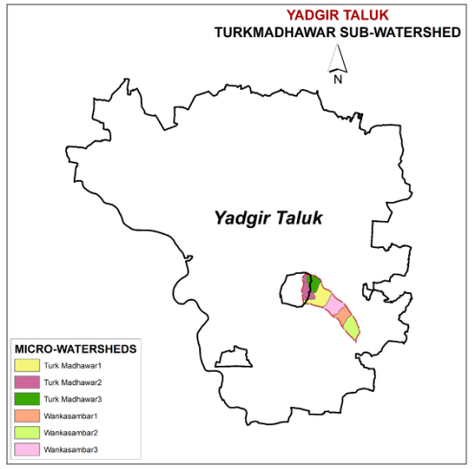
* - Habitation & Waterbody

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



Source: ICAR-NBSS&LUP, Bengaluru

7.6. Land Suitability for Sunflower



LAND SUITABILITY FOR SUNFLOWER

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
Tothaloora
YALASATTI
S3rt
Yalasatti
N1r
Turk Madhawar3
S2r
NA
MADHWARA
Turk Madhawar2
S3n
Madhwara
Turk Madhawar1
S2rt
Thoranathippa
N1n
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
S3r
N2
Vadavata
Wankasambar1
S3t
S2t
Vankasambara
S2z
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S1
Baddepalli

Suitability subclass	Area in ha (%)
S1	195 (6.16)
S2r	413 (13.03)
S2t	23 (0.73)
S2z	149 (4.68)
S2rt	68 (2.13)
S3n	488 (15.38)
S3r	374 (11.8)
S3t	39 (1.23)
S3rt	145 (4.58)
N1n	875 (27.59)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

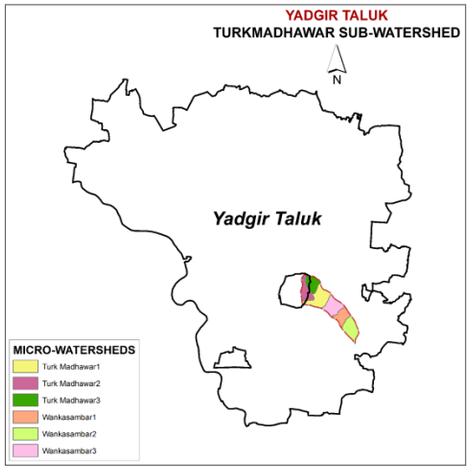
Limitations
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

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



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	195 (6.16)
S2r	601 (18.95)
S2z	149 (4.68)
S3n	472 (14.88)
S3t	277 (8.74)
S3nt	174 (5.48)
S3nz	414 (13.05)
S3tn	269 (8.48)
N1r	55 (1.72)
N1t	385 (12.12)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

LAND SUITABILITY FOR COTTON

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

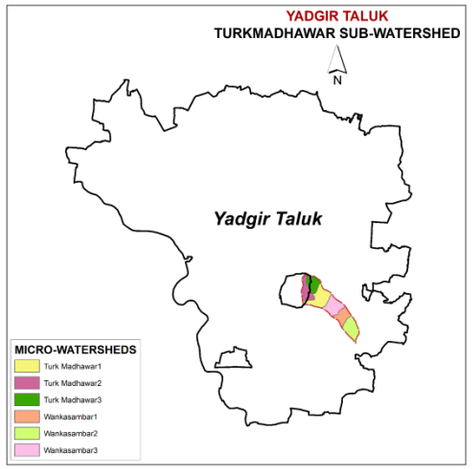
km
0 0.75 1.5 3

N

Yeleri
N1r
Tothaloora
YALASATTI
Yalasatti
N1t
Turk Madhawar3
S2r
NA
MADHWARA
Turk Madhawar2
S3tn
Madhwara
Turk Madhawar1
S3n
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
S3nz
Sambara
S3t
N2
Vadavata
Wankasambar1
Vankasambara
S3nt
S2z
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S1
Baddepalli

Source: ICAR-NBSS&LUP, Bengaluru

7.8. Land Suitability for Bengalgram



LAND SUITABILITY FOR BENGALGRAM

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3

N

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

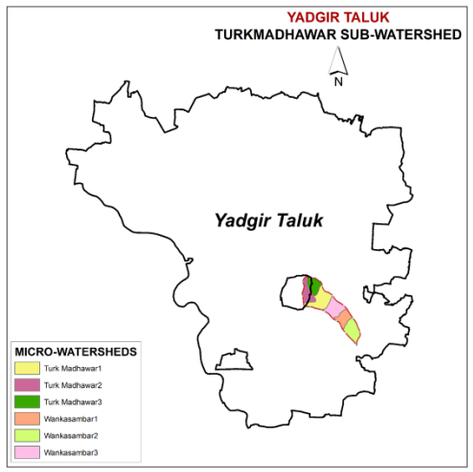
Suitability subclass	Area in ha (%)
S1	195 (6.16)
S2z	367 (11.58)
S3n	253 (7.99)
S3t	1148 (36.17)
S3nt	174 (5.48)
S3nz	414 (13.05)
N1r	55 (1.72)
N1t	385 (12.12)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

7.9. Land Suitability for Groundnut



LAND SUITABILITY FOR GROUNDNUT

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
N1r
Tothaloora
S2rt
S3t
Yalasatti
S3r
YALASATTI
Turk Madhawar3
S2t
NA
MADHWARA
S2r
Turk Madhawar2
S3n
Madhwara
Turk Madhawar1
S3tn
N1n
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
S2rz
N2
Vadavata
Wankasambar1
Vankasambara
S1
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
S3tz
Ajalapura
Baddepalli

Suitability subclass	Area in ha (%)
S1	91 (2.86)
S2r	68 (2.13)
S2t	453 (14.26)
S2rt	17 (0.55)
S2rz	119 (3.75)
S3n	269 (8.48)
S3r	166 (5.24)
S3t	614 (19.34)
S3tn	219 (6.9)
S3tz	46 (1.45)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

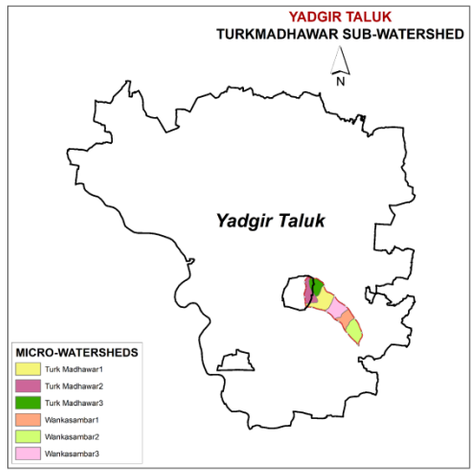
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

7.10. Land Suitability for Chilli



LAND SUITABILITY FOR CHILLI

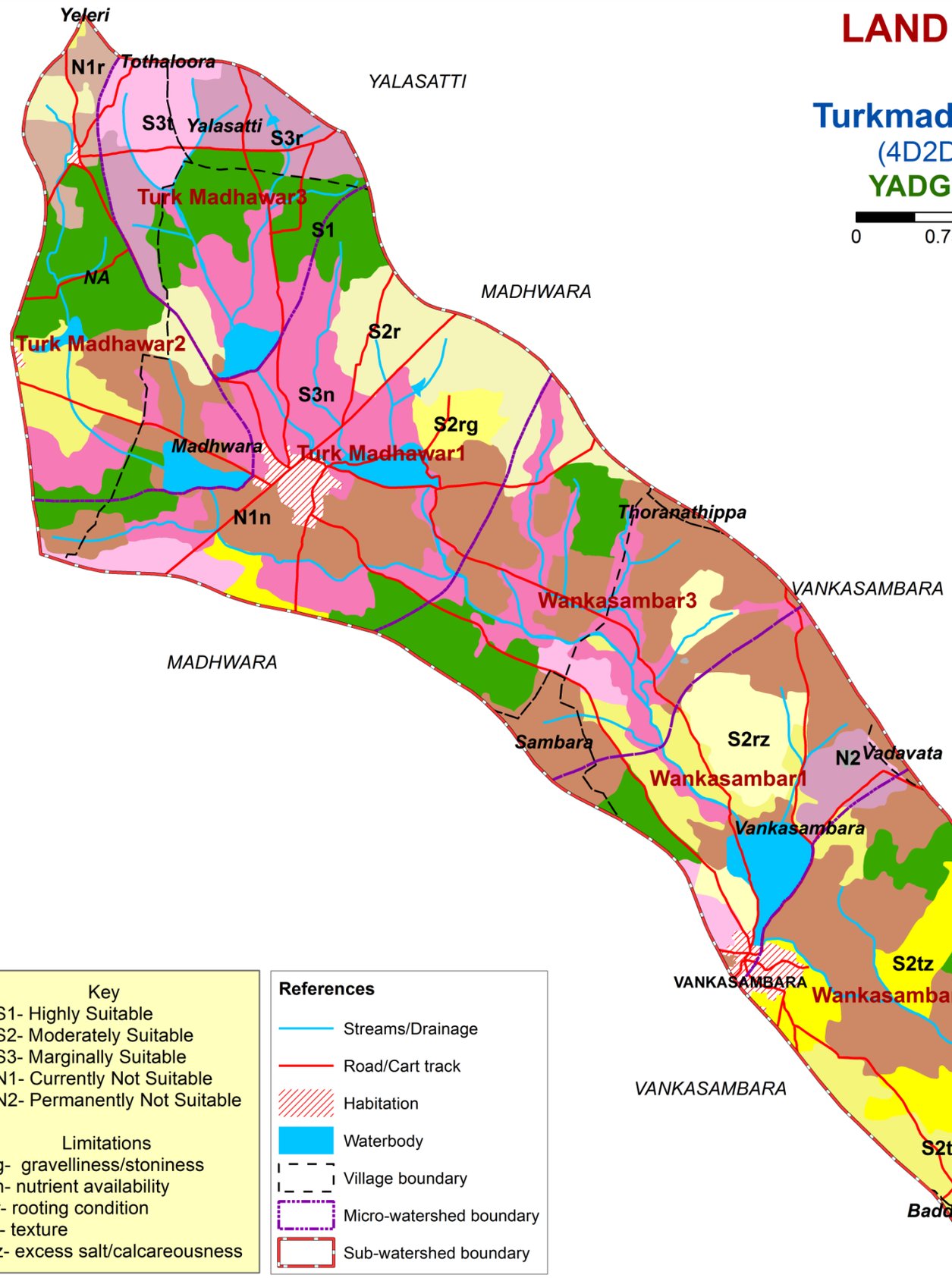
Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N



Suitability subclass	Area in ha (%)
S1	504 (15.89)
S2r	221 (6.97)
S2t	234 (7.39)
S2rg	34 (1.08)
S2rz	119 (3.75)
S2tz	149 (4.68)
S3n	488 (15.38)
S3r	166 (5.24)
S3t	145 (4.58)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

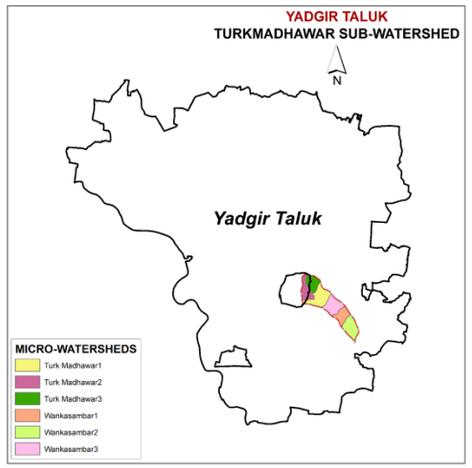
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

References

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

Source: ICAR-NBSS&LUP, Bengaluru

7.11. Land Suitability for Pomegranate



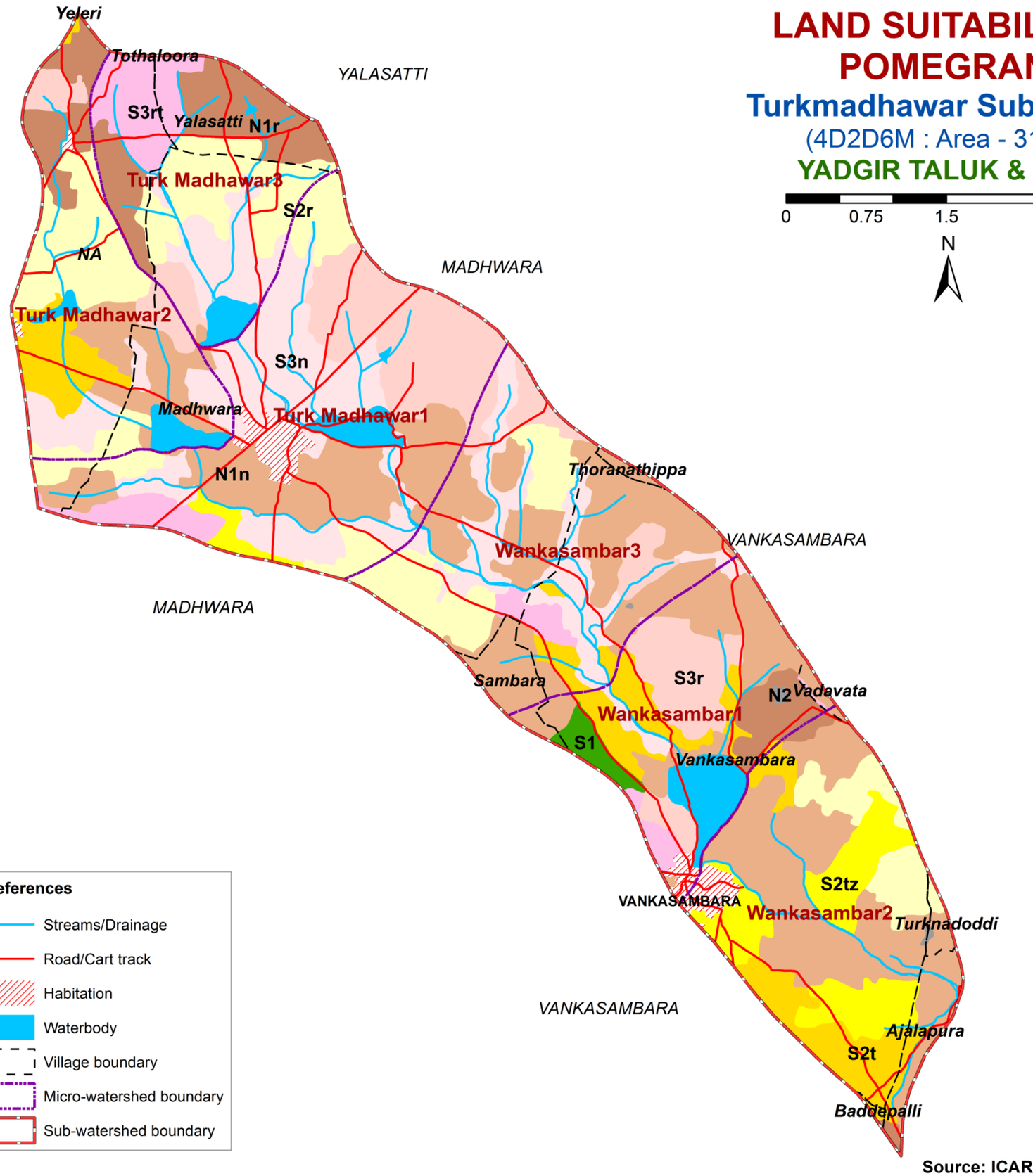
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	23 (0.73)
S2r	481 (15.16)
S2t	234 (7.39)
S2tz	149 (4.68)
S3n	488 (15.38)
S3r	374 (11.8)
S3rt	145 (4.58)
N1n	875 (27.59)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR POMEGRANATE

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

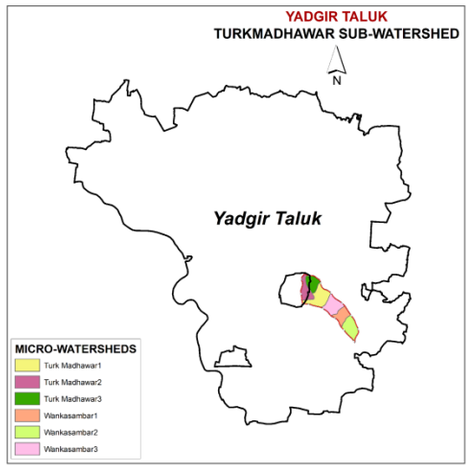
YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3

N

Source: ICAR-NBSS&LUP, Bengaluru

7.12. Land Suitability for Tomato



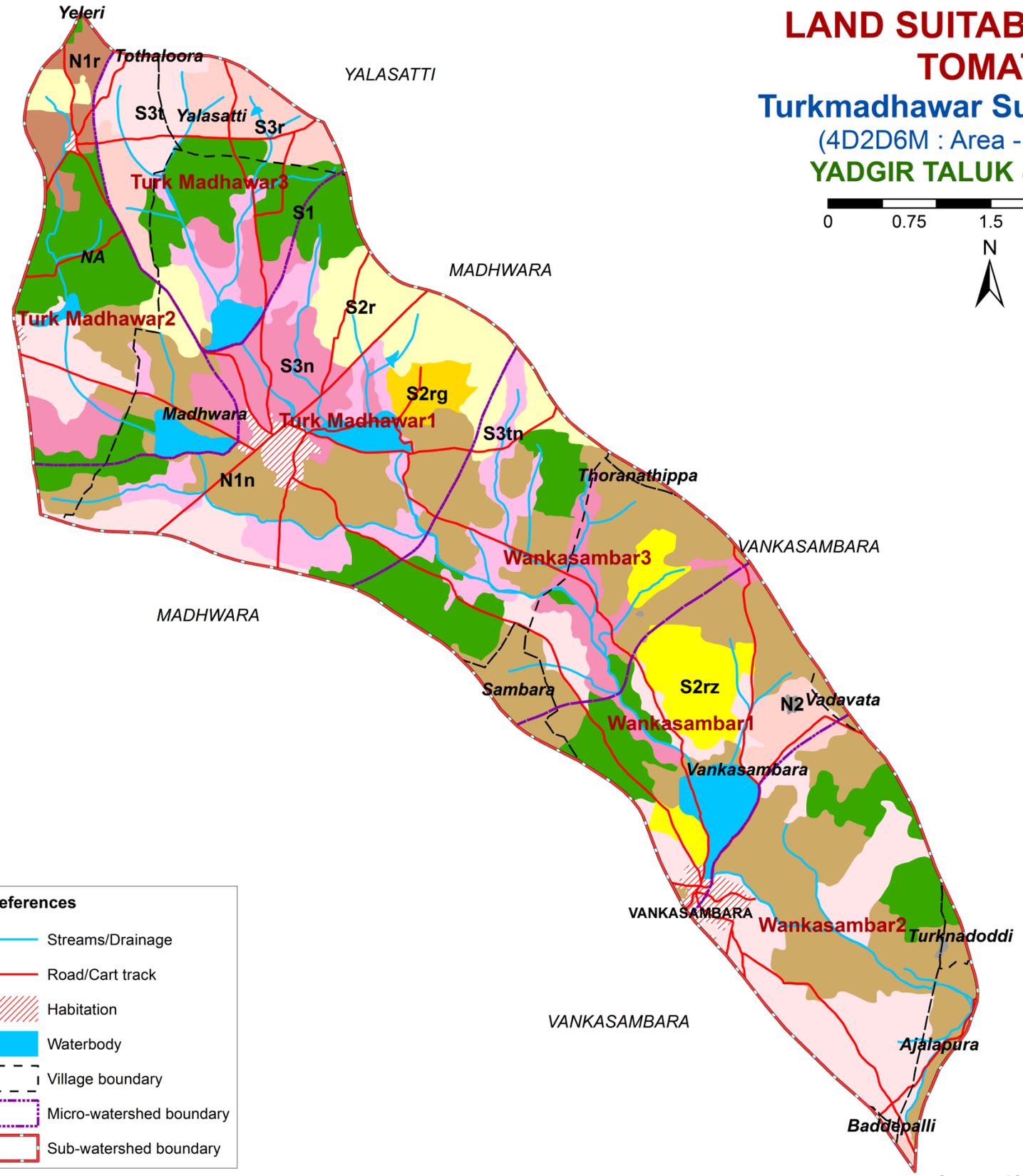
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2r	221 (6.97)
S2rg	34 (1.08)
S2rz	119 (3.75)
S3n	269 (8.48)
S3r	166 (5.24)
S3t	489 (15.42)
S3tn	219 (6.9)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR TOMATO

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

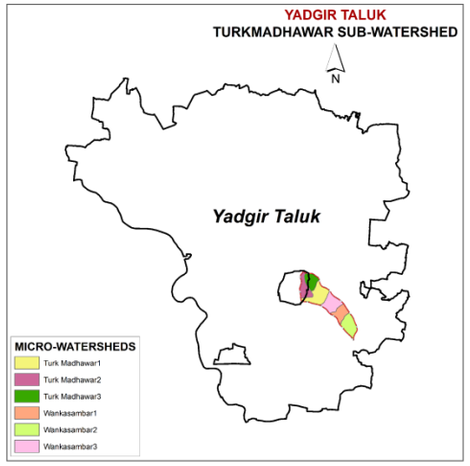
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Source: ICAR-NBSS&LUP, Bengaluru

7.13. Land Suitability for Mulberry



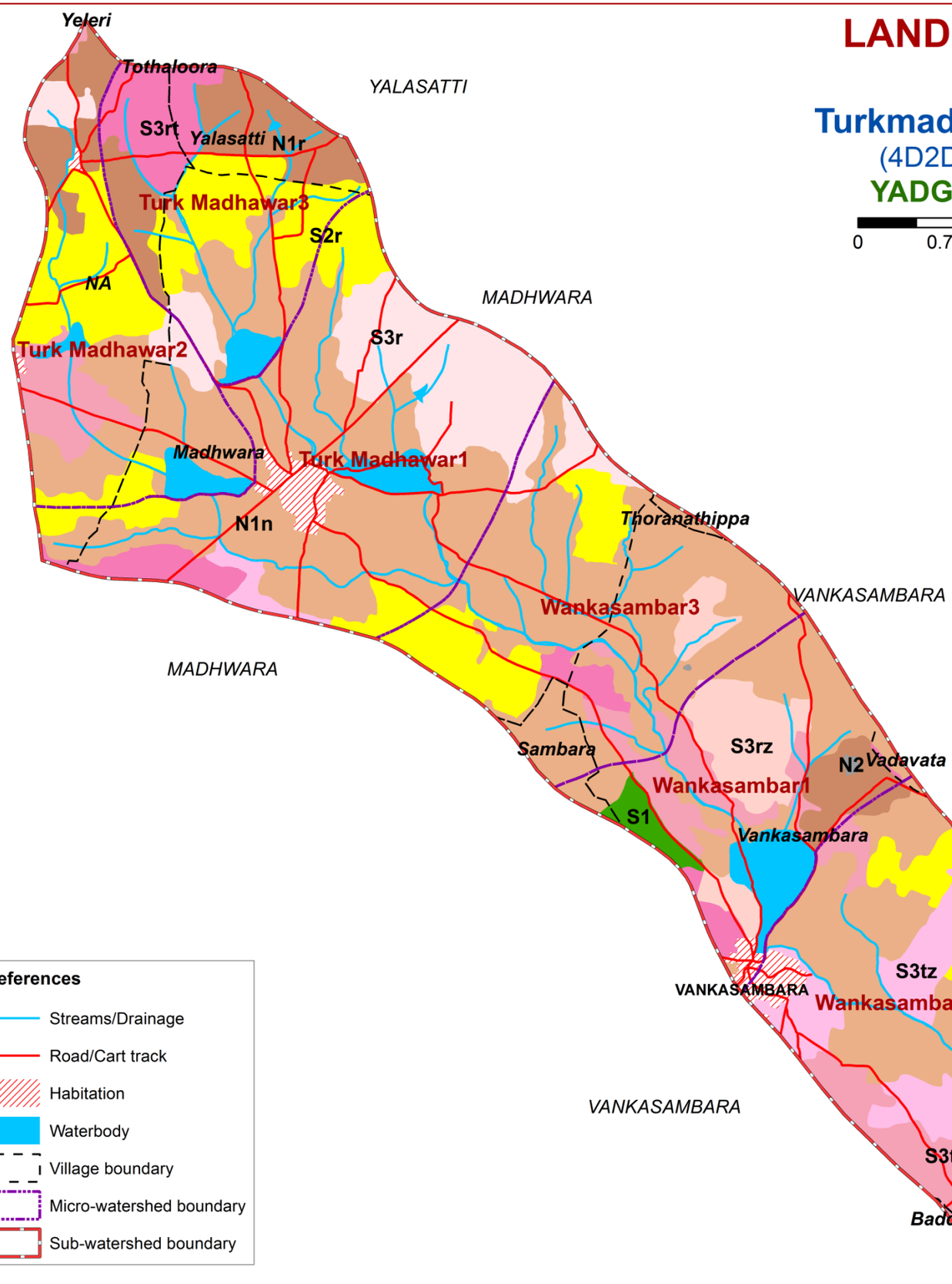
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	23 (0.73)
S2r	481 (15.16)
S3r	256 (8.05)
S3t	234 (7.39)
S3rt	145 (4.58)
S3rz	119 (3.75)
S3tz	149 (4.68)
N1n	1363 (42.97)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR MULBERRY

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

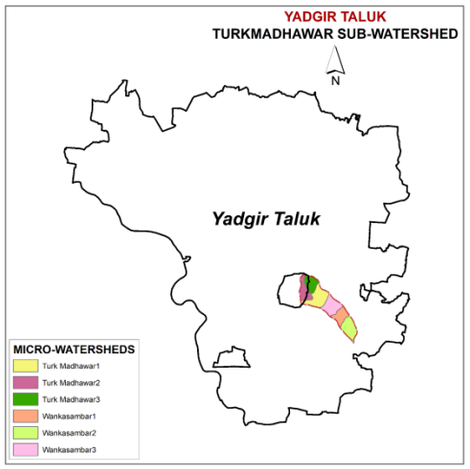
0 0.75 1.5 3 km

N

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

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
N1r
Tothaloora
YALASATTI
S3t
Yalasatti
S3r
Turk Madhawar3
S1
NA
MADHWARA
Turk Madhawar2
S2r
S3n
S2rg
Madhwara
Turk Madhawar1
N1n
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
S2rz
N2
Vadavata
Wankasambar1
Vankasambara
S2tz
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S2t
Baddepalli

Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2r	221 (6.97)
S2t	195 (6.16)
S2rg	34 (1.08)
S2rz	119 (3.75)
S2tz	149 (4.68)
S3n	488 (15.38)
S3r	166 (5.24)
S3t	145 (4.58)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

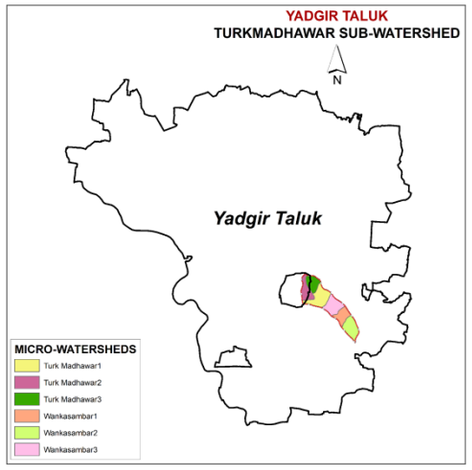
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

7.15. Land Suitability for Guava



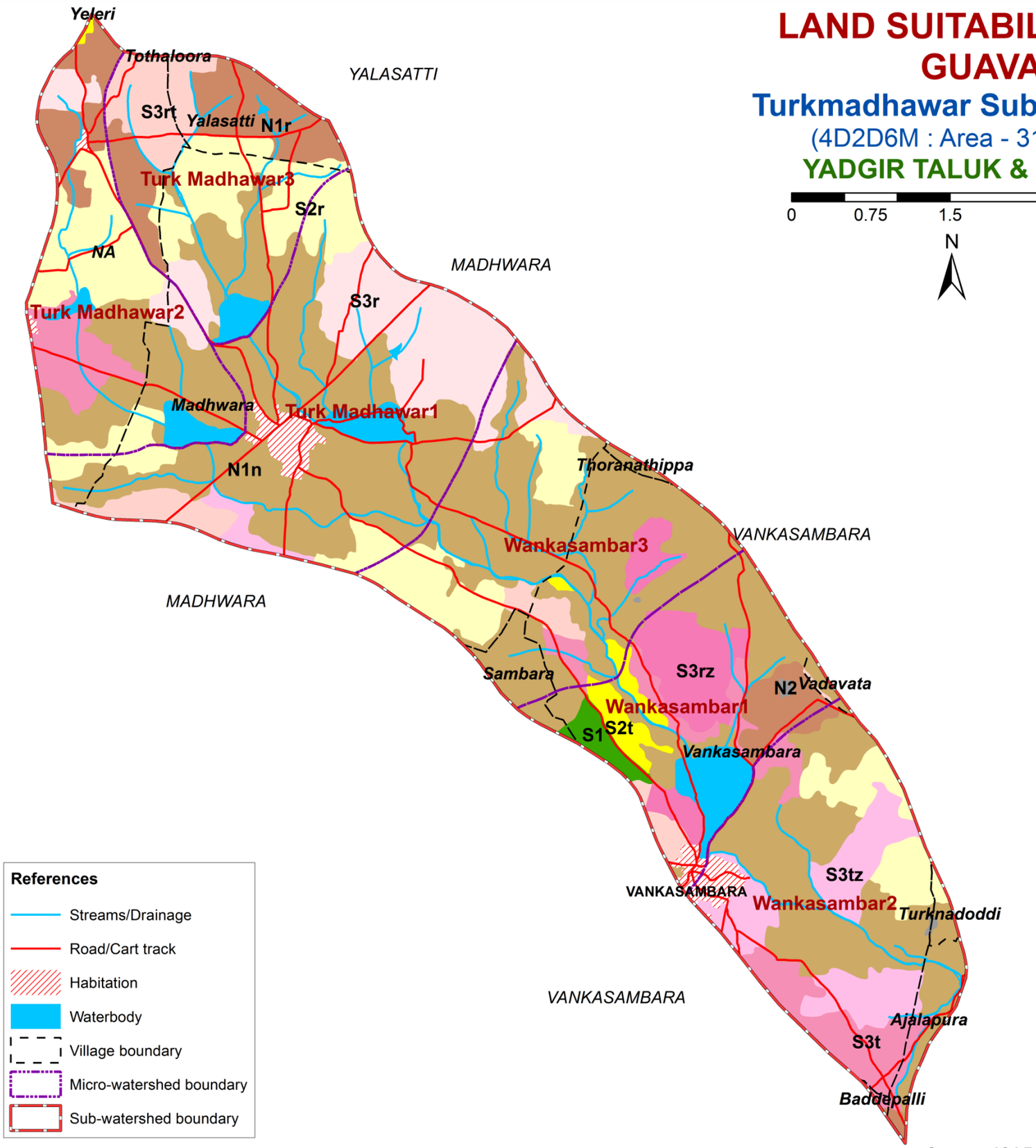
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	23 (0.73)
S2r	481 (15.16)
S2t	39 (1.23)
S3r	256 (8.05)
S3t	195 (6.16)
S3rt	145 (4.58)
S3rz	119 (3.75)
S3tz	149 (4.68)
N1n	1363 (42.97)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

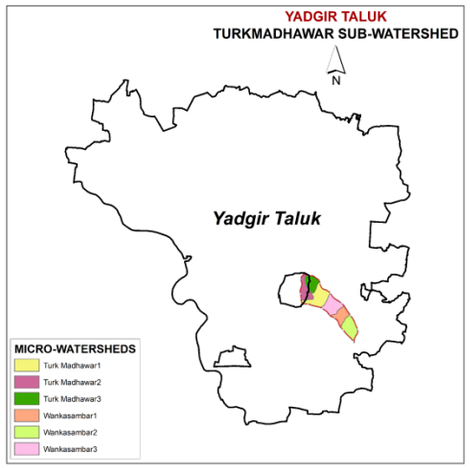
* - Habitation & Waterbody

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



Source: ICAR-NBSS&LUP, Bengaluru

7.16. Land Suitability for Mango



LAND SUITABILITY FOR MANGO

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
Tothaloora
YALASATTI
Yalasatti
Turk Madhawar3
S3r
NA
MADHWARA
Turk Madhawar2
S3n
Madhwara
Turk Madhawar1
S3tn
N1n
Thoranathippa
Wankasambar3
VANKASAMBARA
MADHWARA
Sambara
N1r
N2
Vadavata
Wankasambar1
S2r
Vankasambara
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S3t
Baddepalli

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

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

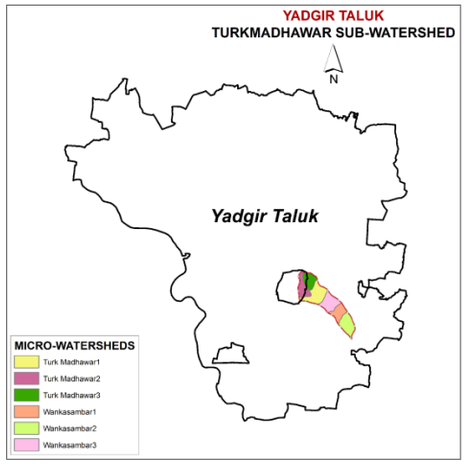
Suitability subclass	Area in ha (%)
S2r	23 (0.73)
S3n	269 (8.48)
S3r	481 (15.16)
S3t	383 (12.07)
S3tn	219 (6.9)
N1n	875 (27.59)
N1r	741 (23.34)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

7.17. Land Suitability for Sapota



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

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

Suitability subclass	Area in ha (%)
S1	23 (0.73)
S2r	481 (15.16)
S2t	39 (1.23)
S3n	269 (8.48)
S3r	374 (11.8)
S3t	344 (10.84)
S3rt	145 (4.58)
S3tn	219 (6.9)
N1n	875 (27.59)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

LAND SUITABILITY FOR SAPOTA

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

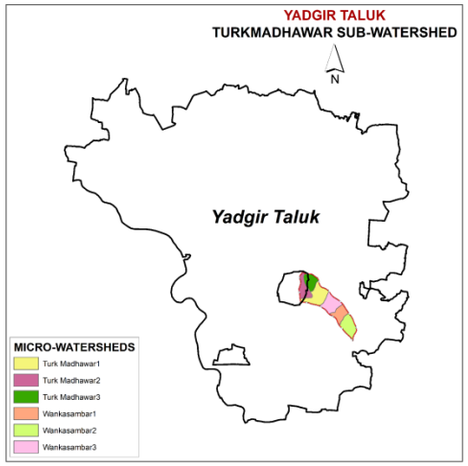
0 0.75 1.5 3 km

N

Yeleri
Tothaloora
YALASATTI
S3rt
Yalasatti
N1r
Turk Madhawar3
S2r
NA
MADHWARA
Turk Madhawar2
S3n
Madhwara
Turk Madhawar1
S3tn
N1n
Thoranathippa
Wankasambar3
VANKASAMBARA
MADHWARA
Sambara
S3r
N2
Vadavata
Wankasambar1
S1
S2t
Vankasambara
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S3t
Baddepalli

Source: ICAR-NBSS&LUP, Bengaluru

7.18. Land Suitability for Jackfruit



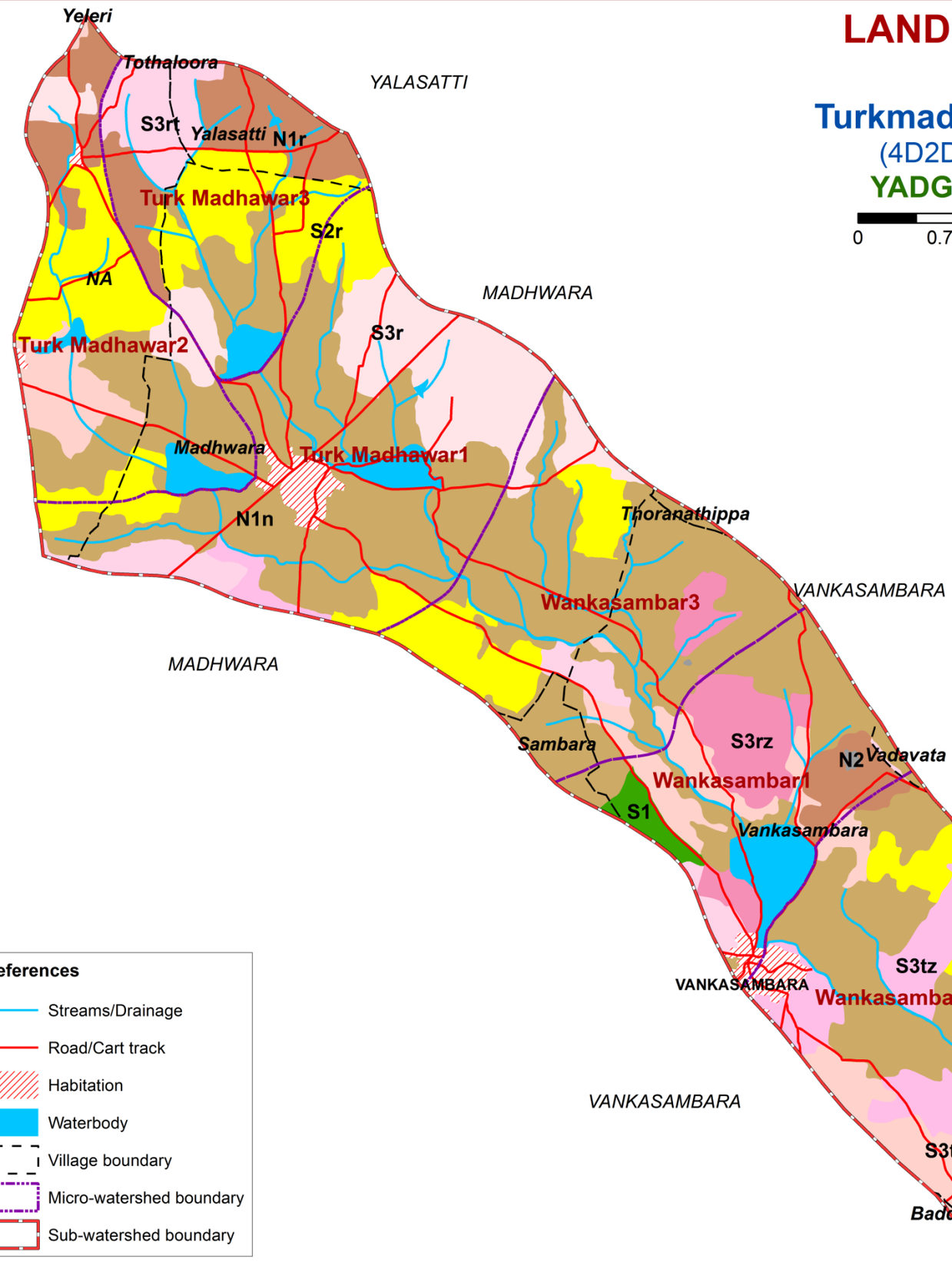
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	23 (0.73)
S2r	481 (15.16)
S3r	256 (8.05)
S3t	234 (7.39)
S3rt	145 (4.58)
S3rz	119 (3.75)
S3tz	149 (4.68)
N1n	1363 (42.97)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR JACKFRUIT

Turkmadhawar Sub-watershed

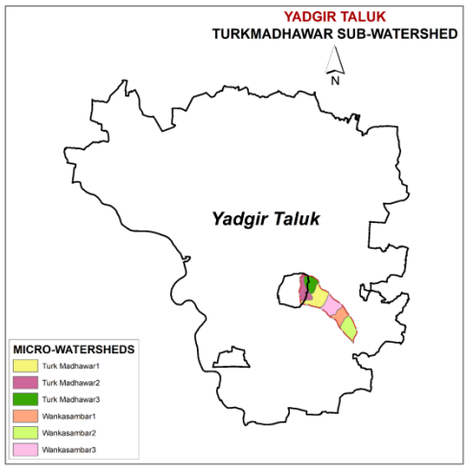
(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3
N

Source: ICAR-NBSS&LUP, Bengaluru

7.19. Land Suitability for Jamun



LAND SUITABILITY FOR JAMUN

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3

N

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

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

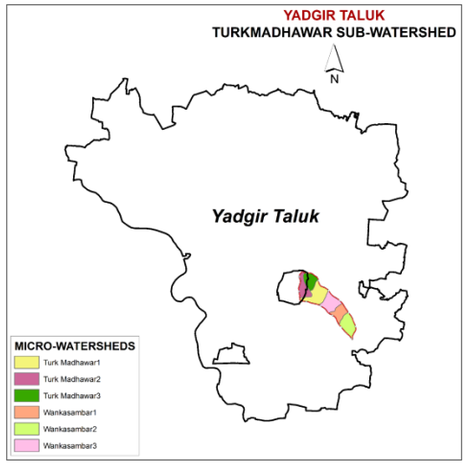
Suitability subclass	Area in ha (%)
S2r	23 (0.73)
S2rt	234 (7.39)
S3r	737 (23.21)
S3z	149 (4.68)
S3rt	145 (4.58)
S3rz	119 (3.75)
N1n	1363 (42.97)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

7.20. Land Suitability for Musambi



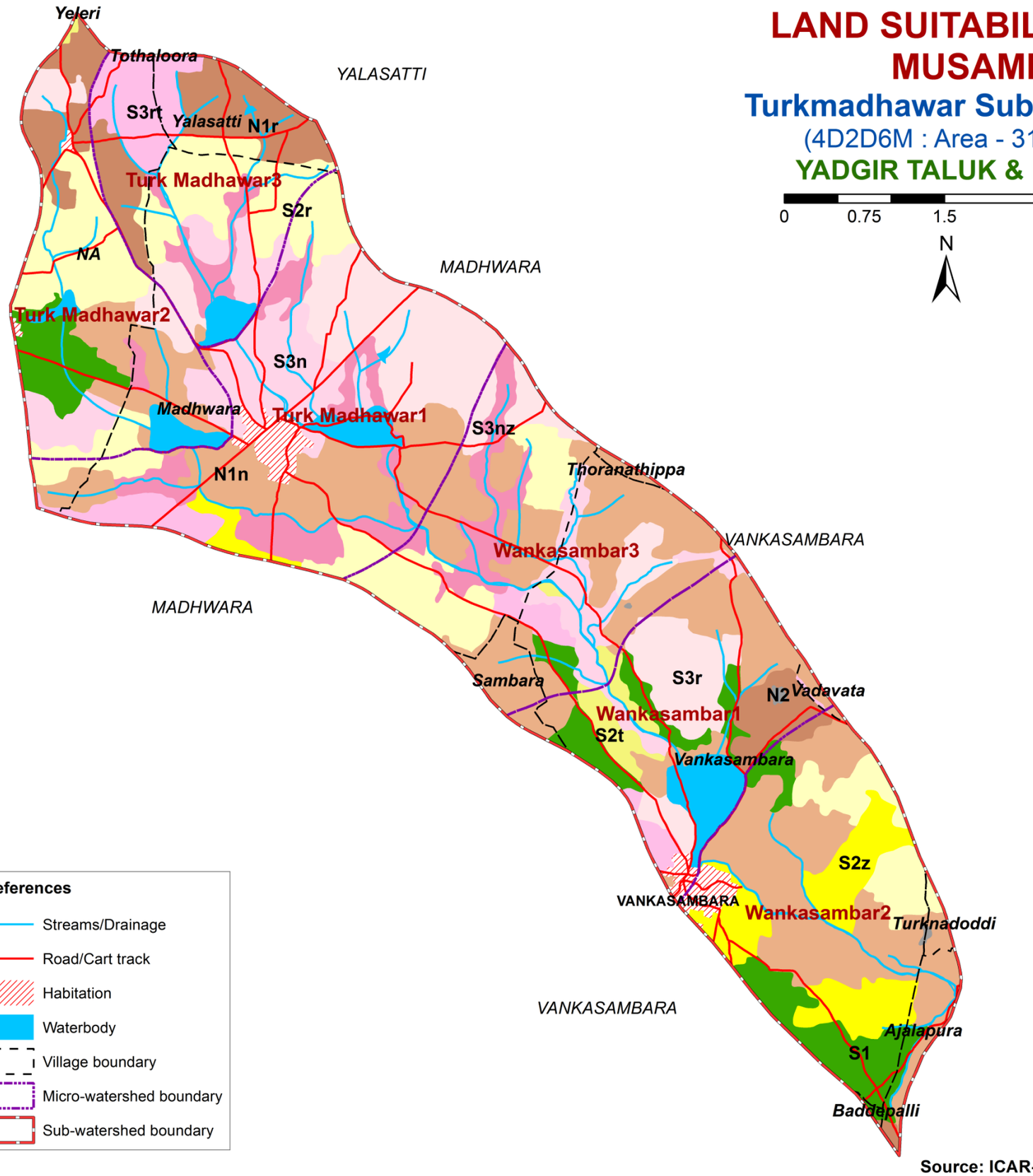
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	218 (6.88)
S2r	481 (15.16)
S2t	39 (1.23)
S2z	149 (4.68)
S3n	269 (8.48)
S3r	374 (11.8)
S3nz	219 (6.9)
S3rt	145 (4.58)
N1n	875 (27.59)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

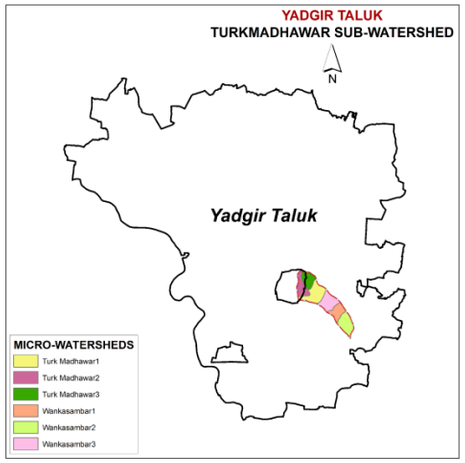
* - Habitation & Waterbody

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



Source: ICAR-NBSS&LUP, Bengaluru

7.21. Land Suitability for Lime



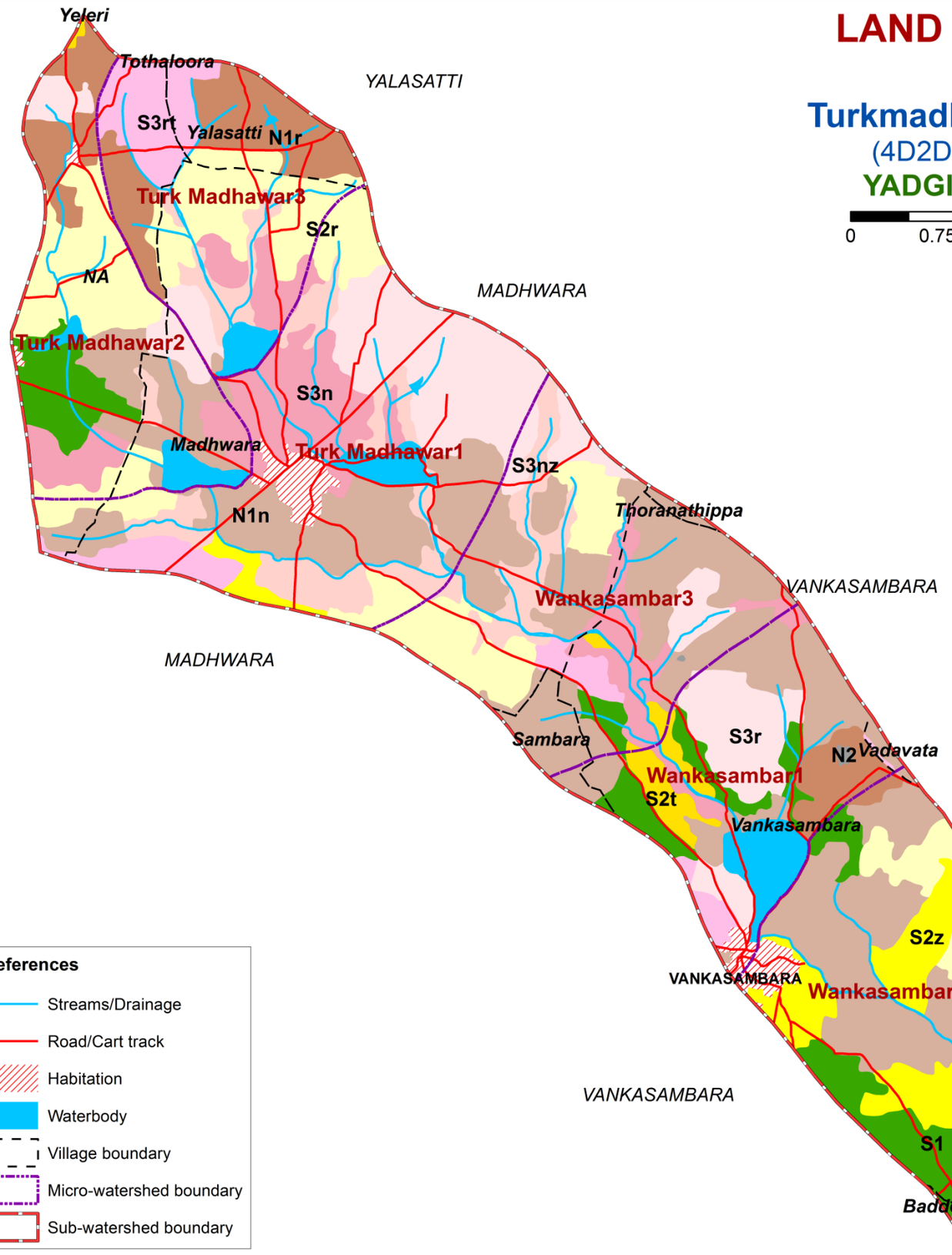
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	218 (6.88)
S2r	481 (15.16)
S2t	39 (1.23)
S2z	149 (4.68)
S3n	269 (8.48)
S3r	374 (11.8)
S3nz	219 (6.9)
S3rt	145 (4.58)
N1n	875 (27.59)
N1r	221 (6.96)
N2	4 (0.11)
Others*	178 (5.62)

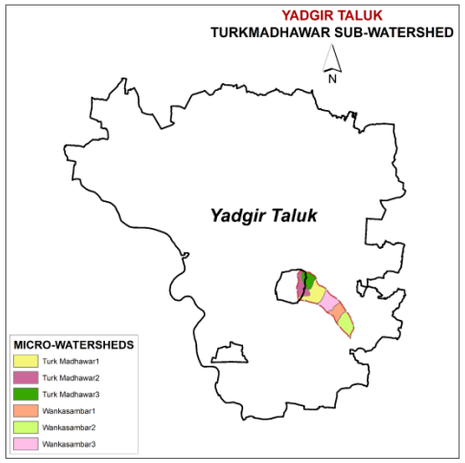
* - Habitation & Waterbody

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



Source: ICAR-NBSS&LUP, Bengaluru

7.22. Land Suitability for Cashew



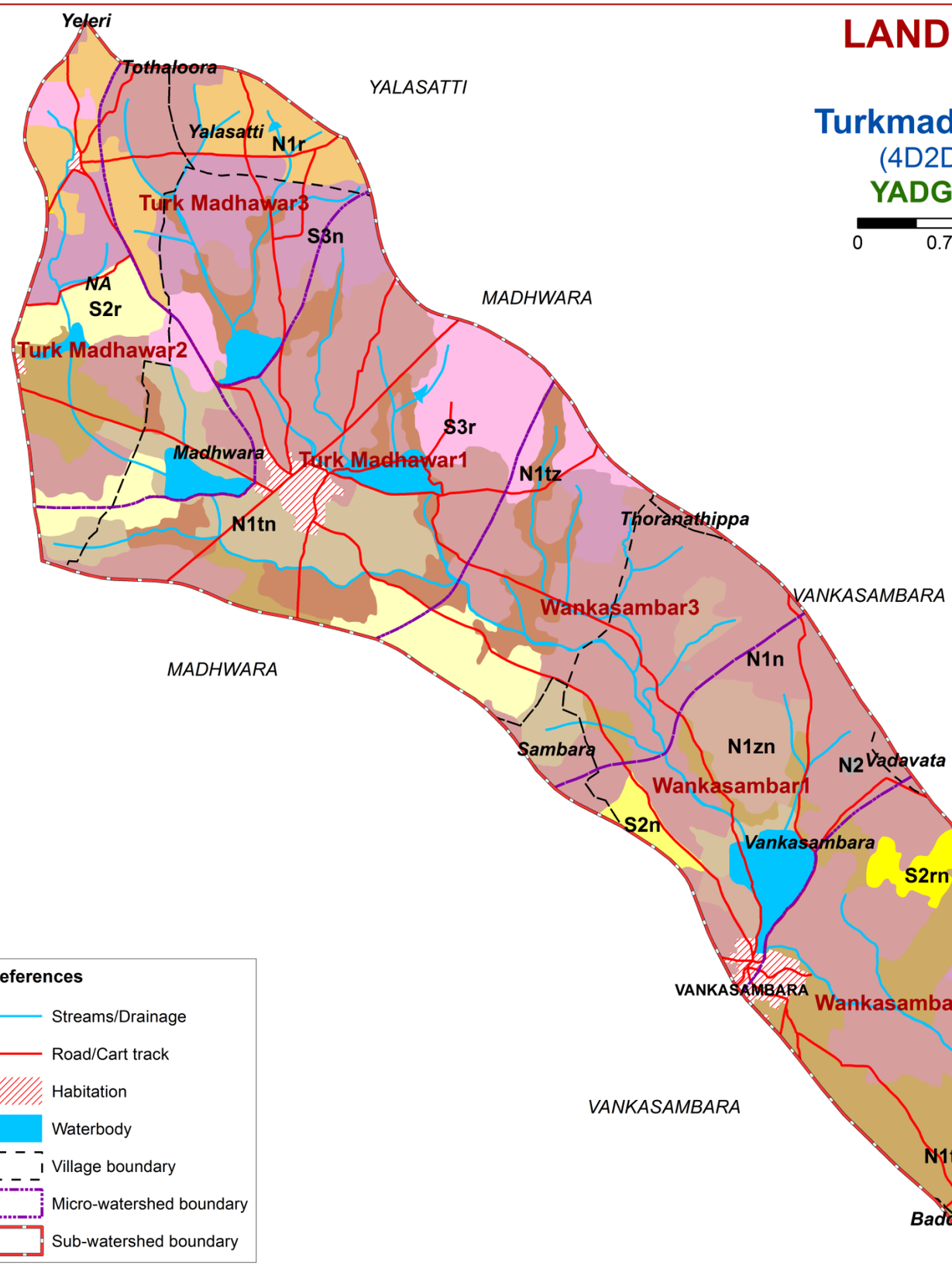
Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S2n	23 (0.73)
S2r	181 (5.71)
S2rn	36 (1.12)
S3n	264 (8.33)
S3r	188 (5.92)
N1n	1193 (37.61)
N1r	171 (5.37)
N1t	344 (10.84)
N1tn	253 (7.99)
N1tz	219(6.9)
N1zn	119 (3.75)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR CASHEW

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

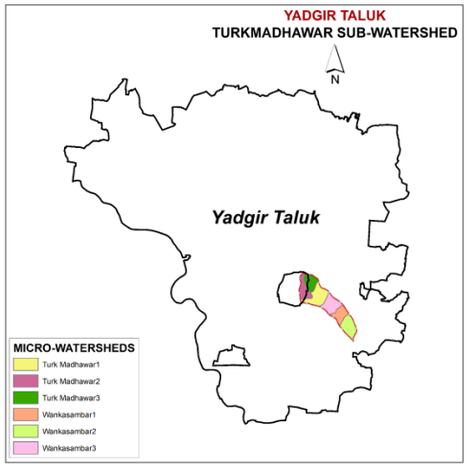
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Source: ICAR-NBSS&LUP, Bengaluru

7.23. Land Suitability for Custard Apple



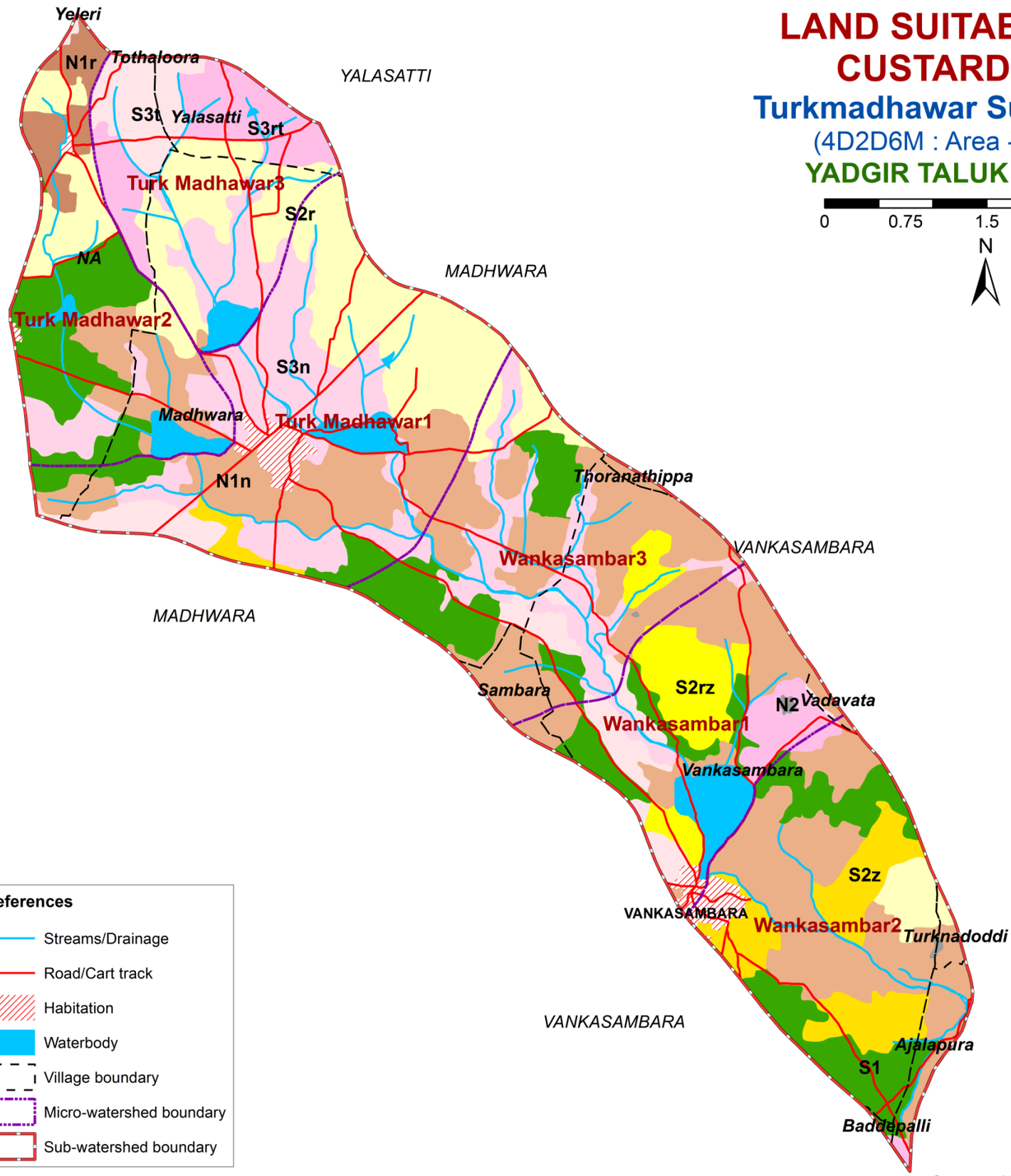
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	467 (14.73)
S2r	488 (15.37)
S2z	149 (4.68)
S2rz	119 (3.75)
S3n	488 (15.38)
S3t	184 (5.81)
S3rt	166 (5.24)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR CUSTARD APPLE

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

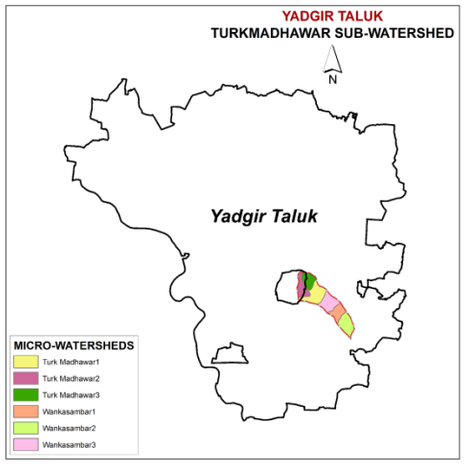
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Source: ICAR-NBSS&LUP, Bengaluru

7.24. Land Suitability for Amla



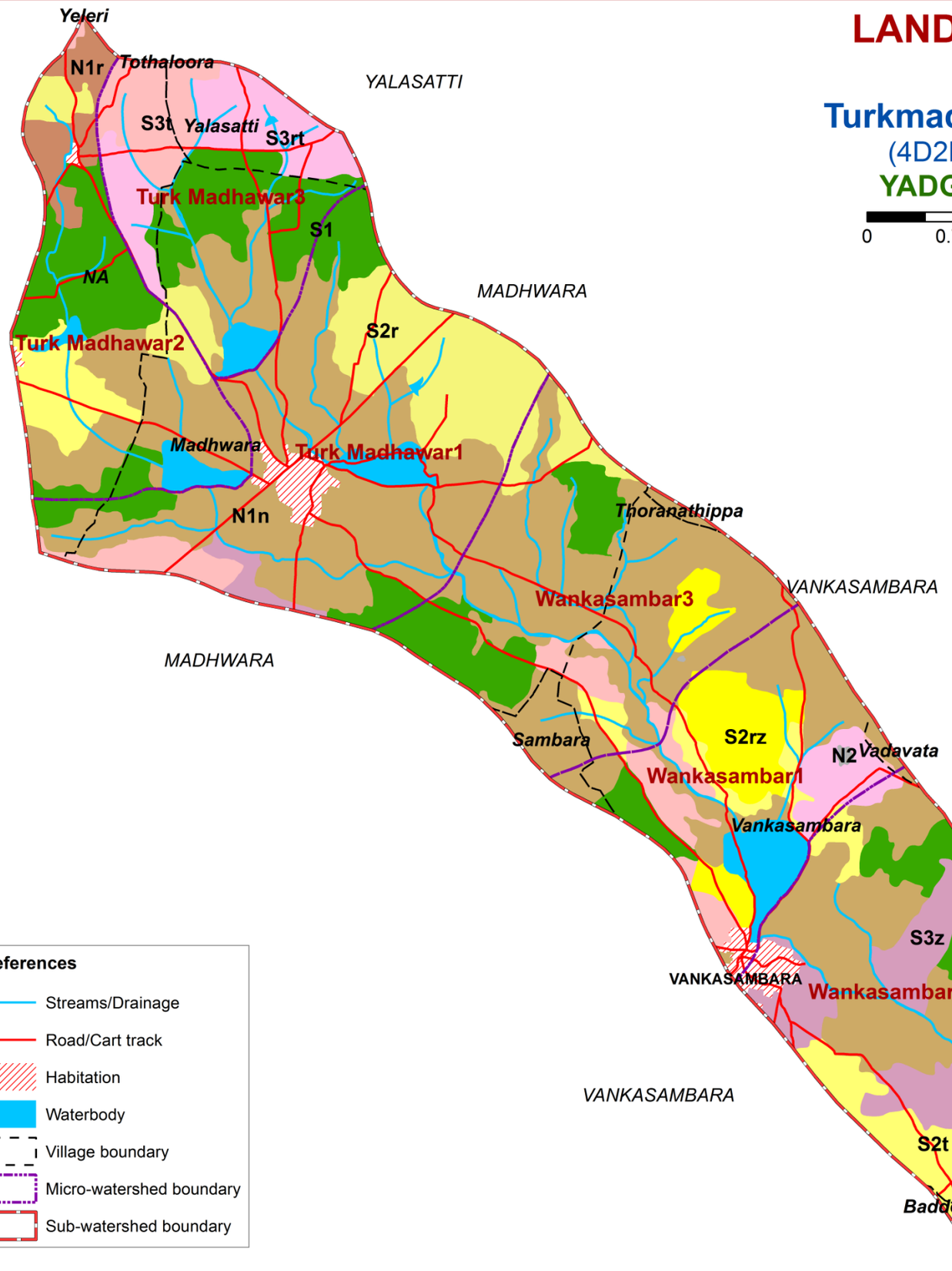
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	504 (15.89)
S2r	256 (8.05)
S2t	195 (6.16)
S2rz	119 (3.75)
S3t	184 (5.81)
S3z	149 (4.68)
S3rt	166 (5.24)
N1n	1363 (42.97)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR AMLA

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

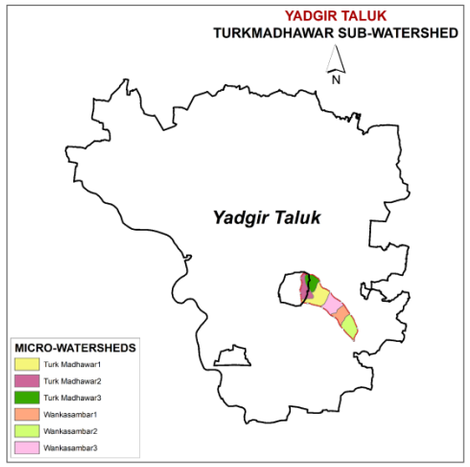
YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3

N

Source: ICAR-NBSS&LUP, Bengaluru

7.25. Land Suitability for Tamarind



LAND SUITABILITY FOR TAMARIND

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Yeleri
Tothaloora
YALASATTI
Yalasatti
Turk Madhawar3
S3r
NA
MADHWARA
Turk Madhawar2
Madhwara
Turk Madhawar1
N1n
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
N1r
N2
Vadavata
Wankasambar1
S2r
Vankasambara
S3z
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S2rt
Baddepalli

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

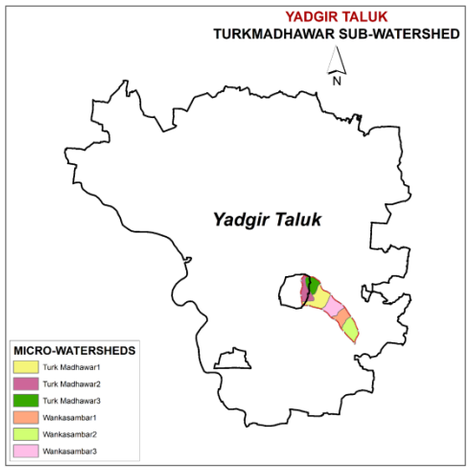
Suitability subclass	Area in ha (%)
S2r	23 (0.73)
S2rt	234 (7.39)
S3r	481 (15.16)
S3z	149 (4.68)
N1n	1363 (42.97)
N1r	741 (23.34)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

7.26. Land Suitability for Brinjal



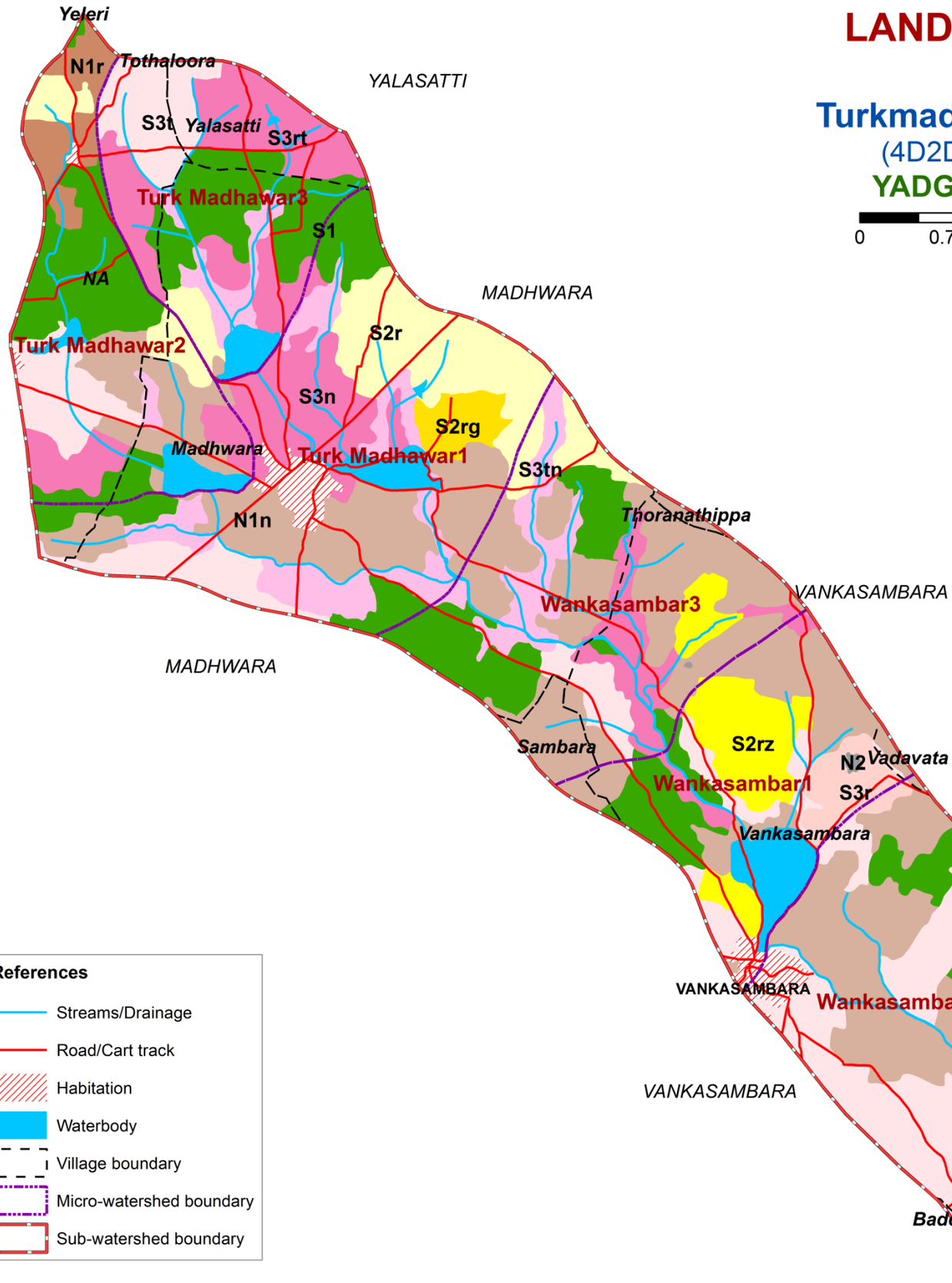
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2r	221 (6.97)
S2rg	34 (1.08)
S2rz	119 (3.75)
S3n	269 (8.48)
S3r	50 (1.58)
S3t	489 (15.42)
S3rt	116 (3.66)
S3tn	219 (6.9)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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



LAND SUITABILITY FOR BRINJAL

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

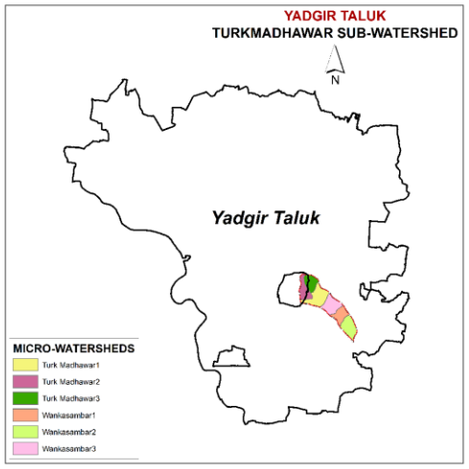
YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N

Source: ICAR-NBSS&LUP, Bengaluru

7.27. Land Suitability for Onion



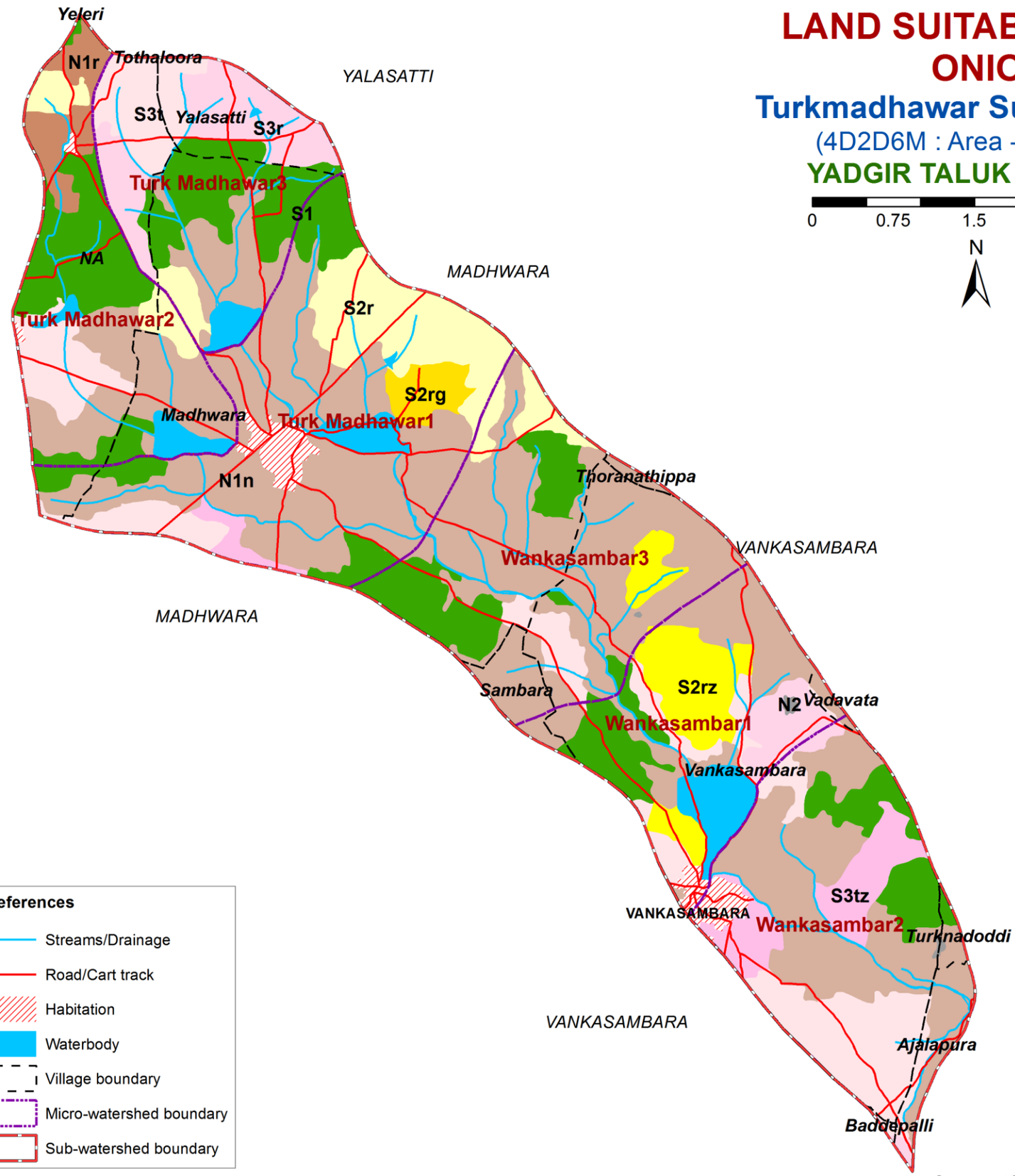
Key
S1- Highly Suitable
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable

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

Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2r	221 (6.97)
S2rg	34 (1.08)
S2rz	119 (3.75)
S3r	166 (5.24)
S3t	387 (12.19)
S3tz	103 (3.23)
N1n	1363 (42.97)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

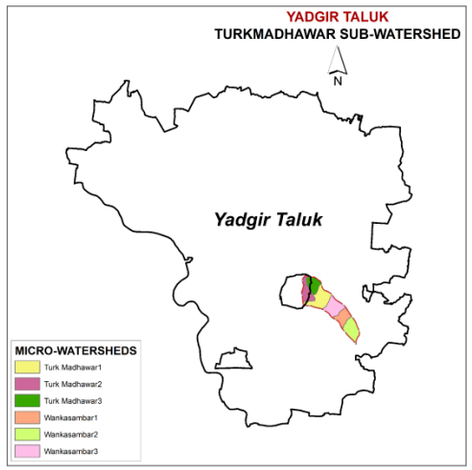
* - Habitation & Waterbody

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



Source: ICAR-NBSS&LUP, Bengaluru

7.28. Land Suitability for Marigold



LAND SUITABILITY FOR MARIGOLD

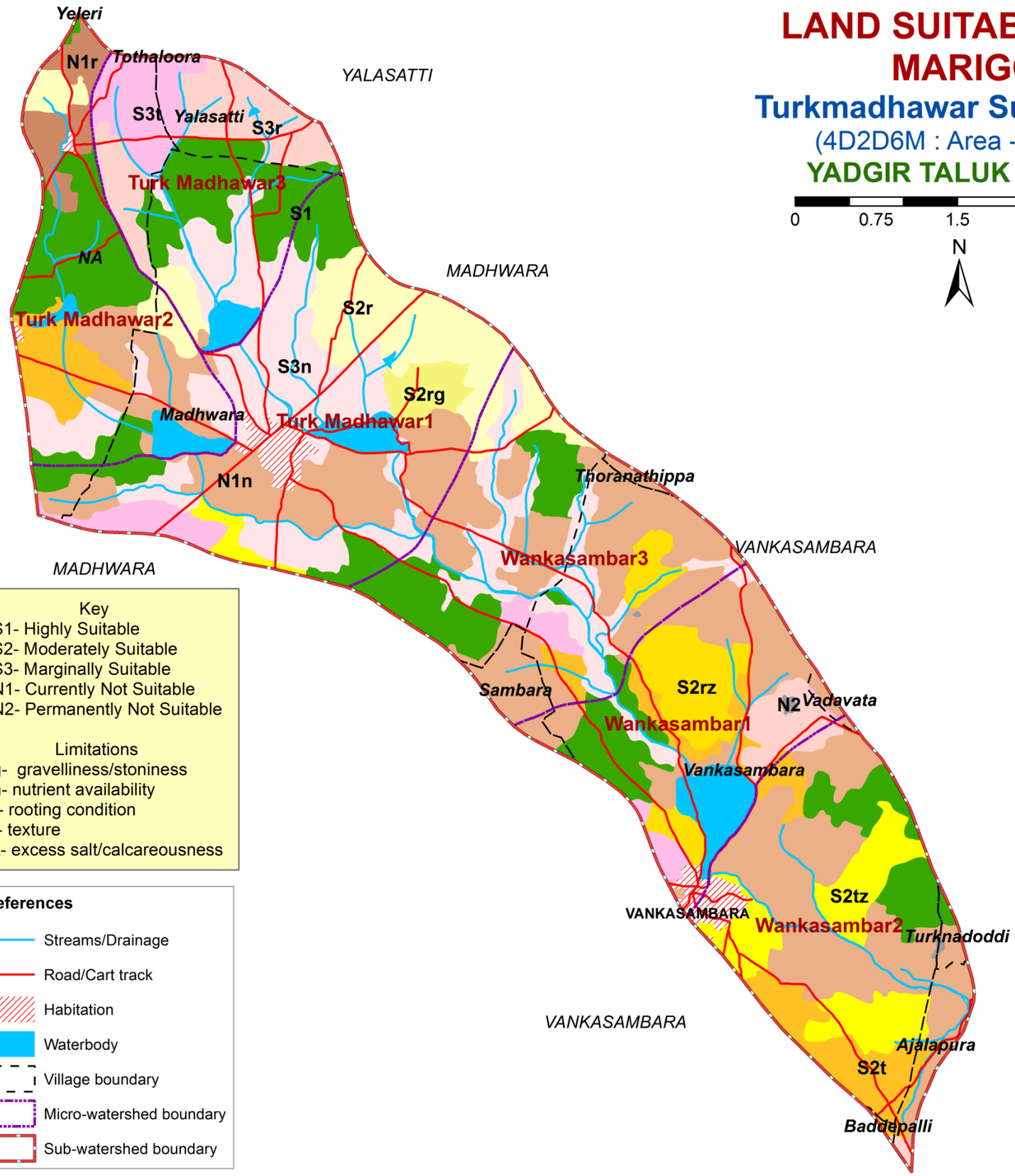
Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

0 0.75 1.5 3 km

N



Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2r	221 (6.97)
S2t	195 (6.16)
S2rg	34 (1.08)
S2rz	119 (3.75)
S2tz	149 (4.68)
S3n	488 (15.38)
S3r	166 (5.24)
S3t	145 (4.58)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

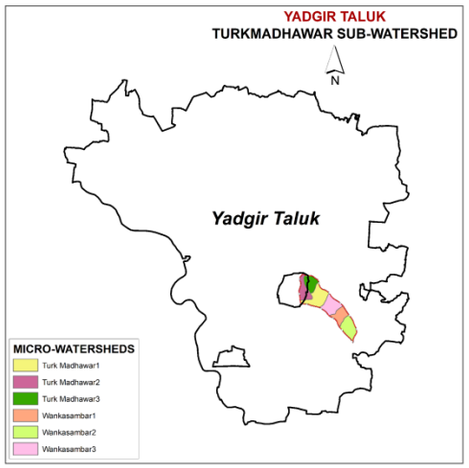
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

References

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

Source: ICAR-NBSS&LUP, Bengaluru

7.29. Land Suitability for Chrysanthemum



LAND SUITABILITY FOR CHRYSANTHEMUM

Turkmadhawar Sub-watershed

(4D2D6M : Area - 3173.22 ha)

YADGIR TALUK & DISTRICT

km
0 0.75 1.5 3

N

Yeleri
N1r
Tothaloora
YALASATTI
S3t
Yalasatti
S3r
Turk Madhawar3
S1
NA
MADHWARA
Turk Madhawar2
S2r
S3n
S2rg
Madhwara
Turk Madhawar1
N1n
Thoranathippa
VANKASAMBARA
Wankasambar3
MADHWARA
Sambara
S2rz
N2
Vadavata
Wankasambar1
Vankasambara
S2tz
VANKASAMBARA
Wankasambar2
Turknadoddi
VANKASAMBARA
Ajalapura
S2t
Baddepalli

Suitability subclass	Area in ha (%)
S1	543 (17.12)
S2r	221 (6.97)
S2t	195 (6.16)
S2rg	34 (1.08)
S2rz	119 (3.75)
S2tz	149 (4.68)
S3n	488 (15.38)
S3r	166 (5.24)
S3t	145 (4.58)
N1n	875 (27.59)
N1r	55 (1.72)
N2	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

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

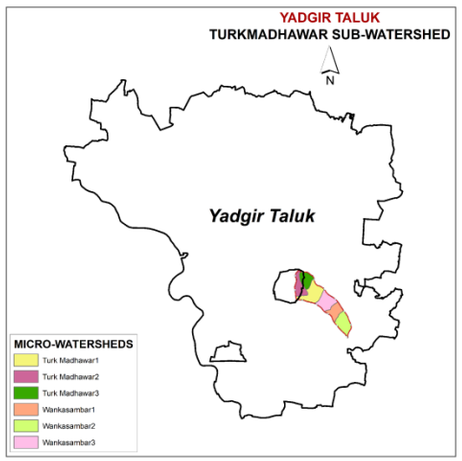
Limitations
g- gravelliness/stoniness
n- nutrient availability
r- rooting condition
t- texture
z- excess salt/calcareousness

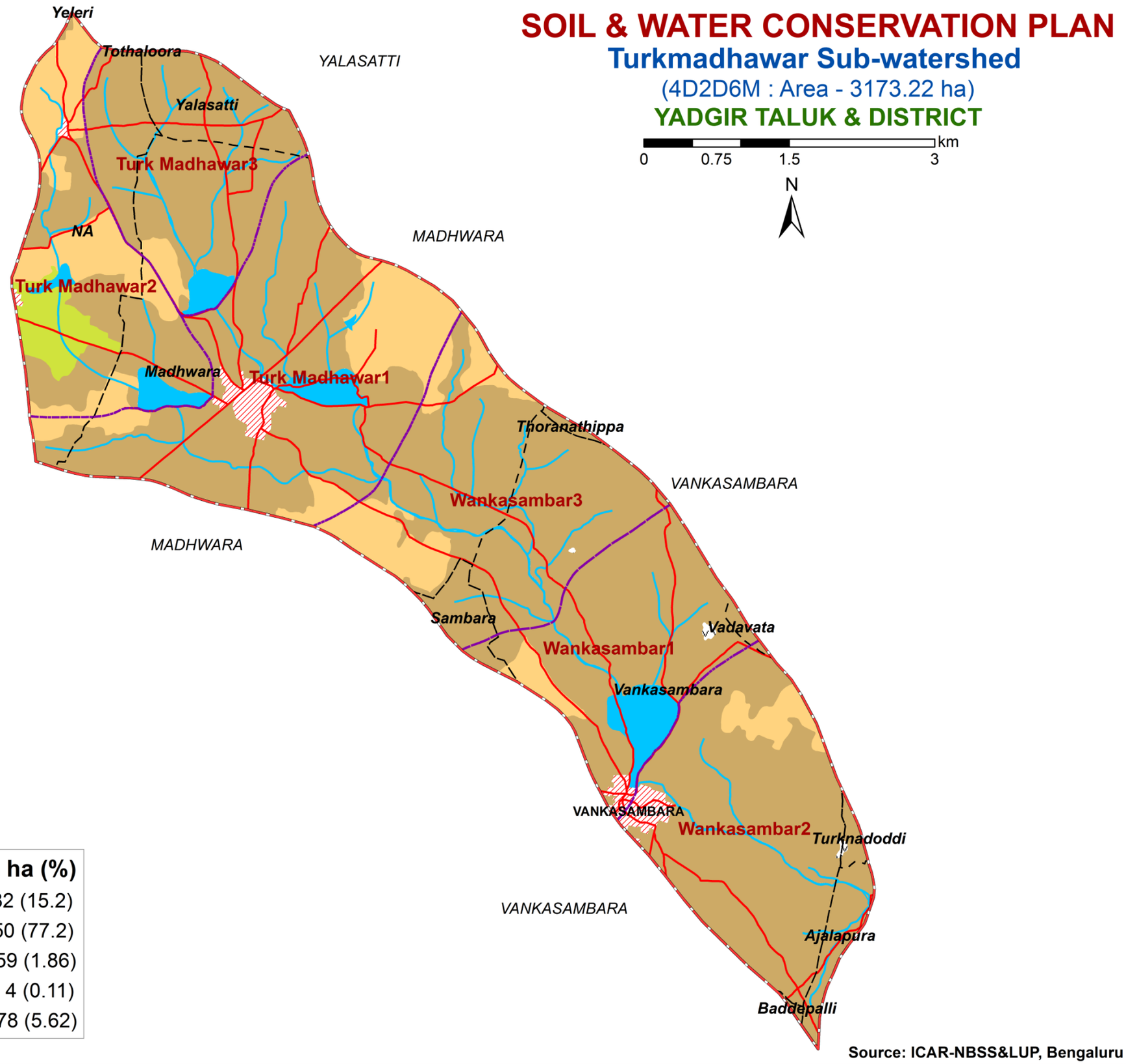
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Source: ICAR-NBSS&LUP, Bengaluru

8. Soil and Water Conservation Measures

8.1. Soil & Water Conservation Plan





References

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

Legend	Area in ha (%)
Trench cum bunding	482 (15.2)
Graded bunding	2450 (77.2)
Strengthening of existing bunds	59 (1.86)
Rock outcrops	4 (0.11)
Others*	178 (5.62)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

9. Table. Proposed Crop Plan for Turkmadhawar Sub-watershed, Balichakra Hobli, Yadgir Taluk, Yadgir District based on soil-site–crop suitability Assessment

LMU. No	Soil Map Units	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	52.ANRbB3 34.GWDcB2 35.GWDiB2 143.SGRiB2 106.SGRmB2 104.TMKiB2 117.VKSiB2 100.VKSmB1 42.YDRcB2 (Sodic soils)	-	**Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage
2	50.BGDbB2 177.BGDiA1 62.BMNmB2 32.HSLcB2 126.HSLhB2 33.HSLiB2 47.NGPbB2 48.NGPiB2 49.NGPmB2 112.SHTmB2 (Moderately deep to deep, black clay soils)	Maize, sorghum, Sunflower, Cotton, Red gram, Bengalgram, Bajra	**Fruit crops:** Lime, Musambi, Custard apple, Pomegranate **Vegetables:** Chilli, Bhendi **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
3	37.BLCcB2 44.GDGbB2 40.PGPcB2 114.PGPhB2 41.PGPiB2 (Moderately deep, red sandy clay to sandy clay loam 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, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices

To be continued….

LMU. No	Soil Map Units	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
4	84.KDRcB2 89.KDRmB2 57.MDGcB2 59.MDRcB2 61.MDRmB2 (Deep to very deep, strongly alkaline soils)	Sorghum, Maize, Bajra	**Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage
5	101.NHLmB1 (Deep, sandy loam lowland 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, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
6	25.DPLcB2 (Moderately shallow, sandy clay soils)	Maize, sorghum Groundnut, Bajra, Cotton	**Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
7	16.HLGcB2 17.HLGiB2 22.JNKiB2 (Moderately shallow, sandy clay loam soils)	Maize, sorghum Groundnut, Bajra	**Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:**Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
8	11.SBRcB2 (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
9	27.YLRbB2 29.YLRcB2g1 31.YLRiB2 (Moderately shallow, red clay soils)	Maize, sorghum Groundnut, Bajra, Cotton	**Fruit crops:** Amla, Custard apple **Vegetables:** Tomato, Chilli, Brinjal, Bhendi, Onion **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
10	2.BDLbB2 165.HTKcB2 (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
11	119.BDPiB3 (Very shallow soils)	-	Hybrid Napier, *Styloxanthes hamata, Styloxanthes scabra*	Use of short duration varieties, sowing across the slope

PART - B

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

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

ICAR - NBSS & LUP

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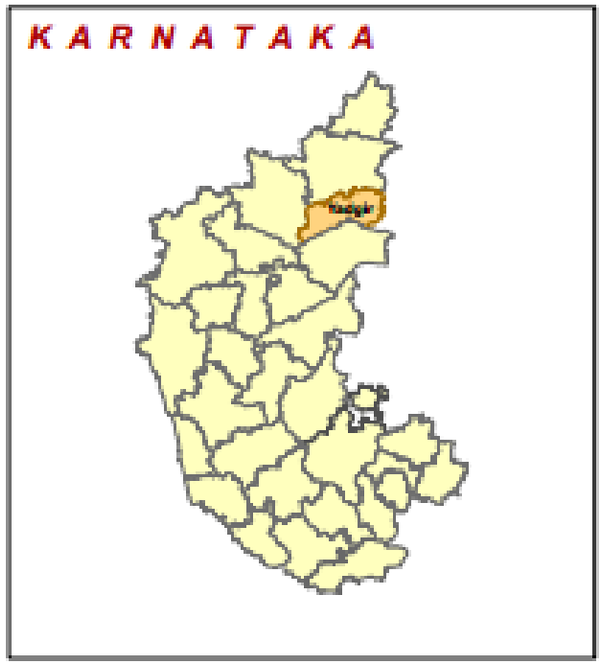
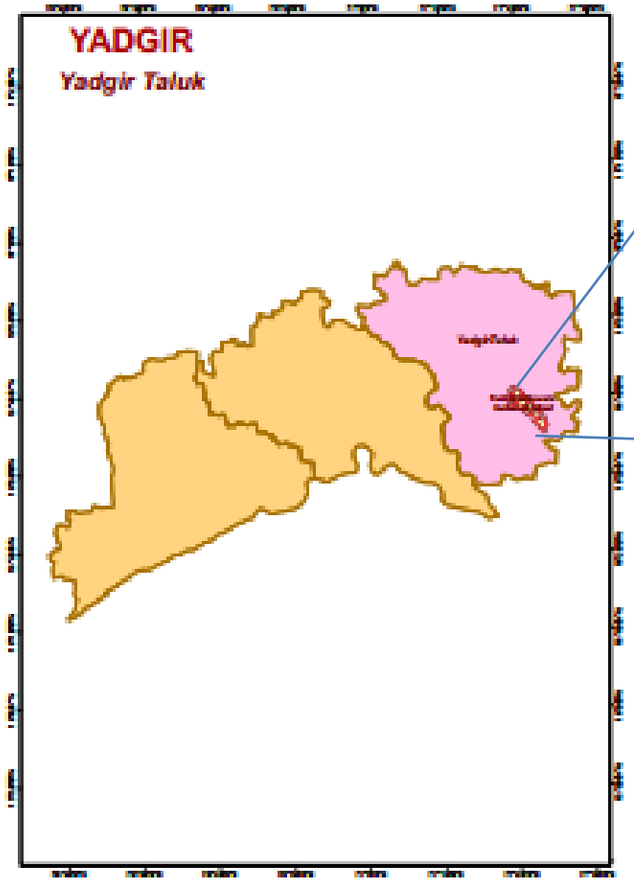
Dr. K .V. Niranjana	Chief Technical Officer
Sh. R.S.Reddy	Consultant
Sh. A.G.Devendra Prasad	Consultant
Smt. K.Karunya Lakshmi	Research Associate
Ms. Seema, K.V.	Senior Research Fellow
Dr. Sekhar Muddu (Reviewed and approved)	Professor & Lead Scientist, Dept. of Civil Engineering & ICWaR, IISc, Bangalore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

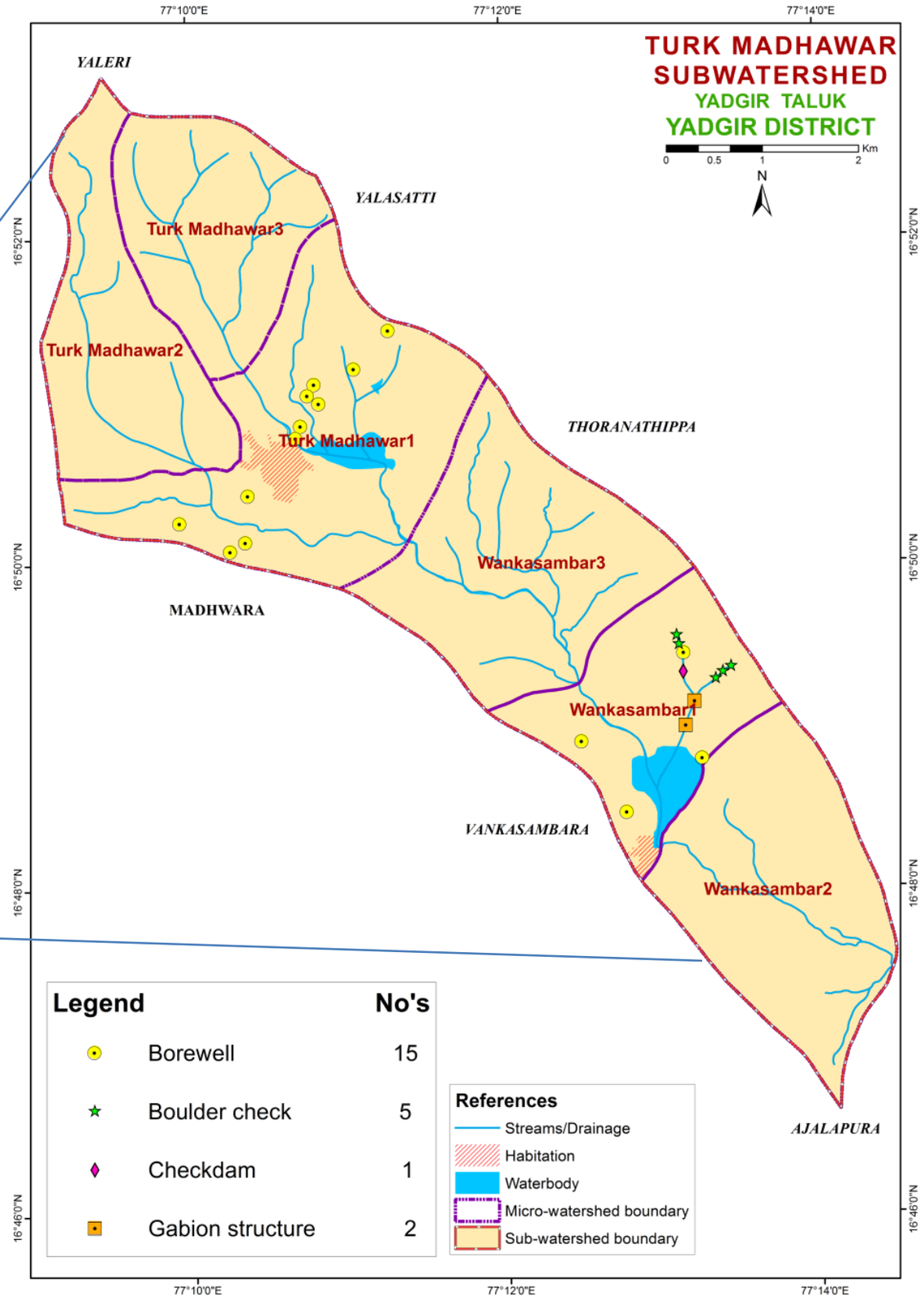
INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Turk Madhawar sub-watershed (4D2D6M) in Yadgir Taluk, Yadgir District, has been undertaken for integrated planning, development and management.
- Turk Madhawar sub-watershed (Yadgir Taluk, Yadgir District) is located between $16^0$35'5"-$16^0$40'53" North latitudes and $77^0$18'53"- $77^0$23'55" East longitudes, covering an area of about 3173.22 ha.
- This sub-watershed encompasses of 6 MWs namely Turk Madhawar-1 (4D2D6M1c), Turk Madhawar-2 (4D2D6M1b), Turk Madhawar-3 (4D2D6M1a), Wankasambar-1 (4D2D6M2b), Wankasambar-2 (4D2D6M2c) and Wankasambar-3 (4D2D6M2a). Land Resource Inventory (LRI) was generated for all the 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 TURKMADHAWAR SUB-WATERSHED

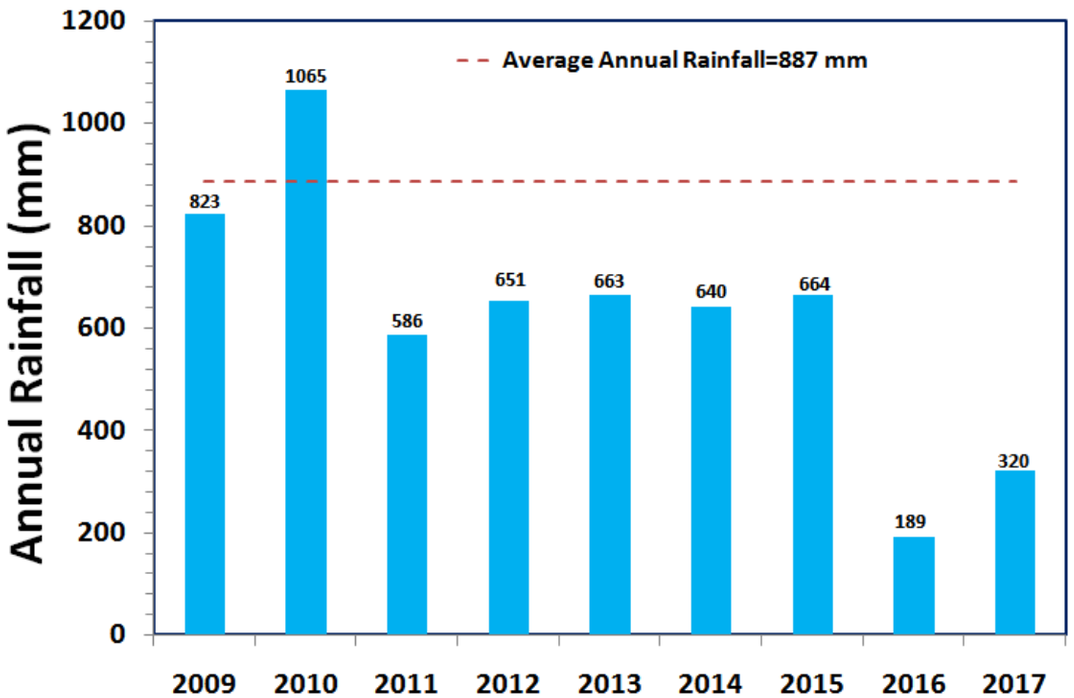






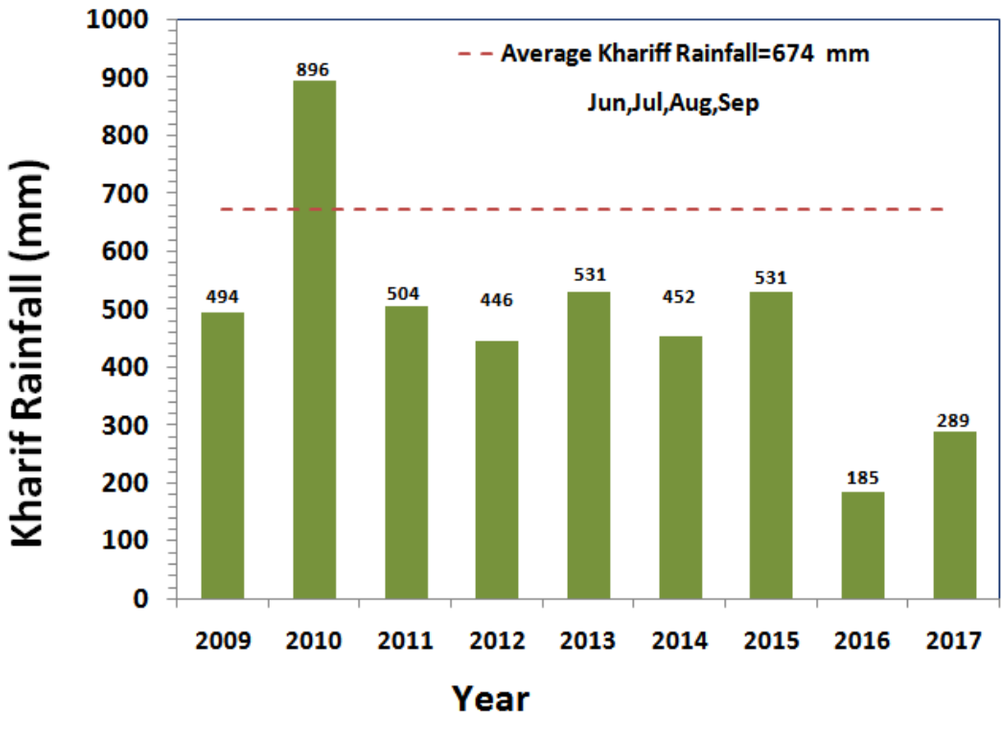
Soil & Water Conservation Structures in Turkmadhawar sub-watershed, Yadgir Taluk, Yadgir District

RAINFALL INDEX

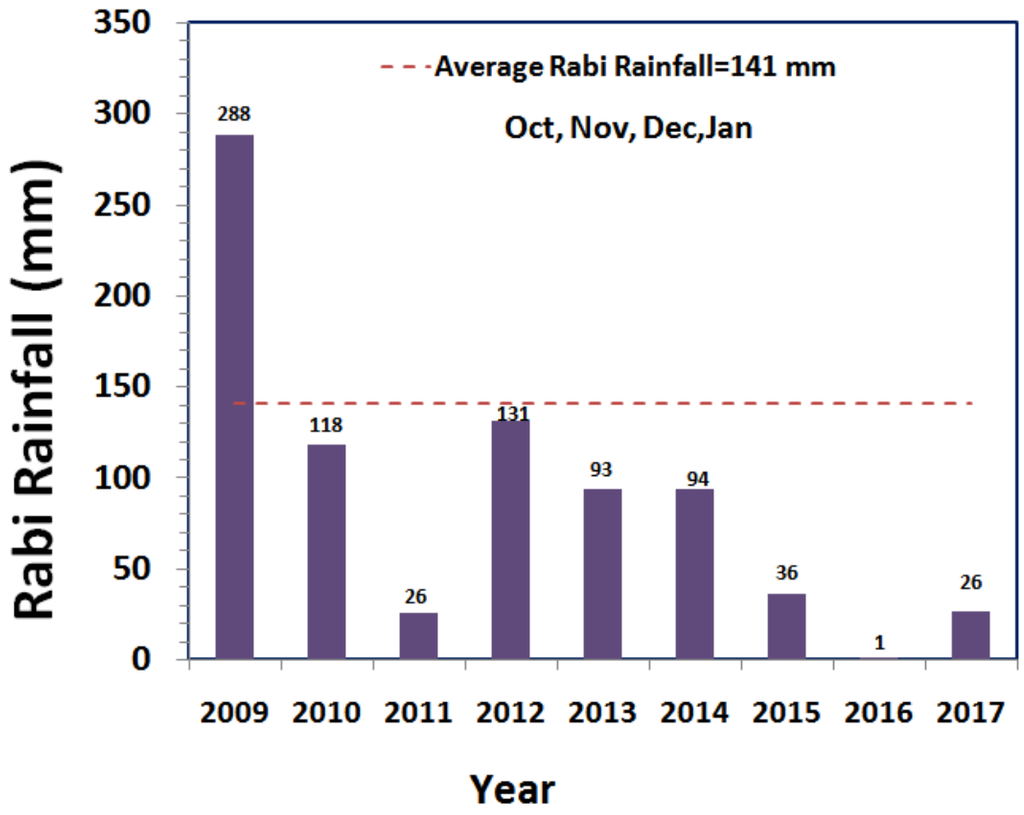


The average annual rainfall (1960-2014) recorded at the Yadgir station in Yadgir taluk of Yadgir district is 887 mm. The annual rainfall at Balichakra station (Hobli H.Q.) is presented. During the years 2009, 2011, 2012, 2013, 2014, 2015, 2016 and 2017 the annual rainfall was deficient by 7%, 34%, 27%, 25%, 28%, 25%, 79% and 64% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 80% of the annual rainfall and it typically follows the annual rainfall patterns. During the year 2010 high *rabi* rainfall was received, where as other years showed deficient rainfall.

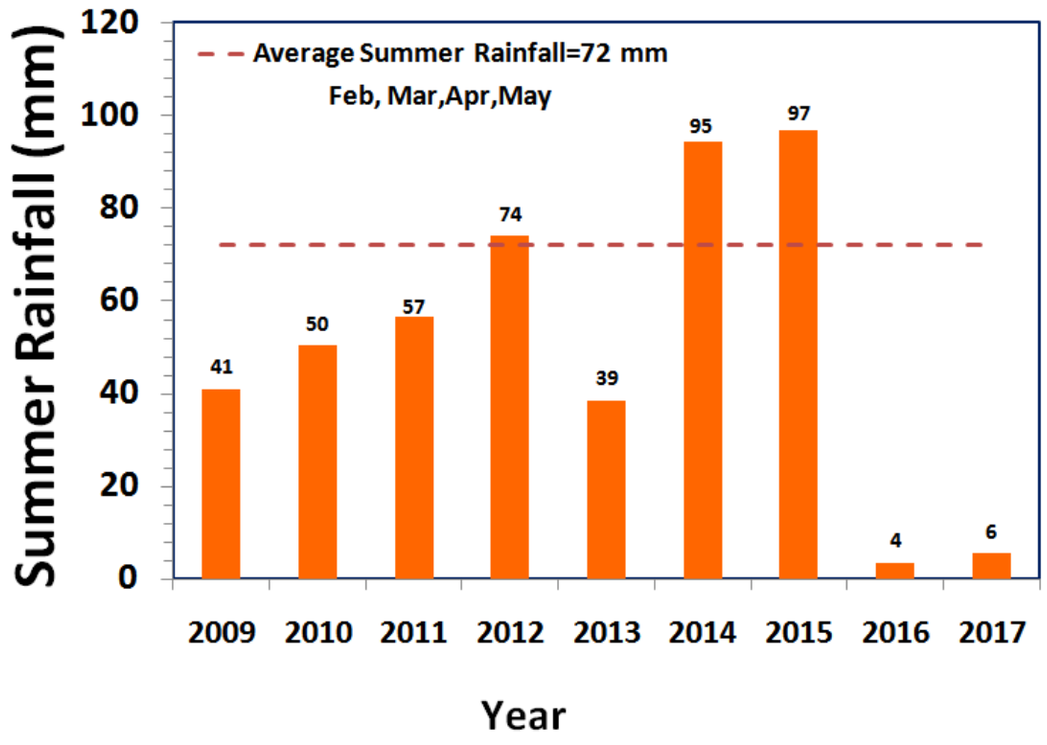


RAINFALL INDEX

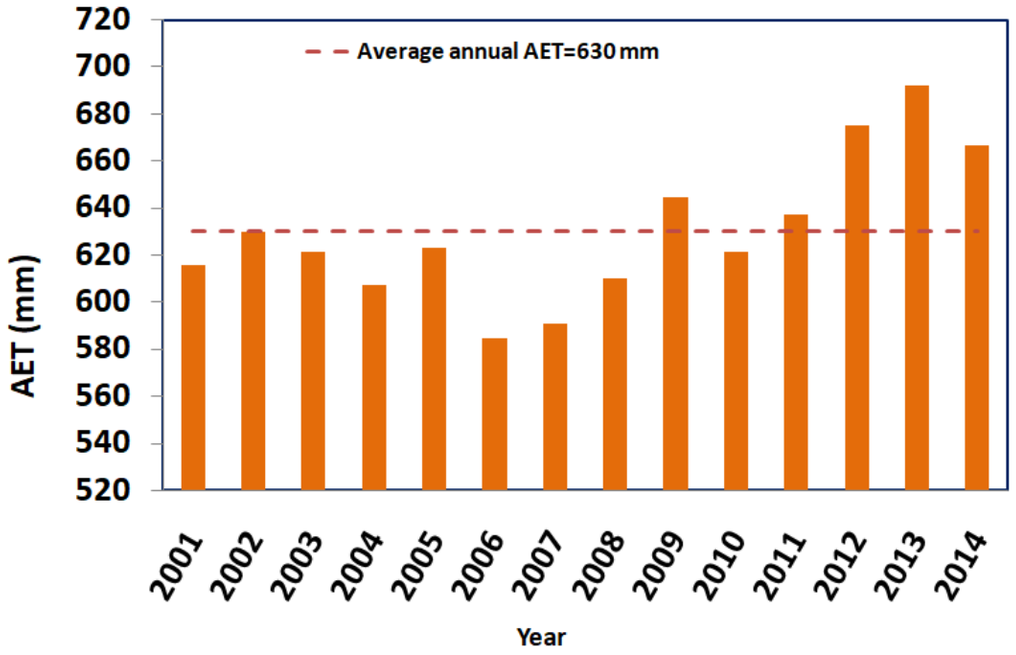


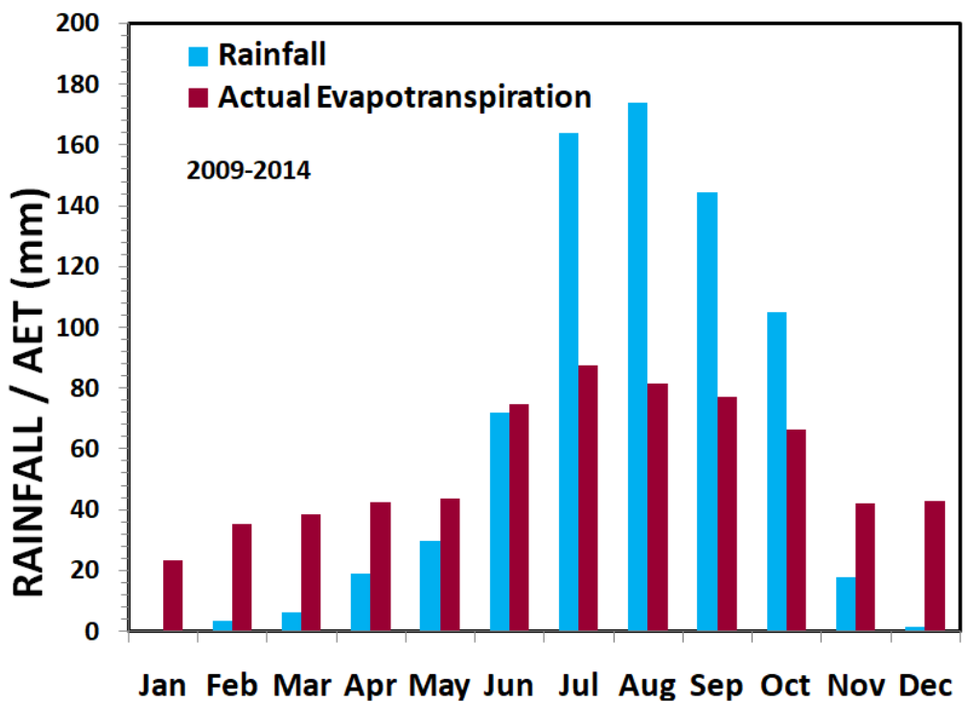
The average *rabi* rainfall (Oct-Jan) is about 13% of the Average annual rainfall. During the year 2009 high *rabi* rainfall was received, where as other years showed deficient rainfall.

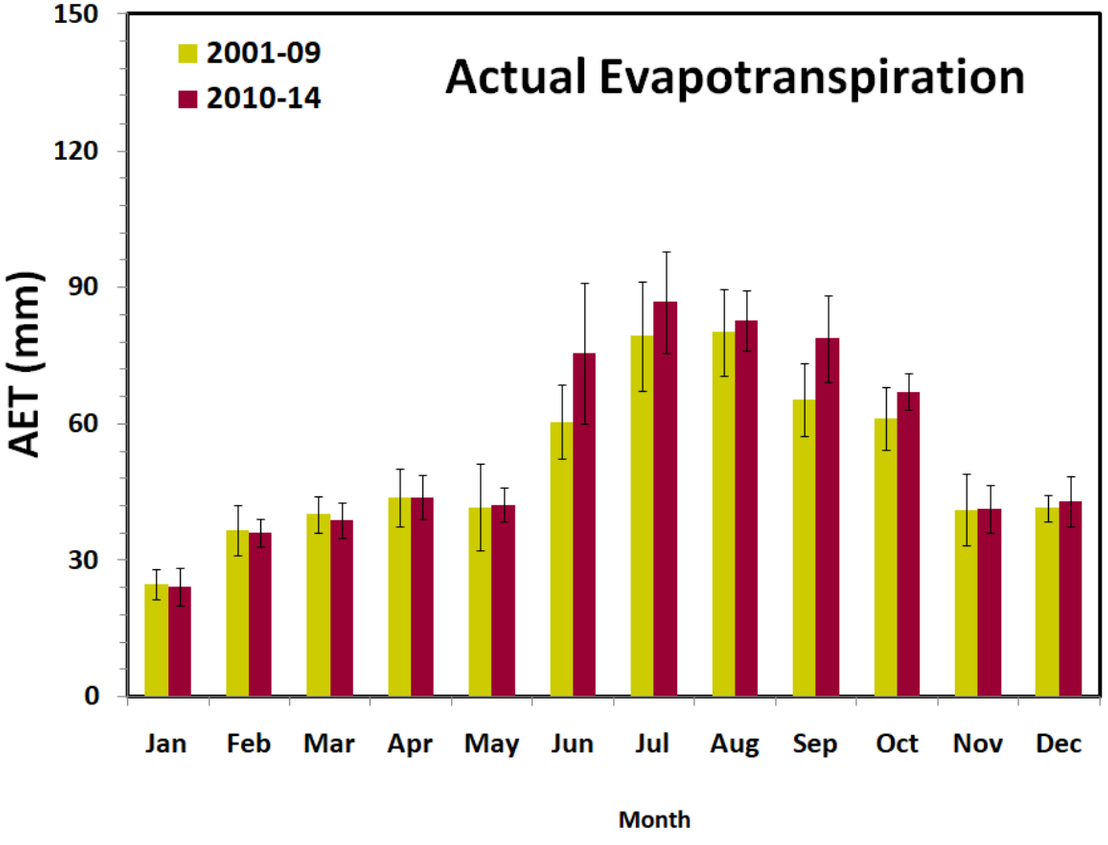
The average summer rainfall (Feb-May) is about 8% of the average annual rainfall.



EVAPOTRANSPIRATION

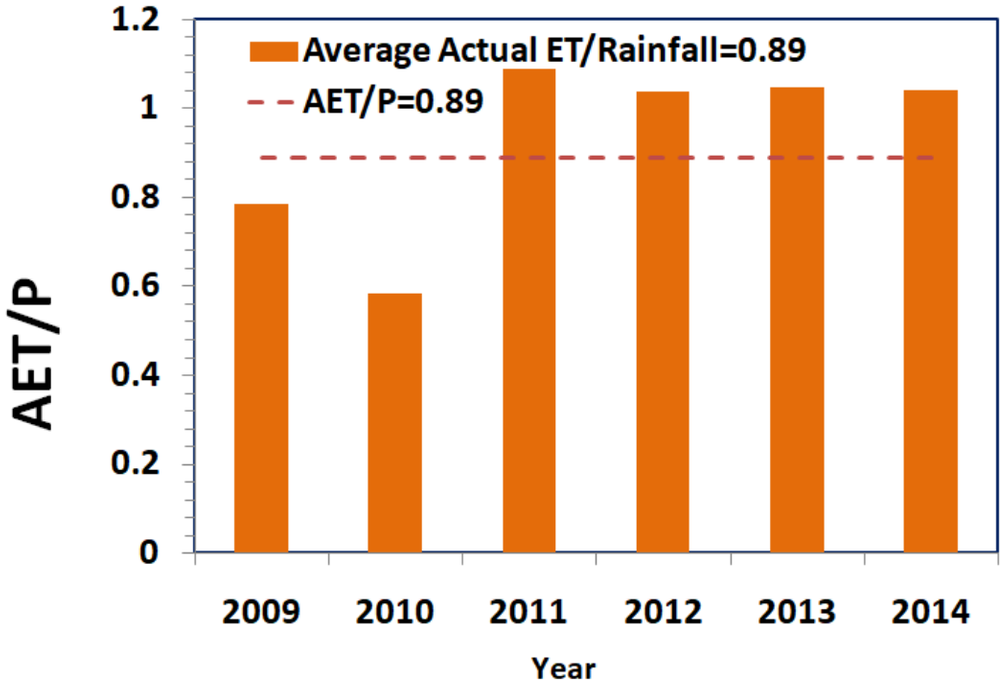


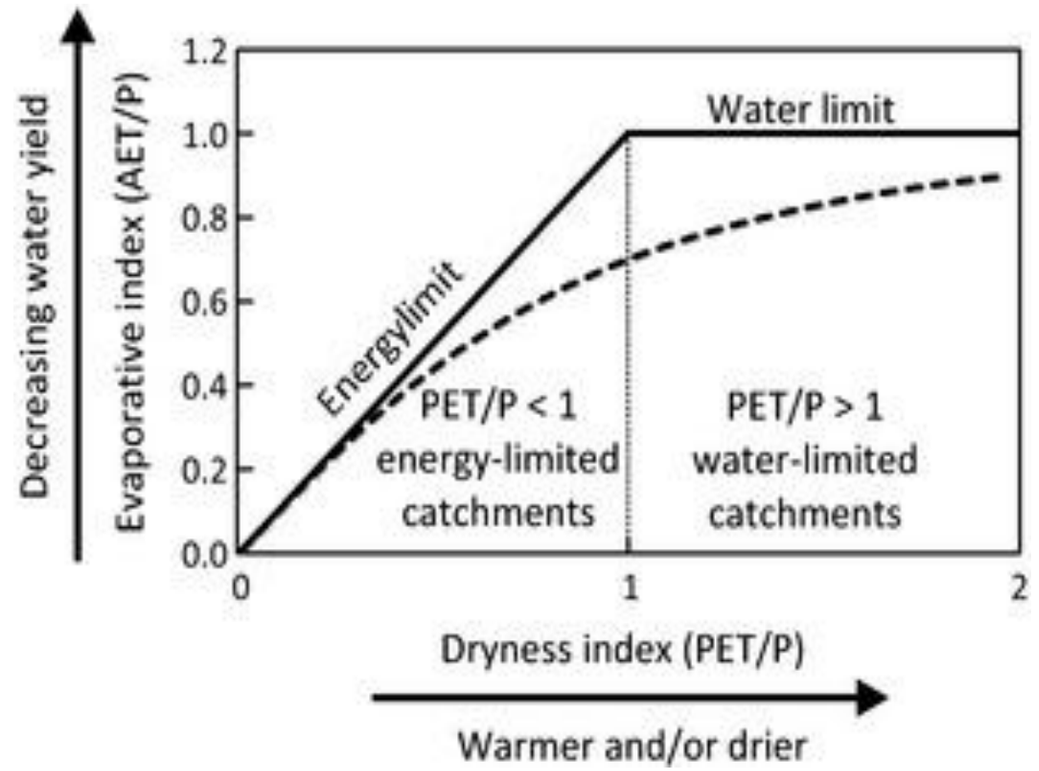




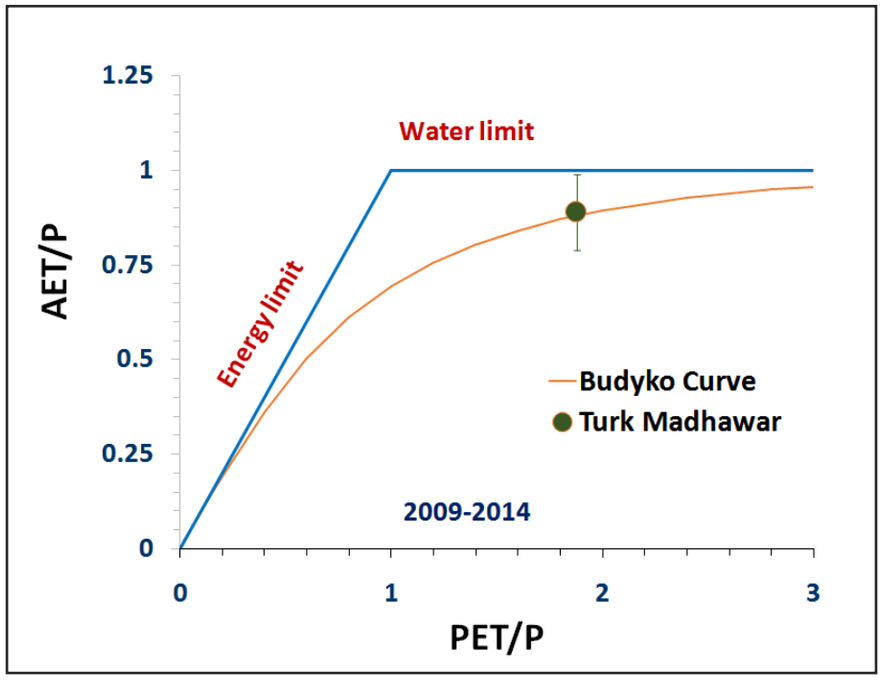
The average annual actual ET is lower than the average rainfall. During *kharif*, average rainfall and AET was found to be 674 mm and 321 mm respectively, whereas in *rabi* it was about 141 mm and 175 mm. The annual ET increased by 7% during 2010-2014 compared to 2001-2009 .

EVAPOTRANSPIRATION INDEX

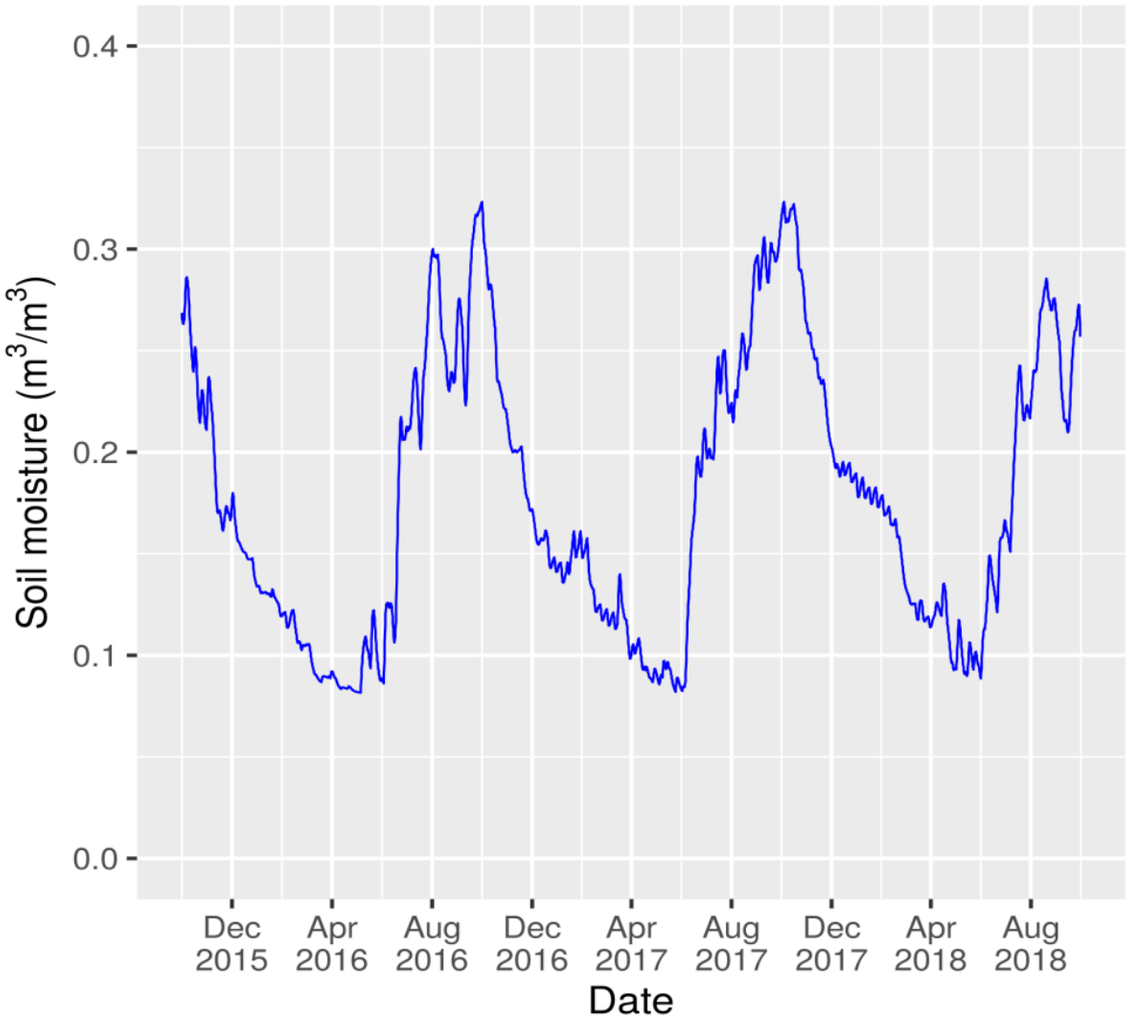




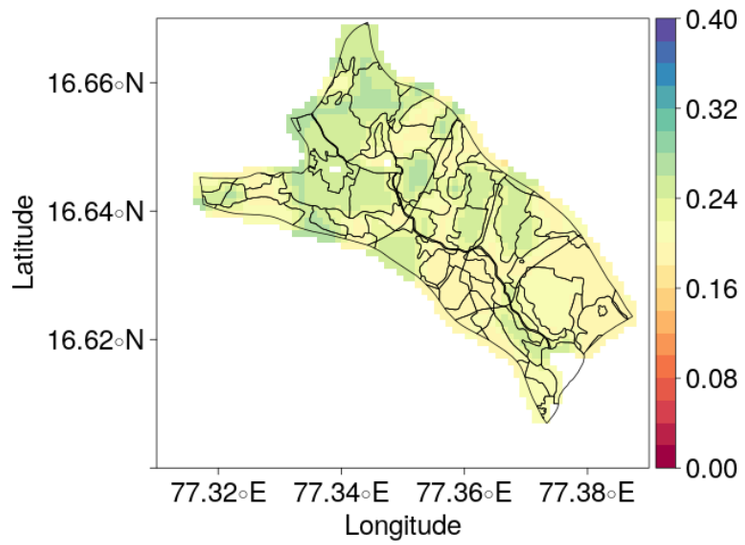
The average AET/P ratio was about 89%, which is slightly higher than the sustainable limit of about 80%. Even during extremely lower rainfall year of 2016, AET was 630 mm. This suggests the presence of water storage and utilization from other sources such as groundwater, which buffered the lower rainfall.



SATELLITE RETRIEVED SOIL MOISTURE

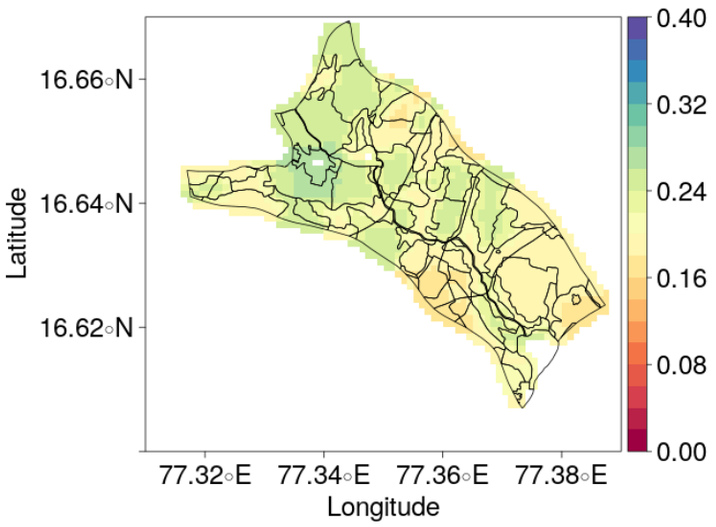


Turk Madhawar– Rabi Soil Moisture



The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 13-27 % in *kharif* and 13-33% in *rabi* seasons of 2016 and 8-31% in *Kharif* and 14-33% in *rabi* seasons of 2017.

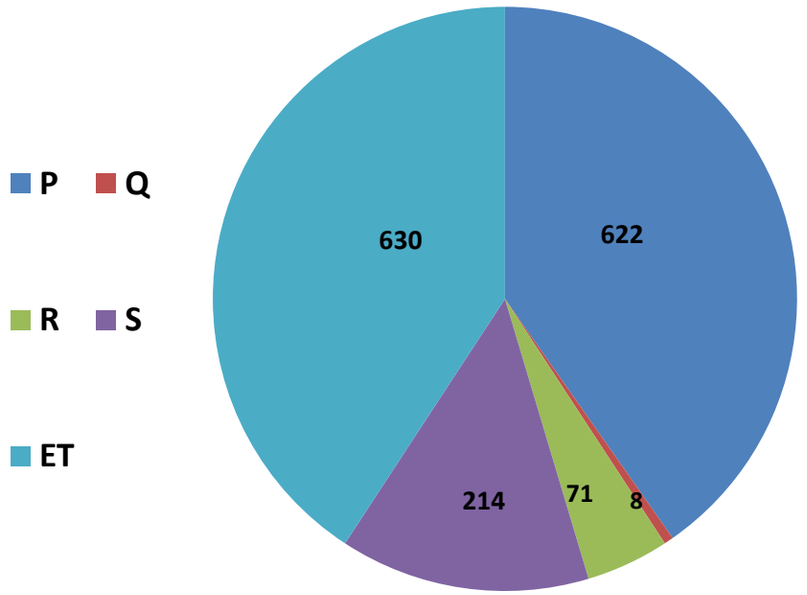
Turk Madhawar– Kharif Soil Moisture



WATER BALANCE

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

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

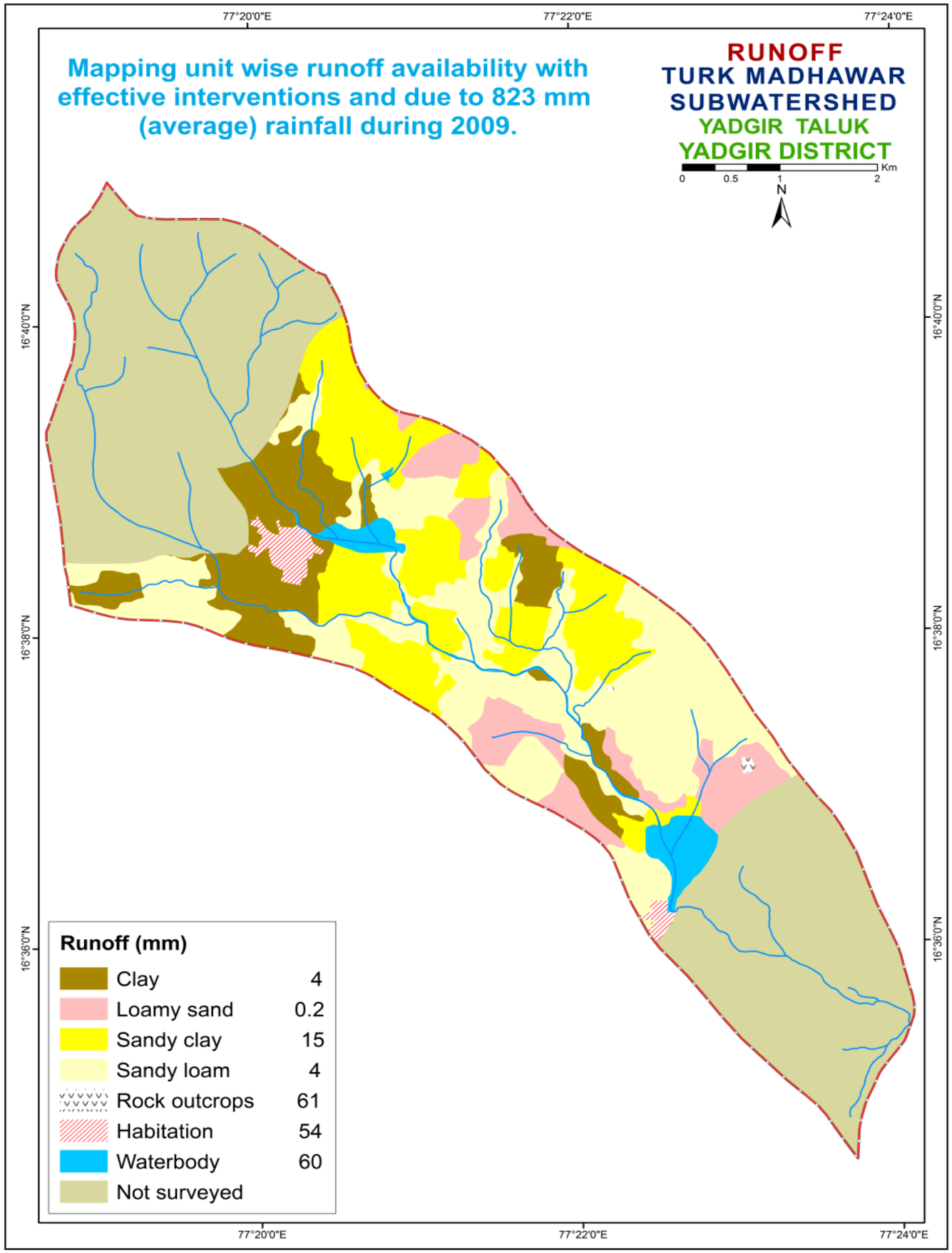


During July-October months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

P = 622 mm (average of 2009-2017) ET = 630 mm R = 71 mm S = 214 mm Q = 8 mm

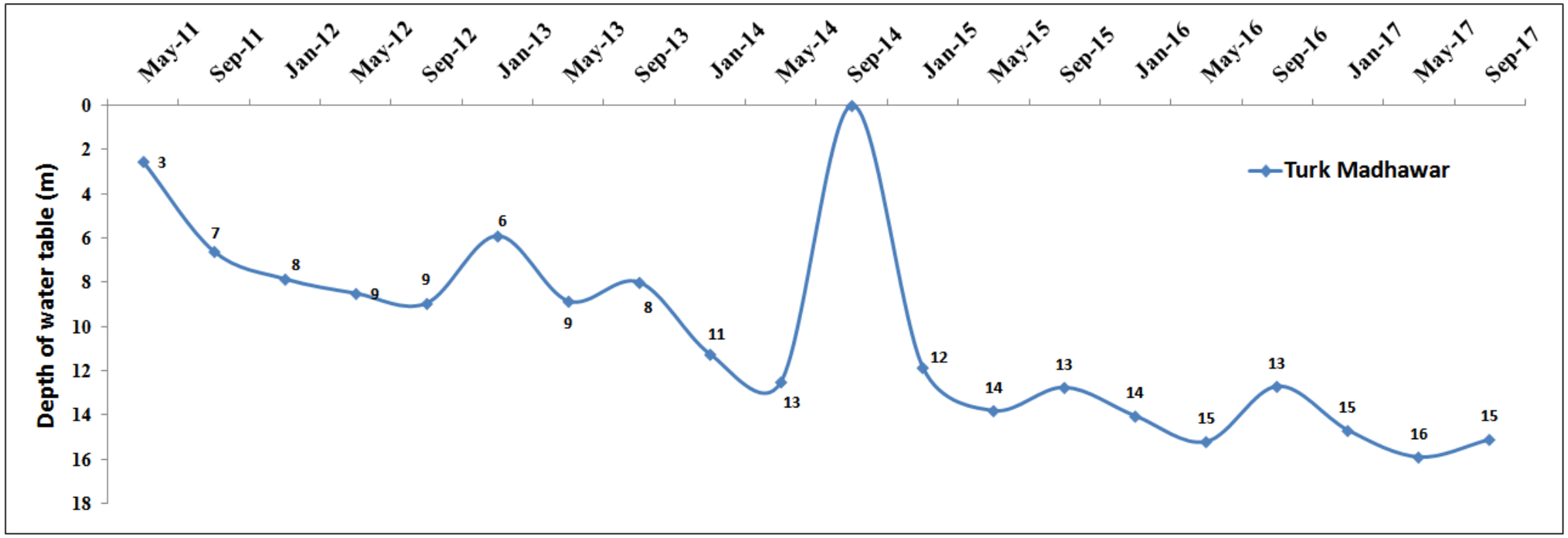
Sl. No.	Parameters	Average_ 2009 (mm)
1.	Rainfall	823
2.	Runoff availability with existing conditions	28
3.	Runoff availability with effective interventions	9
4.	Runoff allowed as environmental flow at the outlet	1
5.	Runoff excess for harvesting by construction of structures	8

RUNOFF


77°20'0"E
77°22'0"E
77°24'0"E
16°40'0"N
16°38'0"N
16°36'0"N
Mapping unit wise runoff availability with effective interventions and due to 823 mm (average) rainfall during 2009.
RUNOFF
TURK MADHAWAR SUBWATERSHED
YADGIR TALUK
YADGIR DISTRICT
0
0.5
1
2
Km
N
Runoff (mm)
Clay 4
Loamy sand 0.2
Sandy clay 15
Sandy loam 4
Rock outcrops 61
Habitation 54
Waterbody 60
Not surveyed

GROUND WATER STATUS

TURK MADHAWAR STATION



The total number of wells present in Turk Madhawar Sub-watershed as per LRI data is 15 Bore wells. The groundwater level shown above is from the data obtained from Dept. of Mines & Geology for the nearest station Turk Madhawar. The graph depicts the groundwater level during the years 2011-2017 were slightly varying, where as during the year 2014 was found constant.

X

SUMMARY

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

- 80%, 13% and 8% of the annual rainfall occurs during *kharif*, *rabi* and summer seasons respectively and exhibited a higher temporal variability.

- The evapotranspiration estimation tool developed indicates that the watershed water balance is in deficit. 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 8 mm for an average annual rainfall of 622 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 (214 mm) and utilizable runoff plus recharge is 272 (=214+8+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 496 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 620 mm (i.e. 125% of AET). This demand for the two seasons is higher by 348 mm, i.e. (620-272). The AET in June-Sept months is only 58% 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 Turk Madhawar Sub-watershed as per LRI data is 15 Bore wells. The groundwater level data obtained from Dept. of Mines & Geology for the nearest station Turk Madhawar. The groundwater level during the years 2011-2017 were slightly varying, where as during the year 2014 was found constant.