Land Resource and Hydrological Inventory of Bewanahalli 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 - 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 Bewanahalli Sub-watershed for Watershed Planning and Development

Yadgir Taluk, Yadgir District, Karnataka (AESR 6.2)

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How to read and use the Atlas

The Land Resource Inventory of Bewanahalli 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.

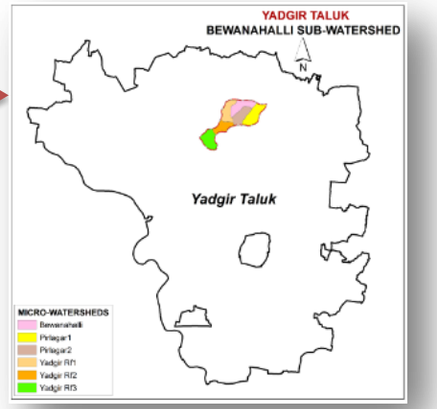
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

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.

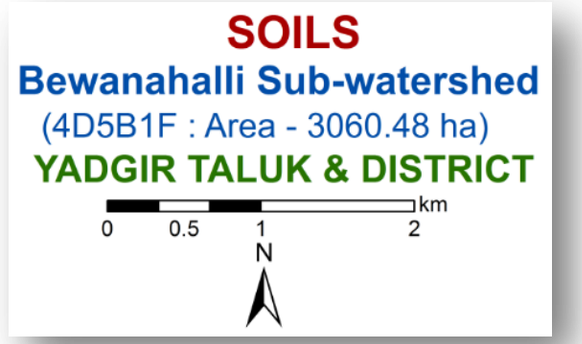
Inset map

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



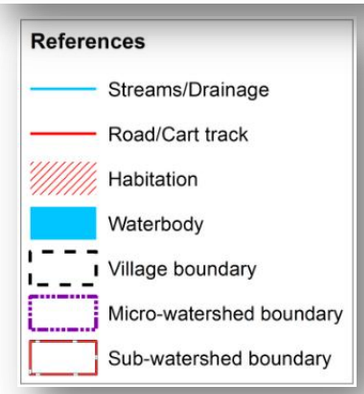
Map title

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



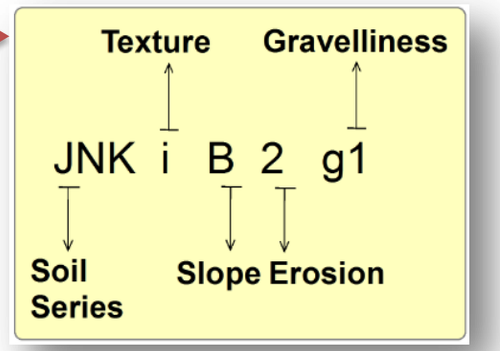
Legends and symbols

*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.*



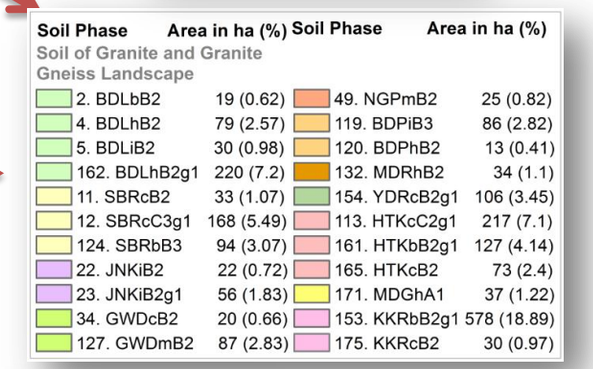
Soil Units

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

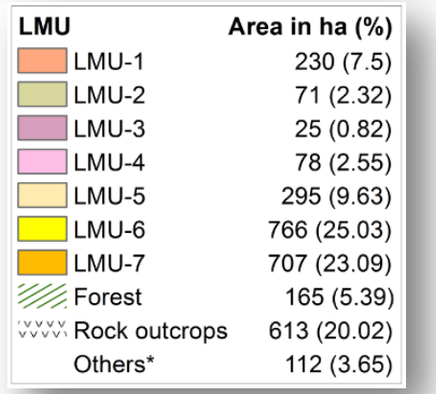
Different shades of colours are used as an aid to distinguish the different classes of soils, crop suitability and other maps.



Soil Phase	Area in ha (%)	Soil Phase	Area in ha (%)
Soil of Granite and Granite Gneiss Landscape			
2. BDLbB2	19 (0.62)	49. NGPmB2	25 (0.82)
4. BDLhB2	79 (2.57)	119. BDPiB3	86 (2.82)
5. BDLiB2	30 (0.98)	120. BDPhB2	13 (0.41)
162. BDLhB2g1	220 (7.2)	132. MDRhB2	34 (1.1)
11. SBRcB2	33 (1.07)	154. YDRcB2g1	106 (3.45)
12. SBRcC3g1	168 (5.49)	113. HTKcC2g1	217 (7.1)
124. SBRbB3	94 (3.07)	161. HTKbB2g1	127 (4.14)
22. JNKiB2	22 (0.72)	165. HTKcB2	73 (2.4)
23. JNKiB2g1	56 (1.83)	171. MDGhA1	37 (1.22)
34. GWDcB2	20 (0.66)	153. KKRbB2g1	578 (18.89)
127. GWDmB2	87 (2.83)	175. KKRcB2	30 (0.97)

Land Management Units (LMU)

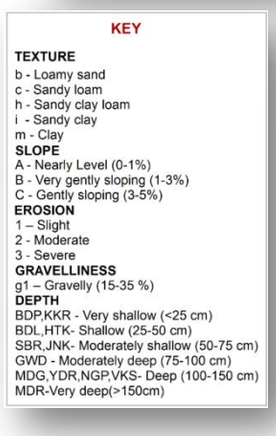
Grouping of similar soil areas based on their soil-site characteristics into management units that respond similarly for a given level of management are designated as land management units..



LMU	Area in ha (%)
LMU-1	230 (7.5)
LMU-2	71 (2.32)
LMU-3	25 (0.82)
LMU-4	78 (2.55)
LMU-5	295 (9.63)
LMU-6	766 (25.03)
LMU-7	707 (23.09)
Forest	165 (5.39)
Rock outcrops	613 (20.02)
Others*	112 (3.65)

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.

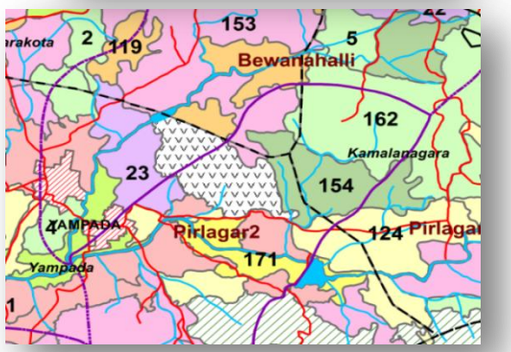


Key
S2- Moderately Suitable
S3- Marginally Suitable
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

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.



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 Bewanahalli Sub-watershed covering an area of 3060.48 ha are indicated below.

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

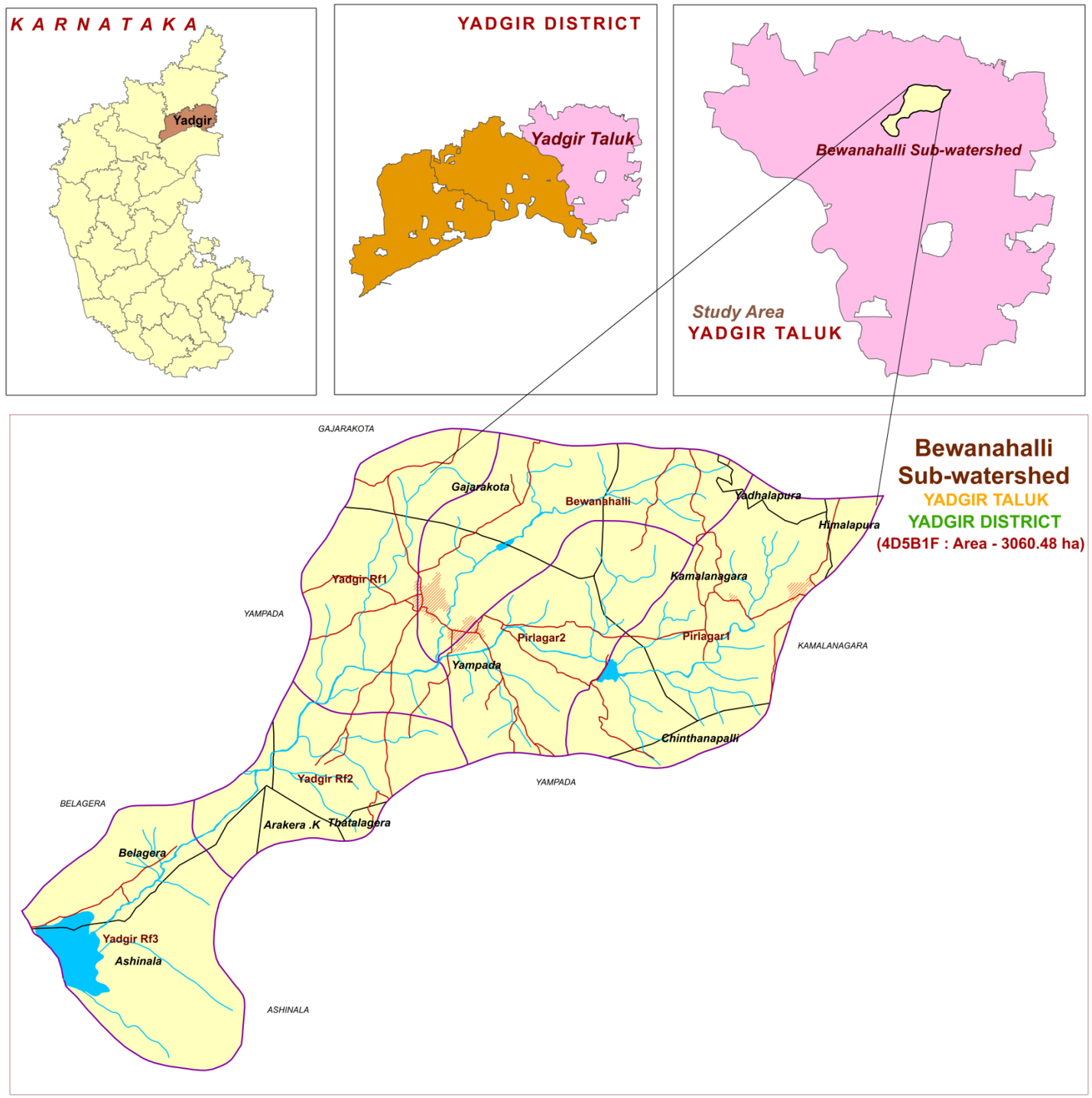
2. General Description of Sub-watershed

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

As a pilot study, **ICAR-NBSS&LUP, Bangalore** carried out the generation of SWs-LRI for the Bewanahalli Sub-watershed in Yadgir taluk, Yadgir district. It was selected for data base generation under Sujala III project. Bewanahalli Sub-watershed (code– 4D5B1F) is covering an area of 3060.48 ha and spread across Gajarakota, Belagera, Yampada, Kamalanagara and Ashinala Villages.

2.1. Location and Extent

LOCATION MAP OF BEWANAHALLI SUB-WATERSHED

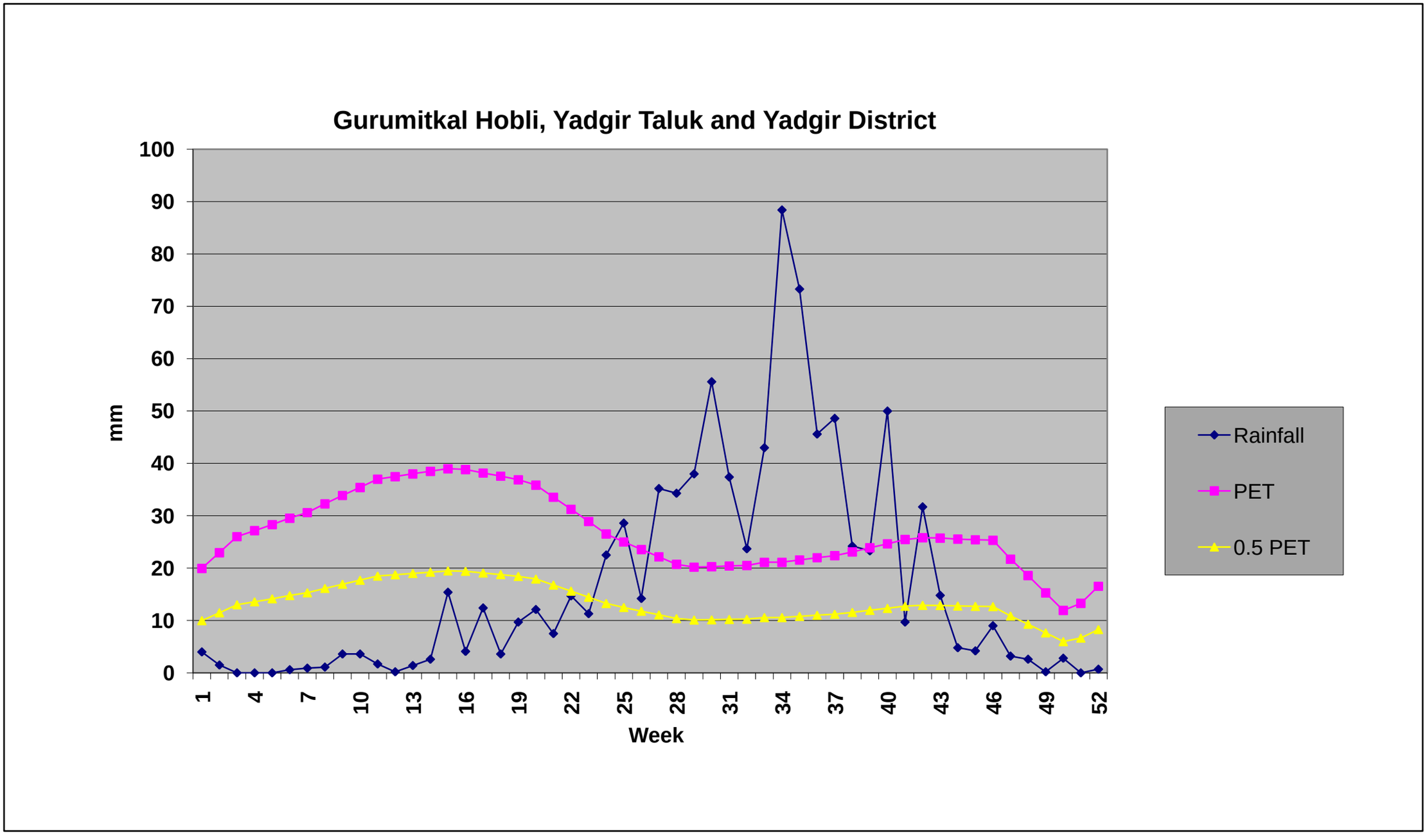


The Bewanahalli Sub-watershed (Yadgir taluk, Yadgir district) is located in between $16^0$47’ – $16^0$52’ North latitudes and $77^0$13’ – $77^0$19’ East longitudes, covering an area of about 3060.48 ha, bounded by Gajarakota, Belagera, Yampada, Kamalanagara and Ashinala Villages.

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

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

Climate

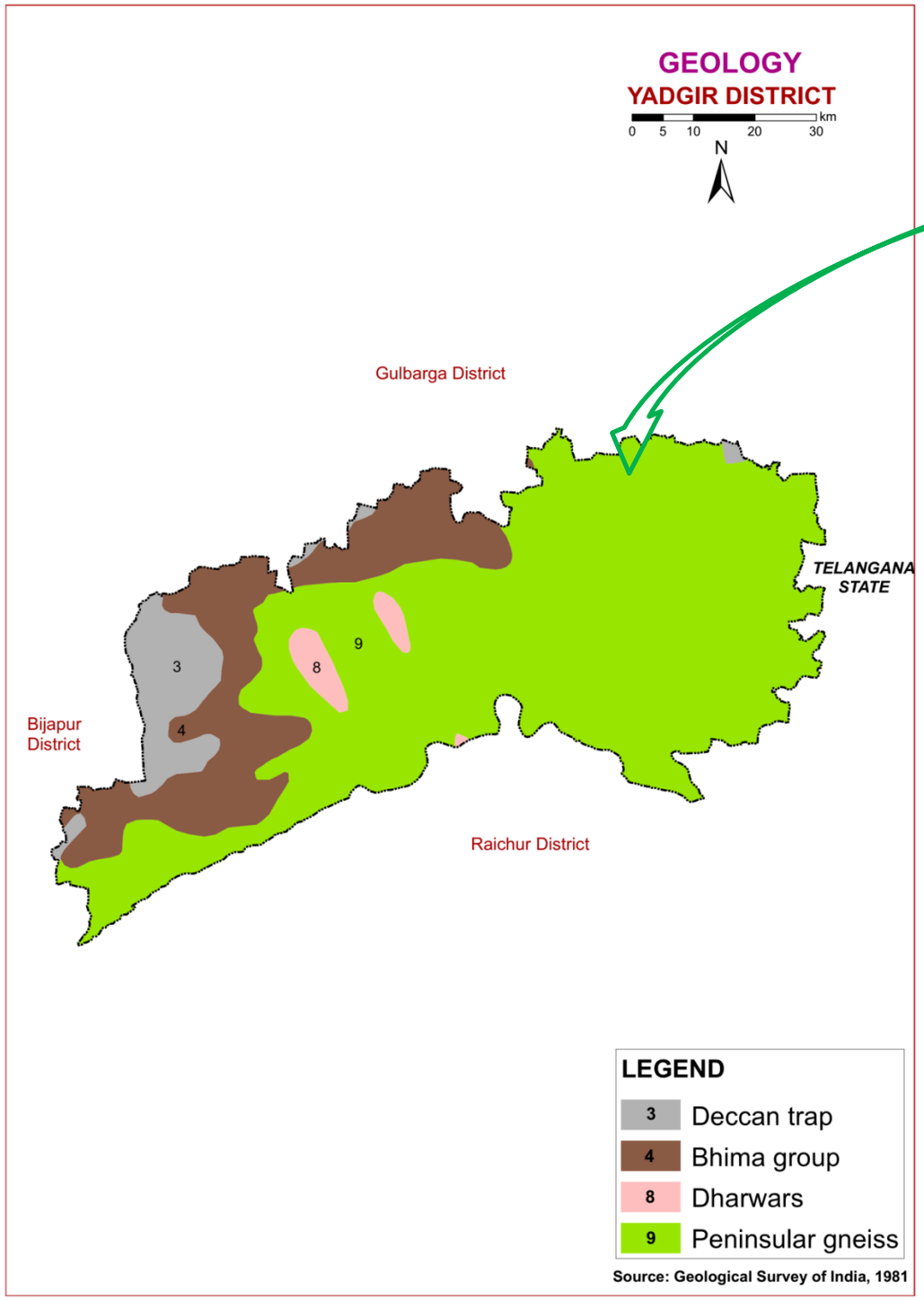


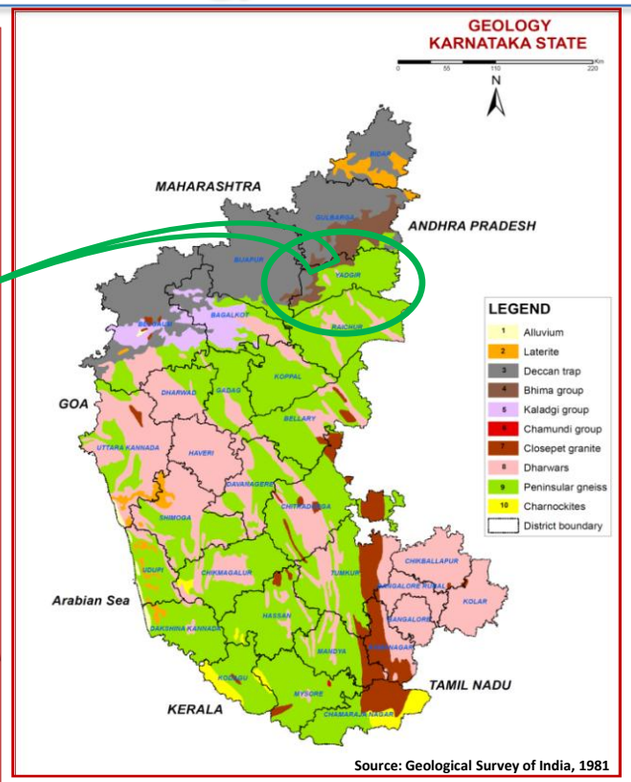
Length of Growing Period (LGP) is varying from June 4th week to 3rd week of October (120 - 150 days)

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

Source: KSNDMC (1980-2011)

2.3. Geology





GEOLOGY - KARNATAKA STATE

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

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

GEOLOGY - YADGIR DISTRICT

Mesozoic Group

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

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

Upper Proterozoic Group

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

Bhima series

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

Dharwar schists

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

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

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

Peninsular Gneiss

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

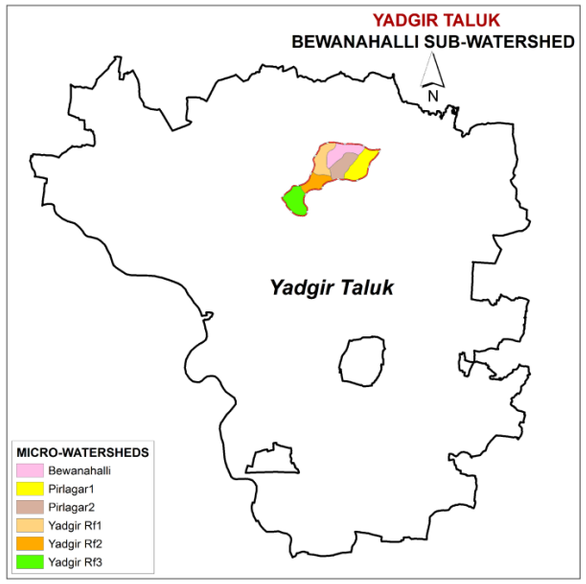
3. Survey Methodology

Sequence of activities in generation of LRI

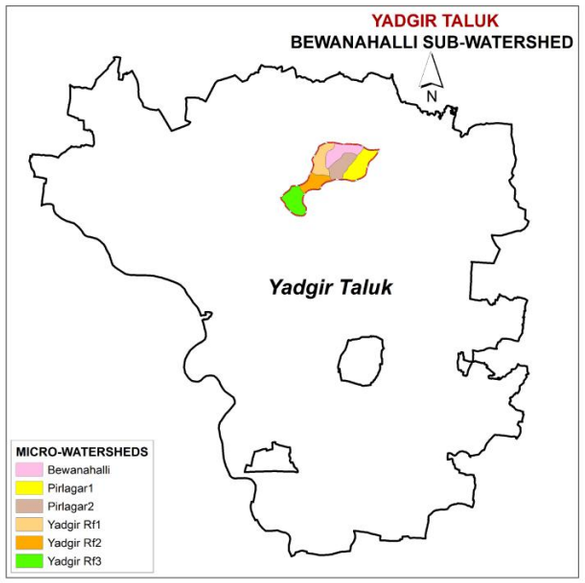
- Traversing the watershed using cadastral maps and imagery as base
- Identifying landforms, geology, land use and other features
- Selecting fields representing land units
- Opening profiles to 2 m depth
- Studying soil and site characteristics
- Grouping similar areas based on their soil-site characteristics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

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

3.1. Database Used - Cadastral map



3.2. Database Used - Satellite Image



SATELLITE IMAGE

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

Gajarakota

Bewanahalli

Yadhalapura

Himalapura

Kamalanagara

Yadgir Rf1

YAMPADA

Pirlagar2

Pirlagar1

KAMALANAGARA

Yampada

Chinthanapalli

Yadgir Rf2

BELAGERA

YAMPADA

Arakera .K

Thatalagera

Belagera

Yadgir Rf3

Ashinala

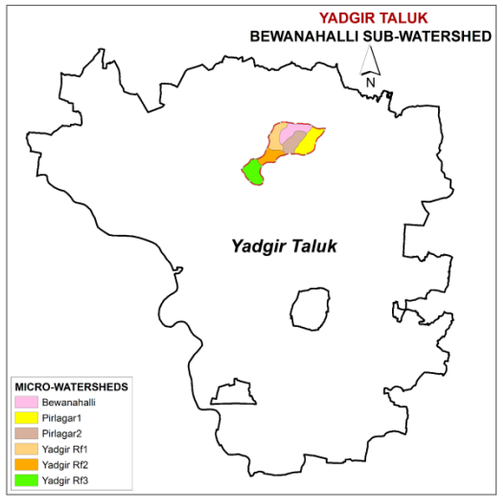
ASHINALA

References

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

Source: ICAR-NBSS&LUP, Bengaluru

3.3. Current Landuse

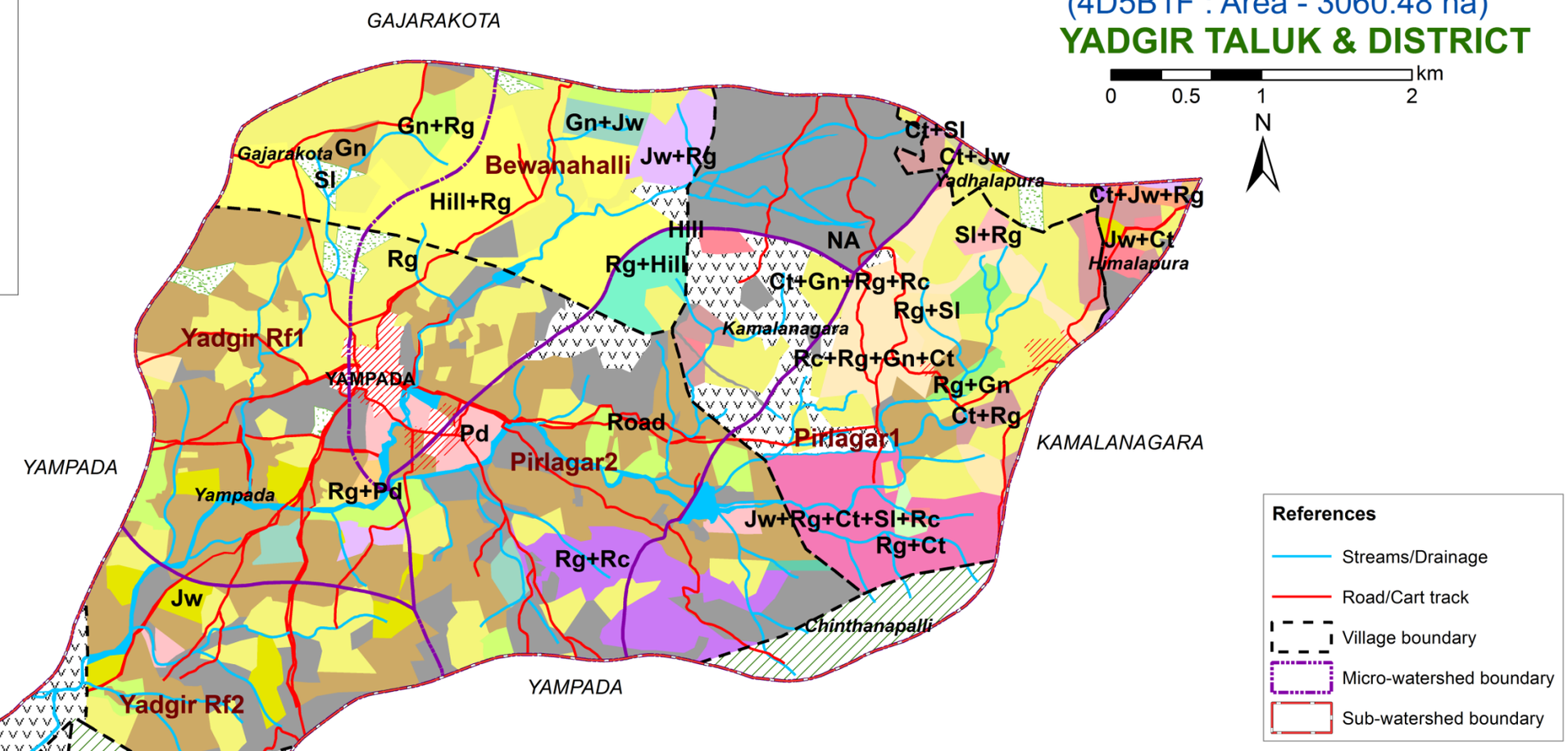


CURRENT LANDUSE (2018)

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



References

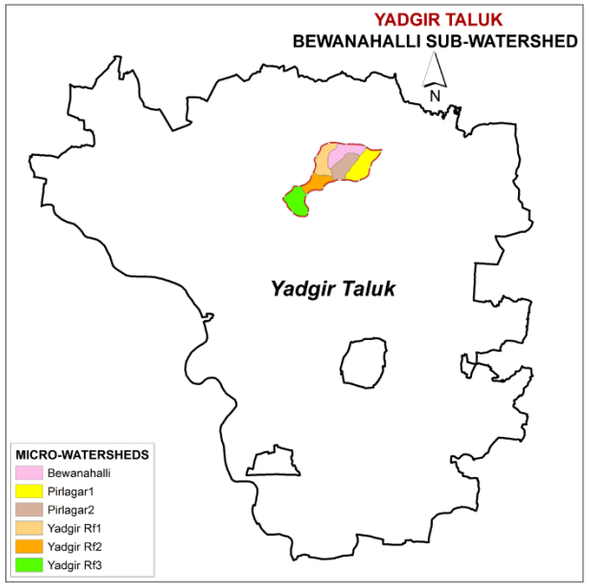
- Streams/Drainage
- Road/Cart track
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Current LandUse

Cotton (Ct)	Hill+Redgram (Hill+Rg)	Cotton+Groundnut+Redgram+Rock outcrops (Ct+Gn+Rg+Rc)
Greengram (Gg)	Jowar+Cotton (Jw+Ct)	Rock outcrops+Redgram+Groundnut+Cotton (Rc+Rg+Gn+Ct)
Groundnut (Gn)	Jowar+Groundnut (Gn+Jw)	Jowar+Redgram+Cotton+Scrubland+Rock outcrops (Jw+Rg+Ct+Sl+Rc)
Jowar (Jw)	Jowar+Redgram (Jw+Rg)	Scrubland+Redgram (Sl+Rg)
Paddy (Pd)	Redgram+Cotton (Rg+Ct)	Scrubland (Sl)
Ragi(Ra)	Redgram+Groundnut (Rg+Gn)	Hill
Redgram (Rg)	Redgram+Hill (Rg+Hill)	Forest
Cotton+Jowar (Ct+Jw)	Redgram+Jowar (Rg+Jw)	Road
Cotton+Redgram (Ct+Rg)	Redgram+Paddy (Rg+Pd)	Habitation
Cotton+Scrubland (Ct+Sl)	Redgram+Rock outcrops (Rg+Rc)	Waterbody
Groundnut+Jowar (Gn+Jw)	Redgram+Scrubland (Rg+Sl)	Rock outcrops (Rc)
Groundnut+Redgram (Gn+Rg)	Cotton+Jowar+Redgram (Ct+Jw+Rg)	Not Available (NA)

Source: ICAR-NBSS&LUP, Bengaluru

3.4. Location of Wells



LOCATION OF WELLS

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

Gajarakota

Bewanahalli

Yadhalapura

Himalapura

Yadgir Rf1

YAMPADA

Kamalanagara

Pirlagar2

Pirlagar1

KAMALANAGARA

Yampada

Chinthanapalli

Yadgir Rf2

BELAGERA

YAMPADA

Arakera .K

Thatalagera

Belagera

Yadgir Rf3

Ashinala

ASHINALA

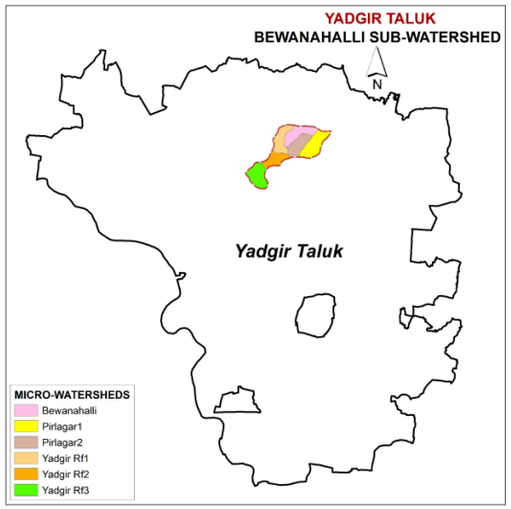
Legend	No's
Borewell	9
Check Dam	1
Openwell	1

References

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

Source: ICAR-NBSS&LUP, Bengaluru

4. The Soils



SOILS
Bewanahalli Sub-watershed
(4D5B1F : Area - 3060.48 ha)
YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

References

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

KEY

TEXTURE
b - Loamy sand
c - Sandy loam
h - Sandy clay loam
i - Sandy clay
m - Clay
SLOPE
A - Nearly Level (0-1%)
B - Very gently sloping (1-3%)
C - Gently sloping (3-5%)
EROSION
1 – Slight
2 - Moderate
3 - Severe
GRAVELLINESS
g1 – Gravelly (15-35 %)
DEPTH
BDP,KKR - Very shallow (<25 cm)
BDL,HTK- Shallow (25-50 cm)
SBR,JNK- Moderately shallow (50-75 cm)
GWD - Moderately deep (75-100 cm)
MDG,YDR,NGP,VKS- Deep (100-150 cm)
MDR-Very deep(>150cm)

Texture Gravelliness
JNK i B 2 g1
Soil Series Slope Erosion

Soil Phase	Area in ha (%)
Low Land	
100. VKSmB1	17 (0.56)
Forest	165 (5.39)
Rock outcrops	613 (20.02)
Others*	112 (3.65)

* - Habitation & Waterbody

Soil Phase	Area in ha (%)	Soil Phase	Area in ha (%)
Soil of Granite and Granite Gneiss Landscape			
2. BDLbB2	19 (0.62)	49. NGPmB2	25 (0.82)
4. BDLhB2	79 (2.57)	119. BDPiB3	86 (2.82)
5. BDLiB2	30 (0.98)	120. BDPhB2	13 (0.41)
162. BDLhB2g1	220 (7.2)	132. MDRhB2	34 (1.1)
11. SBRcB2	33 (1.07)	154. YDRcB2g1	106 (3.45)
12. SBRcC3g1	168 (5.49)	113. HTKcC2g1	217 (7.1)
124. SBRbB3	94 (3.07)	161. HTKbB2g1	127 (4.14)
22. JNKiB2	22 (0.72)	165. HTKcB2	73 (2.4)
23. JNKiB2g1	56 (1.83)	171. MDGhA1	37 (1.22)
34. GWDcB2	20 (0.66)	153. KKRbB2g1	578 (18.89)
127. GWDmB2	87 (2.83)	175. KKRcB2	30 (0.97)

Source: ICAR-NBSS&LUP, Bengaluru

4.1 Mapping unit description of Bewanahalli (4D5B1F) 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				
	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		**34 (1.1)**
132		MDRhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	34 (1.1)
	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		**106 (3.45)**
154		YDRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	106 (3.45)
	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		**37 (1.22)**
171		MDGhA1	Sandy clay loam surface, slope 0-1%, slight erosion	37 (1.22)
	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		**25 (0.82)**
49		NGPmB2	Clay surface, slope 1-3%, moderate erosion	25 (0.82)
	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		**107 (3.49)**
34		GWDcB2	Sandy loam surface, slope 1-3%, moderate erosion	20 (0.66)
127		GWDmB2	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	87 (2.83)
	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		**78 (2.55)**
22		JNKiB2	Sandy clay surface, slope 1-3%, moderate erosion	22 (0.72)
23		JNKiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	56 (1.83)

To be continued….

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
	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		**295 (9.63)**
11		SBRcB2	Sandy loam surface, slope 1-3%, moderate erosion	33 (1.07)
12		SBRcC3g1	Sandy loam surface, slope 3-5%, severe erosion, gravelly (15-35%)	168 (5.49)
124		SBRbB3	Loamy sand surface, slope 1-3%, severe erosion	94 (3.07)
	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		**128 (4.17)**
2		BDLbB2	Loamy sand surface, slope 1-3%, moderate erosion	19 (0.62)
4		BDLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	79 (2.57)
5		BDLiB2	Sandy clay surface, slope 1-3%, moderate erosion	30 (0.98)
	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		**417 (13.64)**
113		HTKcC2g1	Sandy loam surface, slope 3-5%, moderate erosion, gravelly (15-35%)	217 (7.1)
161		HTKbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	127 (4.14)
165		HTKcB2	Sandy loam surface, slope 1-3%, moderate erosion	73 (2.4)
	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		**220 (7.2)**
162		BDLhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	220 (7.2)

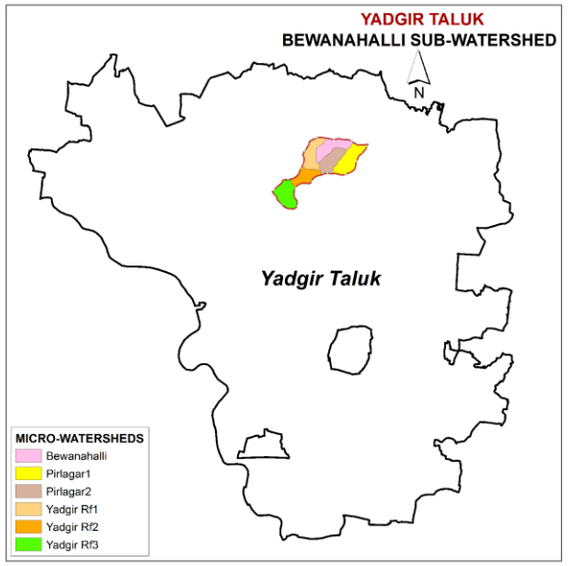
To be continued….

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
	BDP	Baddeppalli soils are very shallow (<25 cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**99 (3.23)**
119		BDPiB3	Sandy clay surface, slope 1-3%, severe erosion	86 (2.82)
120		BDPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	13 (0.41)
	KKR	Kakalawar soils are very shallow (<25 cm), well drained, have dark brown sandy loam soils occurring on very gently sloping uplands under cultivation		**608 (19.86)**
153		KKRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	578 (18.89)
175		KKRcB2	Sandy loam surface, slope 1-3%, moderate erosion	30 (0.97)
	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		**17 (0.56)**
100		VKSmB1	Clay surface, slope 1-3%, slight erosion	17 (0.56)
900		Forest		165 (5.39)
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	613 (20.02)
1000		Others	Habitation & Water body	112 (3.65)

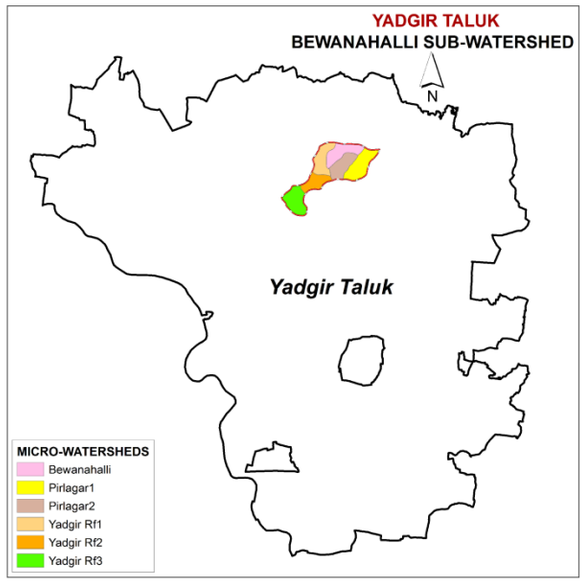
* Soil map unit numbers are continuous for the taluk, not for the sub-watershed

5. Soil Survey Interpretations

5.1. Land Capability Classification



5.2. Soil Depth



SOIL DEPTH
Bewanahalli Sub-watershed
(4D5B1F : Area - 3060.48 ha)
YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
YAMPADA
KAMALANAGARA
BELAGERA
YAMPADA
ASHINALA

Gajarakota
Bewanahalli
Yadhalapura
Himalapura
Yadgir Rf1
YAMPADA
Kamalanagara
Pirlagar2
Pirlagar1
Yampada
Chinthanapalli
Yadgir Rf2
Arakera .K
Thatalagera
Belagera
Yadgir Rf3
Ashinala

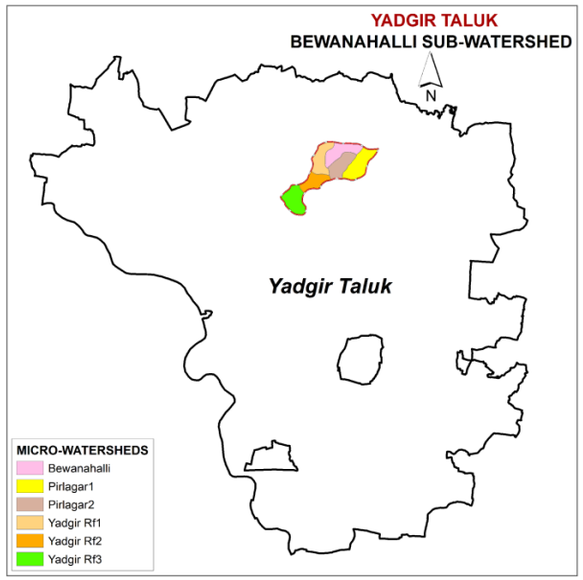
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Depth Class	Area in ha (%)
Very shallow (<25 cm)	707 (23.09)
Shallow (25-50 cm)	766 (25.03)
Moderately shallow (50-75 cm)	373 (12.17)
Moderately deep (75-100 cm)	107 (3.49)
Deep (100-150 cm)	186 (6.06)
Very deep (>150 cm)	34 (1.1)
Rock outcrops	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.3. Surface Soil Texture



SURFACE SOIL TEXTURE

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

References

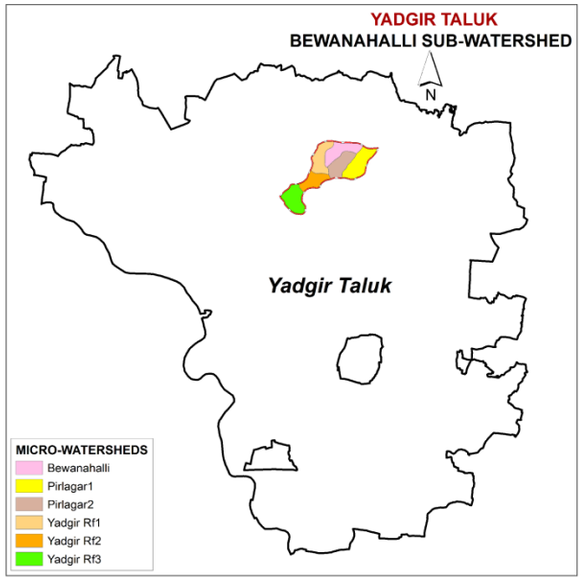
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Texture Class	Area in ha(%)
Loamy sand	818 (26.73)
Sandy loam	647 (21.14)
Sandy clay loam	383 (12.5)
Sandy clay	194 (6.35)
Clay	129 (4.22)
Rock outcrops	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

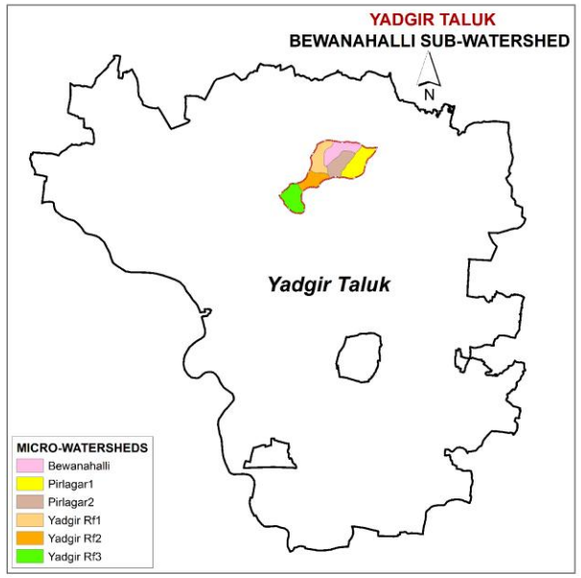
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

5.4. Surface Soil Gravelliness



5.5. Available Water Capacity

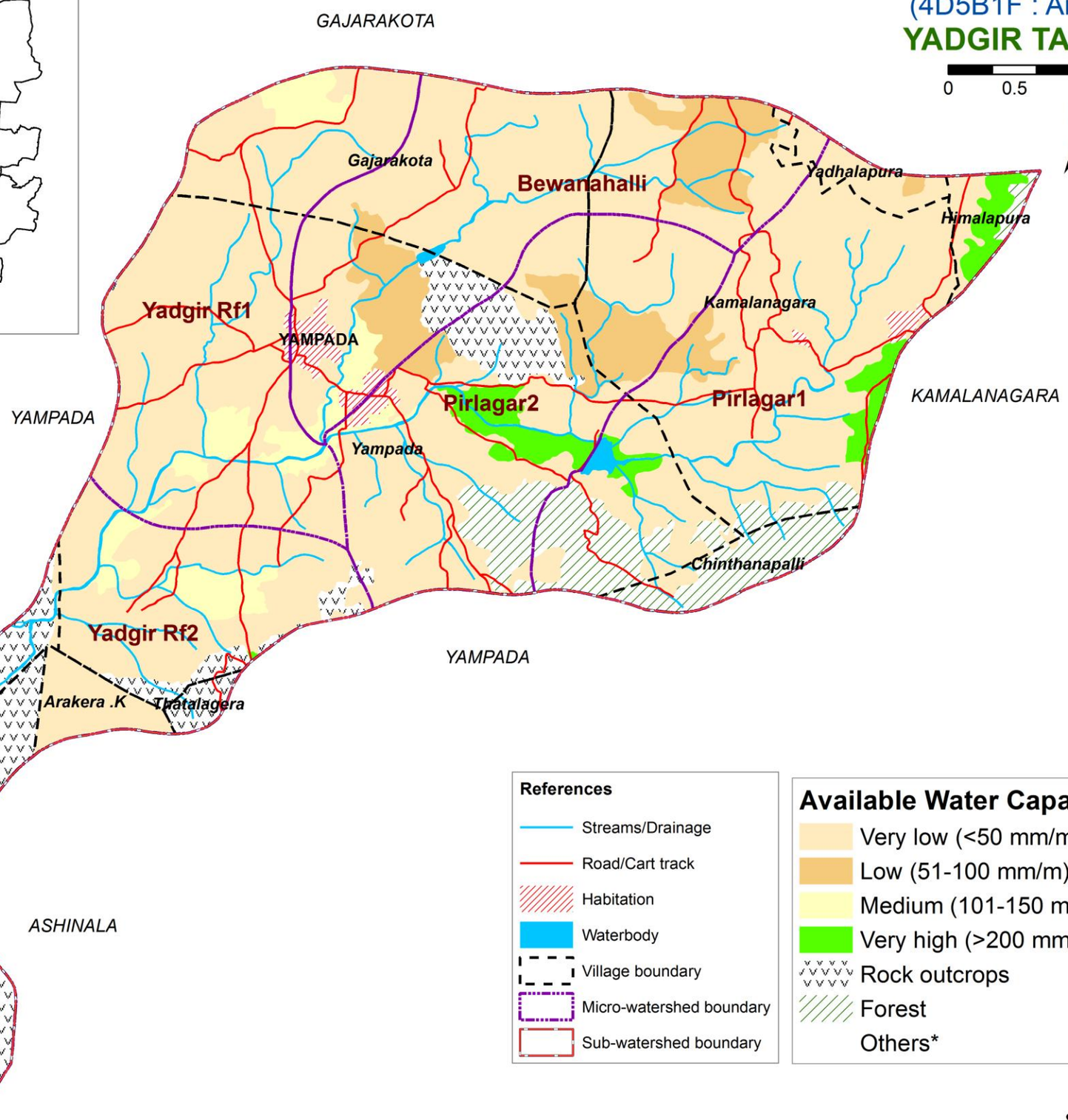


AVAILABLE WATER CAPACITY

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



km
0 0.5 1 2
N

References

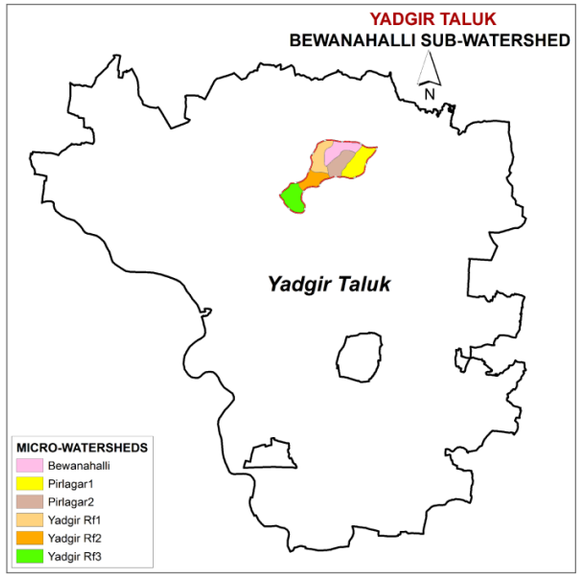
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Available Water Capacity	Area in ha (%)
Very low (<50 mm/m)	1767 (57.74)
Low (51-100 mm/m)	184 (6.0)
Medium (101-150 mm/m)	107 (3.49)
Very high (>200 mm/m)	114 (3.71)
Rock outcrops	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

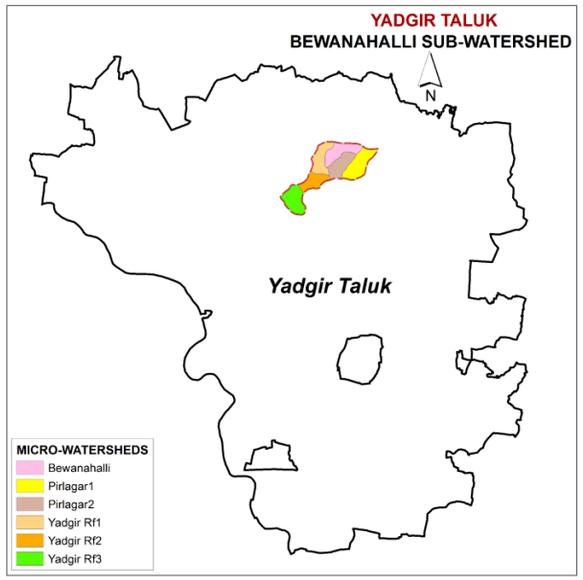
Source: ICAR-NBSS&LUP, Bengaluru

5.6.Slope


YADGIR TALUK
BEWANAHALLI SUB-WATERSHED
N
Yadgir Taluk
MICRO-WATERSHEDS
Bewanahalli
Pirlagar1
Pirlagar2
Yadgir Rf1
Yadgir Rf2
Yadgir Rf3

SLOPE
Bewanahalli Sub-watershed
(4D5B1F : Area - 3060.48 ha)
YADGIR TALUK & DISTRICT
km
0
0.5
1
2
N
GAJARAKOTA
Gajarakota
Bewanahalli
Yadhalapura
Himalapura
Yadgir Rf1
YAMPADA
Kamalanagara
Pirlagar2
Pirlagar1
KAMALANAGARA
Yampada
Chinthanapalli
Yadgir Rf2
BELAGERA
YAMPADA
Arakera .K
Tratalagera
Belagera
Yadgir Rf3
Ashinala
ASHINALA
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%) 37 (1.22)
Very gently sloping (1-3%) 1748 (57.12)
Gently sloping (3-5%) 385 (12.59)
Rock outcrops 613 (20.02)
Forest 165 (5.39)
Others* 112 (3.65)
* - Habitation & Waterbody
Source: ICAR-NBSS&LUP, Bengaluru

5.7.Soil Erosion



SOIL EROSION
Bewanahalli Sub-watershed
(4D5B1F : Area - 3060.48 ha)
YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA
KAMALANAGARA
YAMPADA
BELAGERA
YAMPADA
ASHINALA

Gajarakota
Bewanahalli
Yadhalapura
Himalapura
Yadgir Rf1
YAMPADA
Kamalanagara
Pirlagar2
Pirlagar1
Yampada
Chinthanapalli
Yadgir Rf2
Arakera .K
Tratalagera
Belagera
Yadgir Rf3
Ashinala

References

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

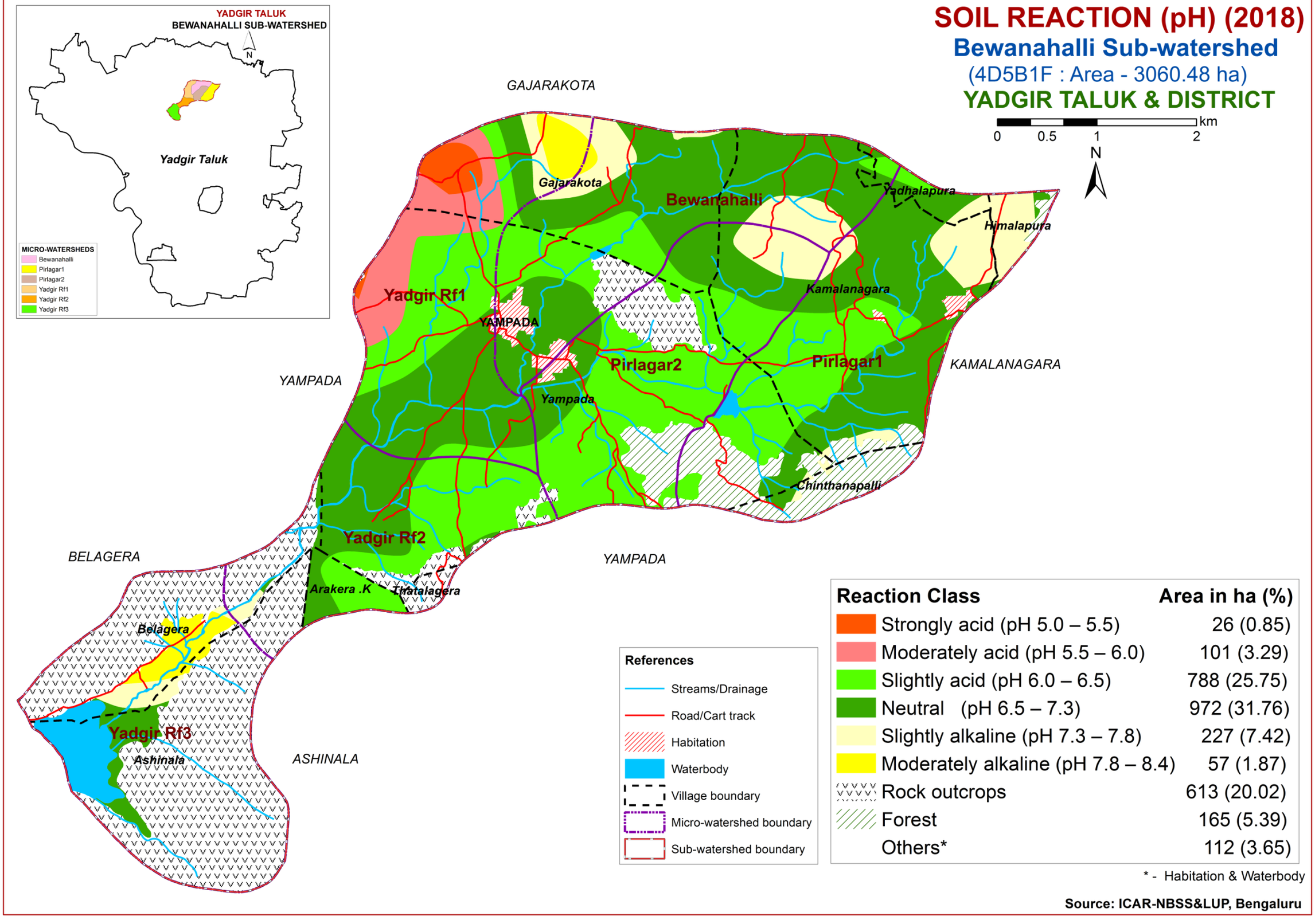
Erosion Class	Area in ha(%)
Slight	55 (1.79)
Moderate	1768 (57.78)
Severe	348 (11.38)
Rock outcrops	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

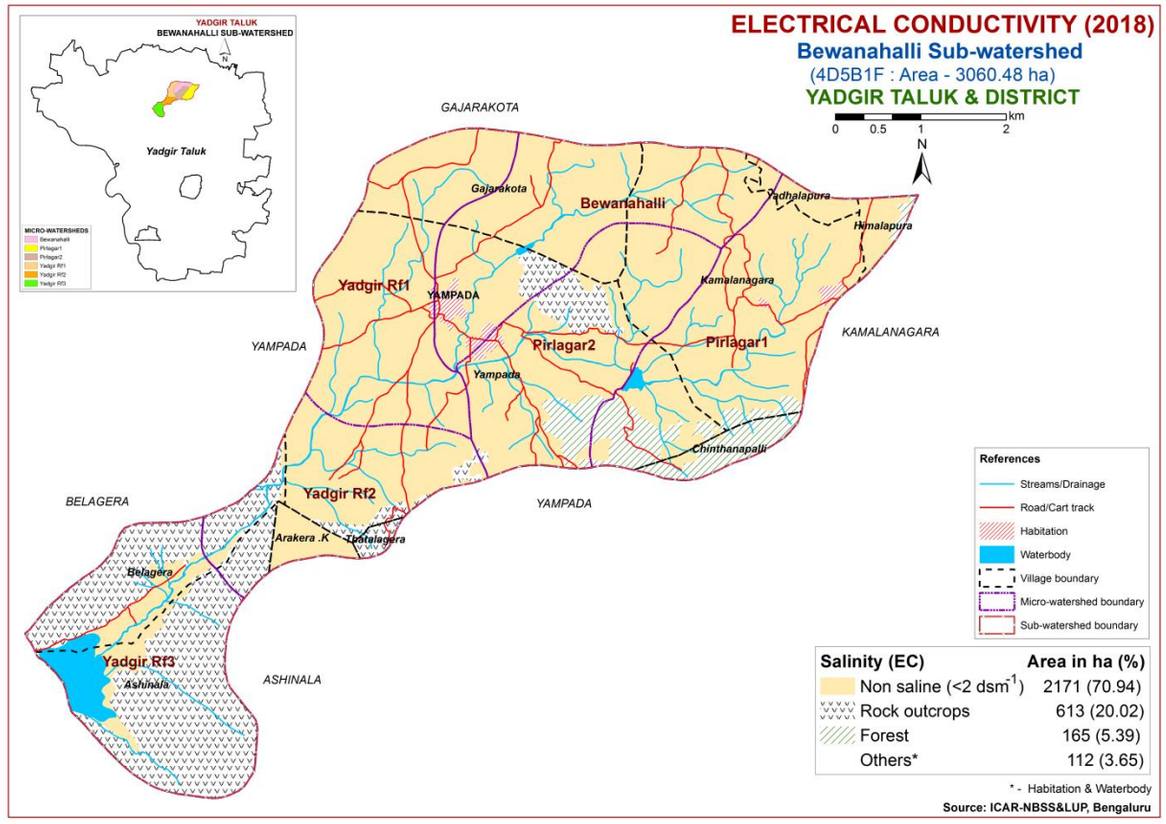
Source: ICAR-NBSS&LUP, Bengaluru

6. Soil Fertility Status

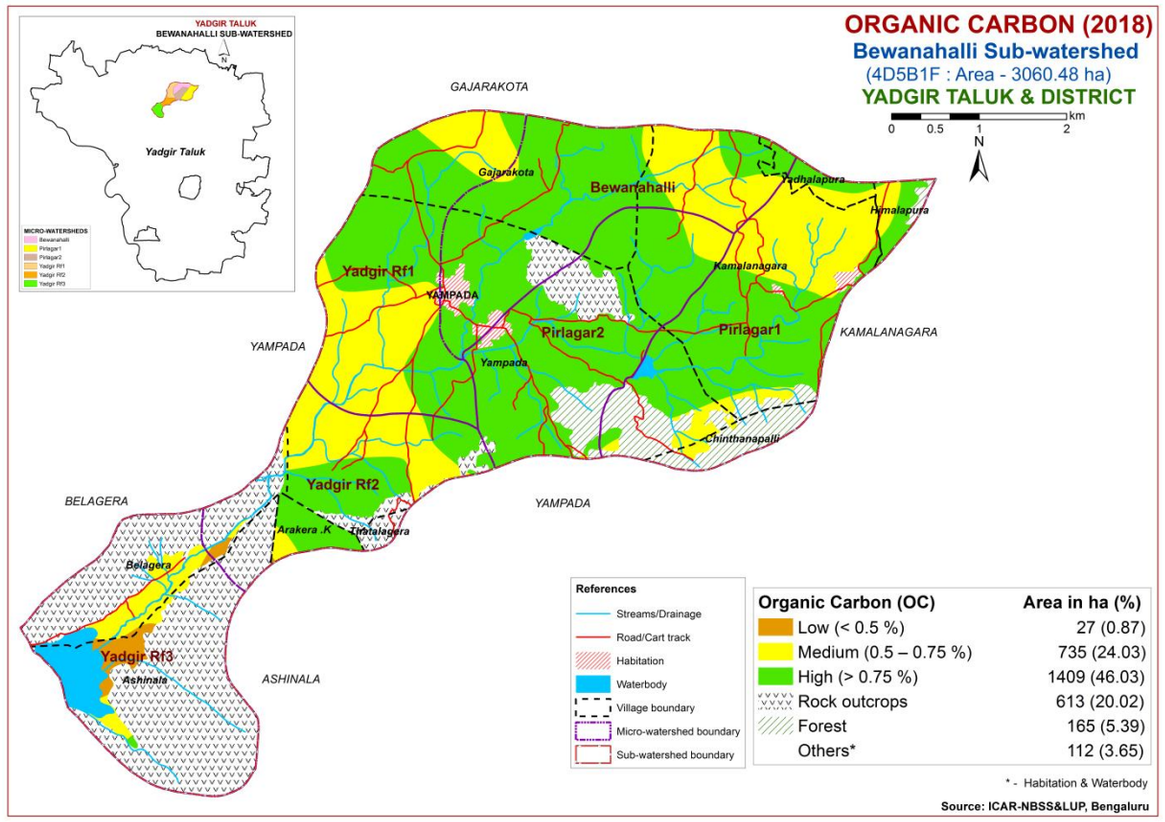
6.1. Soil Reaction (pH)



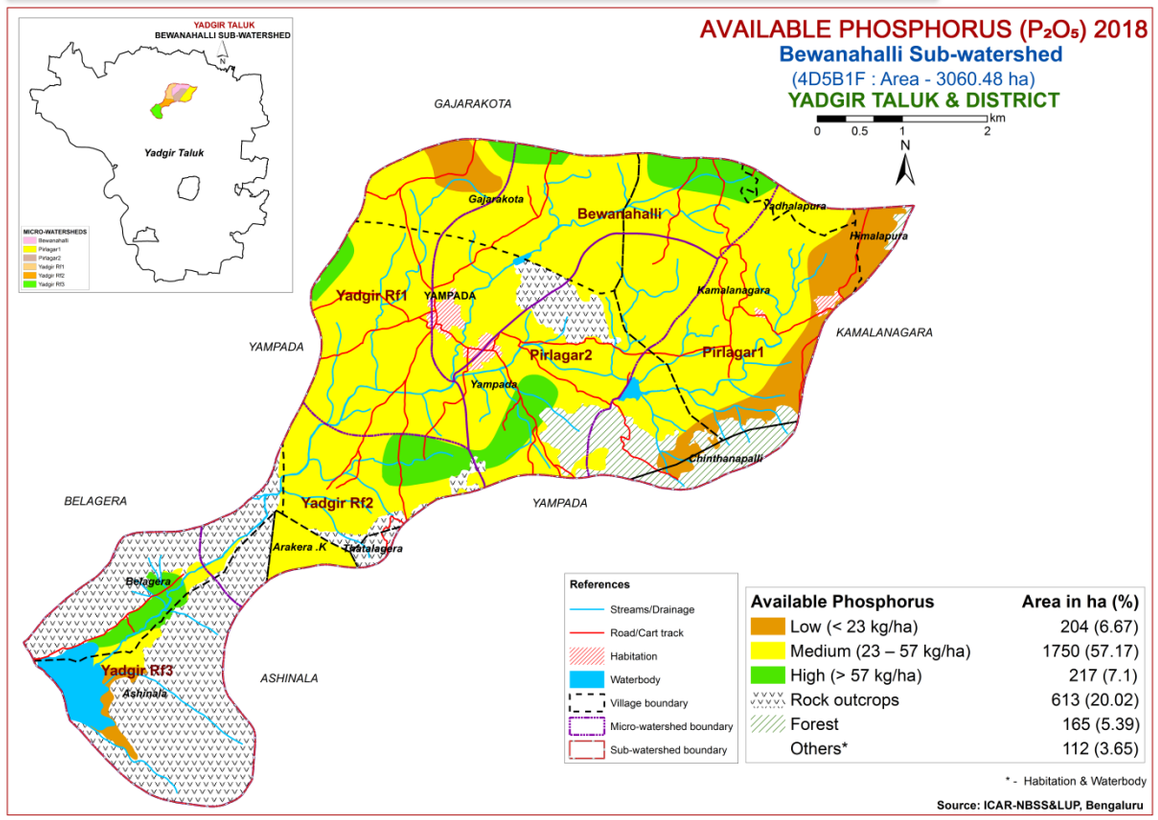
6.2. Electrical Conductivity (EC)



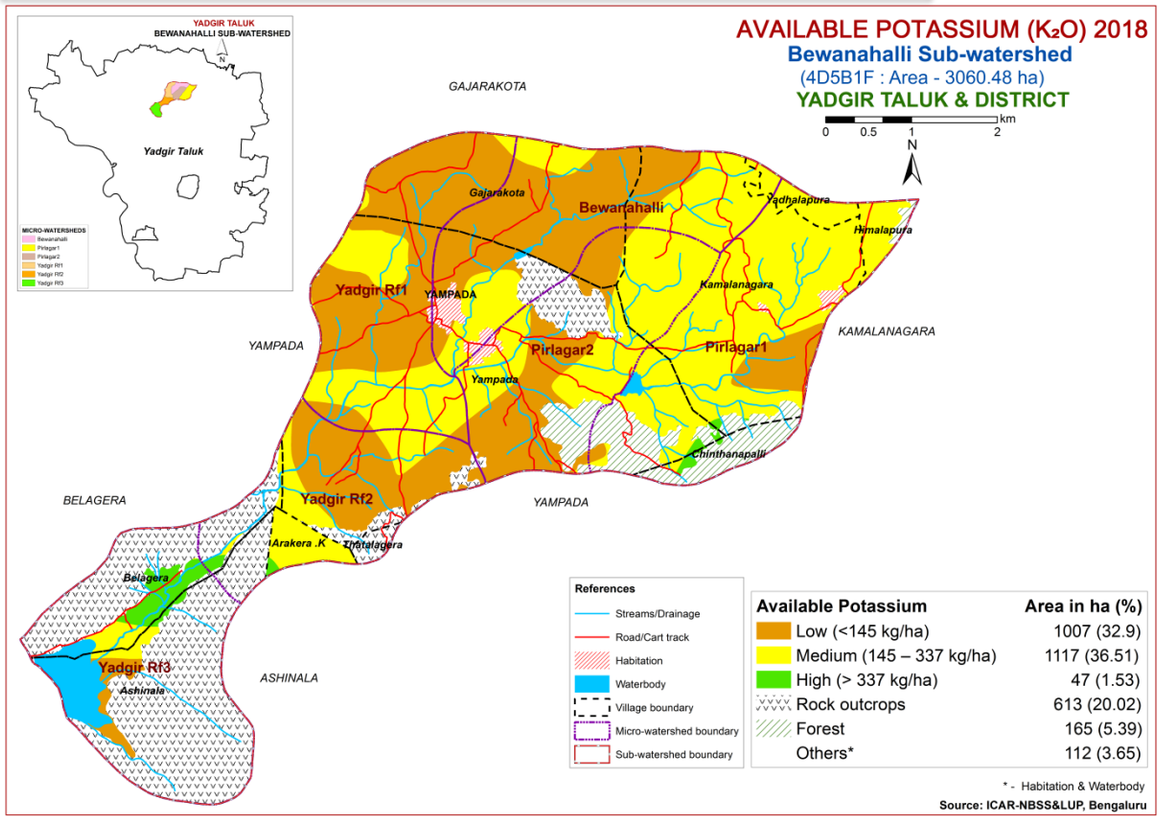
6.3. Organic Carbon



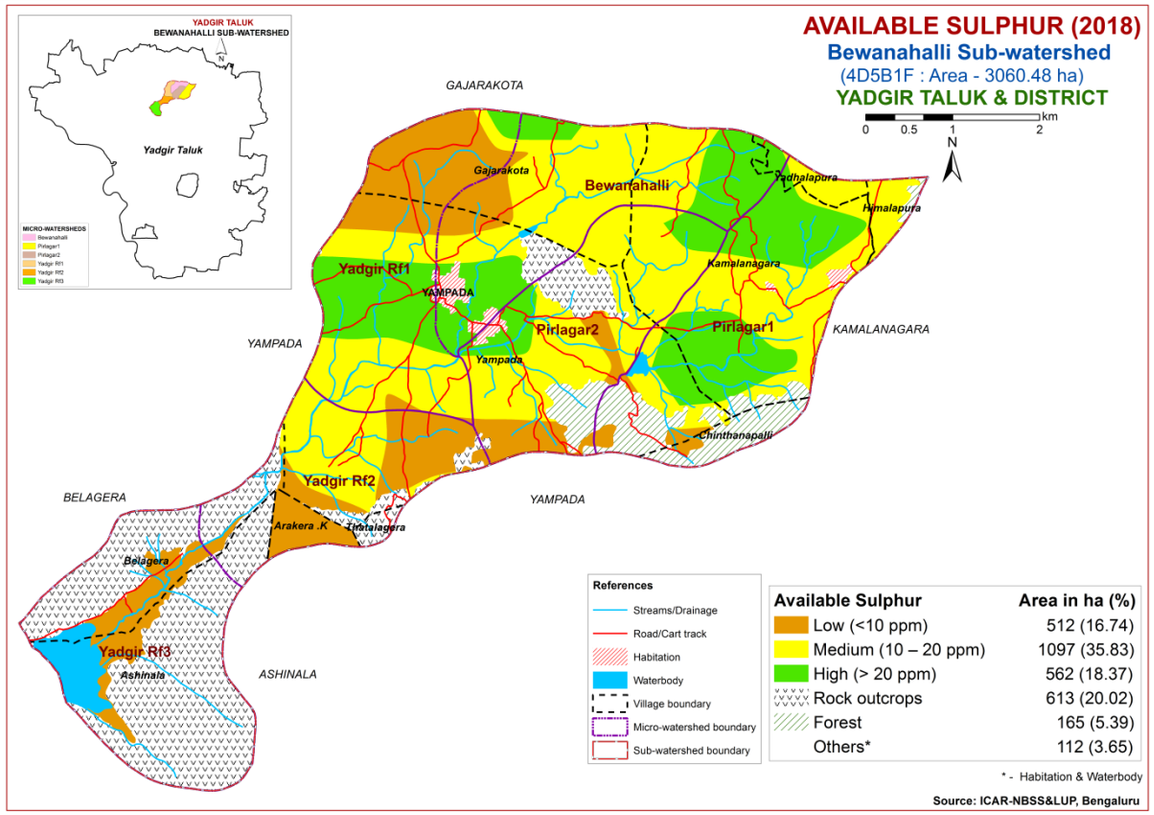
6.4. Available Phosphorus (P_2O_5)



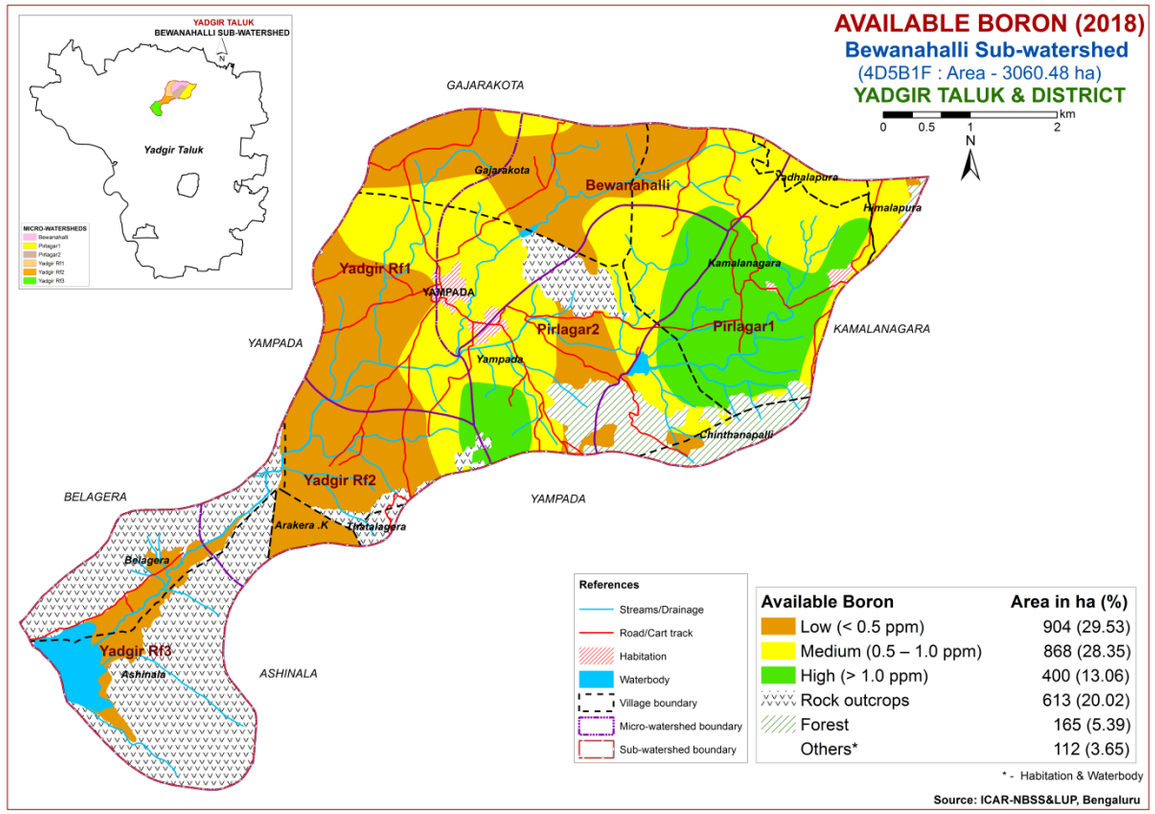
6.5. Available Potassium (K_2O)



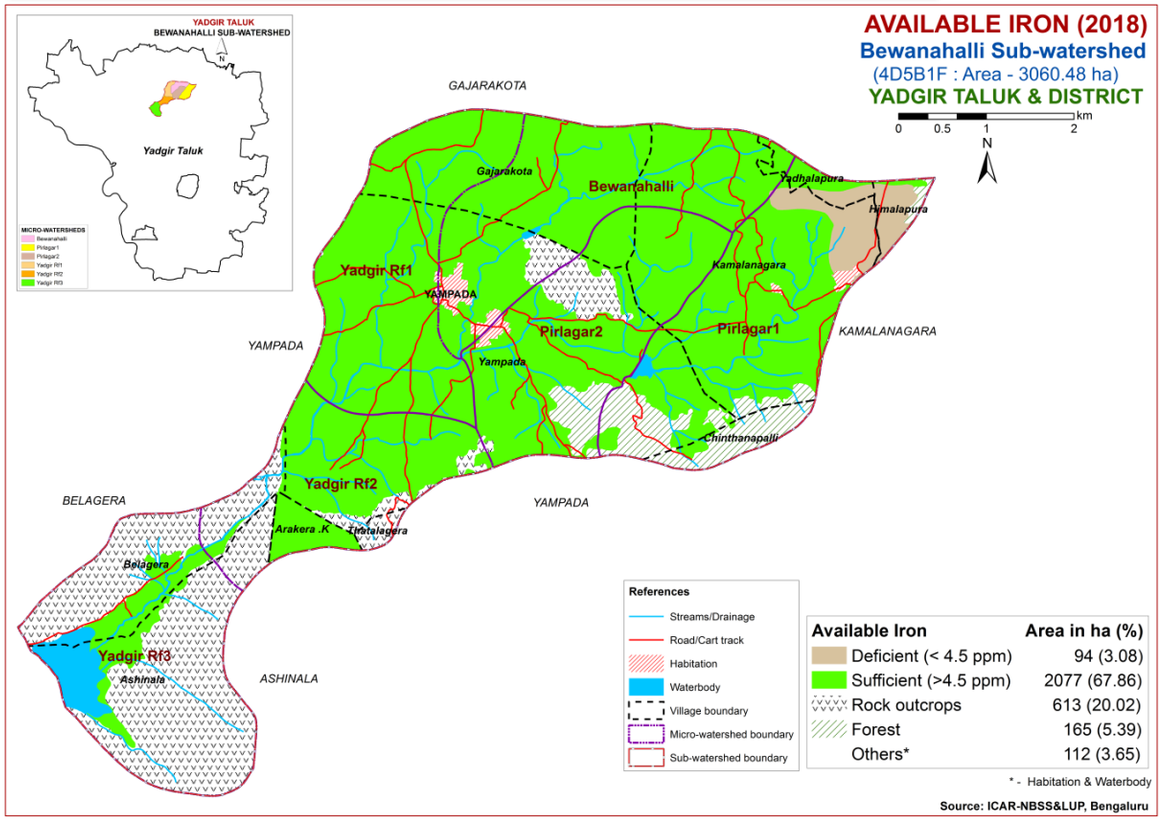
6.6. Available Sulphur



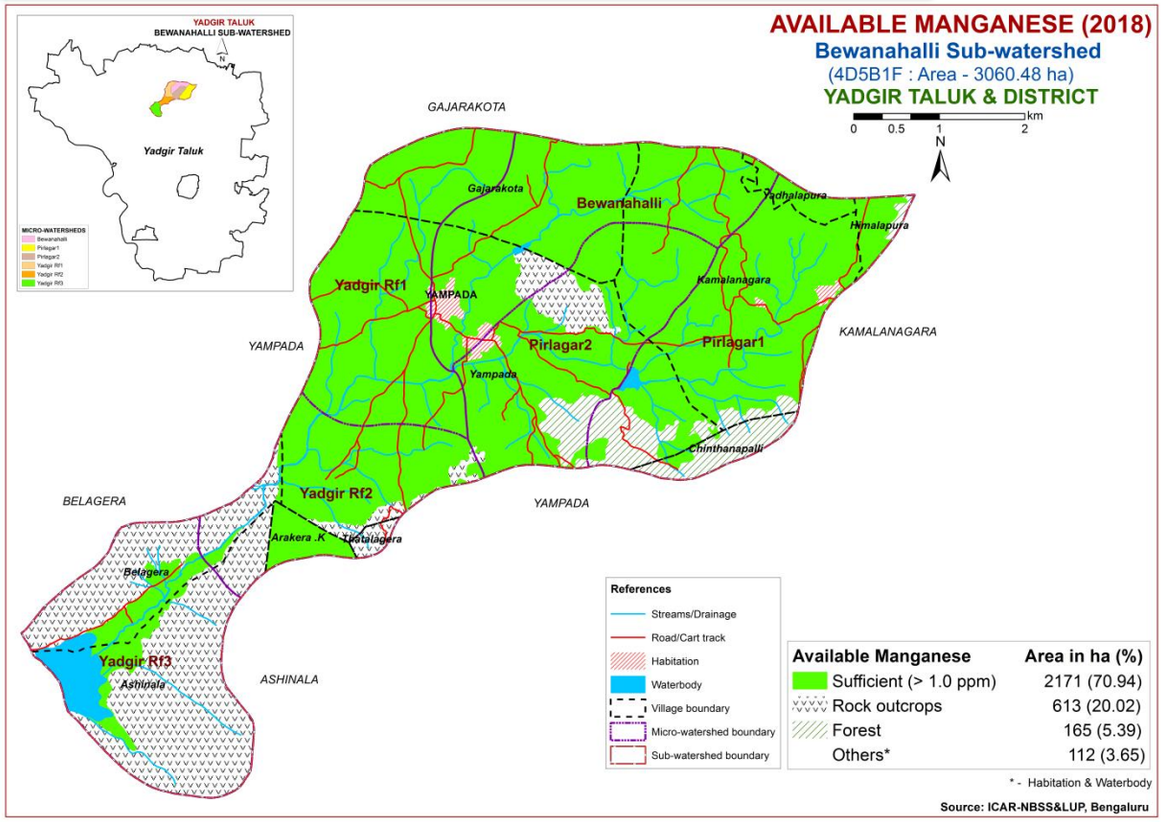
6.7. Available Boron



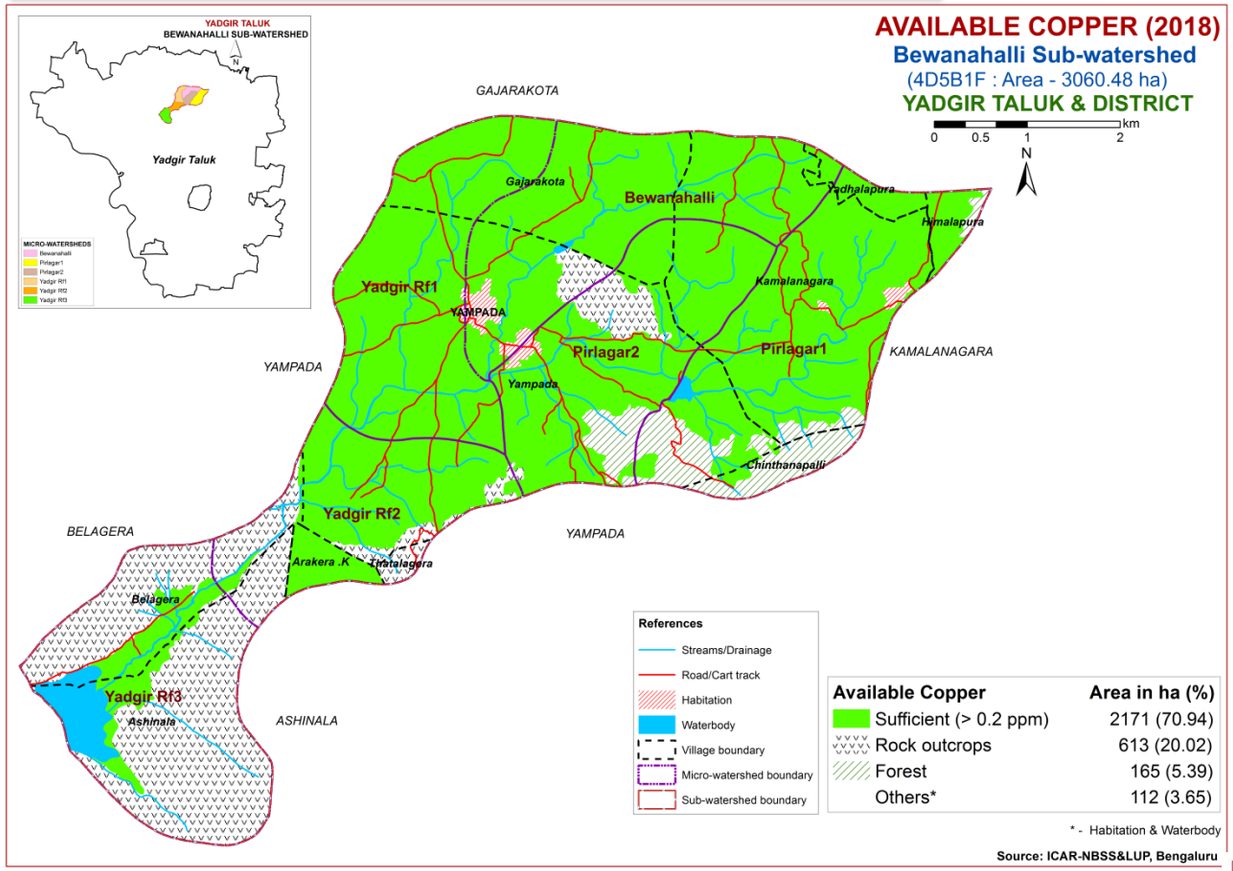
6.8. Available Iron



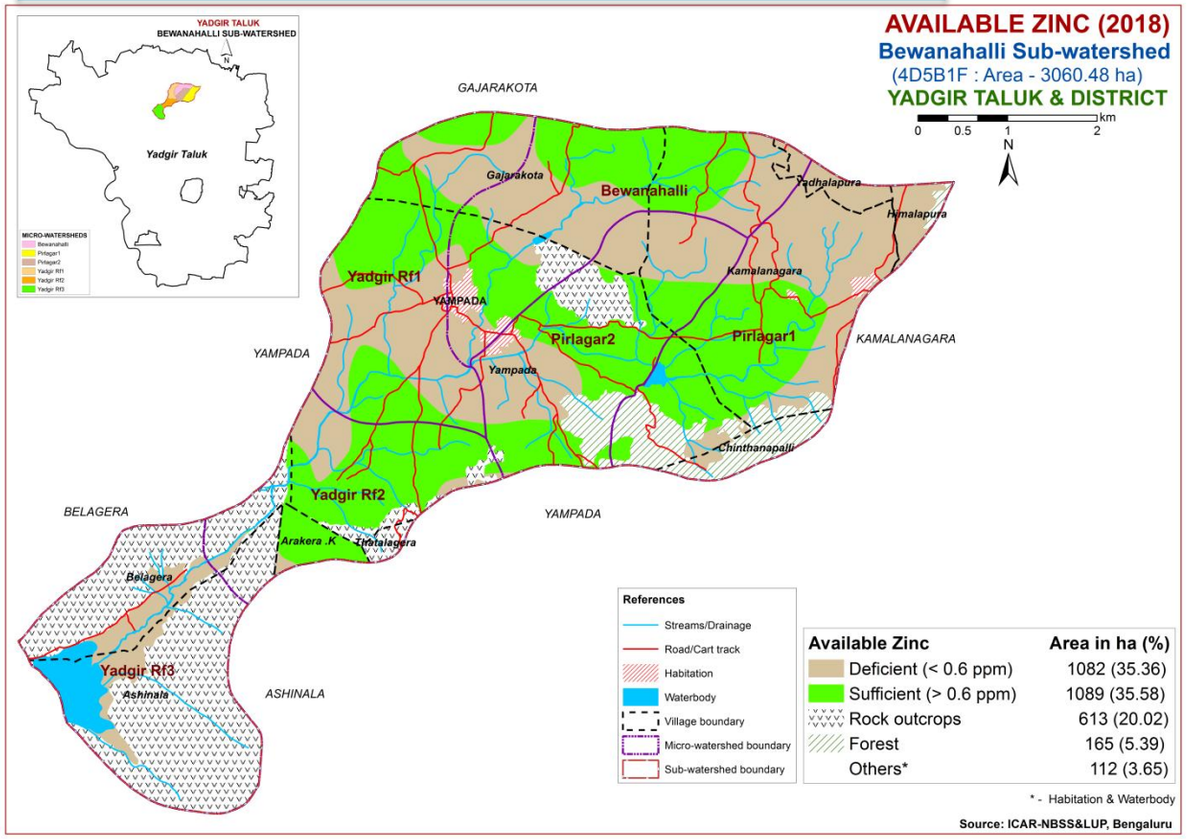
6.9. Available Manganese



6.10. Available Copper



6.11. Available Zinc



6.12. Correcting the Soil Nutrient Deficiencies

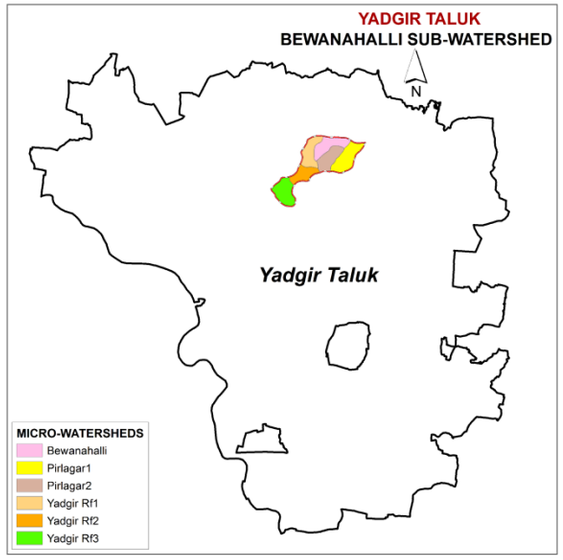
1. Reclamation of Salt affected soils
   a) When the soil is having neutral pH (6.5-7.5), no need of adding amendments (lime or gypsum)
   b) If the soil pH is <6.5, apply burnt lime to soil as per specifically recommended dosage and again after 2 years proper change has to be made based on soil test 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

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

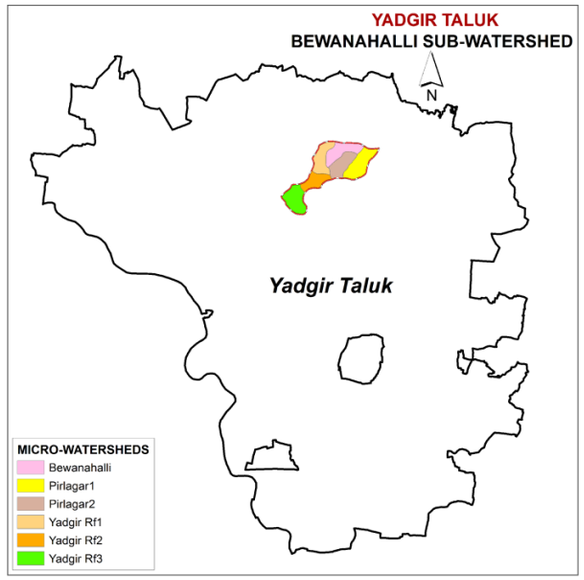
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2z	25 (0.82)
S2rt	78 (2.55)
S2tn	71 (2.32)
S3n	17 (0.56)
S3t	295 (9.63)
S3nt	106 (3.45)
S3nz	107 (3.49)
S3rt	766 (25.03)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.2. Land Suitability for Maize



LAND SUITABILITY FOR MAIZE

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

km 0 0.5 1 2

N

GAJARAKOTA

Gajarakota

N1r

Bewanahalli

Yadhalapura

Himalapura

S2tz

S3rt

Yadgir Rf1

YAMPADA

S2r

S3nt

Kamalanagara

S3t

KAMALANAGARA

Pirlagar2

Pirlagar1

S3n

S2n

Yampada

S3nz

Yadgir Rf2

Chinthanapalli

BELAGERA

YAMPADA

Arakera .K

Thatalagera

Belagera

Yadgir Rf3

Ashinala

N2

ASHINALA

Key

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

Limitations

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

References

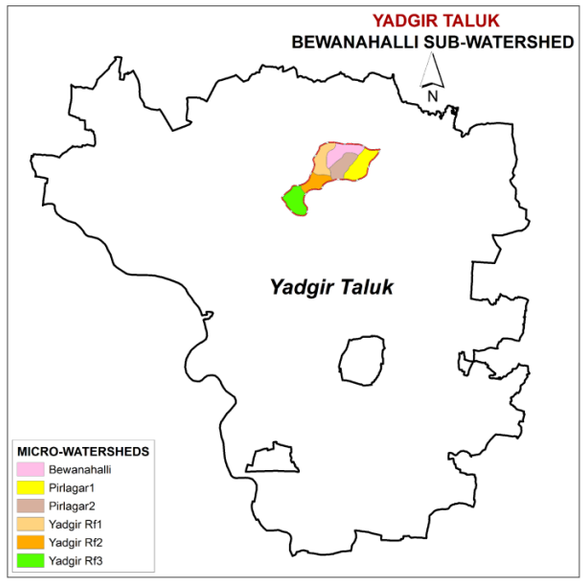
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2n	71 (2.32)
S2r	78 (2.55)
S2tz	25 (0.82)
S3n	17 (0.56)
S3t	295 (9.63)
S3nt	106 (3.45)
S3nz	107 (3.49)
S3rt	766 (25.03)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.3. Land Suitability for Redgram

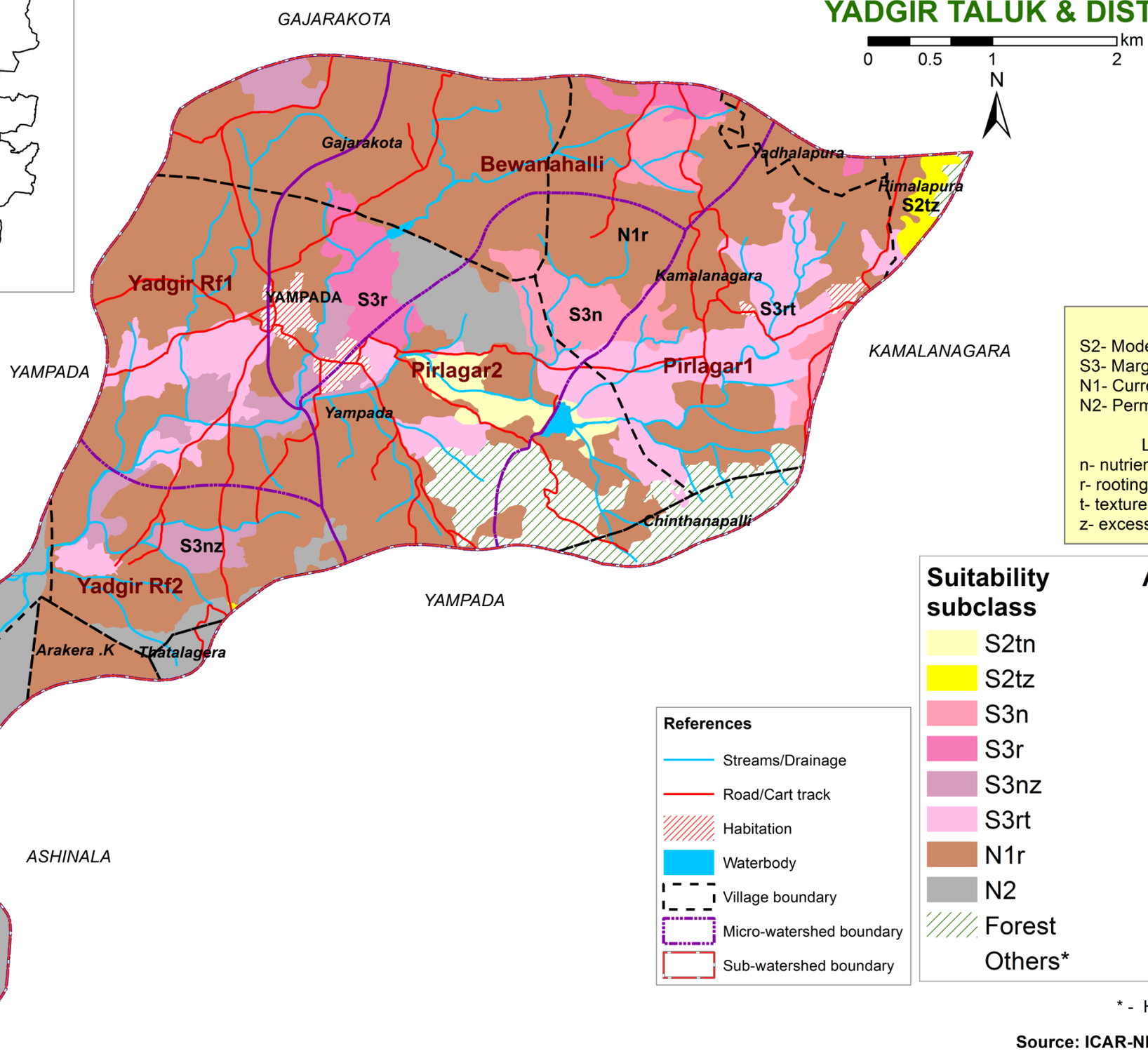


LAND SUITABILITY FOR REDGRAM

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



0 0.5 1 2 km

N

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

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

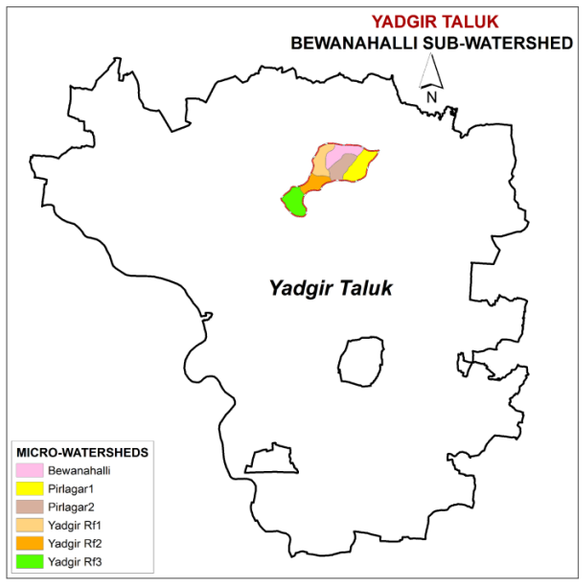
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2tn	71 (2.32)
S2tz	25 (0.82)
S3n	123 (4.02)
S3r	78 (2.55)
S3nz	107 (3.49)
S3rt	295 (9.63)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.4. Land Suitability for Bajra

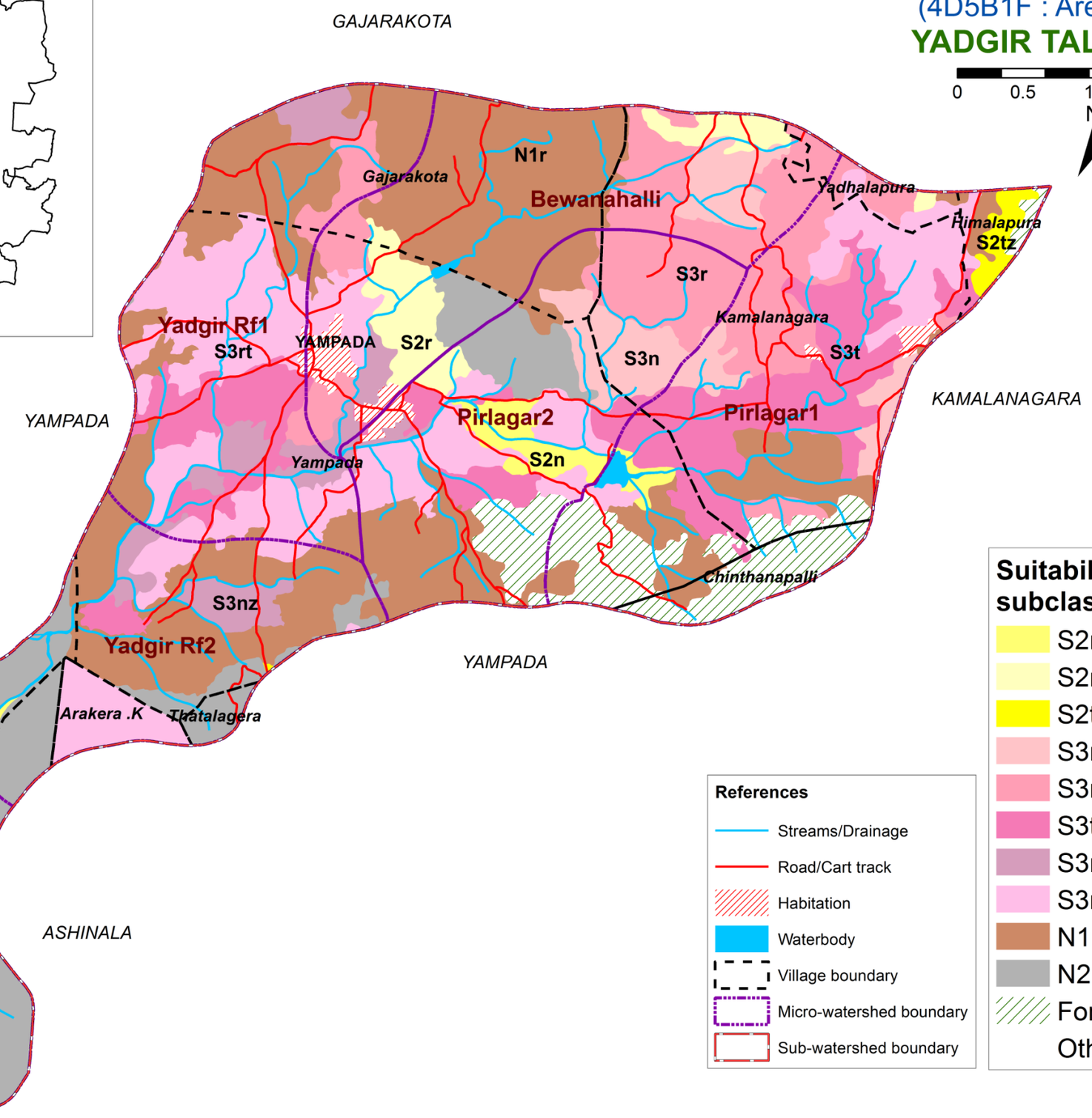


LAND SUITABILITY FOR BAJRA

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



km
0 0.5 1 2
N

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

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

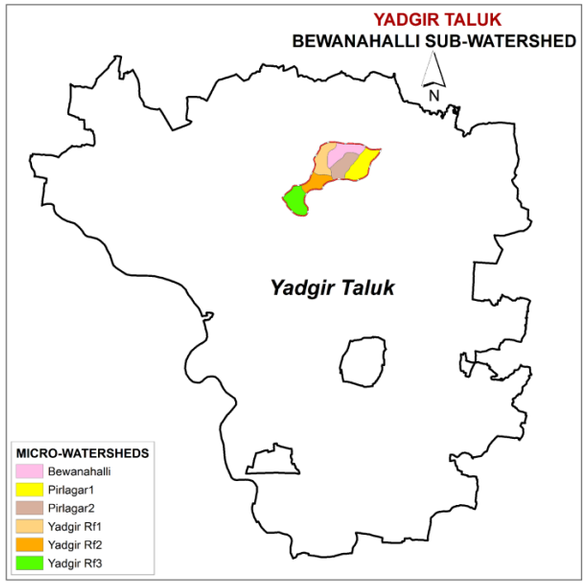
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2n	71 (2.32)
S2r	78 (2.55)
S2tz	25 (0.82)
S3n	123 (4.02)
S3r	348 (11.38)
S3t	295 (9.63)
S3nz	107 (3.49)
S3rt	418 (13.65)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.5. Land Suitability for Drumstick



LAND SUITABILITY FOR DRUMSTICK

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

Key
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

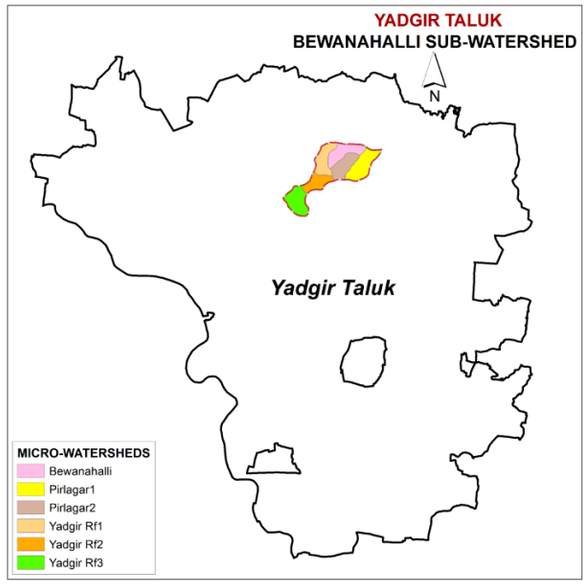
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3r	78 (2.55)
S3z	25 (0.82)
S3rt	295 (9.63)
N1n	301 (9.83)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.6. Land Suitability for Sunflower



LAND SUITABILITY FOR SUNFLOWER

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

References

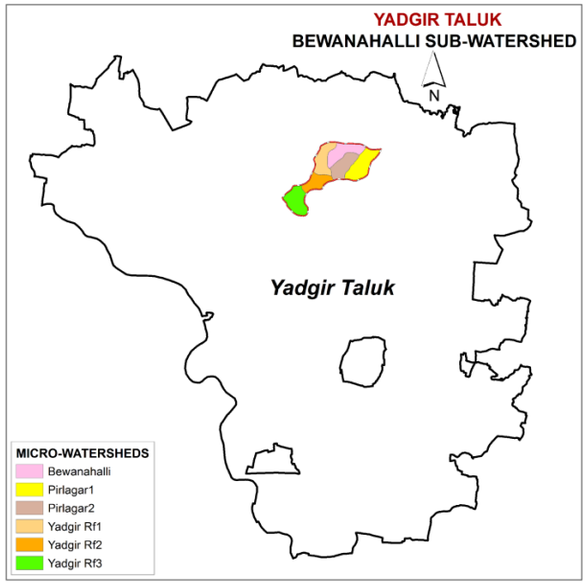
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2z	25 (0.82)
S3n	71 (2.32)
S3r	78 (2.55)
S3rt	295 (9.63)
N1n	230 (7.5)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.7. Land Suitability for Cotton



LAND SUITABILITY FOR COTTON

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

Key

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

Limitations

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

References

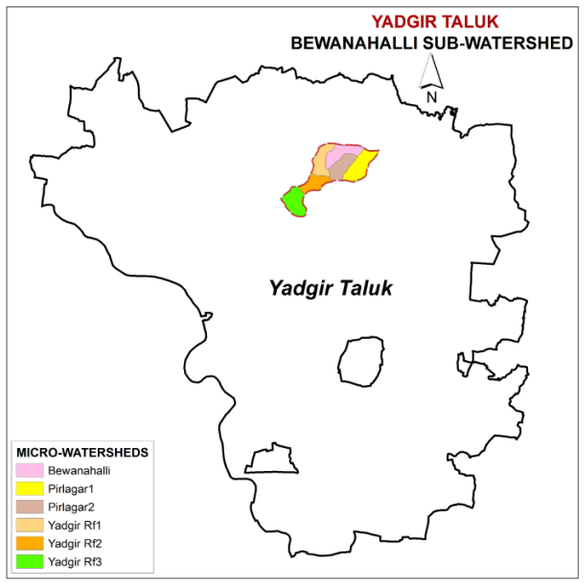
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2z	25 (0.82)
S3t	78 (2.55)
S3nt	17 (0.56)
S3nz	107 (3.49)
S3tn	71 (2.32)
N1r	707 (23.09)
N1t	1166 (38.1)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.8. Land Suitability for Bengalgram



LAND SUITABILITY FOR BENGALGRAM

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

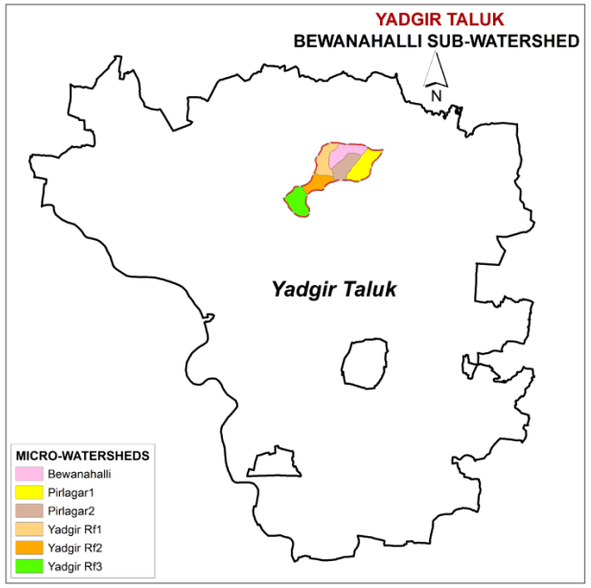
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2z	25 (0.82)
S3t	149 (4.87)
S3nt	17 (0.56)
S3nz	107 (3.49)
N1r	707 (23.09)
N1t	1166 (38.1)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.9. Land Suitability for Groundnut



LAND SUITABILITY FOR GROUNDNUT

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

References

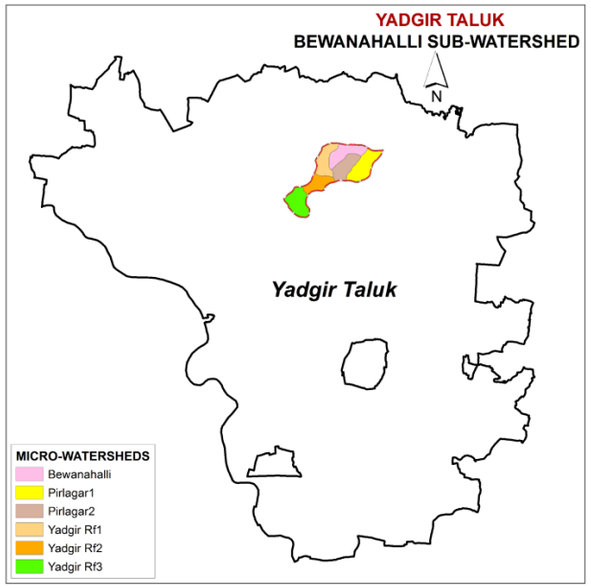
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S3n	71 (2.32)
S3r	766 (25.03)
S3t	320 (10.45)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.10. Land Suitability for Chilli



LAND SUITABILITY FOR CHILLI

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

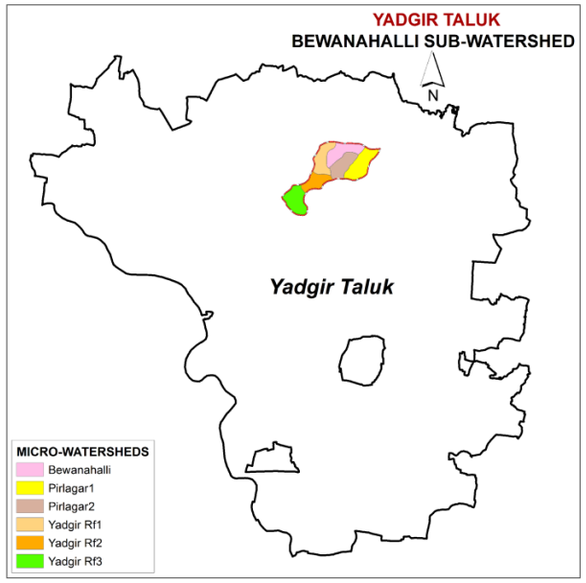
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S2tz	25 (0.82)
S3n	71 (2.32)
S3r	766 (25.03)
S3t	295 (9.63)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.11. Land Suitability for Pomegranate



LAND SUITABILITY FOR POMEGRANATE

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

References

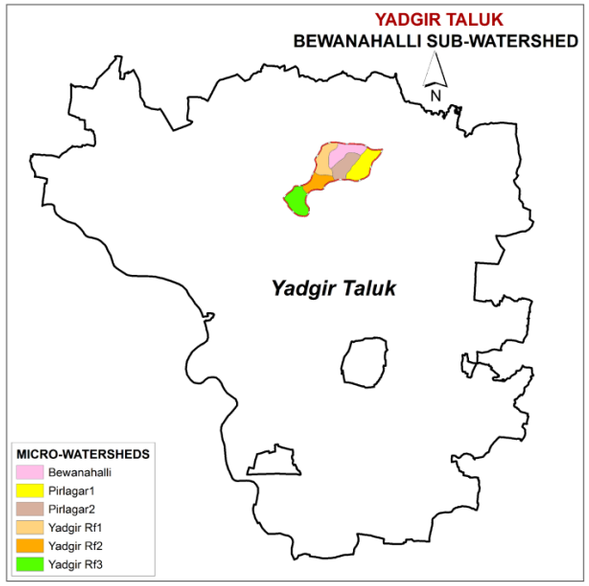
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2tz	25 (0.82)
S3n	71 (2.32)
S3r	78 (2.55)
S3rt	295 (9.63)
N1n	230 (7.5)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.12. Land Suitability for Tomato

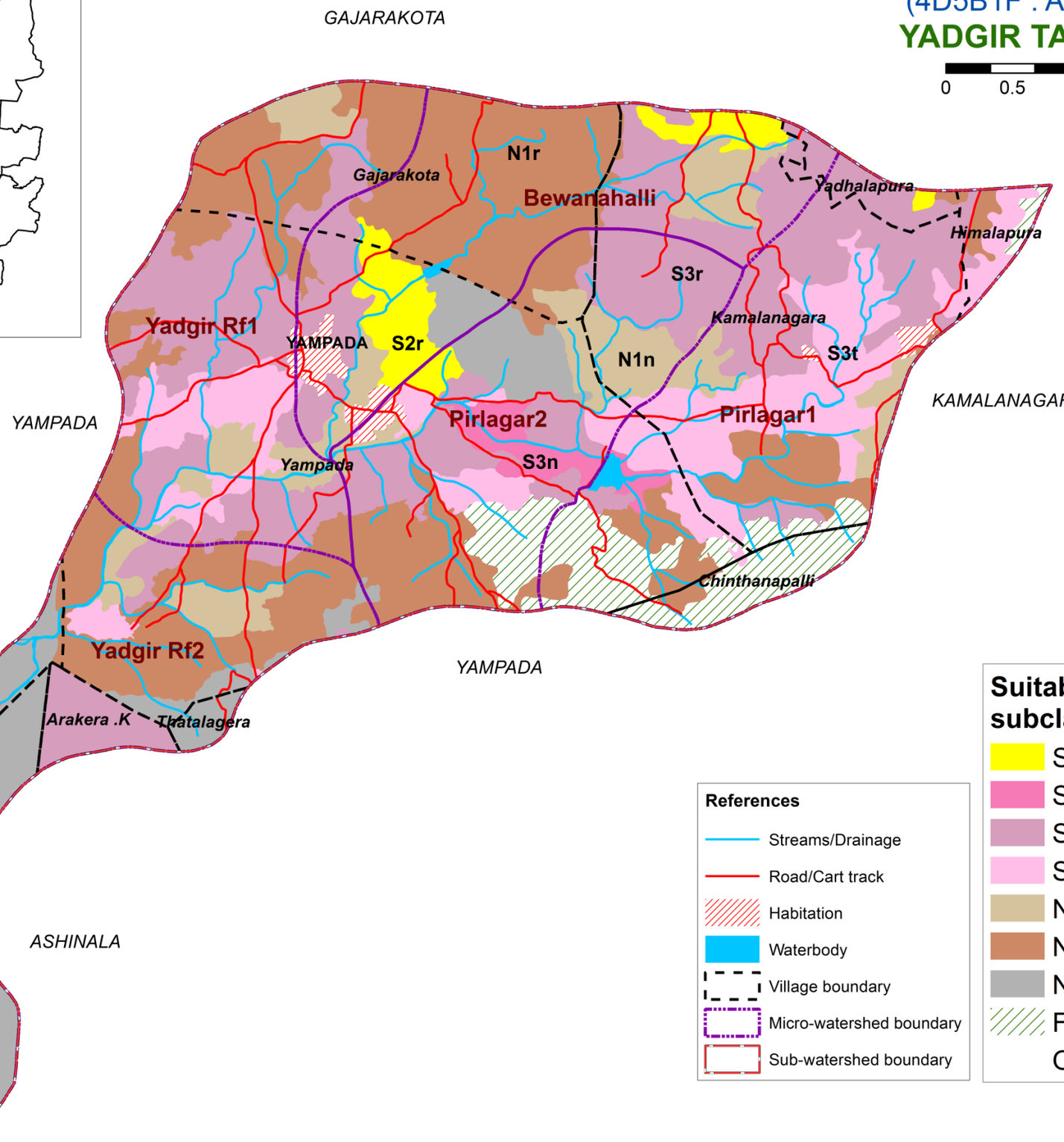


LAND SUITABILITY FOR TOMATO

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



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

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

References

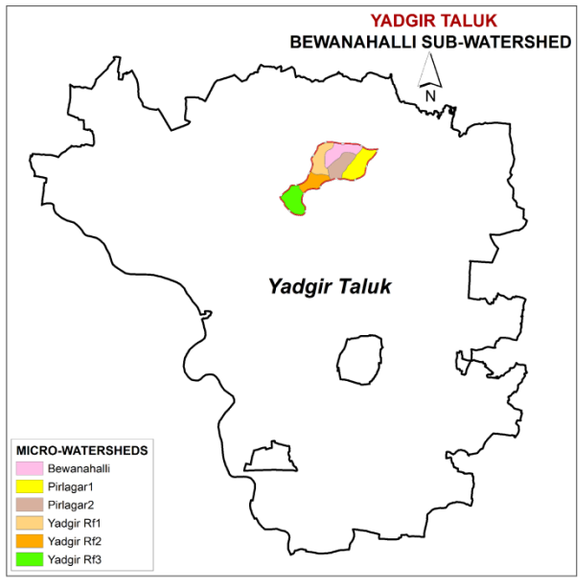
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S3n	71 (2.32)
S3r	766 (25.03)
S3t	320 (10.45)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.13. Land Suitability for Mulberry

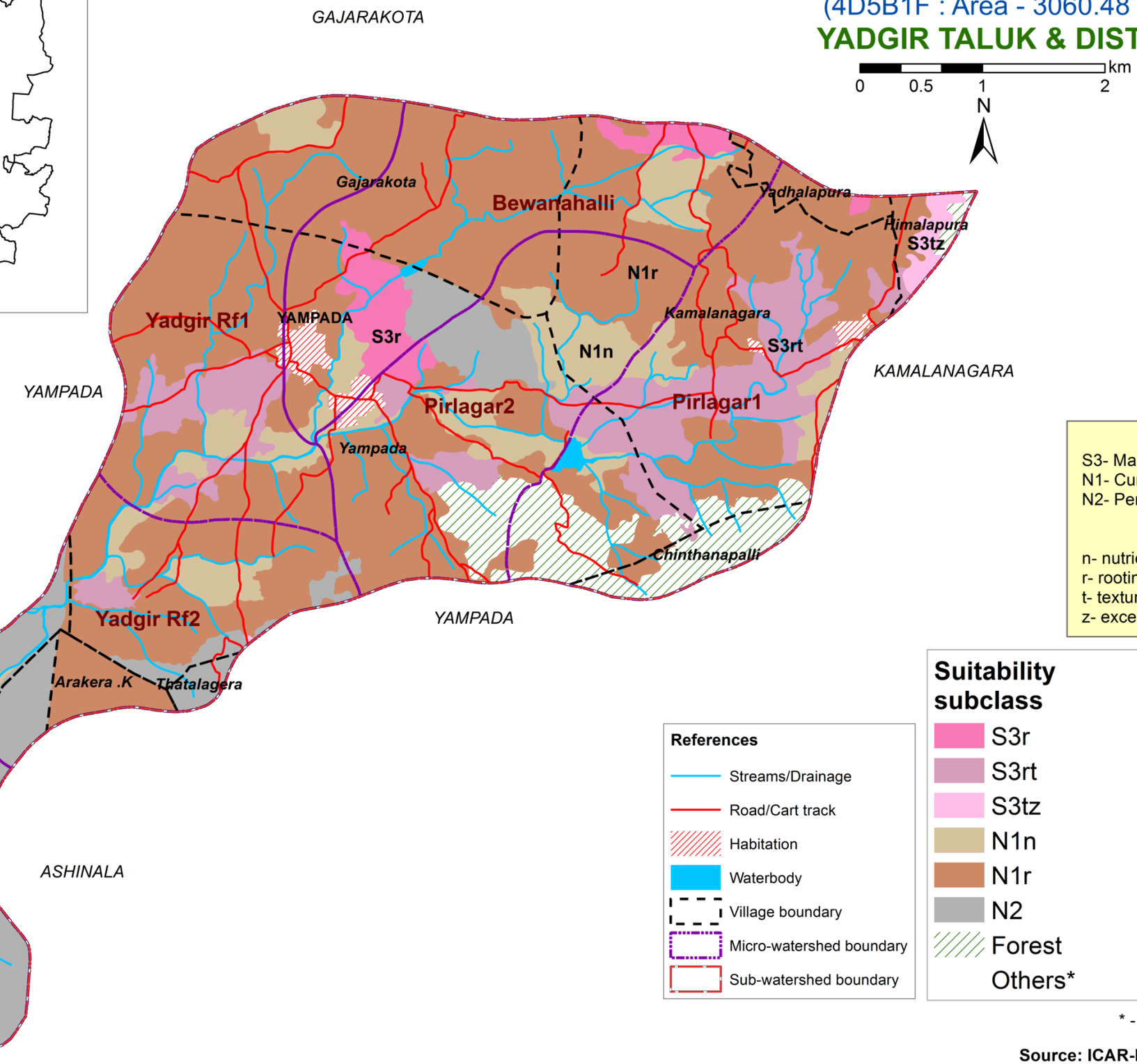


LAND SUITABILITY FOR MULBERRY

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



Key
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

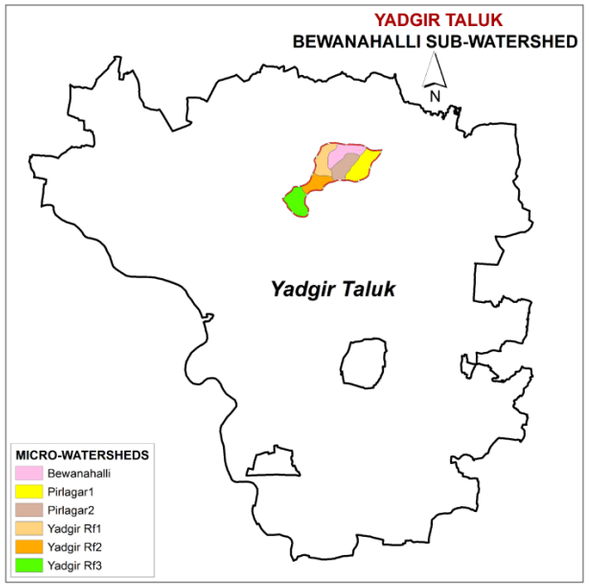
Suitability subclass	Area in ha (%)
S3r	78 (2.55)
S3rt	295 (9.63)
S3tz	25 (0.82)
N1n	301 (9.83)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

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

7.14. Land Suitability for Bhendi



LAND SUITABILITY FOR BHENDI

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

Key

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

Limitations

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

References

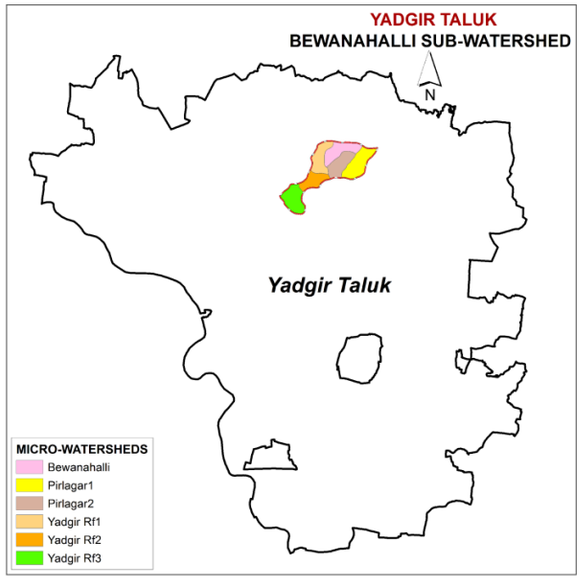
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S2tz	25 (0.82)
S3n	71 (2.32)
S3r	766 (25.03)
S3t	295 (9.63)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.15. Land Suitability for Guava

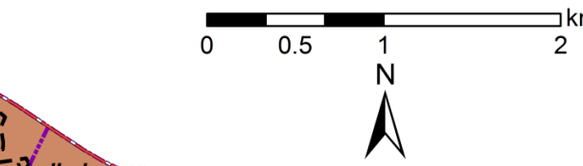


LAND SUITABILITY FOR GUAVA

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



Key
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

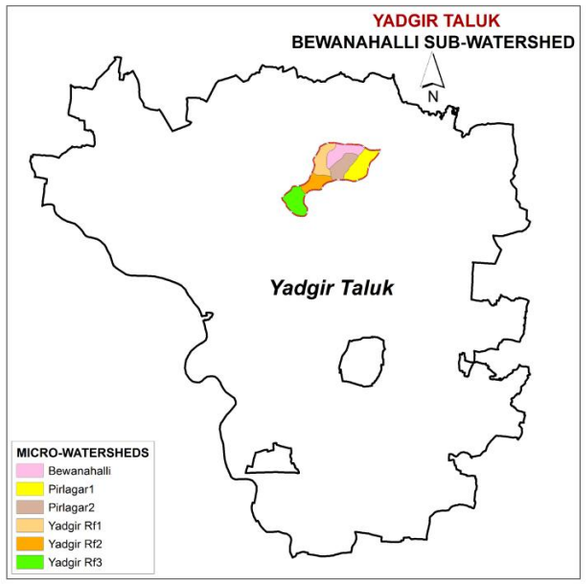
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3r	78 (2.55)
S3rt	295 (9.63)
S3tz	25 (0.82)
N1n	301 (9.83)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.16. Land Suitability for Mango

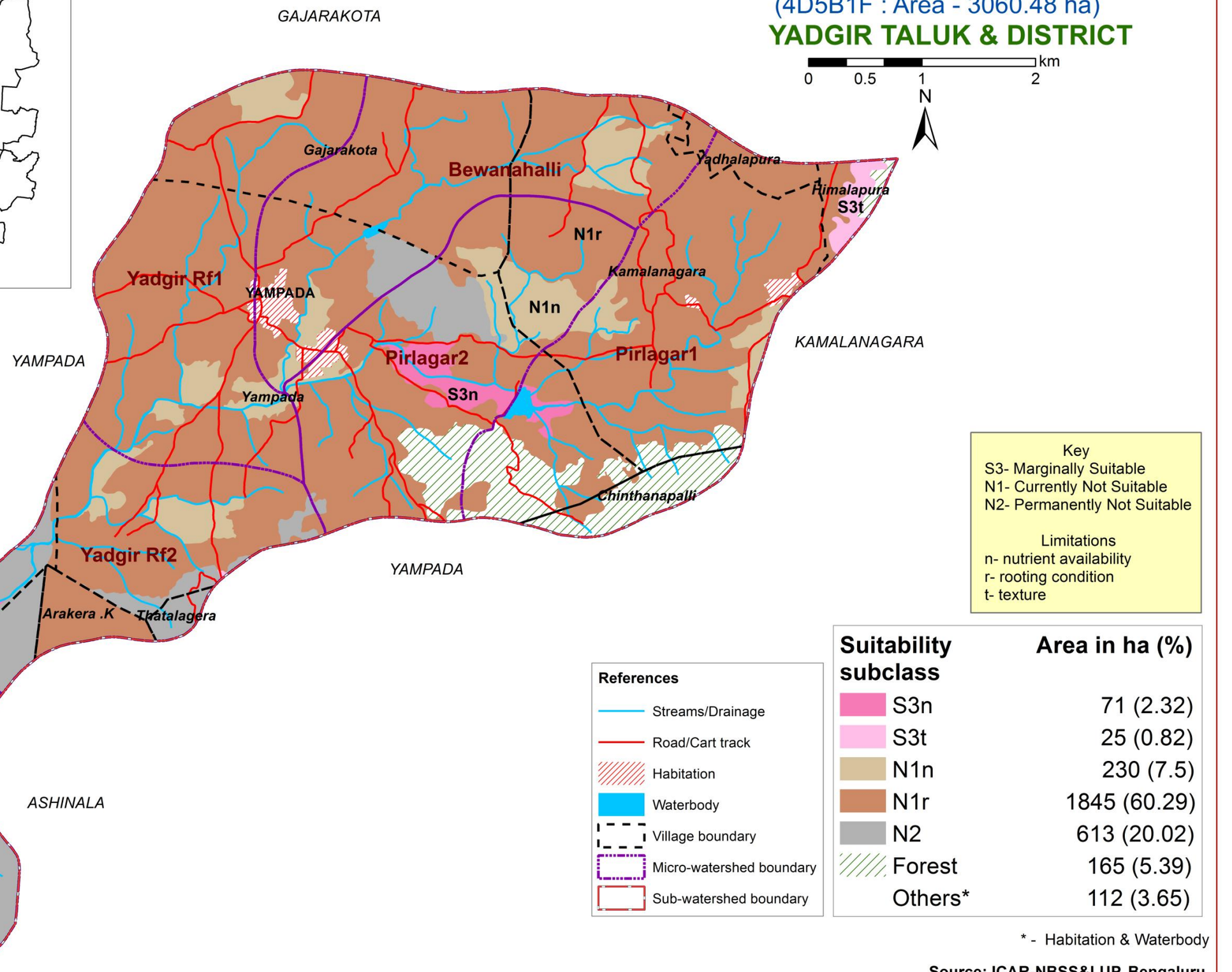


LAND SUITABILITY FOR MANGO

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



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

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

References

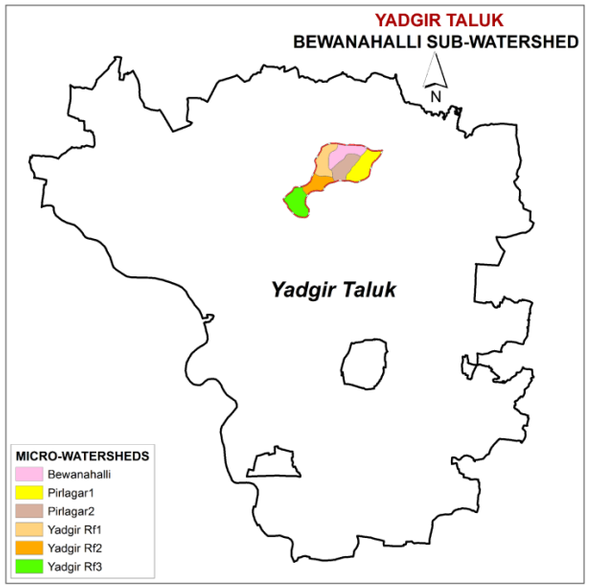
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3n	71 (2.32)
S3t	25 (0.82)
N1n	230 (7.5)
N1r	1845 (60.29)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.17. Land Suitability for Sapota



LAND SUITABILITY FOR SAPOTA

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

References

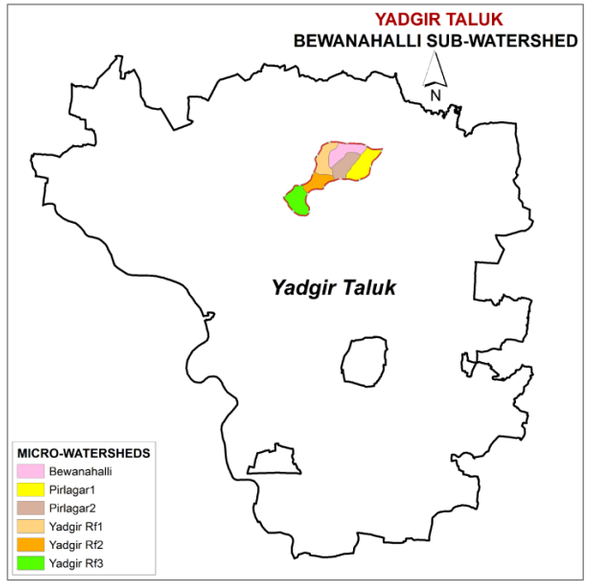
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3n	71 (2.32)
S3r	78 (2.55)
S3t	25 (0.82)
S3rt	295 (9.63)
N1n	230 (7.5)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.18. Land Suitability for Jackfruit



LAND SUITABILITY FOR JACKFRUIT

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

YAMPADA

KAMALANAGARA

BELAGERA

YAMPADA

ASHINALA

Gajarakota
Bewanahalli
Yadhalapura
Himalapura
S3tz
N1r
Kamalanagara
S3rt
Yadgir Rf1
YAMPADA
S3r
N1n
Pirlagar2
Pirlagar1
Yampada
Chinthanapalli
Yadgir Rf2
Arakera .K
Thatalagera
Belagera
Yadgir Rf3
Ashinala
N2

Key
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

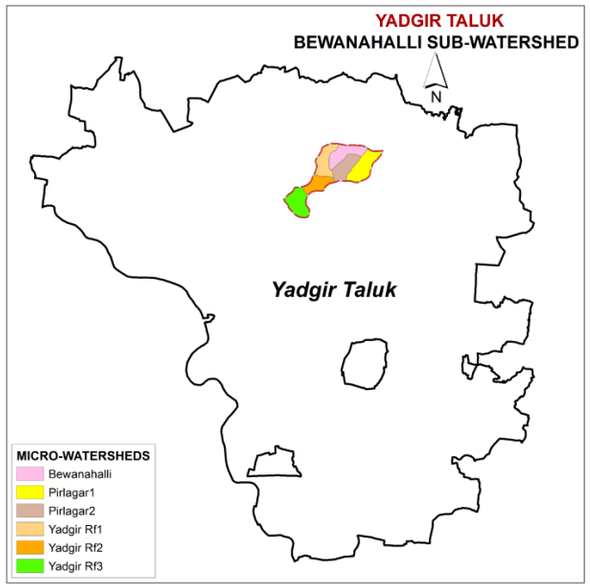
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3r	78 (2.55)
S3rt	295 (9.63)
S3tz	25 (0.82)
N1n	301 (9.83)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.19. Land Suitability for Jamun

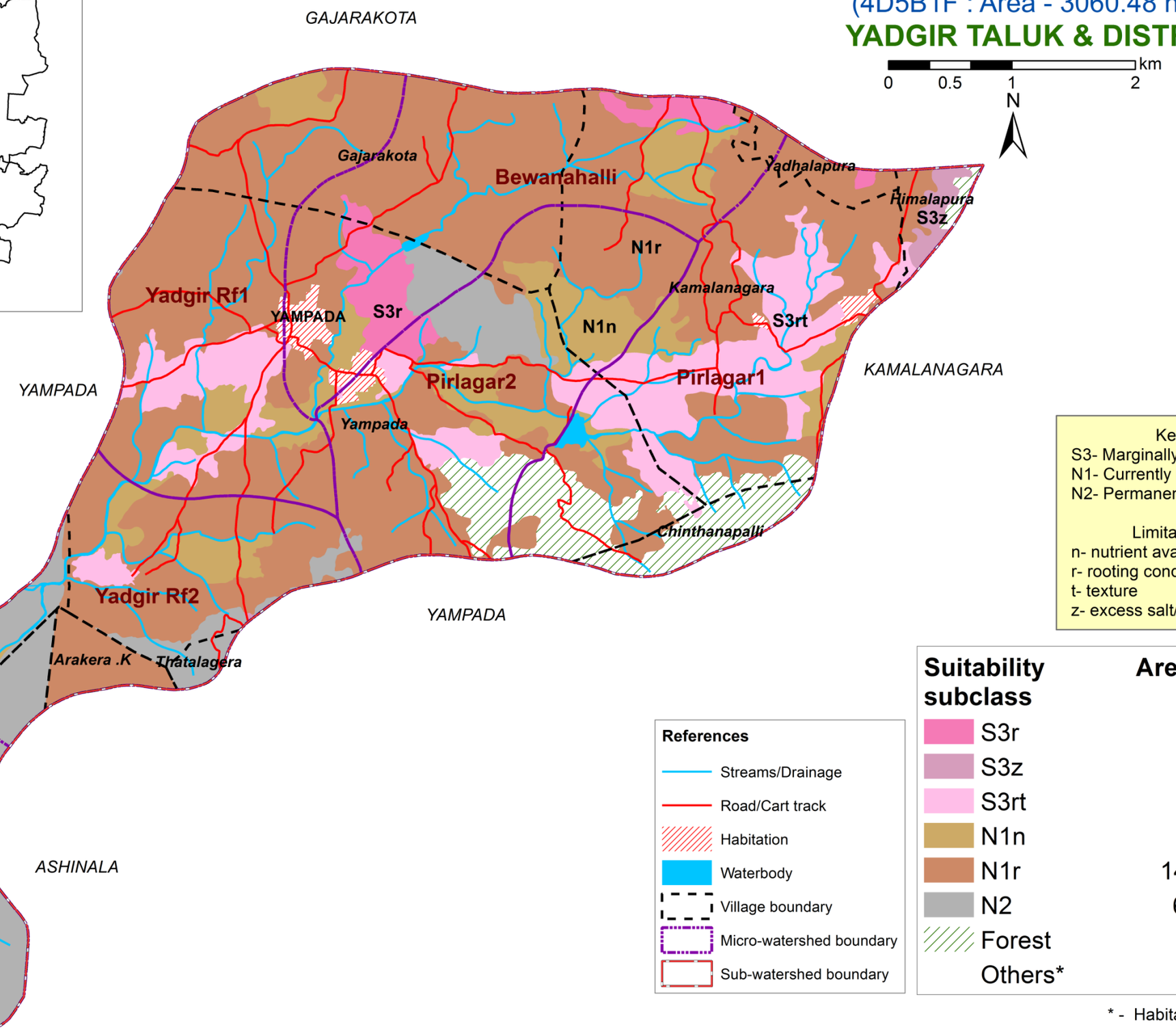


LAND SUITABILITY FOR JAMUN

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



km
0 0.5 1 2
N

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

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

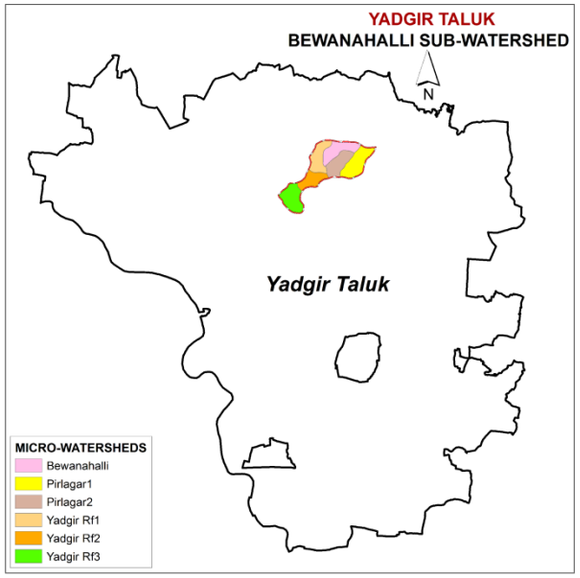
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3r	78 (2.55)
S3z	25 (0.82)
S3rt	295 (9.63)
N1n	301 (9.83)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.20. Land Suitability for Musambi

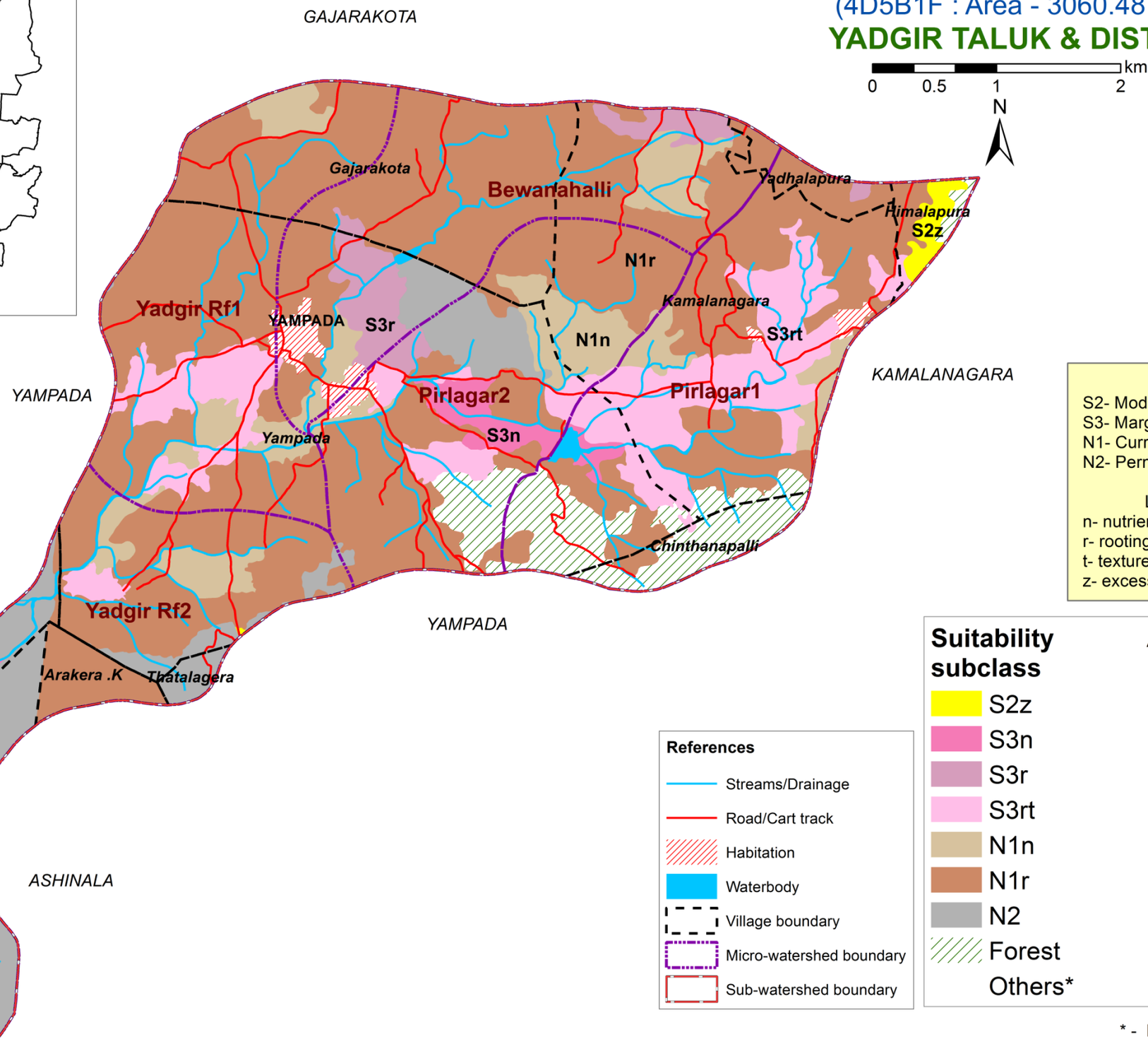


LAND SUITABILITY FOR MUSAMBI

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



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

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

References

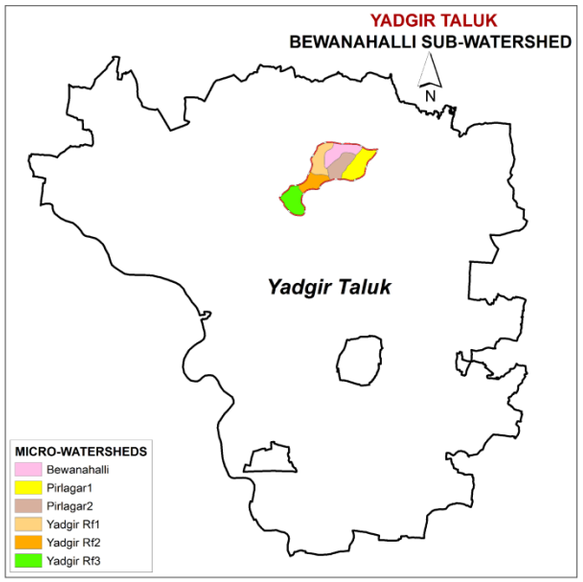
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2z	25 (0.82)
S3n	71 (2.32)
S3r	78 (2.55)
S3rt	295 (9.63)
N1n	230 (7.5)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.21. Land Suitability for Lime

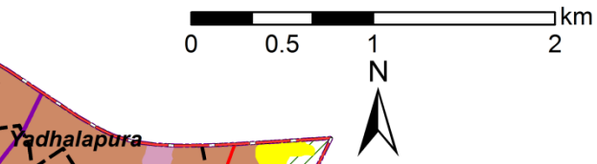


LAND SUITABILITY FOR LIME

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



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

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

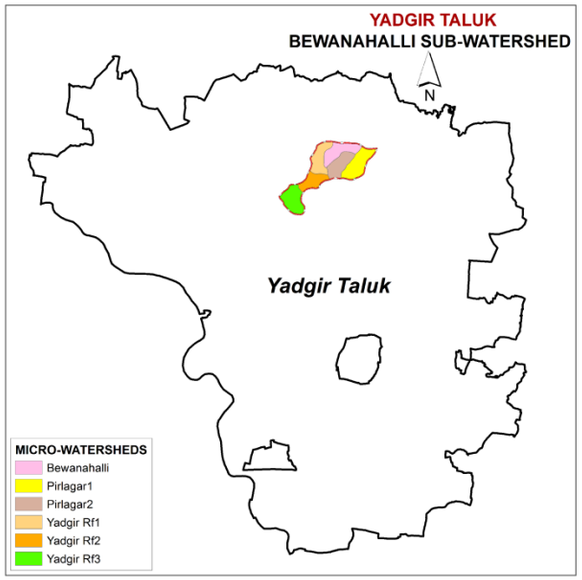
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2z	25 (0.82)
S3n	71 (2.32)
S3r	78 (2.55)
S3rt	295 (9.63)
N1n	230 (7.5)
N1r	1473 (48.12)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.22. Land Suitability for Cashew



LAND SUITABILITY FOR CASHEW

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
YAMPADA
KAMALANAGARA
BELAGERA
YAMPADA
ASHINALA

Gajarakota
N1r
Bewanahalli
Yadhalapura
Himalapura
N1t
N1n
Kamalanagara
Yadgir Rf1
YAMPADA
Pirlagar2
Pirlagar1
Yampada
Chinthanapalli
Yadgir Rf2
Arakera .K
Thatalagera
Belagera
Yadgir Rf3
Ashinala
N2

Key
N1- Currently Not Suitable
N2- Permanently Not Suitable

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

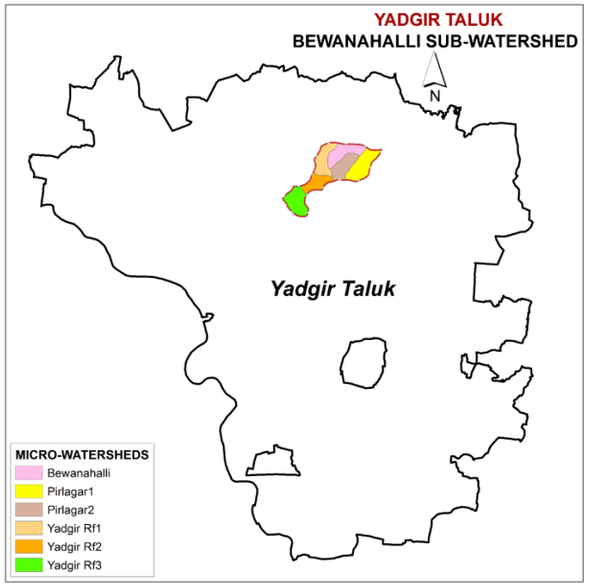
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
N1n	1022 (33.38)
N1r	1124 (36.74)
N1t	25 (0.82)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.23. Land Suitability for Custard Apple



LAND SUITABILITY FOR CUSTARD APPLE

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

References

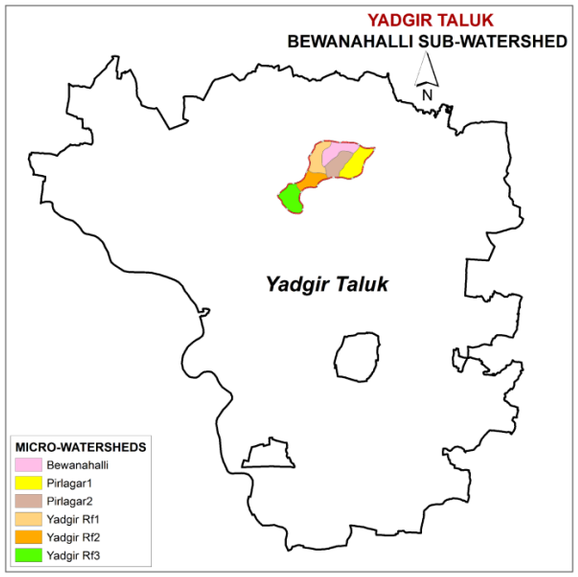
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S2z	25 (0.82)
S3n	71 (2.32)
S3t	295 (9.63)
S3rt	766 (25.03)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.24. Land Suitability for Amla



LAND SUITABILITY FOR AMLA

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

0 0.5 1 2 km

N

GAJARAKOTA

Gajarakota

N1r

Bewanahalli

Yadhalapura

Himalapura

S3z

S3rt

Kamalanagara

S3t

Yadgir Rf1

YAMPADA

S2r

N1n

Pirlagar2

Pirlagar1

KAMALANAGARA

Yampada

Chinthanapalli

Yadgir Rf2

BELAGERA

YAMPADA

Arakera .K

Thatalagera

Belagera

Yadgir Rf3

Ashinala

N2

ASHINALA

Key

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

Limitations

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

References

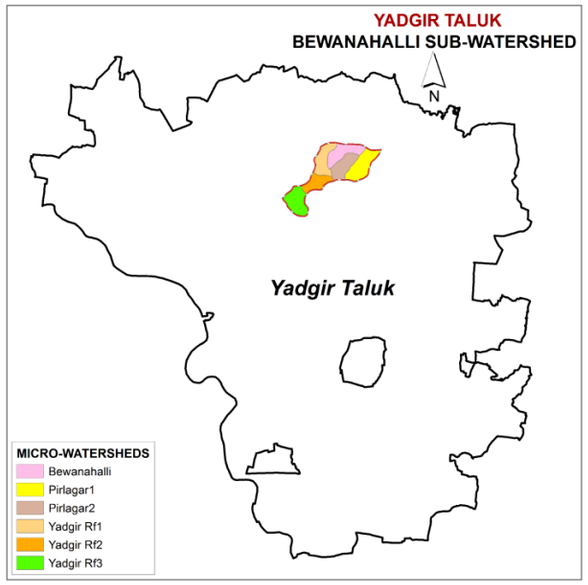
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S3t	295 (9.63)
S3z	25 (0.82)
S3rt	766 (25.03)
N1n	301 (9.83)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.25. Land Suitability for Tamarind

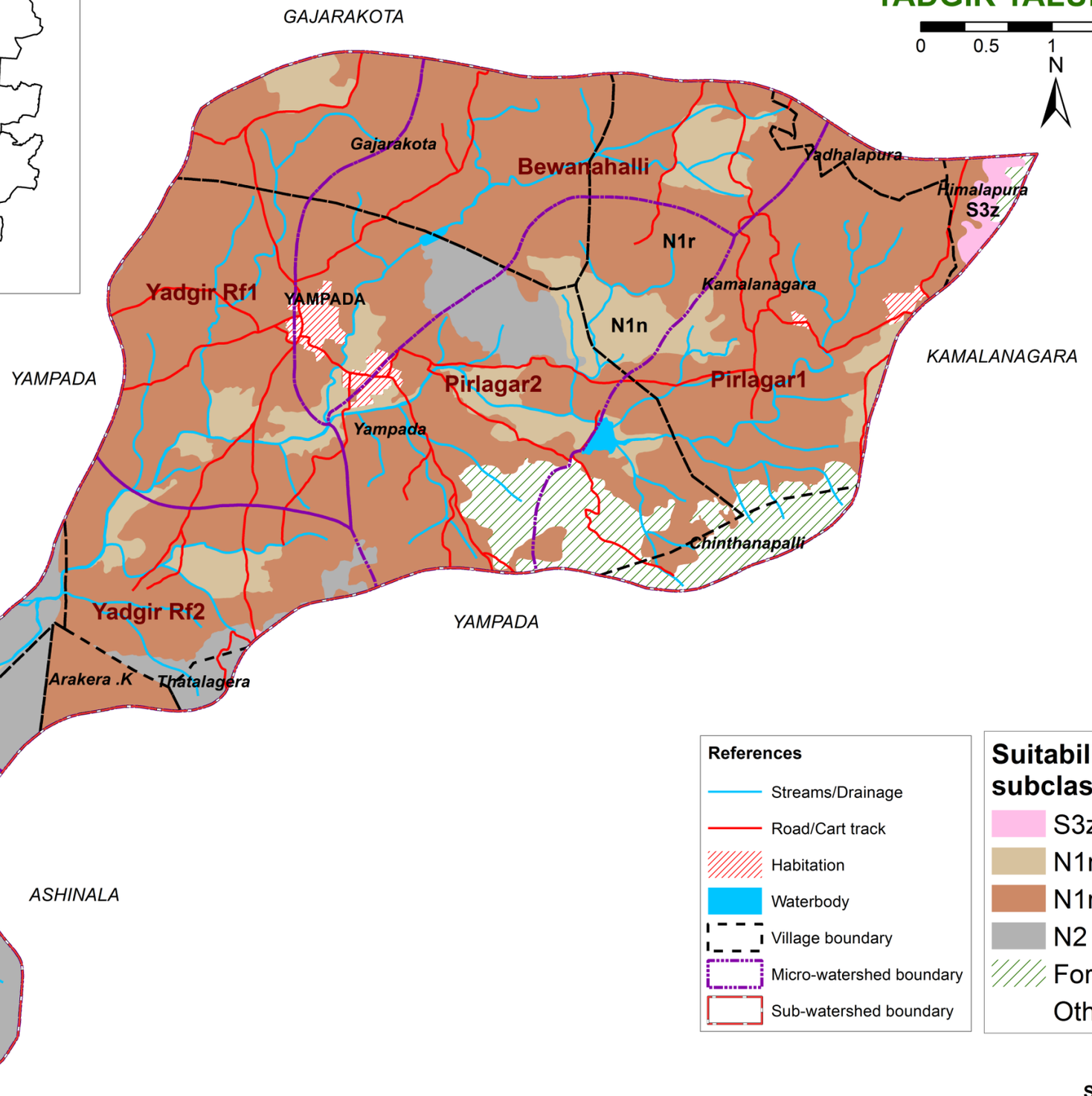


LAND SUITABILITY FOR TAMARIND

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



0 0.5 1 2 km

N

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

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

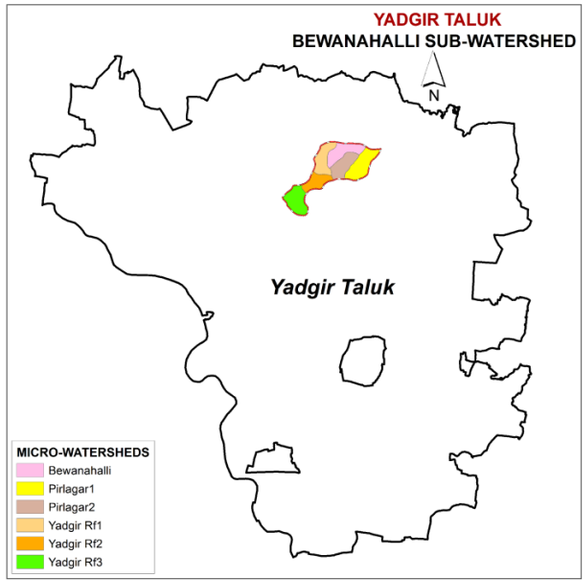
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S3z	25 (0.82)
N1n	301 (9.83)
N1r	1845 (60.29)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.26. Land Suitability for Brinjal



LAND SUITABILITY FOR BRINJAL

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

References

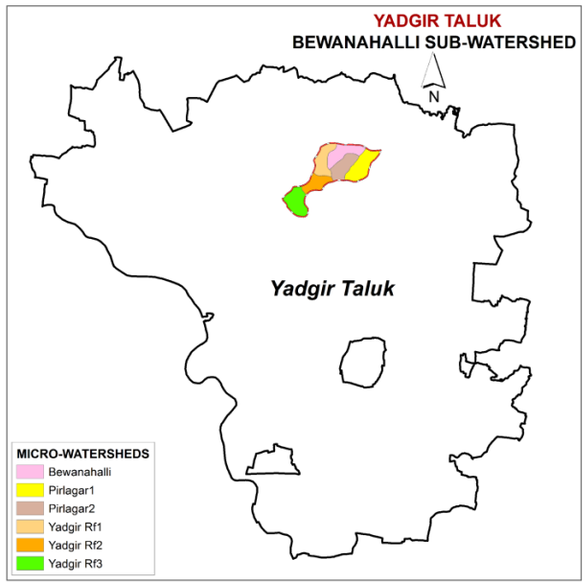
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S3n	71 (2.32)
S3r	348 (11.38)
S3t	320 (10.45)
S3rt	418 (13.65)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.27. Land Suitability for Onion

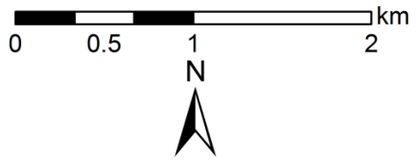


LAND SUITABILITY FOR ONION

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



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

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

References

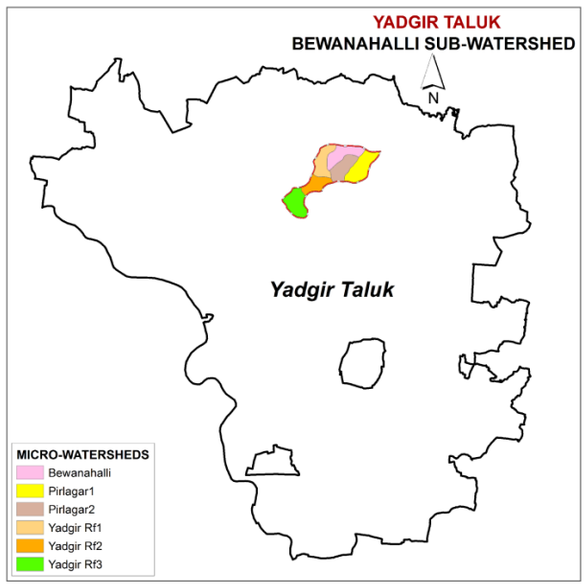
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S3r	766 (25.03)
S3t	295 (9.63)
S3tz	25 (0.82)
N1n	301 (9.83)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.28. Land Suitability for Marigold



LAND SUITABILITY FOR MARIGOLD

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

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

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

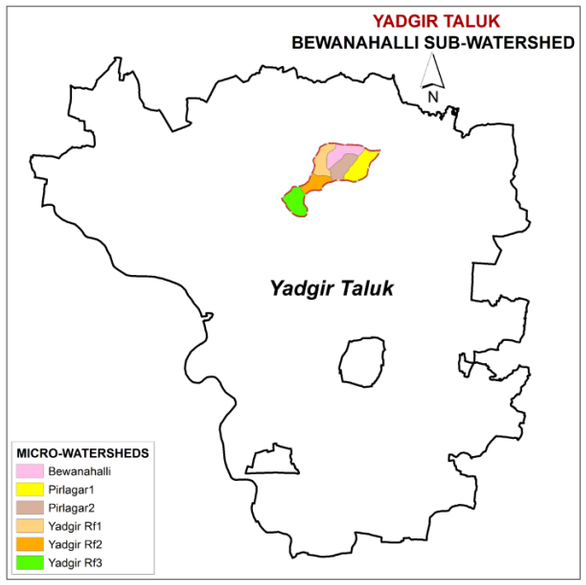
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S2tz	25 (0.82)
S3n	71 (2.32)
S3r	766 (25.03)
S3t	295 (9.63)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

7.29. Land Suitability for Chrysanthemum

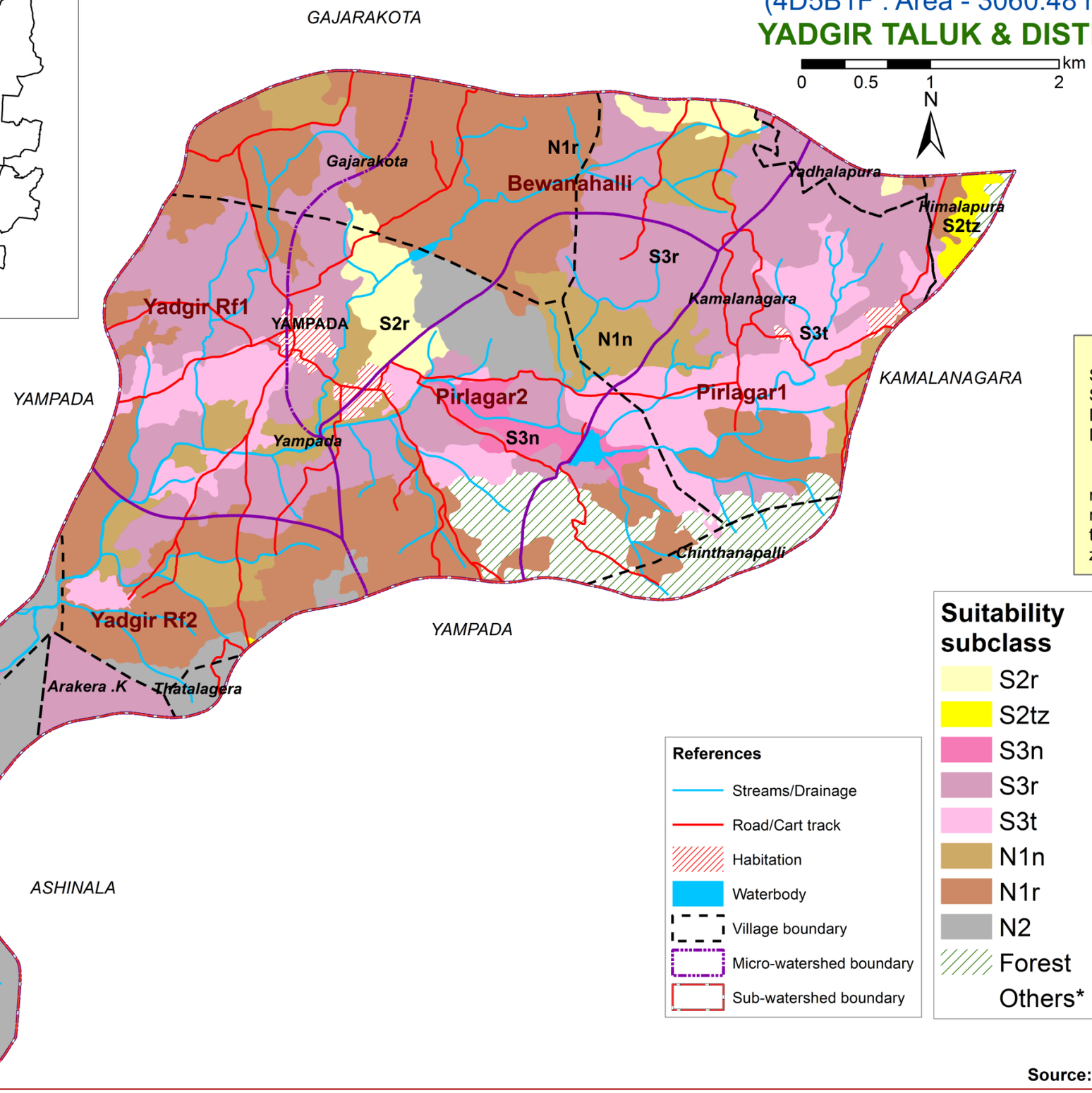


LAND SUITABILITY FOR CHRYSANTHEMUM

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT



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

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

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

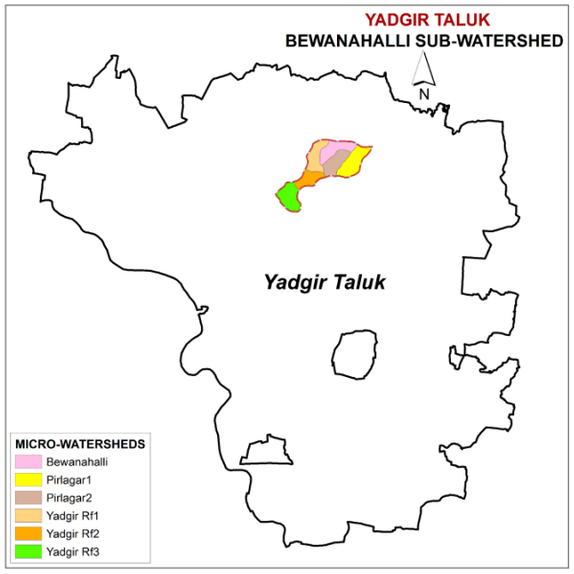
Suitability subclass	Area in ha (%)
S2r	78 (2.55)
S2tz	25 (0.82)
S3n	71 (2.32)
S3r	766 (25.03)
S3t	295 (9.63)
N1n	230 (7.5)
N1r	707 (23.09)
N2	613 (20.02)
Forest	165 (5.39)
Others*	112 (3.65)

* - Habitation & Waterbody

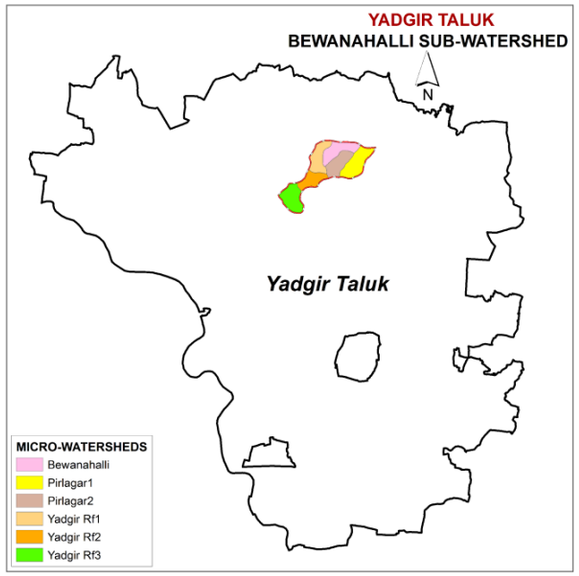
Source: ICAR-NBSS&LUP, Bengaluru

8. Soil and Water Conservation Measures

8.1. Soil & Water Conservation Plan



9. Land Management Units



LAND MANAGEMENT UNITS

Bewanahalli Sub-watershed

(4D5B1F : Area - 3060.48 ha)

YADGIR TALUK & DISTRICT

km
0 0.5 1 2
N

GAJARAKOTA
YAMPADA
KAMALANAGARA
BELAGERA
YAMPADA
ASHINALA
Gajarakota
Bewanahalli
Yadhalapura
Himalapura
Kamalanagara
Yampada
Chinthanapalli
Arakera .K
Thatalagera
Belagera
Ashinala
LMU-1
LMU-2
LMU-3
LMU-4
LMU-5
LMU-6
LMU-7
Yadgir Rf1
Yadgir Rf2
Yadgir Rf3
Pirlagar1
Pirlagar2

References

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

LMU	Area in ha (%)
LMU-1	230 (7.5)
LMU-2	71 (2.32)
LMU-3	25 (0.82)
LMU-4	78 (2.55)
LMU-5	295 (9.63)
LMU-6	766 (25.03)
LMU-7	707 (23.09)
Forest	165 (5.39)
Rock outcrops	613 (20.02)
Others*	112 (3.65)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

NOTE: *Proposed Crop Plan for LMUs are given in Table*

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

LMU. No	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	34.GWDcB2 100.VKSmB1 127.GWDmB2 154.YDRcB2g1 (Moderately deep to very deep, sodic soils)	**Gajarakota :** 676,696,697,703,704,705 **Kamalanagara :** 10,12,13,14,2,20/5,29,30,31,33, 56,57,58,59,60,61,68,9 **Yampada :** ,33,34,35,36,64,65,66,69,168, 179,180,182,183,184,185,186, 189,190,191,192,193,194,195, 216,217,225,226,243,244,251 ,257,259,260,263,264,265, 266	-	**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	171.MDGhA1 132.MDRhB2 (Deep, strongly alkaline sandy clay loam soils)	**Belagera:** 74,75,76,77,80,81,84,85 **Yampada:** 74,81,82,83,84,86, 97,98,99, 100,101,111	Sorghum, Maize, Bajra	**Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage
3	49.NGPmB2 (Deep, black clay soils)	**Belagera:** 86,87 **Himalapura:** 273,274,352,353,357,358,359, 361,370	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
4	22.JNKiB2 23.JNKiB2g1 (Moderately shallow, sandy clay loam soils)	**Kamalanagara :** 47,49,50,54,55,62,63,64,65,66 **Yadhalapura :** 118 **Yampada:** 8,9,24,25,28,29,30,31,32,37,38, 39,40,41,42,43,44,45,48,49,50, 51	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

To be continued….

LMU. No	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
5	11.SBRcB2 12.SBRcC3g1 124.SBRbB3 (Moderately shallow, loamy sand soils)	**Himalapura:** 272 **Kamalanagara :** 3,5,6,7,8,16,20/6,20/7,21,22,23, 24,82,84,85 **Yampada :** 70,71,72,73,75,91,92,94,95,112,113,114,187,210,211,212,213,218,219,220,221,255,256,258,261,262,267,268,269,270,273,287,296,297,298,299,300,301,302,303,304,308,309, 310,311, 312,313,314	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Application of FYM, Biofertilizers and micronutrients, drip irrigation, Mulching, suitable soil and water conservation practices
6	2.BDLbB2 4.BDLhB2 5.BDLiB2 113.HTKcC2g1 161.HTKbB2g1 162.BDLhB2g1 165.HTKcB2 (Shallow soils)	**ArakeraK:** 76 **Ashinala:** 136,137,138,146,147,148,169, 170,171 **Belagera :** 82,83 **Gajarakota:** 690,695 **Himalapura :** 354 **Kamalanagara :** 20/1,20/2,20/3,20/4,25,26,27,28,32,34,35,36,37,38,39,4,40,41,42,43,45,46,48,67,69, 70,71,72,73,74,75,76,77, 78,79, 80,81,83,91 **Yadhalapura:** 107,108,109,110,111,112,114,115,116,117,121 **Yampada:** 1,6,7,10,11,12,14,15,16,17,18,52,76,77,78,79,80,85,87,88,89,90,93,96,102,103,105,106, 107,152,153,154,155,173,174,175,176,177, 178,181,19,2,20,23,204,206,207,208,209,21,214,215,22,222,248,249,250,252,271,272, 278,279,289,293,295,3,307,315,316,317,318, 319,320,321,322,323,324,325,326,327,328, 329,330,332,333,334,335,336,337,338,339, 344,345,346,347,348,349,350,351,352,353, 354,355,357,359,360,361,362,363,365, 366	-	Custard apple, Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope

To be continued….

LMU. No	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
7	119.BDPiB3 120.BDPhB2 153.KKRbB2g1 175.KKRcB2 (Very shallow, soils)	**Gajarakota :** 639,666,667,668,669,670,671, 672,673,674,675,677,678,679, 680,681,682,683,684,685,686, 687,688,689,691,692,693,694, 698,699,700,706,707,708,709, 814 **Himalapura :** 355,356,362,369 **Kamalanagara :** 1,15,17,18,19,20/8 **Yampada :** 109,110,115,116,123,124,126, 127,128,132,133,134,136,138, 141,142,143,144,145,146,147, 148,149,150,151,156,157,158, 159,160,161,162,163,164,166, 167,169,170,171,172,223,224, 227,228,229,230,231,232,233, 234,235,236,237,238,239,240, 241,242,245,246,247,253,254, 26,274,275,276,277,280,281, 282,283,284,286,292,294,331, 342,356,358	-	*Styloxanthes hamata, Styloxanthes scabra*	Use of short duration varieties, sowing across the slope

PART-B

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

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

ICAR - NBSS & LUP

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Sh. R.S.Reddy	Consultant
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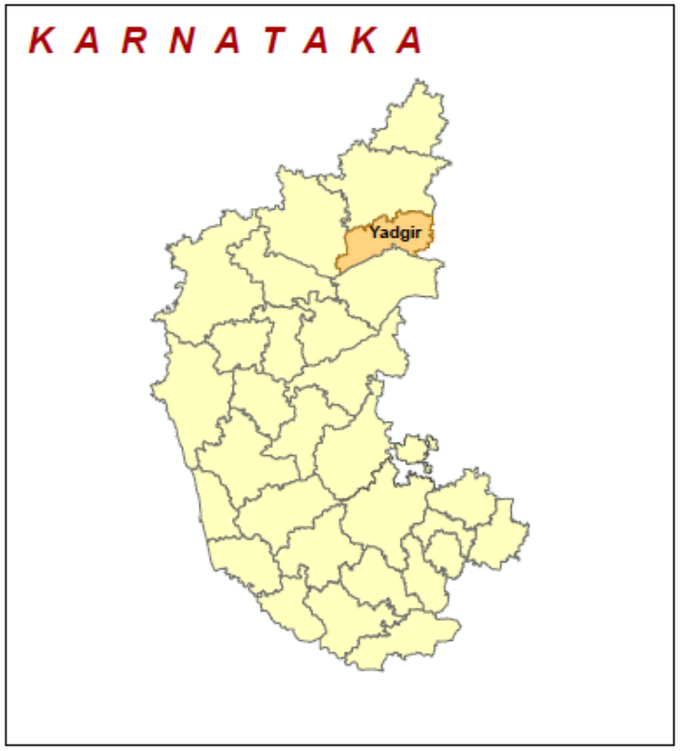
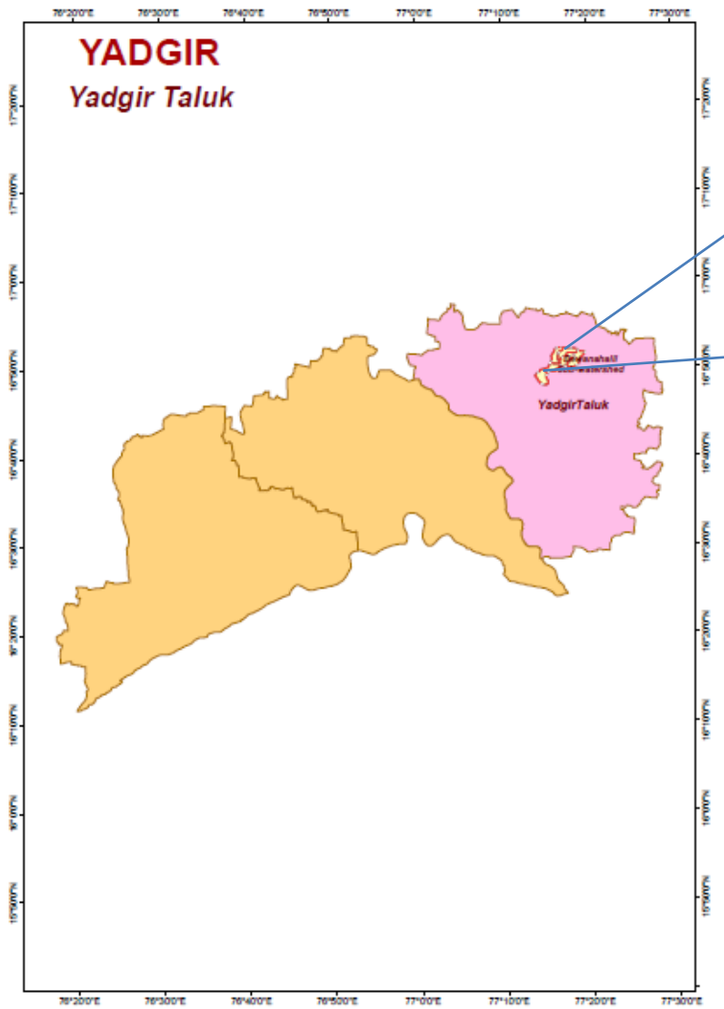
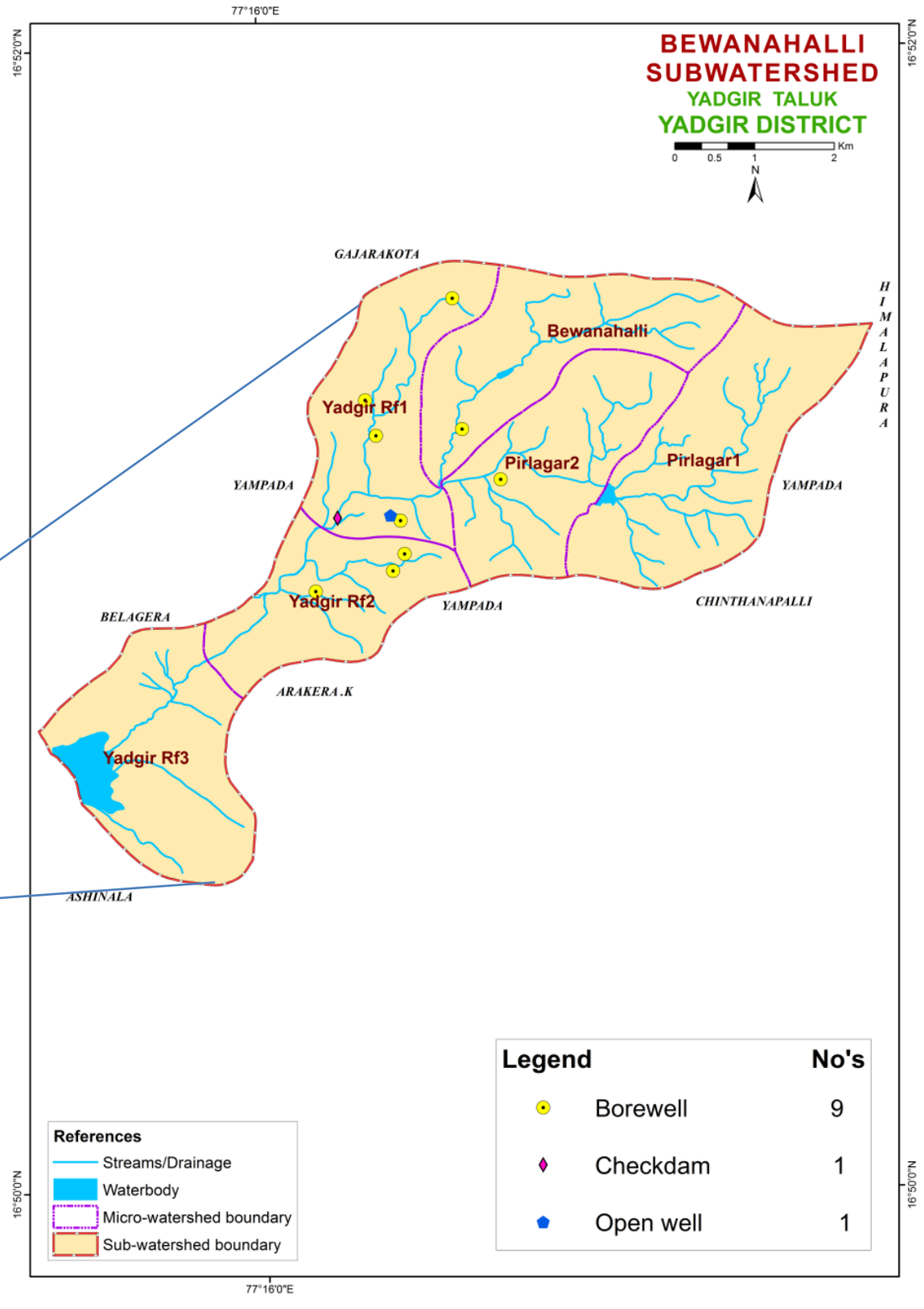
INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Bewanahalli sub-watershed (4D5B1F) in Yadgir Taluk, Yadgir District, has been undertaken for integrated planning, development and management at the level of soil mapping units.
- Bewanahalli sub-watershed (Yadgir taluk, Yadgir district) is located between $16^0$47’38’’–$16^0$52’28’’ North latitudes and 77^0 14’29’’–77^0 19’38’’ East longitudes, covering an area of about 3059 ha.
- This sub-watershed encompasses of 6 MWs namely, Yadgir Rf-1 (4D5B1F2a), Bewanahalli (4D5B1F1c), Pirlagar-1 (4D5B1F1a), Pirlagar-2 (4D5B1F1b) , Yadgir Rf-3 (4D5B1F2c) and Yadgir Rf-2 (4D5B1F2b) micro watersheds. 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, Redgram, Chilli, Soybean , Paddy and major *rabi* crops are Sorghum, Bengal gram and Bajra.
- Hydrological components namely rainfall (annual, *kharif, rabi* and summer*)*, PET, AET, runoff, surface soil moisture, ground water status and water balance are presented.

LOCATION MAP OF BEWANAHALLI SUB-WATERSHED

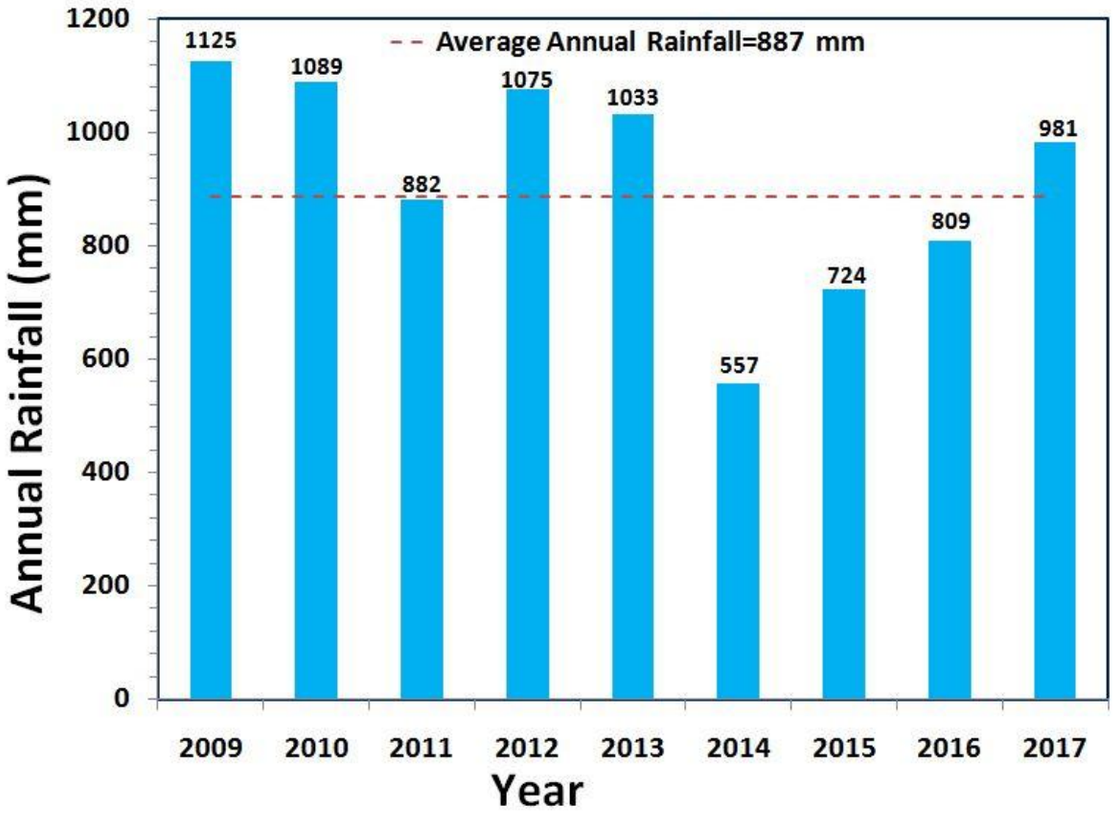






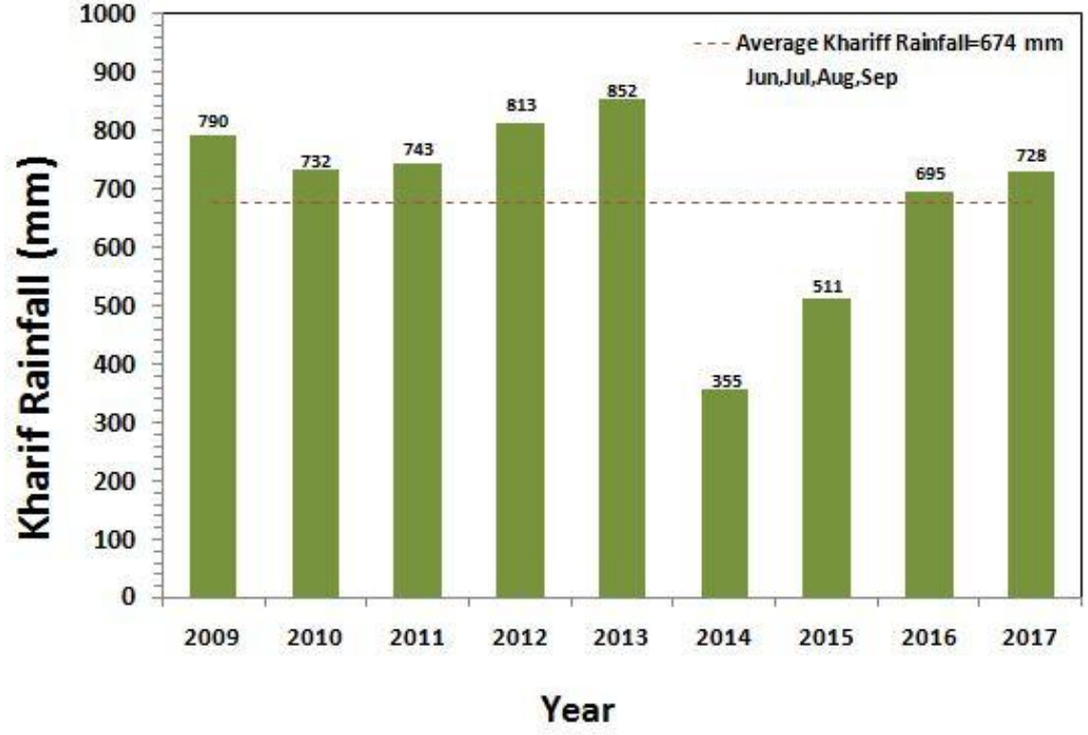
Soil & Water Conservation Structures in Bewanahalli Sub-watershed, Yadgir taluk, Yadgir district

RAINFALL INDEX

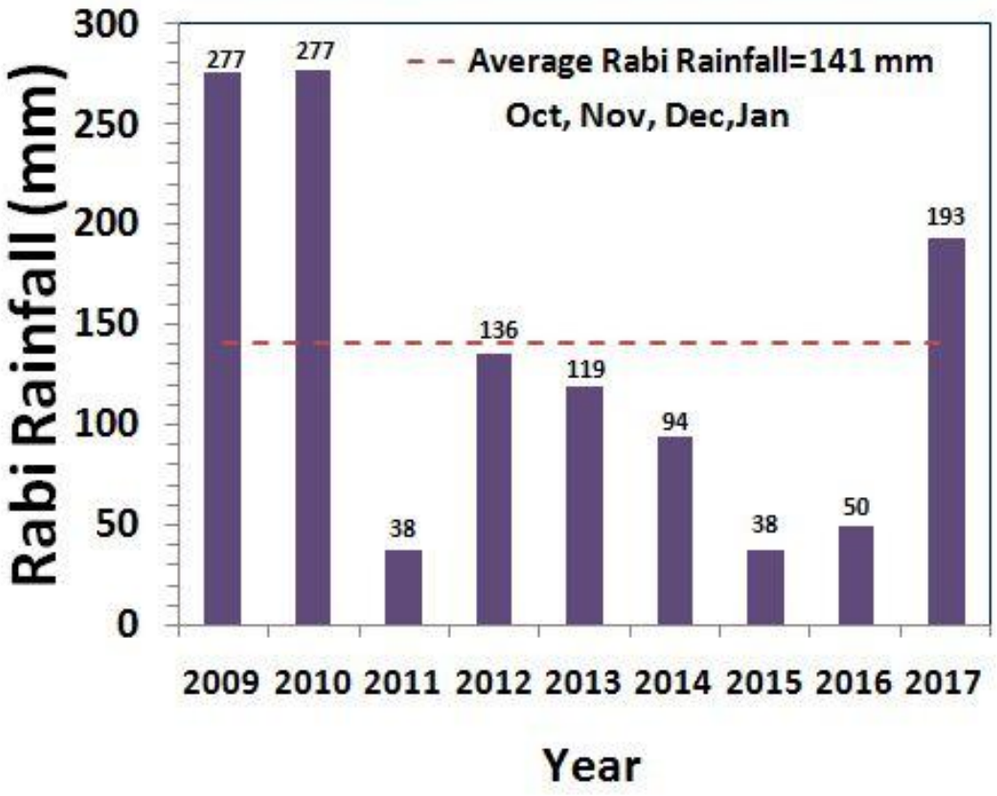


The average annual rainfall (1960-2014) recorded at the Yadgir station in Yadgir taluk of Yadgir district is 887 mm. The annual rainfall at Gurmatkal station (Hobli H.Q.) During the years 2014, 2015 and 2016 the annual rainfall was deficient by 37%, 18% and 9% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 75% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2014 and 2015 the *kharif* rainfall was deficient by 47% and 24% respectively.

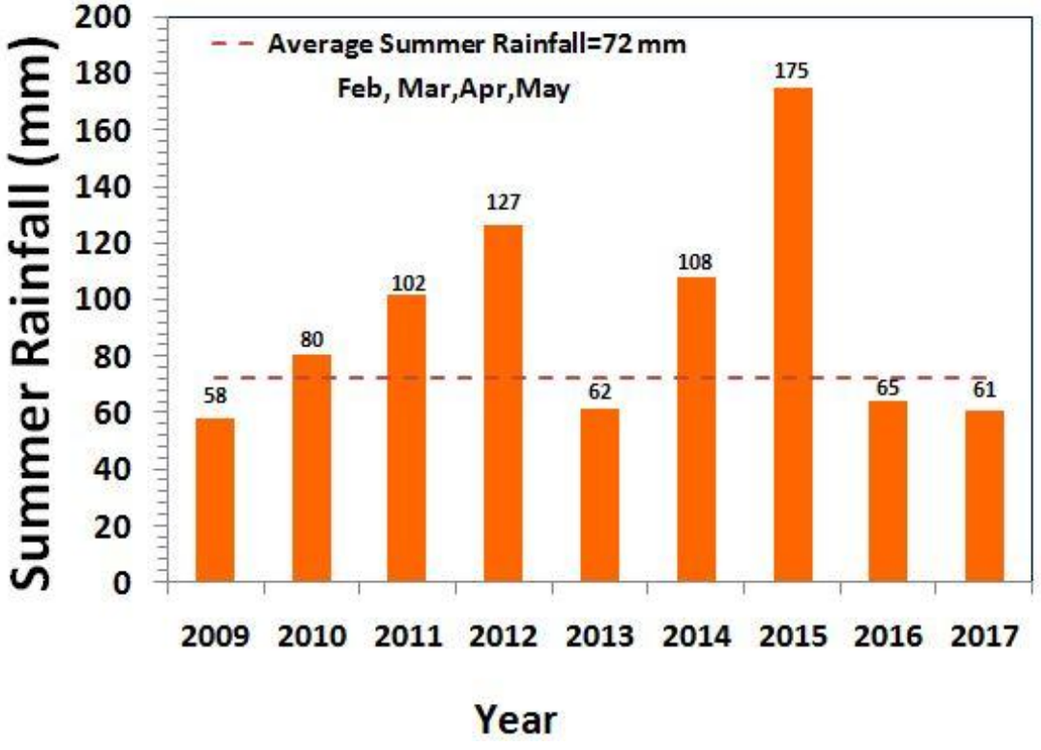


RAINFALL INDEX

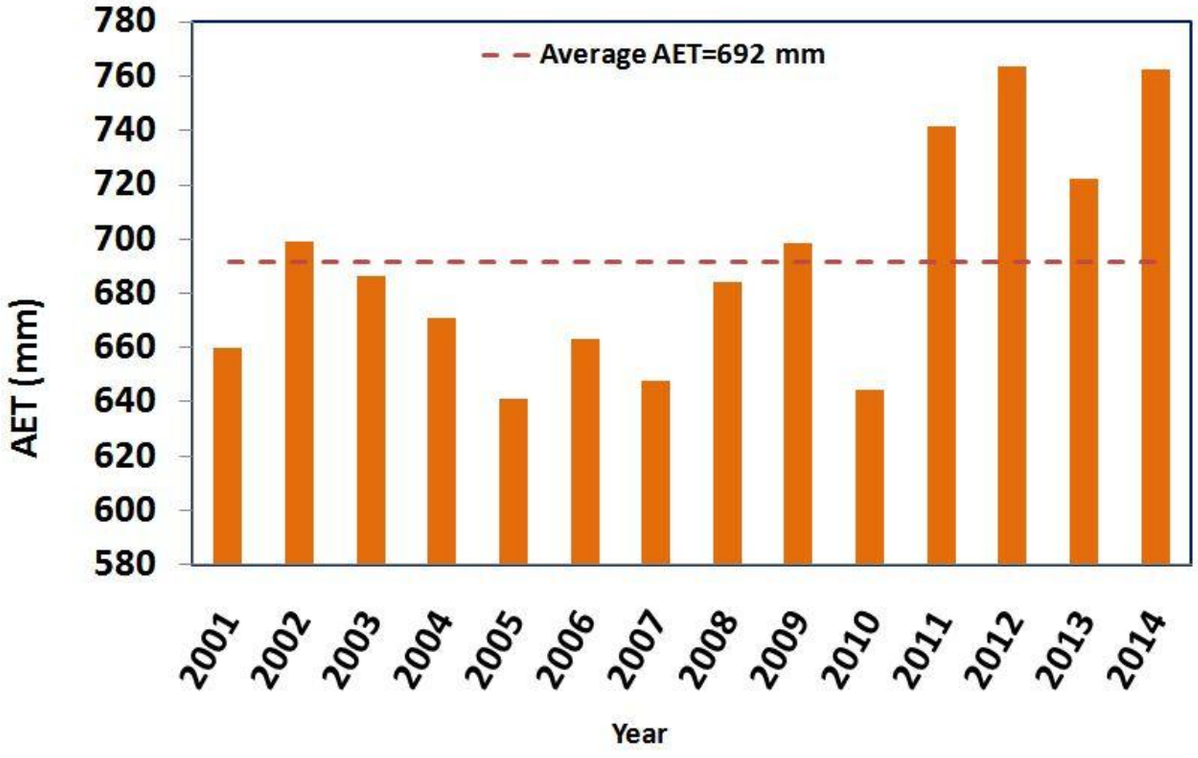


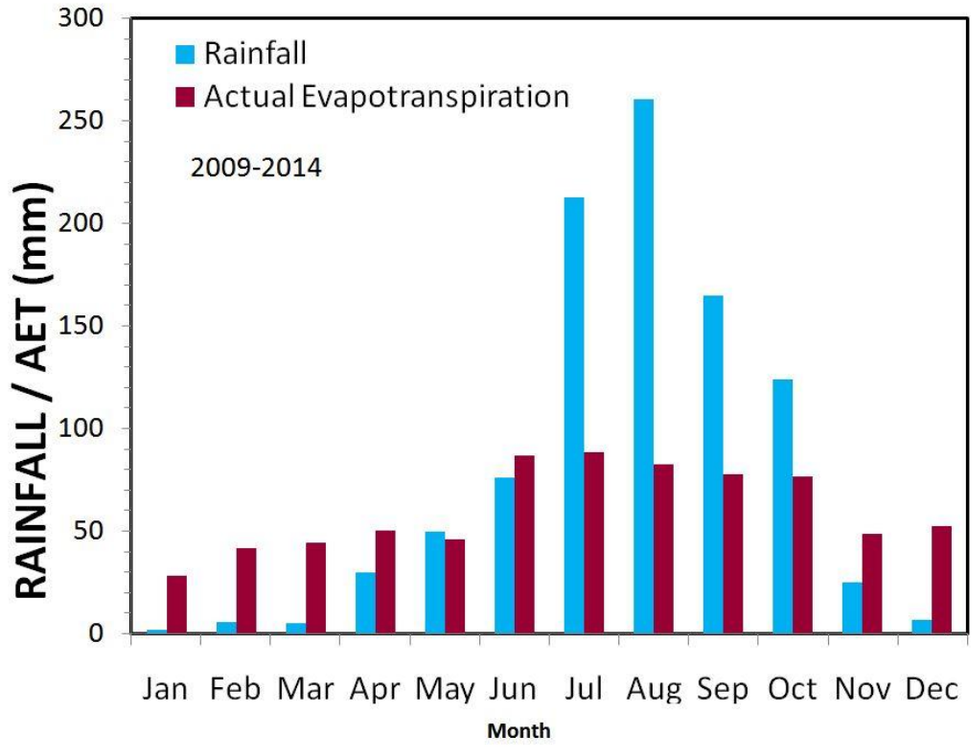
The average *rabi* rainfall (Oct-Jan) is about 14% of the average annual rainfall. During the years 2011, 2012, 2013, 2014, 2015 and 2016 the *rabi* rainfall was deficient by 73%, 4%, 16%, 33%, 73% and 65% respectively.

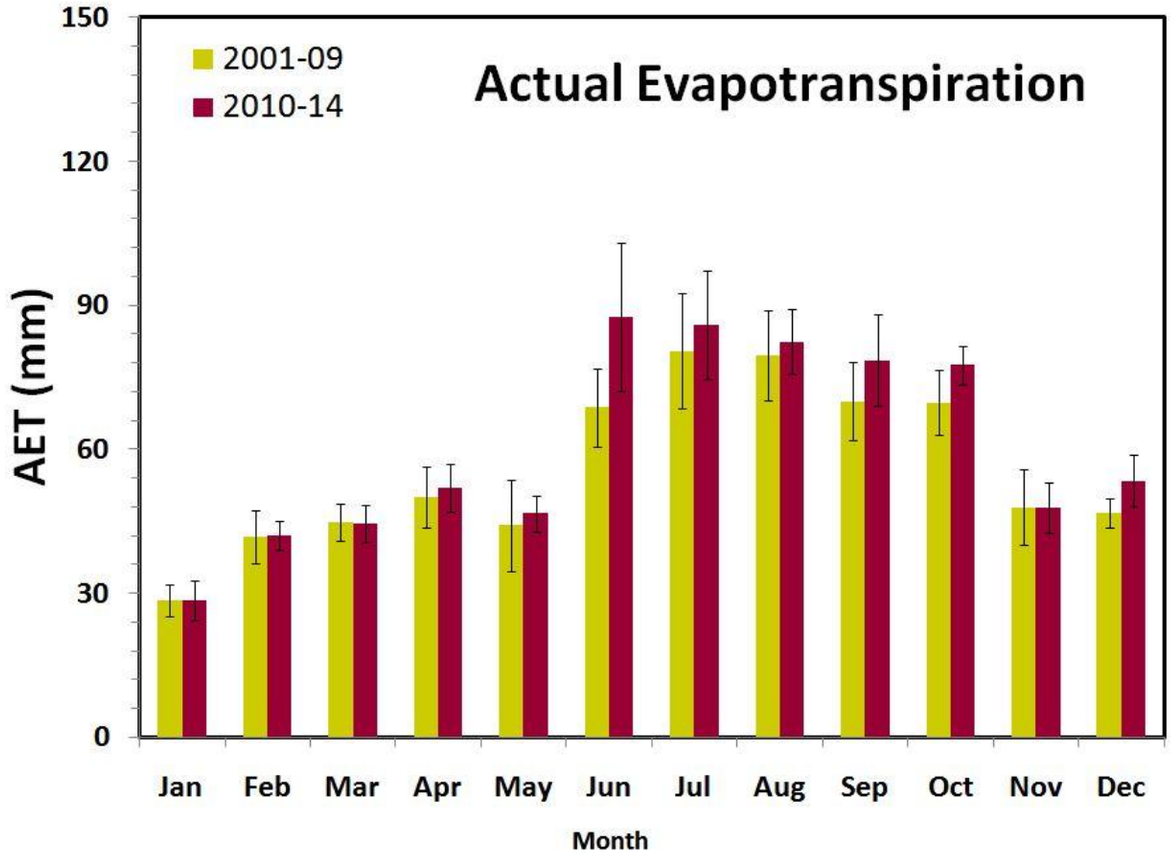
The average summer rainfall (Feb-May) is about 11% of the average annual rainfall.



EVAPOTRANSPIRATION

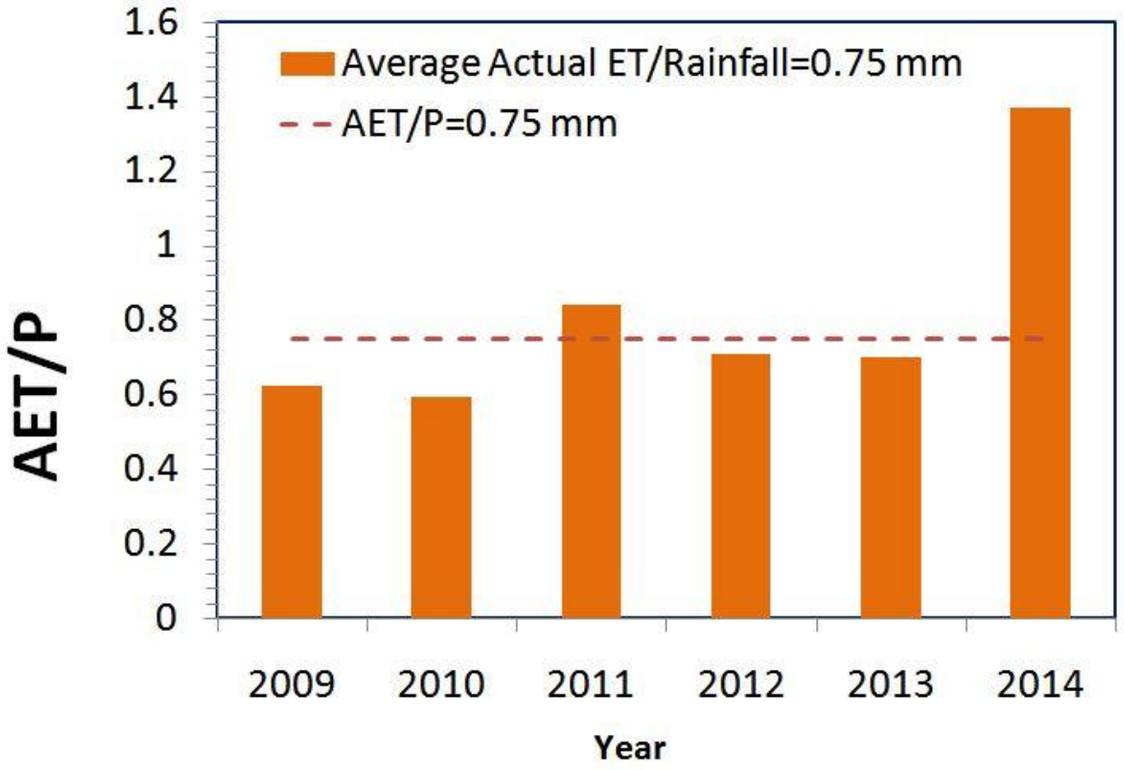




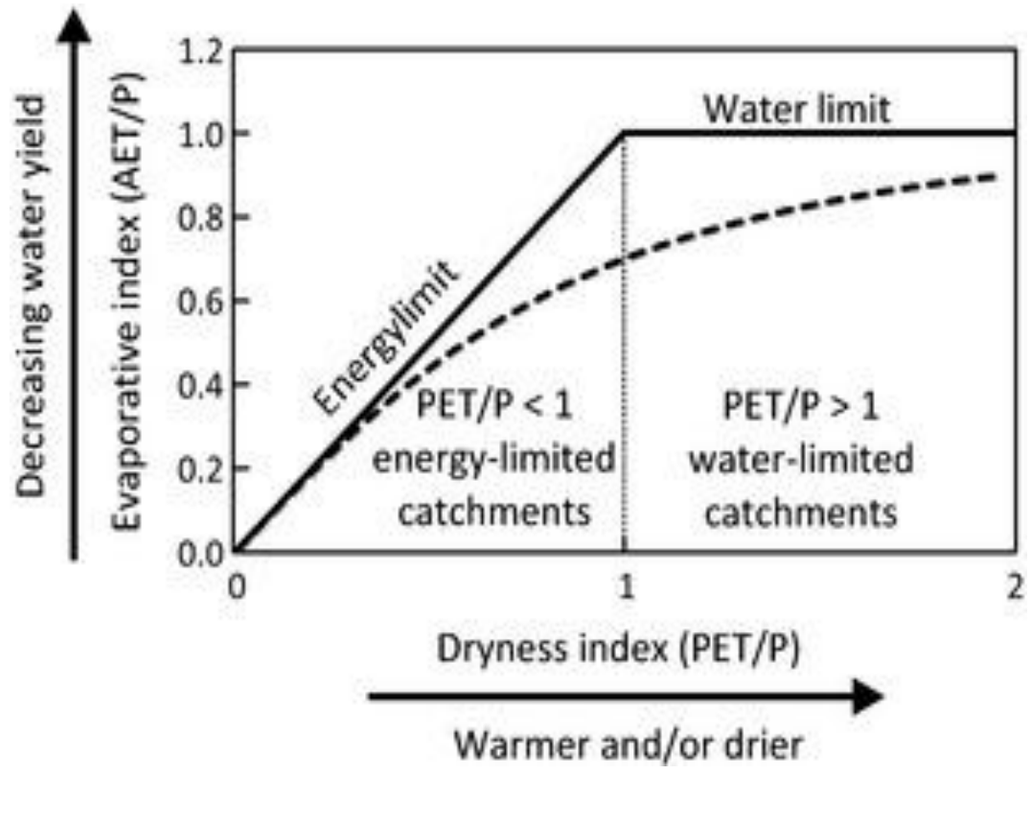


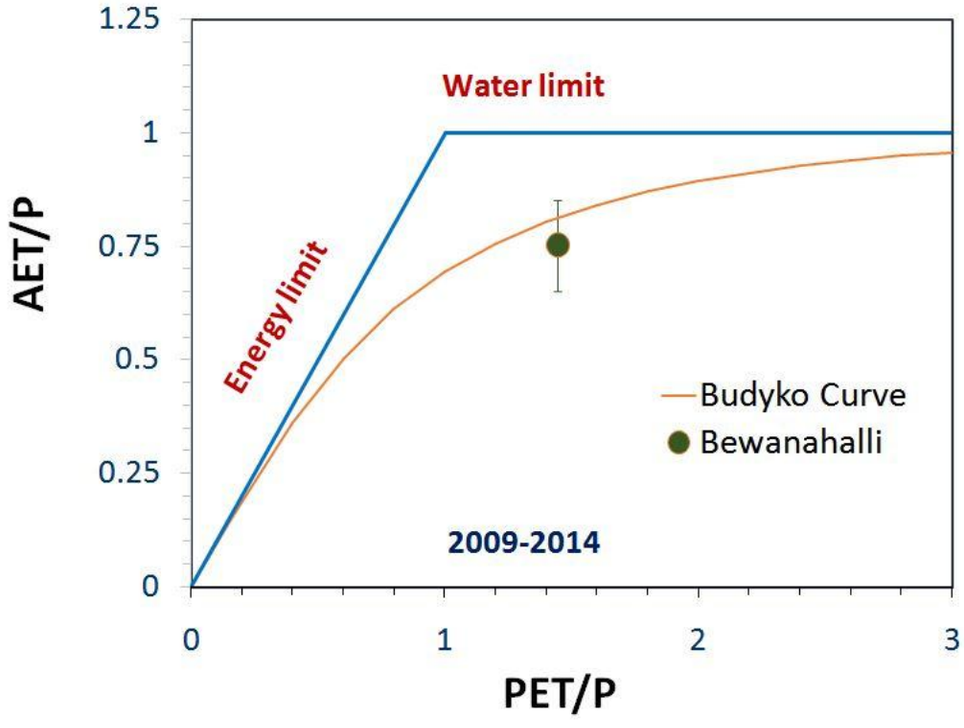
The average annual actual ET is lower than the average annual rainfall. During *kharif*, average rainfall and ET was found to be 691 mm and 335 mm respectively, whereas in *rabi* it was about 136 mm and 205 mm. In comparison to the 2001-2009, the annual ET increased by 7% during 2010-2014.

EVAPOTRANSPIRATION INDEX

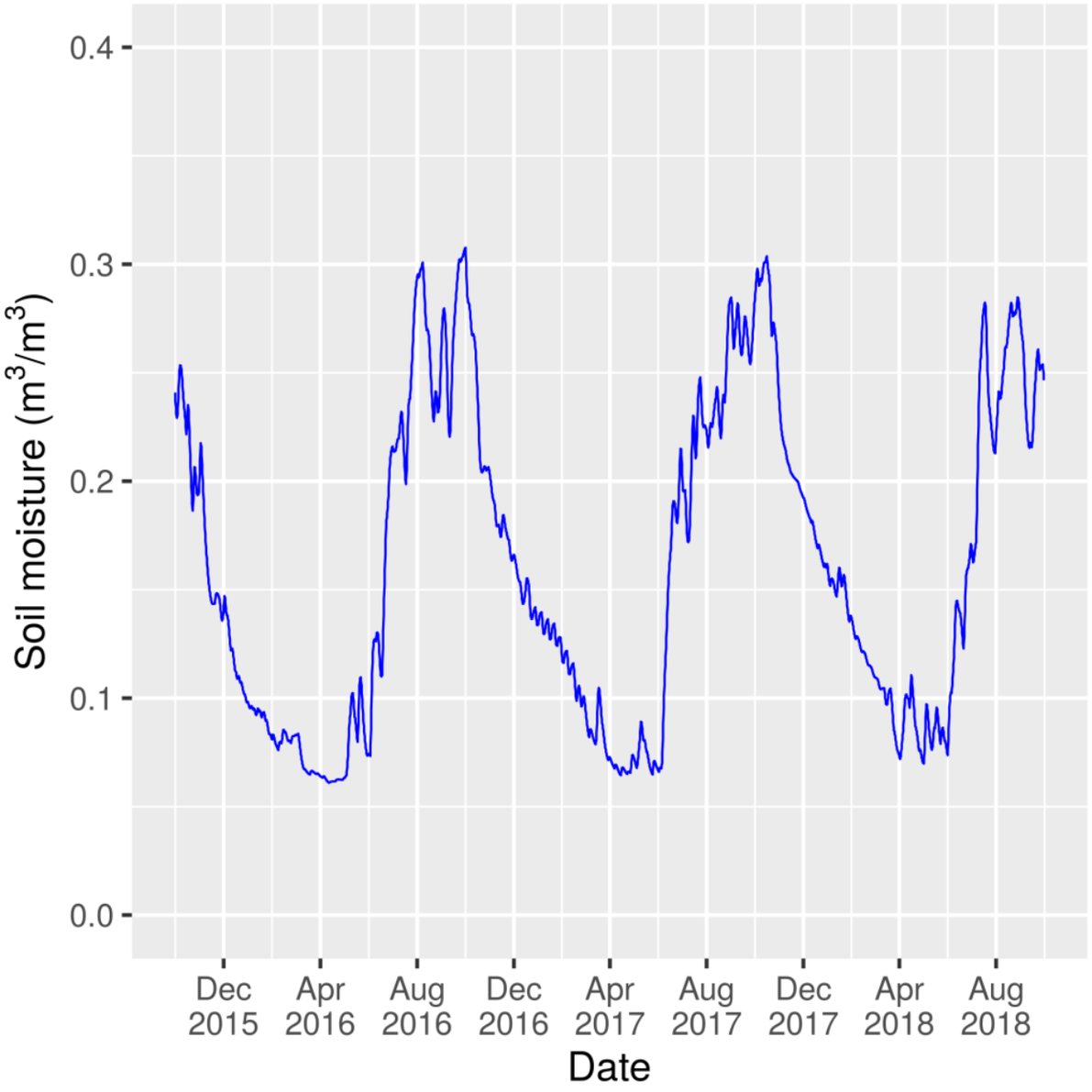


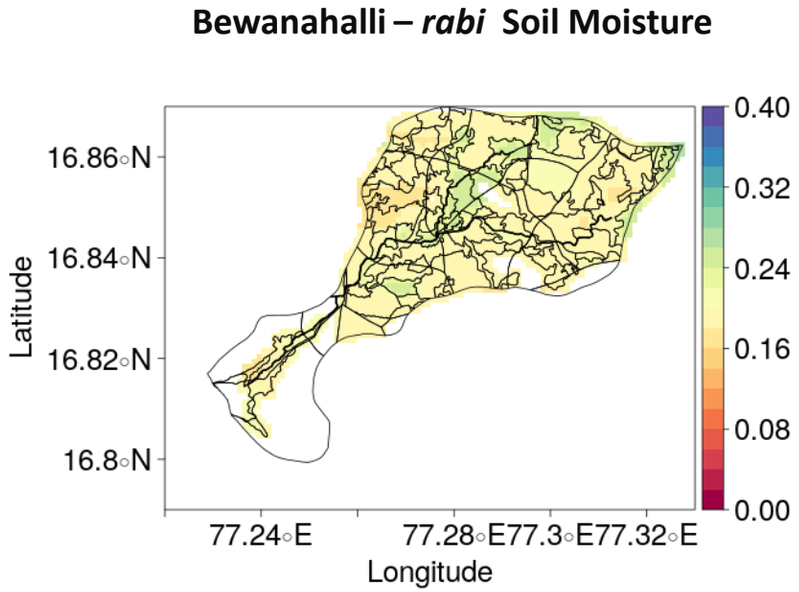
The average AET/P ratio was about 75%, which is slightly lower than the sustainable limit of about 80%. Even during extremely lower rainfall year of 2014, AET was 690 mm. Sub-watershed is within sustainable limit due to good rainfall during kharif season.

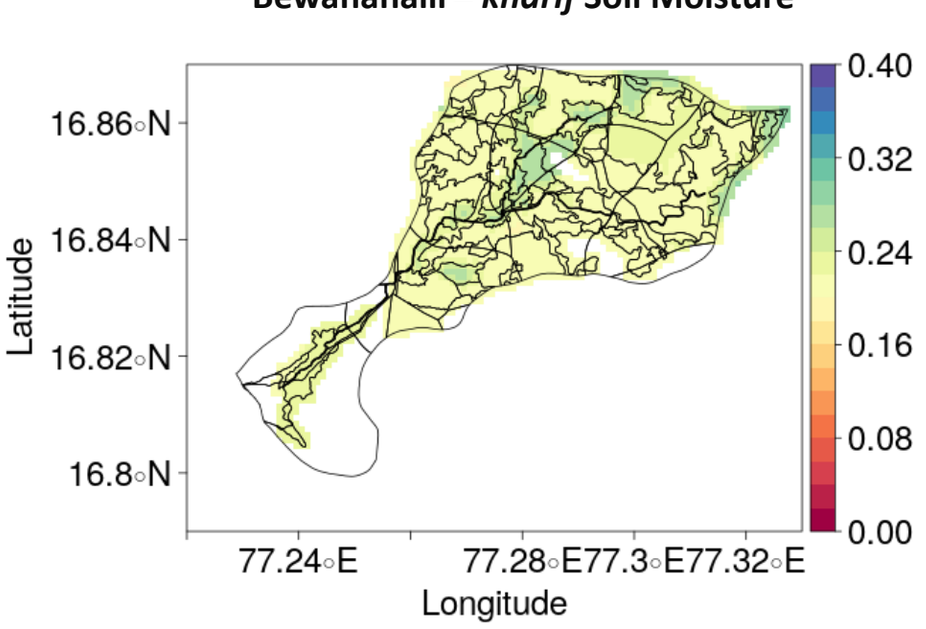




SATELLITE RETRIEVED SOIL MOISTURE





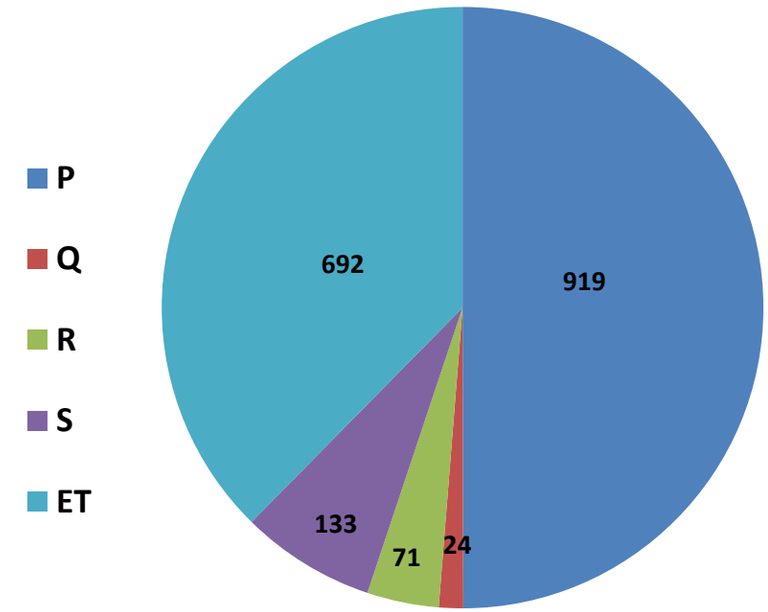


The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 8-27 % in *kharif* and 14-31 % in *rabi* seasons of 2016, 6-23 % in *kharif* and 15-30% in *rabi* seasons of 2017.

WATER BALANCE

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

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

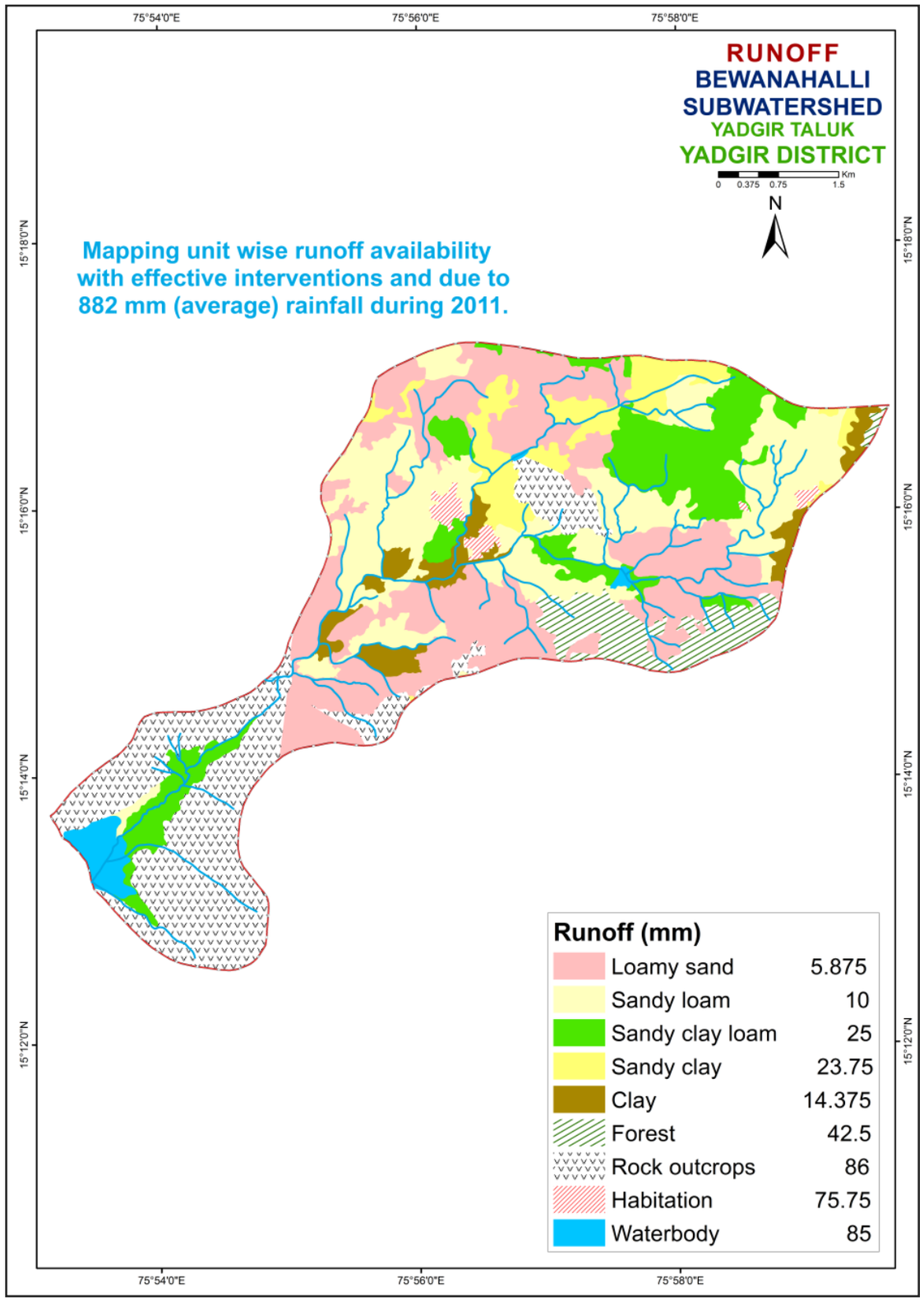


During June-September months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

P = 919 mm (average of 2009-2017) ET = 692 mm R = 71 mm S = 133 mm Q = 24 mm

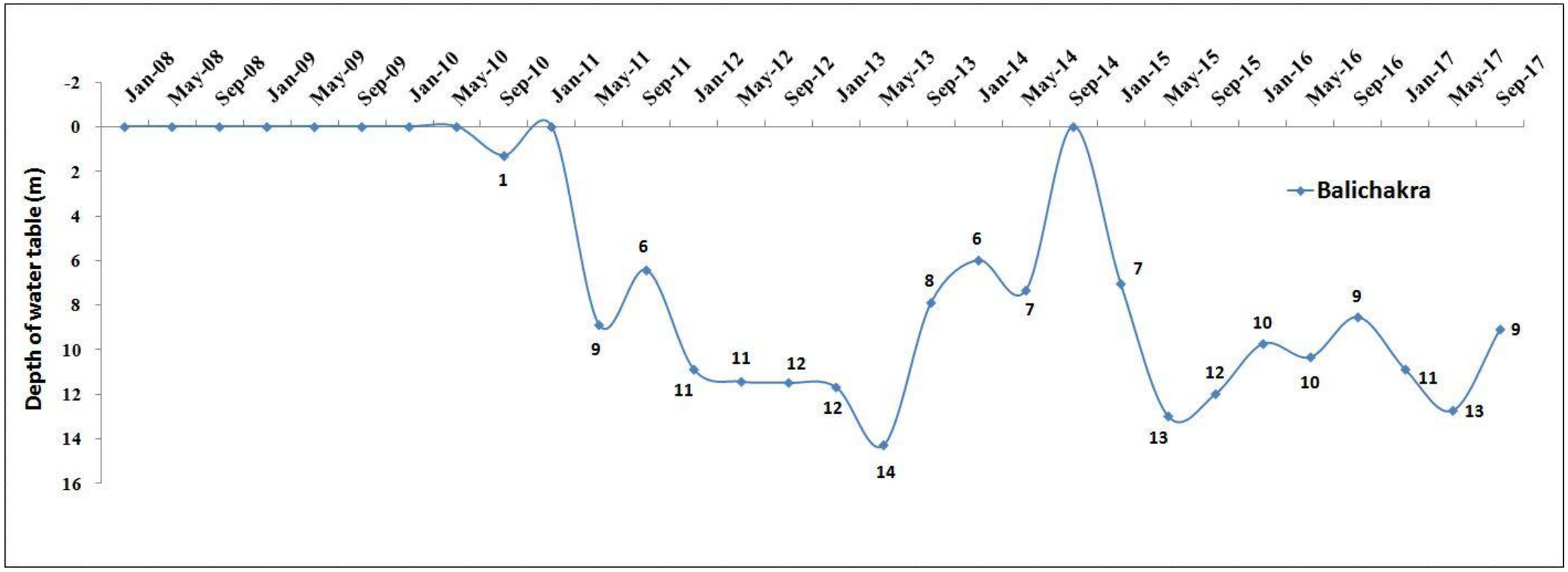
Sl. No.	Parameters	Average_ 2011 (mm)
1.	Rainfall	882
2.	Runoff availability with existing conditions	42
3.	Runoff availability with effective interventions	30
4.	Runoff allowed as environmental flow at the outlet	6
5.	Runoff excess for harvesting by construction of structures	24

RUNOFF


RUNOFF
BEWANAHALLI
SUBWATERSHED
YADGIR TALUK
YADGIR DISTRICT
0 0.375 0.75 1.5 Km
N
Mapping unit wise runoff availability with effective interventions and due to 882 mm (average) rainfall during 2011.
75°54'0"E
75°56'0"E
75°58'0"E
15°18'0"N
15°16'0"N
15°14'0"N
15°12'0"N
Runoff (mm)
Loamy sand 5.875
Sandy loam 10
Sandy clay loam 25
Sandy clay 23.75
Clay 14.375
Forest 42.5
Rock outcrops 86
Habitation 75.75
Waterbody 85

GROUND WATER STATUS

BALICHAKRA STATION



The total number of wells present in Bewanahalli Sub-watershed as per LRI data is 10 (9-Borewells & 1-Openwell). The groundwater level was found from the data obtained from KSNDMC for the nearest station Balichakra. The above graph depicts the groundwater levels during the years 2008-2010 was almost constant. Whereas groundwater levels during the years 2011-2017 was slightly varying except Sept -2014. Deepest levels were found in 2013.

SUMMARY

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

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

- The evapotranspiration estimation tool developed indicates that the watershed water balance is in 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 24 mm for an average annual rainfall of 919 mm (2009-2017). The utilizable groundwater is 49.7 mm (70% of 71 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (133 mm) and utilizable runoff plus recharge is 207 (=133+24+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 540 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 675 mm (i.e 125% of AET). This demand for the two seasons is higher by 468 mm, i.e. (675-207). The AET in June-Sept months is only 47% 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 Bewanahalli Sub-watershed as per LRI data is 10 (9-Borewells & 1-Openwell). The groundwater level was found from the data obtained from KSNDMC for the nearest station Balichakra. Deepest levels were found in 2013.