हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
Agrisearch with a human touch

# Land Resource and Hydrological Inventory of Chik Bamanhal Sub-watershed for Watershed Planning and Development Koppal Taluk, Koppal District, Karnataka (AESR 3.0)

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

ICAR - NBSS & LUP

THE 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 Chik Bamanhal Sub-watershed for Watershed Planning and Development

## Koppal Taluk, Koppal District, Karnataka (AESR 3.0)

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# How to read and use the Atlas

The Land Resource Inventory of Chik Bamanhal Sub-watershed (Koppal Taluk, Koppal District) for Watershed Planning (AESR 3.0) was undertaken to provide comprehensive site- specific cadastral level information useful for farm level planning and integrated development of the area under Sujala – III, Karnataka Watershed Development Project- II.

This atlas contains the basic information on kinds of soils, their geographic distribution, characteristics and classification. The soil map and soil based thematic maps derived from soils data on soil depth, soil gravelliness, slope, land suitability for various crops and land use management maps are presented on 1:12,500 scale. The maps of fertility status (soil reaction, organic carbon, available phosphorus, available potassium, available sulphur, available calcium, available copper, available manganese, available zinc, available iron, available boron and salinity (EC) on 1:12,500 scale were derived from grid point sampling of the surface soils from the watersheds.

The atlas illustrates maps and tables that depict the soil resources of the watershed and the need for their sustainable management.

The user, depending on his/her requirement, can refer this atlas first by identifying his/her field and survey number on the village soil map and by referring the soil legend which is provided in tabular form after the soil map for details pertaining to his/her area of interest.

The atlas explains in simple terms the different kinds of soils present in the watershed, their potentials and problems through a series of thematic maps that help to develop site-specific plans as well as the need to conserve and manage this increasingly threatened natural resource through sustainable land use management. The Land Resource Atlas contains database collected at land parcel/ survey number level on soils, climate, water, vegetation, crops and cropping patterns, socio-economic conditions, marketing facilities *etc.* helps in identifying soil and water conservation measures required, suitability for crops and other uses and finally for preparing a viable and sustainable land use options for each and every land parcel.

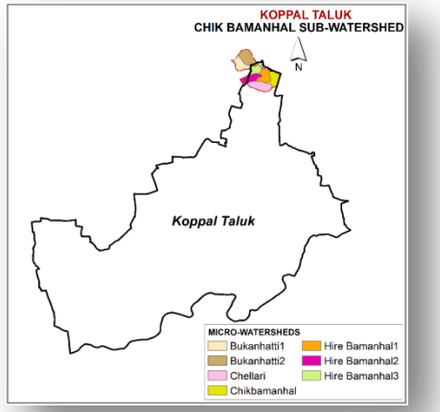
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

# Physical, Cultural and Scientific symbols used in the Atlas

Each map in the atlas sheet is complemented with the physical, cultural and scientific symbols to facilitate easy map reading.

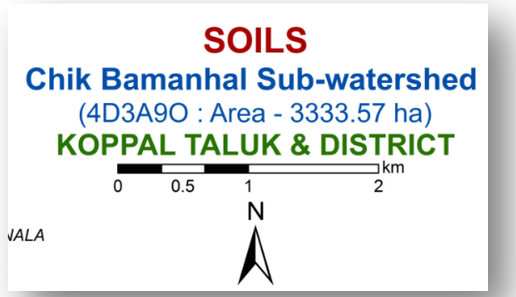
***Inset map***

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



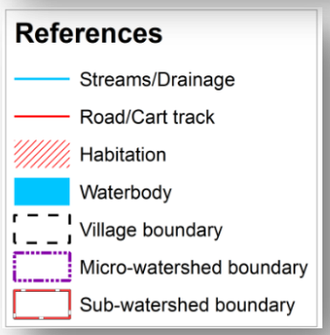

***Map title***

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



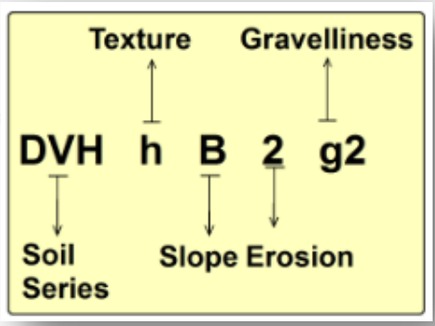

***Legends and symbols***

*Two legends accompany each map, a **map reference**, which depicts geographic features and a **thematic legend** which portrays spatial information. Picking up the symbol and colour of a particular enables one to go to the legends to obtain the required information.*



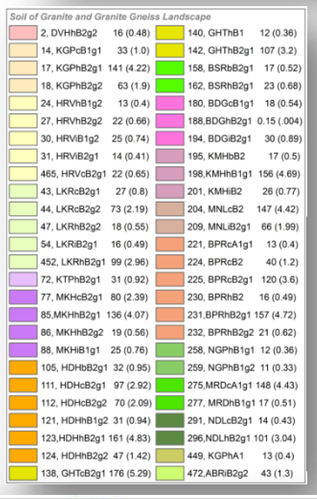

***Soil Units***

*The soil map may be read at different levels. The most detailed level is that of the soil phase. Soil phases are distinguished within soil series mainly based on differences in surface of soil texture, slope, gravelliness , erosion ,etc.*



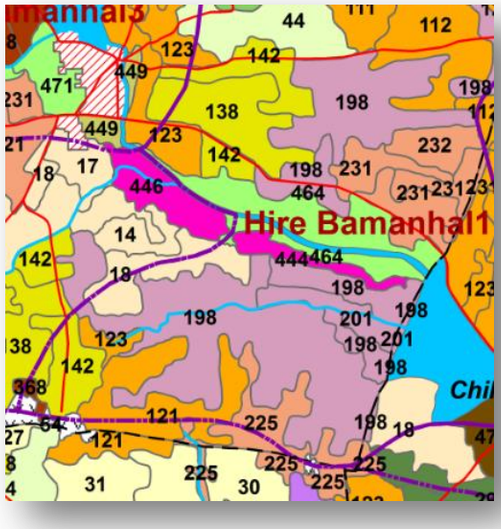

***Map colours***

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



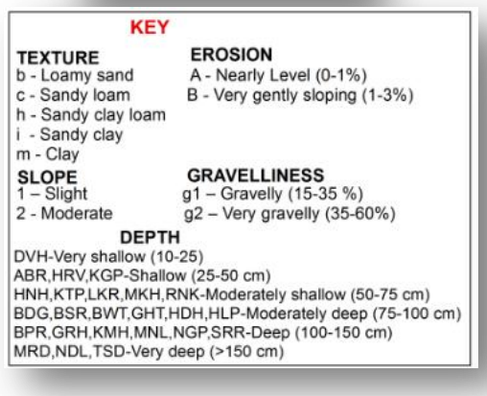

***Soil and plot boundaries***

*Soil units shown on the map are represented by both the color and a numeral. The soil boundaries are superimposed on land parcel with revenue survey number boundaries to visualize its spatial extent.*




***Map key***

*There are many thematic types to be differentiated on the map solely based on colour. Therefore soils and suitability types and their limitations are distinguished by colours with a combination of alpha-numeric characters.*




# 1. Introduction

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use land in a rational and judicious manner. But what is happening in many areas of the state is a cause for concern to anyone involved in the management of land resources at the grassroots level. In India the area available for agriculture is about 51 per cent of the total area and more than 60 per cent of the people are still relying on agriculture for their livelihood. The limited land area is under severe stress and strain due to increasing population pressure and competing demands of various land uses. Due to this, every year there is a significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest for farming among the farmers in many areas, large tracts of cultivable lands are turning into fallows and this trend is continuing at an alarming rate.

The watershed management programs are aimed at designing suitable soil and water conservation measures, productivity enhancement of existing crops, crop diversification with horticultural species, greening the wastelands with forestry species of multiple uses and improving the livelihood opportunities for landless people.

The objectives can be met to a great extent when an appropriate Natural Resources Management (NRM) plan is prepared and implemented. It is essential to have site specific Land Resources Inventory (LRI) indicating the potentials and constraints for developing such a site specific plan. LRI can be obtained by carrying out detailed characterization and mapping of all the existing land resources like soils, climate, water, minerals and rocks, vegetation, crops, land use pattern, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed to the farmer and other land users of the area.

The major landforms identified in the Sub-watershed are uplands and low lands. The database was generated by using cadastral map of the village as a base along with high resolution satellite imagery (IRS LISS IV and Cartosat-1). The objectives of the land resource survey, carried out in the Chik Bamanhal Sub-watershed covering an area of 3333.57 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

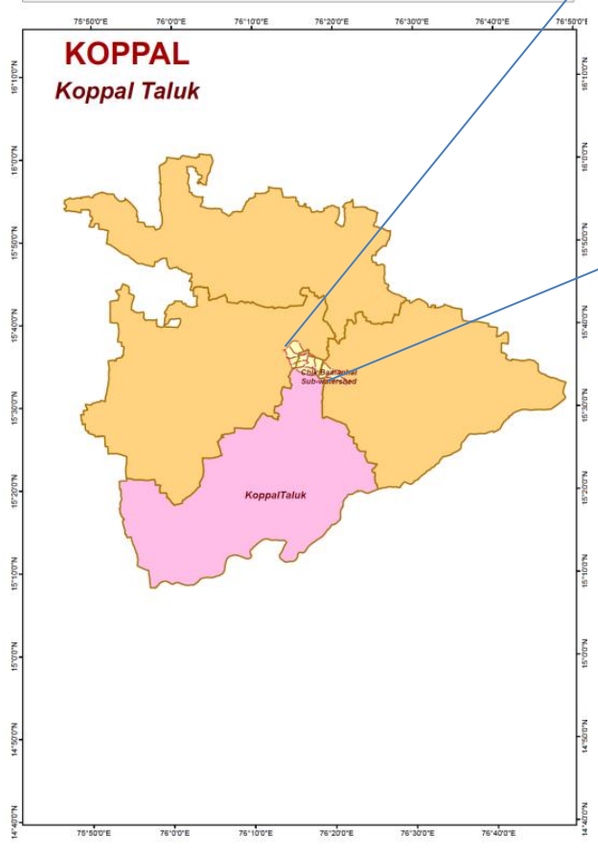
The Koppal district came to existence on 1st April 1998 by carving out of erst-while Raichur district of Karnataka with a geographical area of 552495 ha out of which forest area is 29451 ha, located in the northern part of the state. It lies between north latitudes 15˚ 09′ and 16˚ 01′ and east longitudes 75˚ 46′ and 76˚ 48′. The area falls in the Tungabhadra sub-basin of the Krishna basin. Tungabhadra river flows in the southern boundary of the district in north –easterly direction. The climate of the district is very hot and dry. The district has an average annual rainfall of 572 mm. Soils are well drained red sandy loam to medium deep black soils. This may be the weathering product of schistose, gneissic and granite terrain. Agriculture in Koppal district is dependent upon rainfall, irrigation tanks, wells, streams etc. The major agricultural crops grown are Jawar, Bajra, Wheat, Maize, Paddy, Horsegram, Greengram, Cowpea, Groundnut, Cotton, Niger seeds, Castor, Sunflower, Sugarcane etc. The major fruit crops include Pomegranates, Mango, Sapota, Citrus, Guava, Papaya. The major vegetable crops are leafy vegetables, Tomato, Onion, Brinjal *etc*.

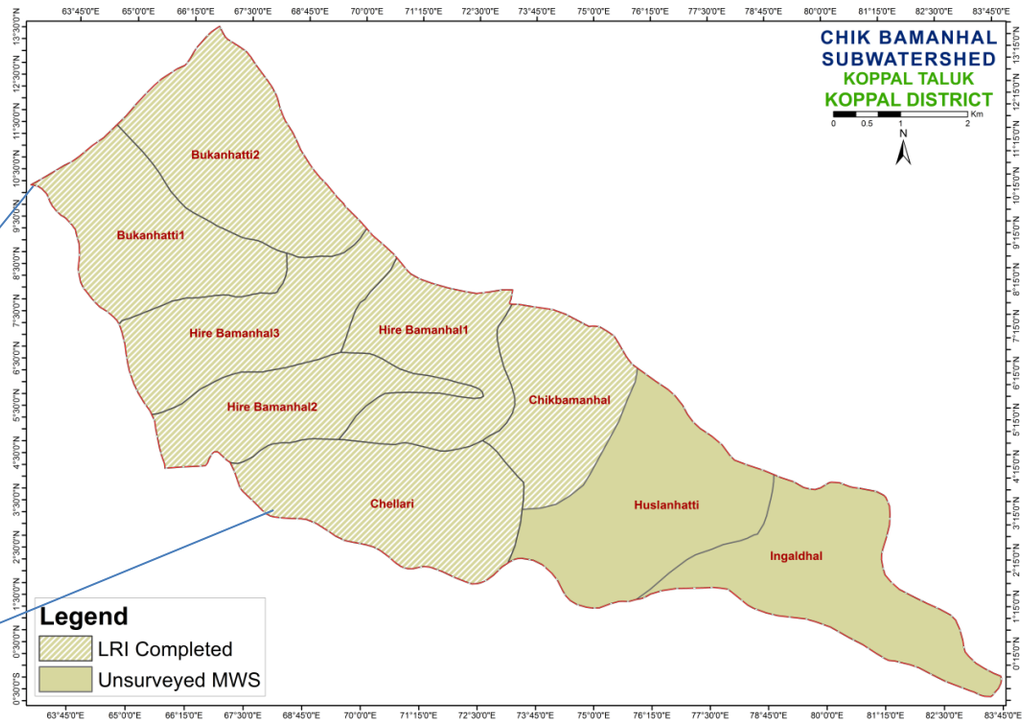
As a pilot study, **ICAR-NBSS&LUP, Bangalore** carried out the generation of LRI for the Chik Bamanhal Sub-watershed (code - 4D3A9O) in Koppal taluk, Koppal district. It was selected for data base generation under Sujala III project. This sub-watershed encompasses of 9 MWs namely Bukanhatti-1 (4D3A9O1b), Bukanhatti-2 (4D3A9O1a), Chellari (4D3A9O2a), Chikbamanhal (4D3A9O2b), Hire Bamanhal-1 (4D3A9O1e), Hire Bamanhal-2 (4D3A9O1d) , Hire Bamanhal-3 (4D3A9O1c) , Huslanhatti (4D3A9O2c) and Ingaldhal (4D3A9O2d). Land Resource Inventory (LRI) was generated for seven among nine micro-watersheds.

# LOCATION AND EXTENT

Chik Bamanhal sub-watershed (Koppal Taluk, Koppal District) is located between $15^0$32’ 40’’–$15^0$38’ 6’’ North latitudes and $76^0$ 13’44’’-$76^0$ 21’43’’ East longitudes, covering an area of about 4954 ha.

## LOCATION MAP OF CHIK BAMANHAL SUB-WATERSHED


**Agro Ecological Region (AER) – 3: (Deccan plateau, hot arid ecosubregion)**

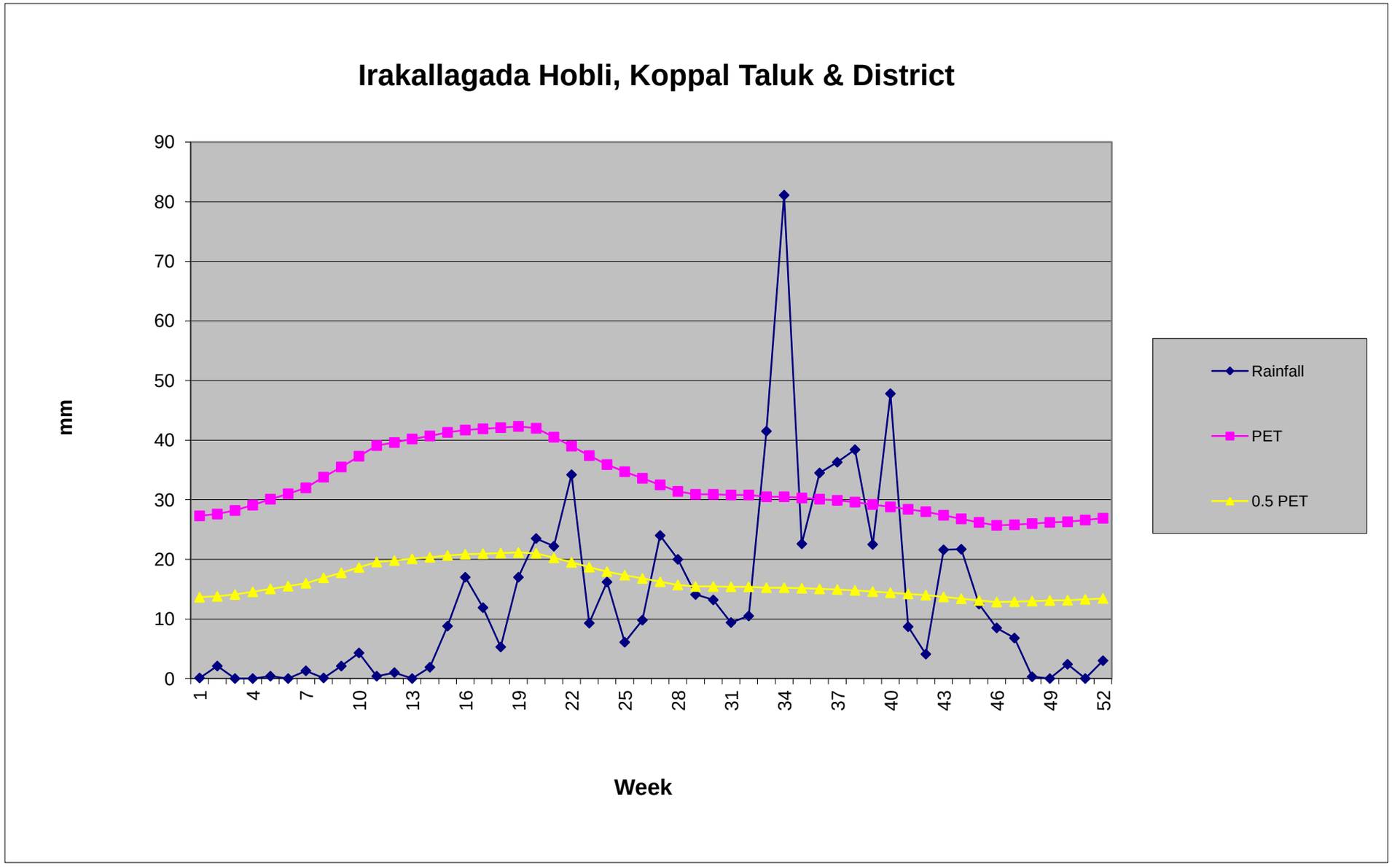
Karnataka Plateau (Rayalseema as inclusion), hot arid ESR with deep loamy and clayey mixed Red and Black soils, low to medium AWC and LGP 60-90 days.

**Agro-climatic Zone 3: Northern Dry Zone:**

This zone is the largest in the state with a geographical area of 5.04 M ha, of which about 3.55 M ha is under cultivation. Irrigation is available to about 0.49 M ha. The zone encompasses the entire districts of Bijapur and Bellary, 6 taluks of Koppal, 5 taluks of Dharwad and 5 taluks of Belgaum. Of the 35 taluks in the zone, 9 taluks have a mean elevation of 800-900 m MSL while the rest have an elevation of 450-800 m. The rainfall is similar to that of the northeastern dry zone, ranging between 465 and 785 mm. Black soils are predominant in the zone with depth ranging from shallow to deep. General cropping season is *kharif* in shallow black soils and *rabi* in medium and deep black soils. Important crops of the zone are jowar, maize, bajra, groundnut, pulses, sunflower, cotton and sugarcane.

**NOTE: Land Resource Inventory (LRI) was generated for seven among the nine micro-watersheds.**

# Climate

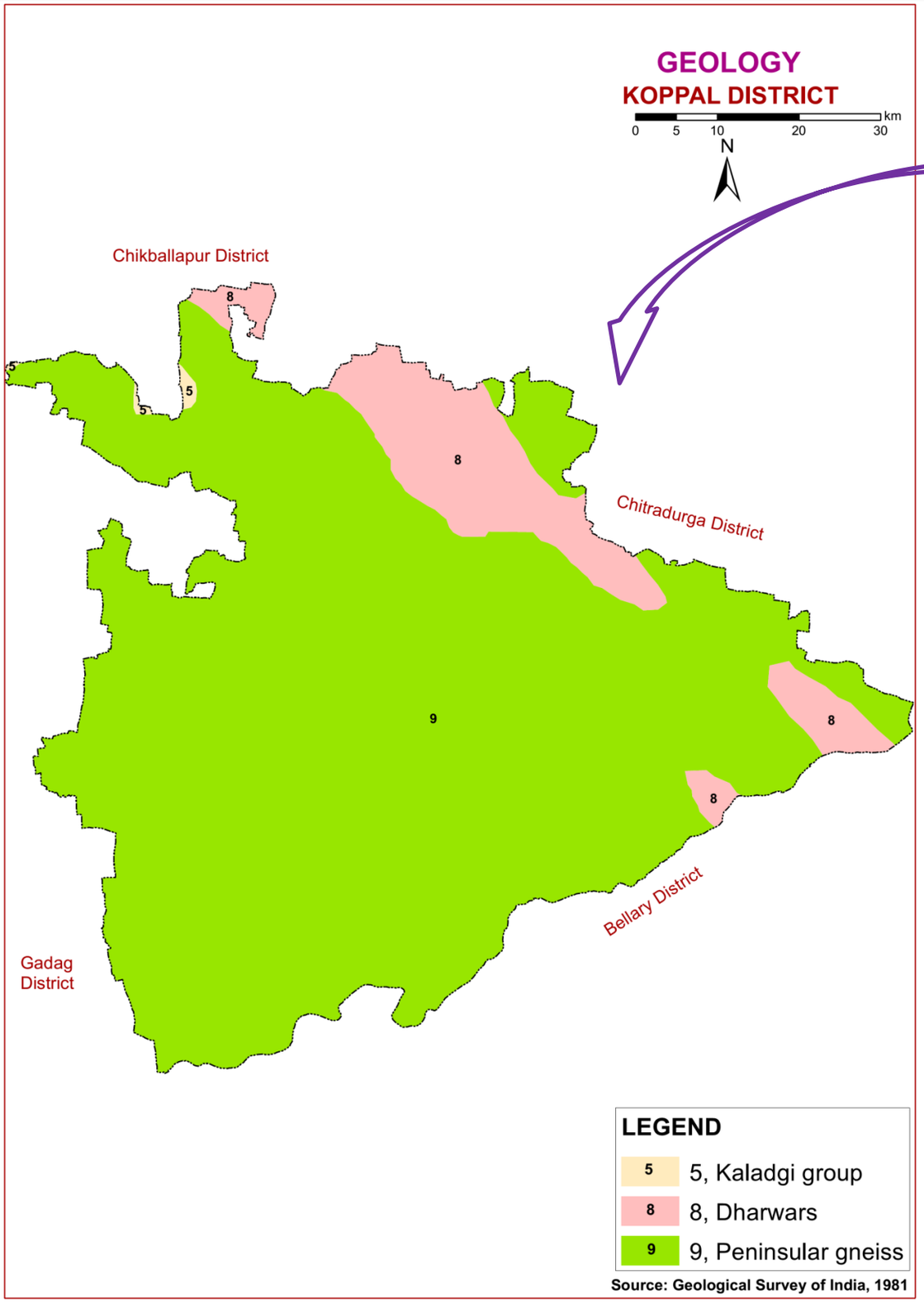


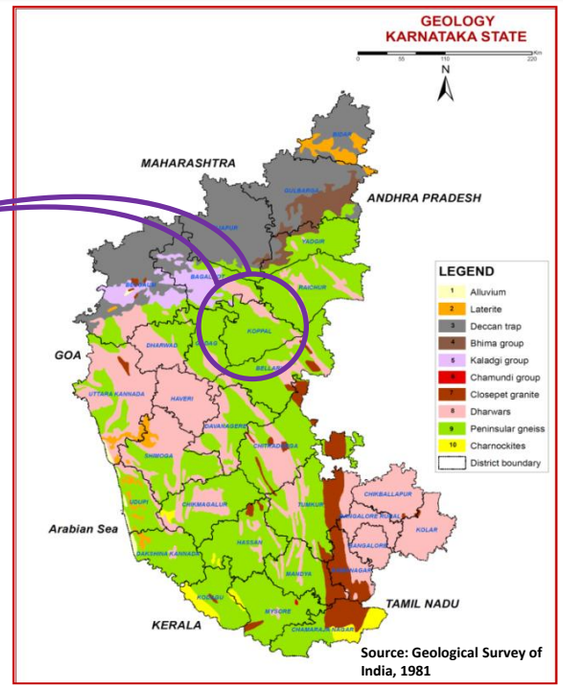

Length of Growing Period (LGP) is varying from July 1st week to last week of September (< 90 days)

Annual Rainfall : 701 mm. in the Irakallagada Hobli, Koppal Taluk & District

**Source: KSNMDC (1980-2011)**

# 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 - KOPPAL DISTRICT**

**Kaladgi group**

It consists of nearly horizontal sedimentary rocks 3000 to 5000m thick overlying the Archaeans. The component rocks are sandstones, shales, limestone, dolomite and schists.

***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 (comprises banded ferruginous quartzites, pyroxenite, gabbro, serpentinite, acid volcanic, phyllites, metabasalt, and quartz-chlorite schist) and Chitradurga groups (includes quartzite, limestone, dolomite, chlorite-schist, and manganese and iron ores with phyllite, metabasalt and conglomerates).

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.

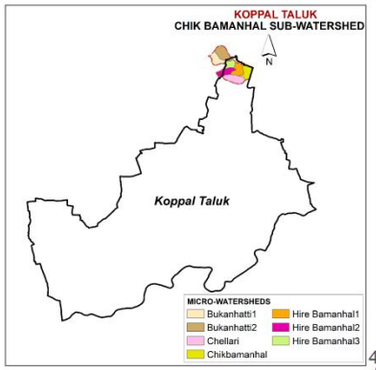
# 3. SURVEY METHODOLOGY

## 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




## Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

**KOPPAL TALUK & DISTRICT**

0 0.5 1 2 km

N

Bukanhatti1

Bukanhatti2

Hire Bamanhal3

Hire Bamanhal1

Hire Bamanhal2

Chikbamanhal

Chellari

Challari

Bukanahatti

HIREBOMMANALA

BUKANAHATTI

CHALLARI

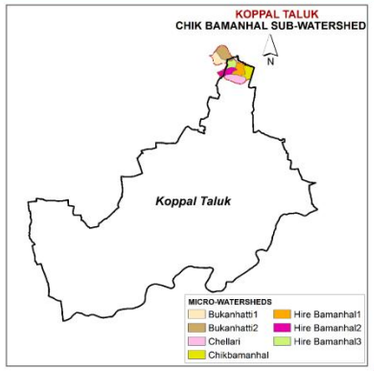
CHIKKABOMMANAHALA

**References**

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 3.2. Database Used - Satellite Image




## SATELLITE IMAGE

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

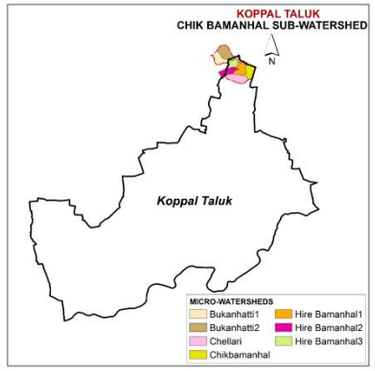
Uchhalakunti
Bukanhatti2
Thippanahala
Bukanhatti1
Bukanahatti
HIREBOMMANALA
Hire Bamanhal3
BUKANAHATTI
Hirebommanala
Hire Bamanhal1
Hire Bamanhal2
Chikbamanhal1
Chikkabommanahala
CHIKKABOMMANAHALA
Challari
Chellari
CHALLARI

**References**

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

Source : Cartosat 1 Imagery

# 3.3. Location of Wells




## LOCATION OF WELLS

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

Uchhalakunti
Bukanhatti2
Thippanahala
Bukanhatti1
Bukanahatti
HIREBOMMANALA
BUKANAHATTI
Hire Bamanhal3
Hirebommanala
Hire Bamanhal1
Hire Bamanhal2
Chikbamanhal
Chikkabommanahala
CHIKKABOMMANAHALA
Challari
Chellari
CHALLARI

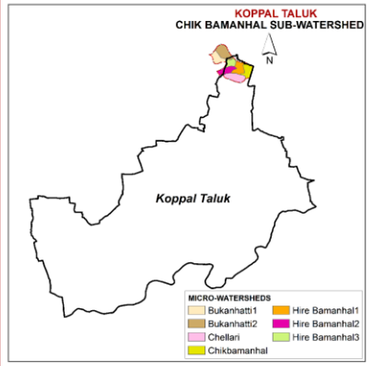
**References**

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

| Wells | No's |
|---|---|
| Borewell | 123 |

**Source: ICAR-NBSS&LUP, Bengaluru**

# 4. The Soils

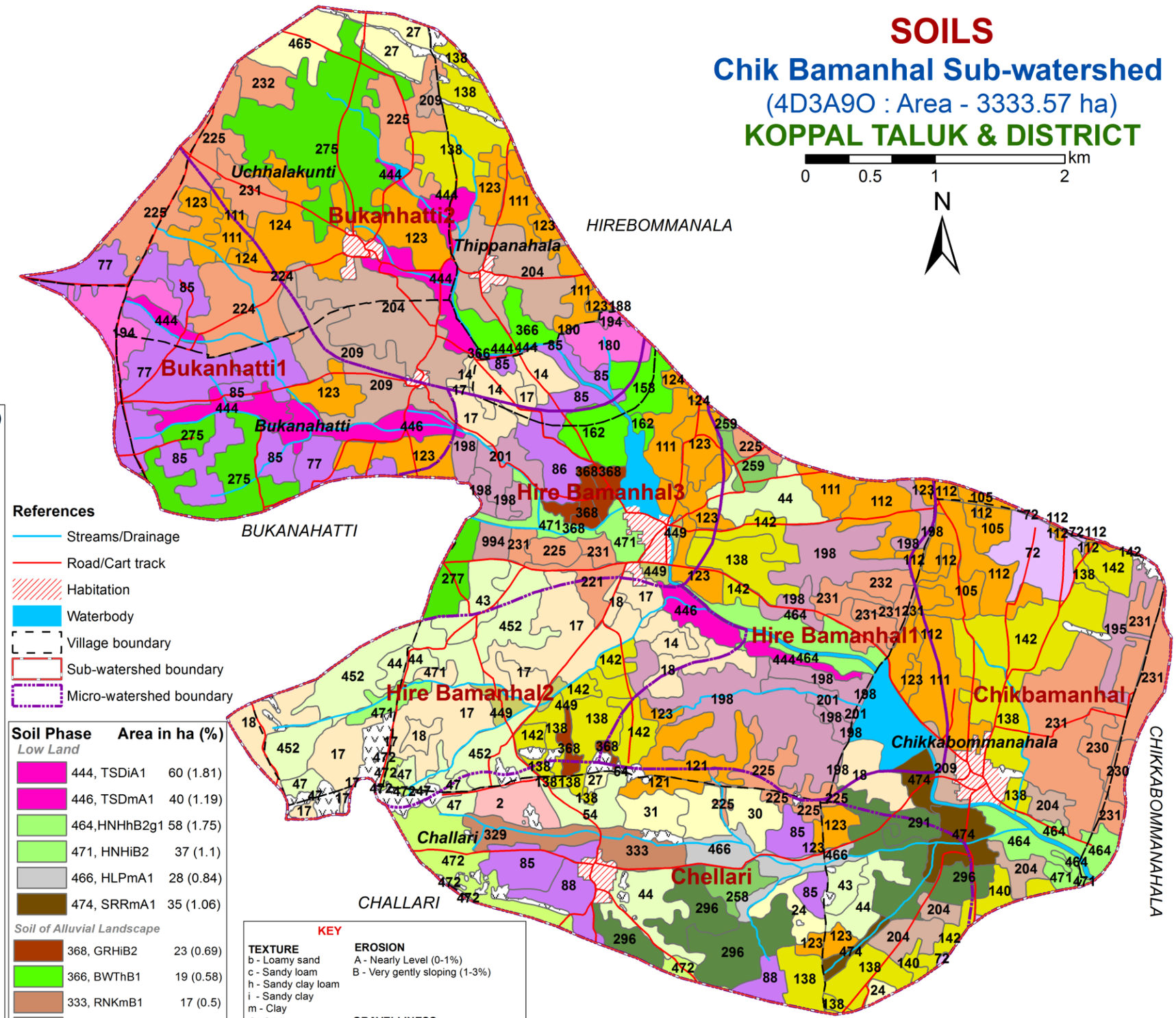



Texture Gravelliness

DVH h B 2 g2

Soil Series | Slope | Erosion

| Soil Phase | Area in ha (%) | Soil Phase | Area in ha (%) |
|---|---|---|---|
| *Soil of Granite and Granite Gneiss Landscape* | | | |
| 2, DVHhB2g2 | 16 (0.48) | 140, GHThB1 | 12 (0.36) |
| 14, KGPcB1g1 | 33 (1.0) | 142, GHThB2g1 | 107 (3.2) |
| 17, KGPhB2g1 | 141 (4.22) | 158, BSRbB2g1 | 17 (0.52) |
| 18, KGPhB2g2 | 63 (1.9) | 162, BSRhB2g1 | 23 (0.68) |
| 24, HRVhB1g2 | 13 (0.4) | 180, BDGcB1g1 | 18 (0.54) |
| 27, HRVhB2g2 | 22 (0.66) | 188,BDGhB2g1 | 0.15 (.004) |
| 30, HRViB1g2 | 25 (0.74) | 194, BDGiB2g1 | 30 (0.89) |
| 31, HRViB2g1 | 14 (0.41) | 195, KMHbB2 | 17 (0.5) |
| 465, HRVcB2g1 | 22 (0.65) | 198,KMHhB1g1 | 156 (4.69) |
| 43, LKRcB2g1 | 27 (0.8) | 201, KMHiB2 | 26 (0.77) |
| 44, LKRcB2g2 | 73 (2.19) | 204, MNLcB2 | 147 (4.42) |
| 47, LKRhB2g2 | 18 (0.55) | 209, MNLiB2g1 | 66 (1.99) |
| 54, LKRiB2g1 | 16 (0.49) | 221, BPRcA1g1 | 13 (0.4) |
| 452, LKRhB2g1 | 99 (2.96) | 224, BPRcB2 | 40 (1.2) |
| 72, KTPhB2g1 | 31 (0.92) | 225, BPRcB2g1 | 120 (3.6) |
| 77, MKHcB2g1 | 80 (2.39) | 230, BPRhB2 | 16 (0.49) |
| 85,MKHhB2g1 | 136 (4.07) | 231,BPRhB2g1 | 157 (4.72) |
| 86, MKHhB2g2 | 19 (0.56) | 232, BPRhB2g2 | 21 (0.62) |
| 88, MKHiB1g1 | 25 (0.76) | 258, NGPhB1g1 | 12 (0.36) |
| 105, HDHbB2g1 | 32 (0.95) | 259, NGPhB1g2 | 11 (0.33) |
| 111, HDHcB2g1 | 97 (2.92) | 275,MRDcA1g1 | 148 (4.43) |
| 112, HDHcB2g2 | 70 (2.09) | 277, MRDhB1g1 | 17 (0.51) |
| 121, HDHhB1g2 | 31 (0.94) | 291, NDLcB2g1 | 14 (0.43) |
| 123,HDHhB2g1 | 161 (4.83) | 296,NDLhB2g1 | 101 (3.04) |
| 124, HDHhB2g2 | 47 (1.42) | 449, KGPhA1 | 13 (0.4) |
| 138, GHTcB2g1 | 176 (5.29) | 472,ABRiB2g2 | 43 (1.3) |




**References**

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

| Soil Phase | Area in ha (%) |
|---|---|
| *Low Land* | |
| 444, TSDiA1 | 60 (1.81) |
| 446, TSDmA1 | 40 (1.19) |
| 464,HNHhB2g1 | 58 (1.75) |
| 471, HNHiB2 | 37 (1.1) |
| 466, HLPmA1 | 28 (0.84) |
| 474, SRRmA1 | 35 (1.06) |
| *Soil of Alluvial Landscape* | |
| 368, GRHiB2 | 23 (0.69) |
| 366, BWThB1 | 19 (0.58) |
| 333, RNKmB1 | 17 (0.5) |
| 329, RNKiA1 | 17 (0.52) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**KEY**

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

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

**SLOPE**
1 – Slight
2 - Moderate

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

**DEPTH**
DVH-Very shallow (10-25)
ABR,HRV,KGP-Shallow (25-50 cm)
HNH,KTP,LKR,MKH,RNK-Moderately shallow (50-75 cm)
BDG,BSR,BWT,GHT,HDH,HLP-Moderately deep (75-100 cm)
BPR,GRH,KMH,MNL,NGP,SRR-Deep (100-150 cm)
MRD,NDL,TSD-Very deep (>150 cm)

**Source: ICAR-NBSS&LUP, Bengaluru**

## 4.1 Mapping unit description of Chik Bamanhal (4D3A9O) Sub-watershed in Koppal taluk, Koppal district

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| **Soils of Granite and Granite Gneiss Landscape** | | | | |
| | DVH | Devihal soils are very shallow (< 25 cm), well drained, have dark reddish brown to yellowish red sandy clay loam soils occurring on very gently sloping uplands. | | **16 (0.48)** |
| 2 | | DVHhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 16 (0.48) |
| | KGP | Kaggalipura soils are shallow (25-50 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay soils occurring on nearly level to moderately sloping uplands under cultivation | | **250 (7.5)** |
| 14 | | KGPcB1g1 | Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 33 (1.0) |
| 17 | | KGPhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 141 (4.22) |
| 18 | | KGPhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 63 (1.9) |
| 449 | | KGPhA1 | Sandy clay loam surface, slope 0-1%, slight erosion | 13 (0.4) |
| | HRV | Harve soils are shallow (25-50 cm), well drained, dark red to dark red dish brown, red gravelly sandy clay loam soils occurring on nearly level to gently sloping uplands under cultivation | | **95 (2.8)** |
| 24 | | HRVhB1g2 | Sandy clay loam surface, slope 1-3%, slight erosion, very gravelly (35-60%) | 13 (0.4) |
| 27 | | HRVhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 22 (0.66) |
| 30 | | HRViB1g2 | Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%) | 25 (0.74) |
| 31 | | HRViB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 14 (0.41) |
| 465 | | HRVcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 22 (0.65) |
| | ABR | Abbigere soils are shallow (25-50 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation. | | **43 (1.3)** |
| 472 | | ABRiB2g2 | Sandy clay surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 43 (1.3) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | LKR | Lakkur soils are moderately shallow (50-75 cm), well drained, have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation | | **233 (6.9)** |
| 43 | | LKRcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 27 (0.8) |
| 44 | | LKRcB2g2 | Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 73 (2.19) |
| 47 | | LKRhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 18 (0.55) |
| 54 | | LKRiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 16 (0.49) |
| 452 | | LKRhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 99 (2.96) |
| | KTP | Kethanapura soils are moderately shallow (50-75 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation | | **31 (0.92)** |
| 72 | | KTPhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 31 (0.92) |
| | MKH | Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown gravelly red sandy clay soils occurring on gently very gently to gently sloping uplands under cultivation | | **260 (7.7)** |
| 77 | | MKHcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 80 (2.39) |
| 85 | | MKHhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 136 (4.07) |
| 86 | | MKHhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 19 (0.56) |
| 88 | | MKHiB1g1 | Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%) | 25 (0.76) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | HDH | Hooradhahalli soils are moderately deep (75-100 cm), well drained, dark red to dark reddish brown, red gravelly sandy clay to clay soils occurring on nearly level to moderately sloping uplands under cultivation | | **438 (13.1)** |
| 105 | | HDHbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 32 (0.95) |
| 111 | | HDHcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 97 (2.92) |
| 112 | | HDHcB2g2 | Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 70 (2.09) |
| 121 | | HDHhB1g2 | Sandy clay loam surface, slope 1-3%, slight erosion, very gravelly (35-60%) | 31 (0.94) |
| 123 | | HDHhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 161 (4.83) |
| 124 | | HDHhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 47 (1.42) |
| | GHT | Gollarahatti soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red gravelly sandy clay loam soils occurring on nearly level very gently sloping uplands under cultivation | | **295 (8.8)** |
| 138 | | GHTcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 176 (5.29) |
| 140 | | GHThB1 | Sandy clay loam surface, slope 1-3%, slight erosion | 12 (0.36) |
| 142 | | GHThB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 107 (3.2) |
| | BSR | Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation | | **295 (8.8)** |
| 158 | | BSRbB2g1 | Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 17 (0.52) |
| 162 | | BSRhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 23 (0.68) |
| | BDG | Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red clay soils occurring on nearly level to gently sloping uplands under cultivation | | **48 (1.47)** |
| 180 | | BDGcB1g1 | Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 18 (0.54) |
| 188 | | BDGhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 0.14 (0.004) |
| 194 | | BDGiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 30 (0.89) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | KMH | Kumchahalli soils are deep (100-150cm), well drained, have dark reddish brown to dark red sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation | | **199 (5.9)** |
| 195 | | KMHbB2 | Loamy sand surface, slope 1-3%, moderate erosion | 17 (0.5) |
| 198 | | KMHhB1g1 | Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 156 (4.69) |
| 201 | | KMHiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 26 (0.77) |
| | MNL | Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation | | **214 (6.4)** |
| 204 | | MNLcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 147 (4.42) |
| 209 | | MNLiB2g1 | Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 66 (1.99) |
| | BPR | Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation | | **199 (5.9)** |
| 221 | | BPRcA1g1 | Sandy loam surface, slope 0-1 %, slight erosion, gravelly (15-35%) | 13 (0.4) |
| 224 | | BPRcB2 | Sandy loam surface, slope 1-3%, moderate erosion | 40 (1.2) |
| 225 | | BPRcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 120 (3.6) |
| 230 | | BPRhB2 | Sandy clay loam surface, slope 1-3%, moderate erosion | 16 (0.49) |
| 231 | | BPRhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 157 (4.72) |
| 232 | | BPRhB2g2 | Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%) | 21 (0.62) |
| | NGP | Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red gravelly sandy clay soils occurring on nearly level to gently sloping uplands under cultivation | | **23 (0.68)** |
| 258 | | NGPhB1g1 | Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 12 (0.36) |
| 259 | | NGPhB1g2 | Sandy clay loam surface, slope 1-3%, slight erosion, very gravelly (35-60%) | 11 (0.33) |
| | MRD | Muradi soils are very deep (>150 cm), well drained, have red to dark red sandy clay loam soils occurring on nearly level to gently sloping uplands under cultivation | | **164 (4.9)** |
| 275 | | MRDcA1g1 | Sandy loam surface, slope 0-1%, slight erosion, gravelly (15-35%) | 148 (4.43) |
| 277 | | MRDhB1g1 | Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%) | 17 (0.51) |

*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | NDL | Niduvalalu soils are very deep (>150 cm), well drained, have red to dark reddish brown red gravelly sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation | | **115 (3.4)** |
| 291 | | NDLcB2g1 | Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 14 (0.43) |
| 296 | | NDLhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 101 (3.04) |
| | HNH | Honnenahalli soils are moderately shallow (50-75 cm), moderately well drained, have brown to dark brown sandy clay soils occurring on nearly level to very gently sloping lowlands under cultivation | | **95 (2.8)** |
| 464 | | HNHhB2g1 | Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%) | 58 (1.75) |
| 471 | | HNHiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 37 (1.1) |
| | HLP | Huliyapura soils are moderately deep (75-100 cm), well drained, have dark- strong brown to dark yellowish brown sandy clay loam soils occurring on very gently sloping low lands under cultivation | | **28 (0.84)** |
| 466 | | HLPmA1 | Clay surface, slope 0-1%, slight erosion | 28 (0.84) |
| | SRR | Sirur soils are deep (100-150cm), moderately well drained, very dark grayish brown to grayish brown calcareous cracking clay soils occuring on nearly level to very gently sloping lowlands under cultivation | | **35 (1.06)** |
| 474 | | SRRmA1 | Clay surface, slope 0-1%, slight erosion | 35 (1.06) |
| | TSD | Thimmasandra soils are very deep (>150 cm), moderately well drained, have very dark brown to very dark grayish brown, clay soils occurring on nearly level to very gently sloping lowlands under cultivation | | **100 (3.0)** |
| 444 | | TSDiA1 | Sandy clay surface, slope 0-1%, slight erosion | 60 (1.81) |
| 446 | | TSDmA1 | Clay surface, slope 0-1%, slight erosion | 40 (1.19) |
| **Soils of Alluvial Landscape** | | | | |
| | RNK | Ravanaki soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to very dark grayish brown and dark gray, sodic black clay soils occurring on nearly level to very gently sloping plains under cultivation | | **34 (1.0)** |
| 329 | | RNKiA1 | Sandy clay surface, slope 0-1%, slight erosion | 17 (0.52) |
| 333 | | RNKmB1 | Clay surface, slope 1-3%, slight erosion | 17 (0.5) |

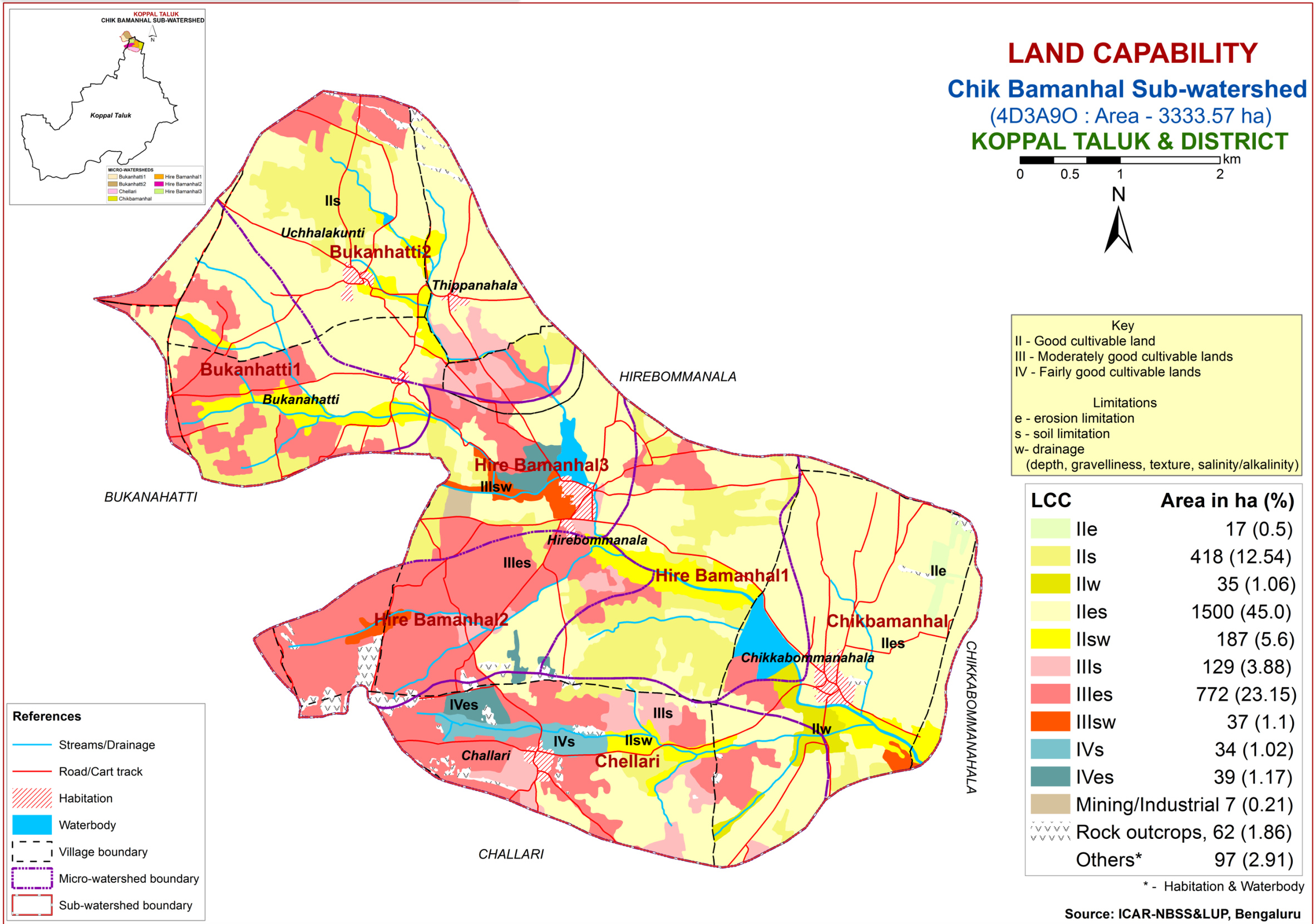
*To be continued...*

| Soil map unit No* | Soil Series | Soil phase | Mapping Unit Description | Area in ha (%) |
|---|---|---|---|---|
| | BWT | Bedwatti soils are moderately deep (75-100 cm), moderately well drained, dark brown to dark gray and very dark gray, black calcareous gravelly sandy clay to clay soils occurring on very gently sloping plains under cultivation | | **19 (0.58)** |
| 366 | | BWThB1 | Sandy clay loam surface, slope 1-3%, slight erosion | 19 (0.58) |
| | GRH | Gatareddihal soils are deep (100-150 cm), moderately well drained, have light olive brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation | | **23 (0.69)** |
| 368 | | GRHiB2 | Sandy clay surface, slope 1-3%, moderate erosion | 23 (0.69) |
| 994 | | Mining/Industrial | Mining/Industrial area | 7 (0.21) |
| 999 | | Rock outcrops | Rock lands, both massive and bouldery with little or no soil | 62 (1.86) |
| 1000 | | Others | Habitation & Waterbody | 97 (2.91) |

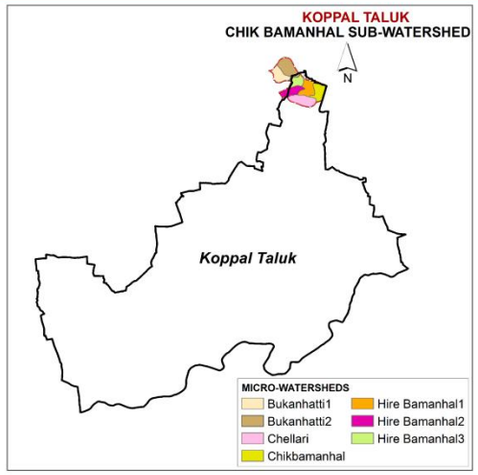
*Soil map unit numbers are continuous for the taluk, not for the Sub-watershed

# 5. Soil Survey Interpretations

## 5.1. Land Capability Classification



# 5.2. Soil Depth




## SOIL DEPTH

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

Uchhalakunti
Bukanhatti2
Thippanahala
Bukanhatti1
Bukanahatti
HIREBOMMANALA
BUKANAHATTI
Hire Bamanhal3
Hirebommanala
Hire Bamanhal1
Hire Bamanhal2
Chikbamanhal
Chikkabommanahala
Challari
Chellari
CHIKKABOMMANAHALA
CHALLARI

**References**

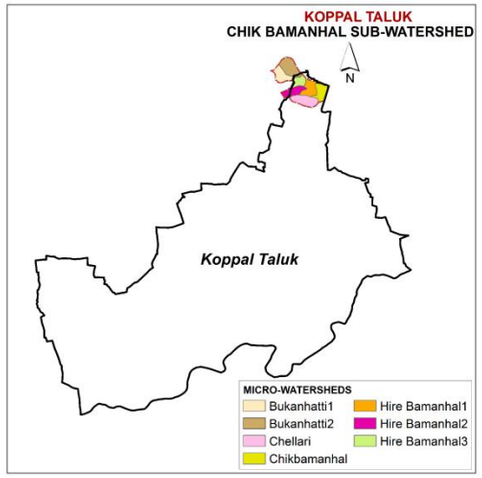
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Depth Class | Area in ha (%) |
|---|---|
| Very shallow (<25 cm) | 16 (0.48) |
| Shallow (25-50 cm) | 389 (11.67) |
| Moderately shallow (50-75 cm) | 652 (19.57) |
| Moderately deep (75-100 cm) | 869 (26.06) |
| Deep (100-150 cm) | 861 (25.84) |
| Very deep (>150 cm) | 380 (11.4) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 5.3. Surface Soil Texture




## SURFACE SOIL TEXTURE

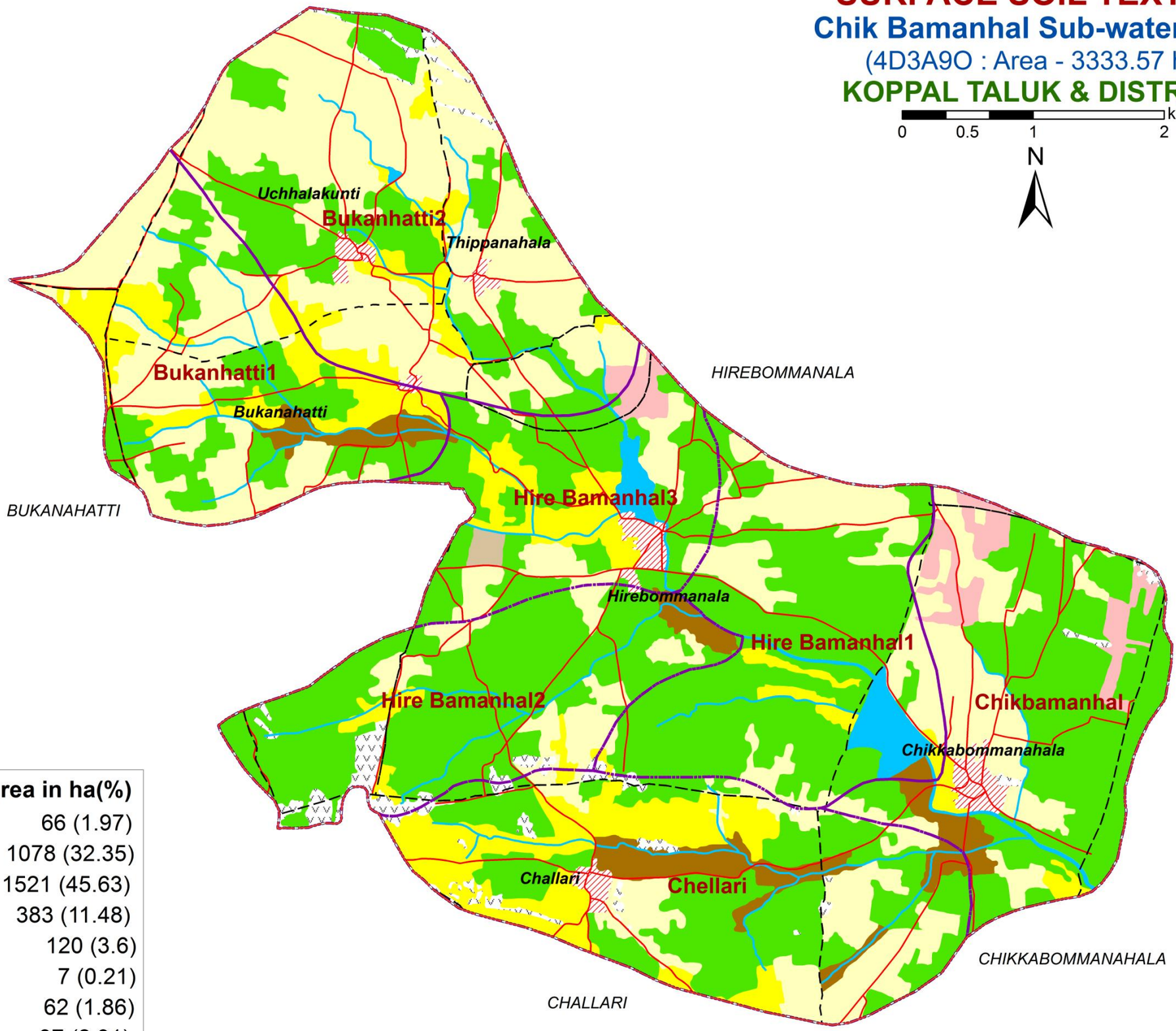
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N




**References**

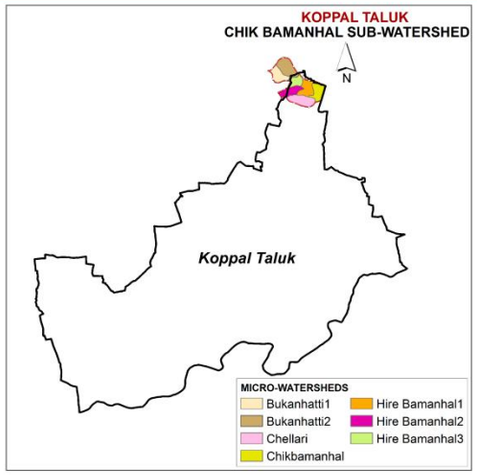
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Texture Class | Area in ha(%) |
|---|---|
| Loamy sand | 66 (1.97) |
| Sandy loam | 1078 (32.35) |
| Sandy clay loam | 1521 (45.63) |
| Sandy clay | 383 (11.48) |
| Clay | 120 (3.6) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.4. Surface Soil Gravelliness




## SOIL GRAVELLINESS

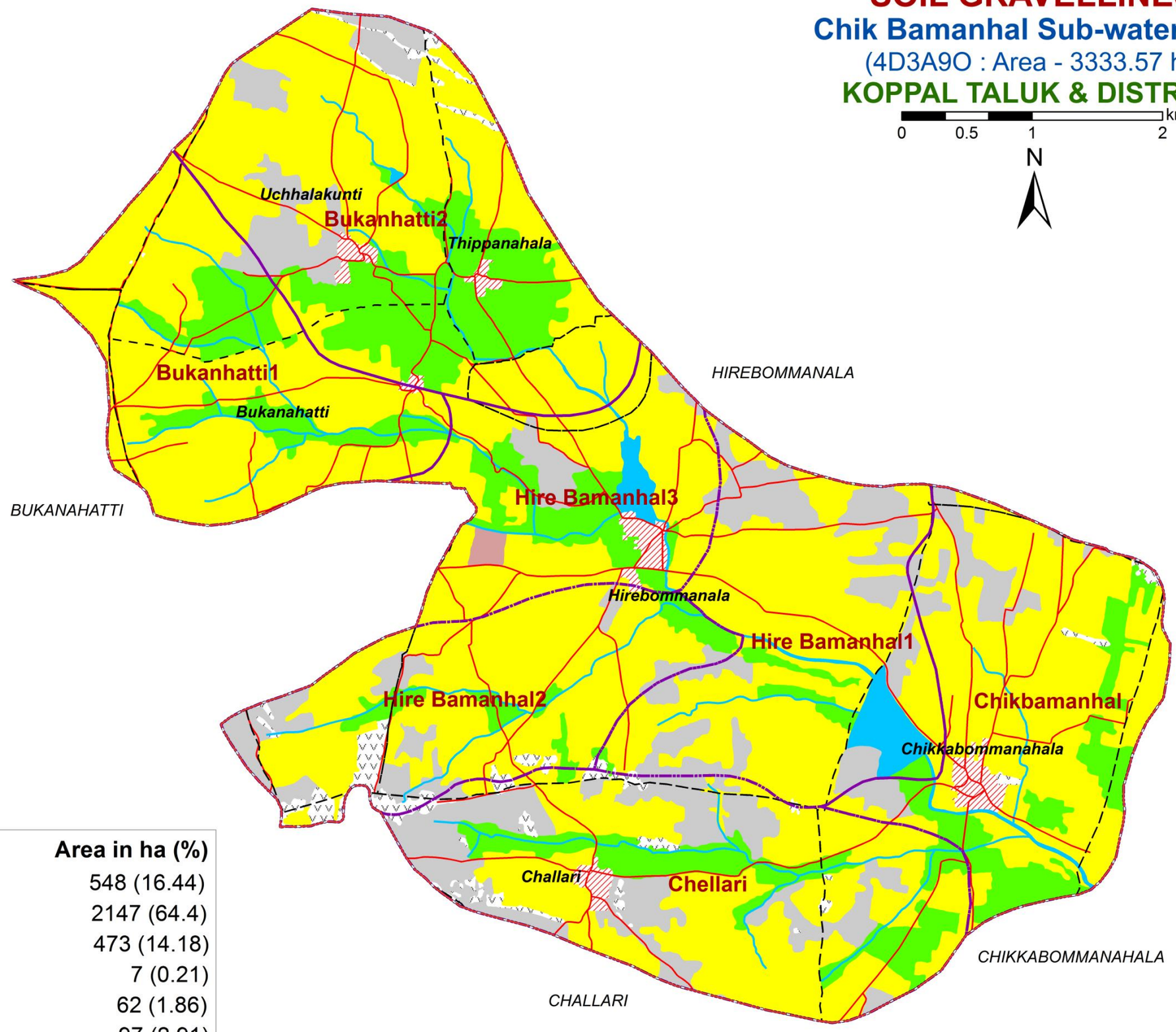
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N




**References**

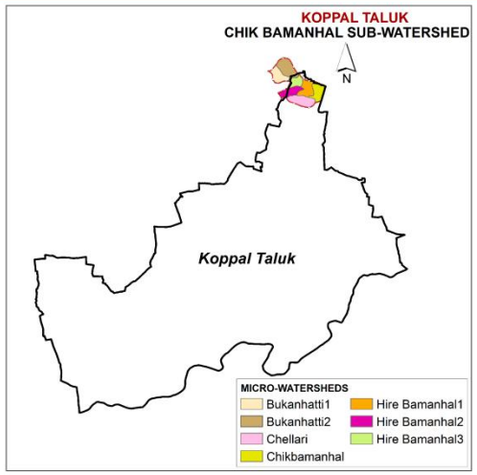
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Gravelly Class | Area in ha (%) |
|---|---|
| Non gravelly (<15%) | 548 (16.44) |
| Gravelly (15-35%) | 2147 (64.4) |
| Very gravelly (35-60%) | 473 (14.18) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.5. Available Water Capacity




## AVAILABLE WATER CAPACITY

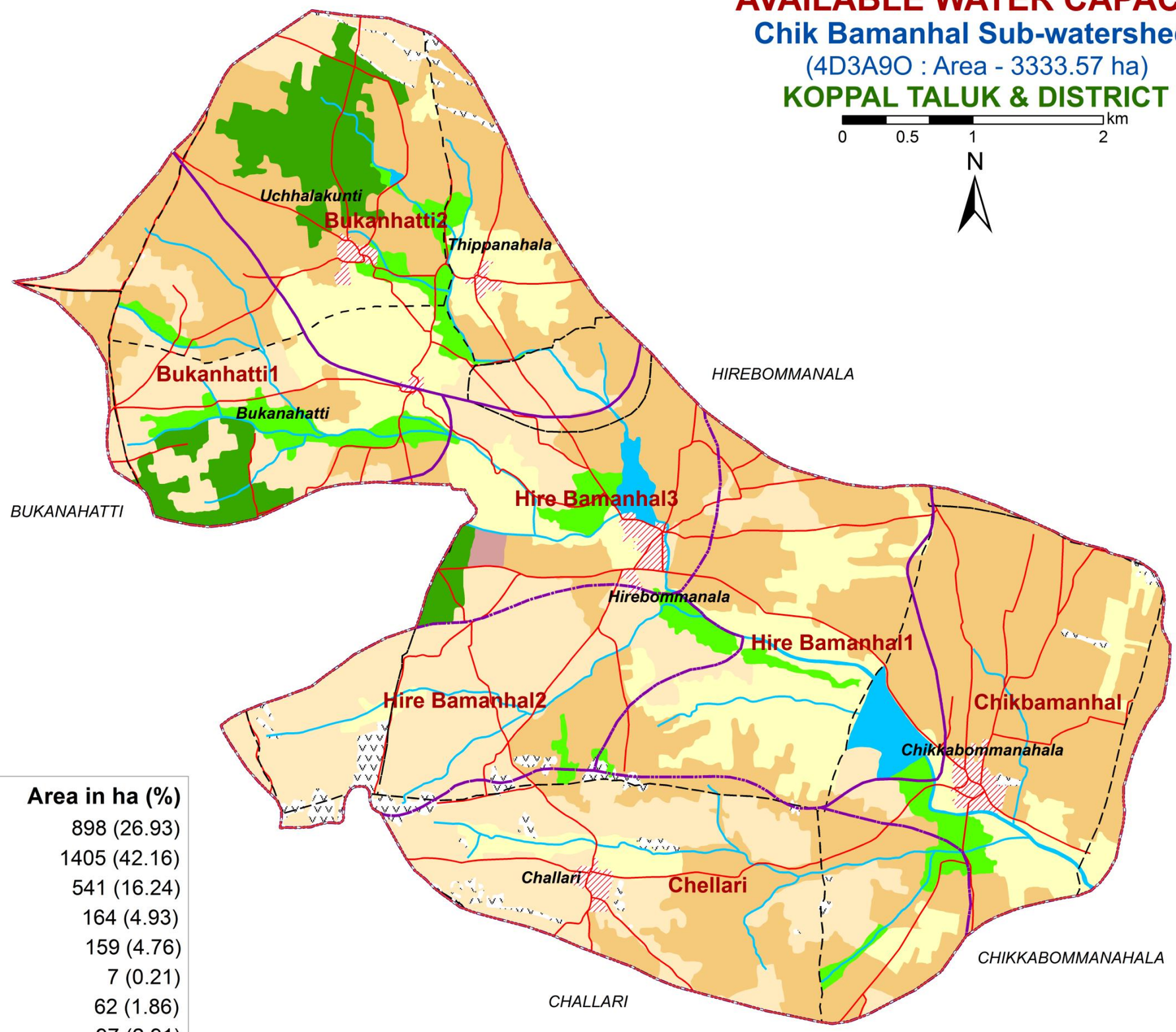
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N




**References**

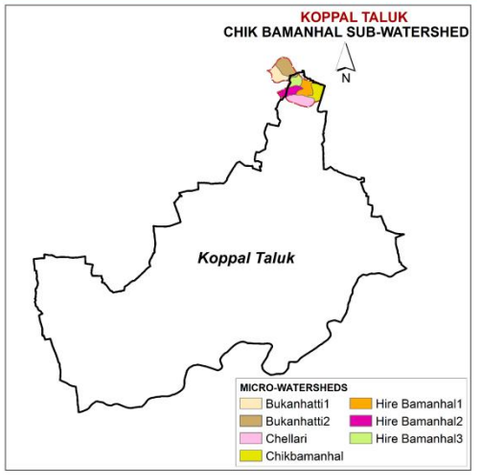
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Available Water Capacity | Area in ha (%) |
|---|---|
| Very Low (<50 mm/m) | 898 (26.93) |
| Low (51-100 mm/m) | 1405 (42.16) |
| Medium (101-150 mm/m) | 541 (16.24) |
| High (151-200 mm/m) | 164 (4.93) |
| Very high (>200 mm/m) | 159 (4.76) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.6.Slope




## SLOPE

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

Uchhalakunti
Bukanhatti2
Thippanahala
Bukanhatti1
Bukanahatti
HIREBOMMANALA
BUKANAHATTI
Hire Bamanhal3
Hirebommanala
Hire Bamanhal1
Hire Bamanhal2
Chikbamanhal
Chikkabommanahala
Challari
Chellari
CHIKKABOMMANAHALA
CHALLARI

**References**

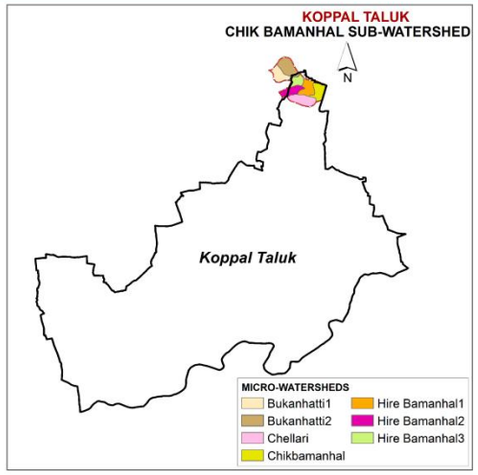
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Slope Class | Area in ha (%) |
|---|---|
| Nearly level (0-1%) | 355 (10.65) |
| Very gently sloping (1-3%) | 2813 (84.37) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 5.7.Soil Erosion




## SOIL EROSION

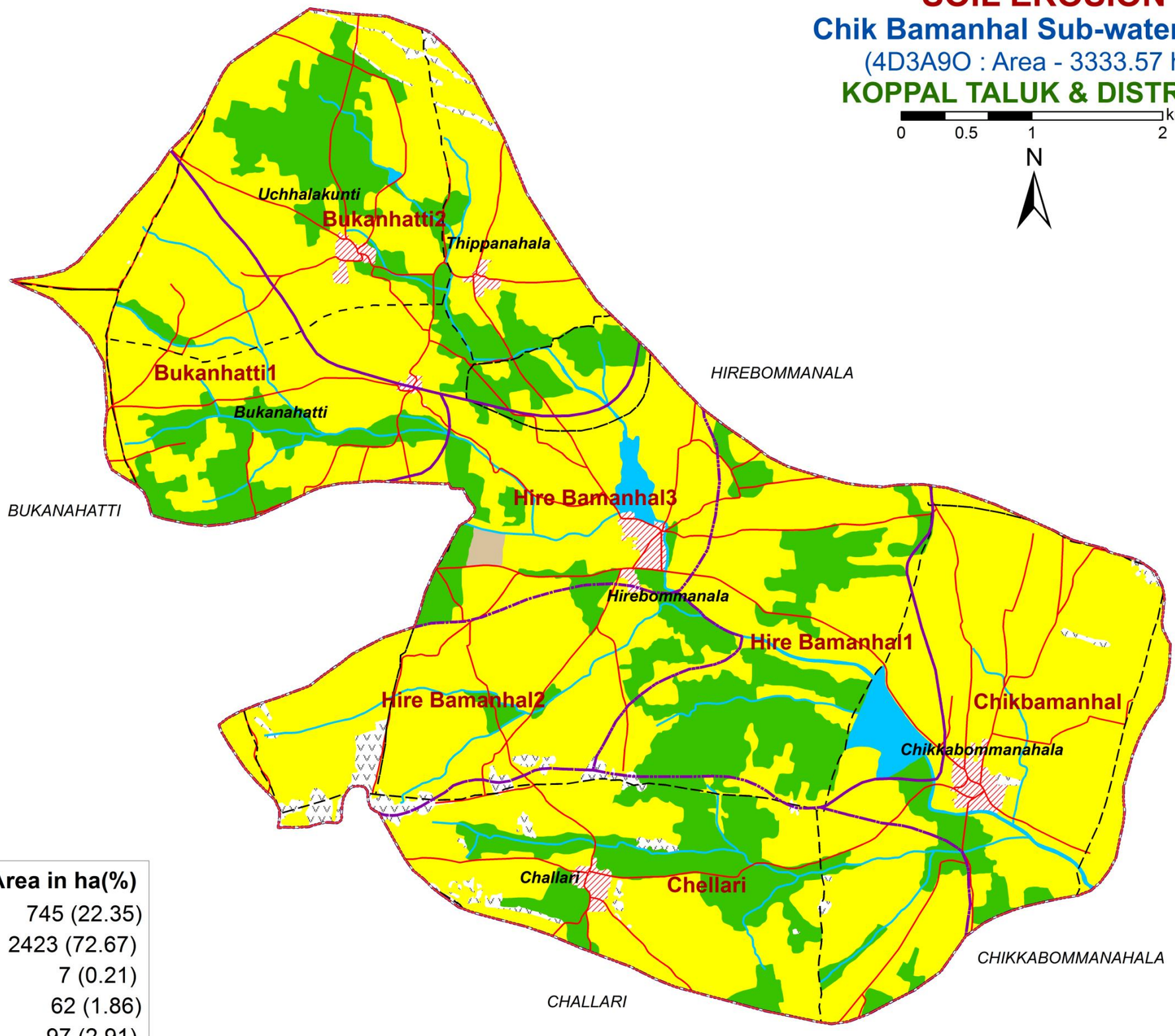
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL 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

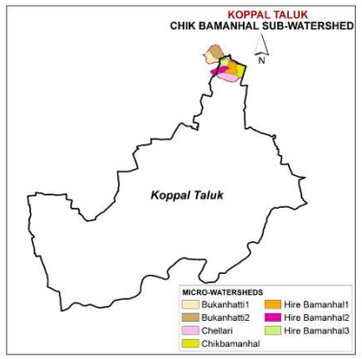
| Erosion Class | Area in ha(%) |
|---|---|
| Slight | 745 (22.35) |
| Moderate | 2423 (72.67) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6. Land Suitability for Major Crops

## 6.1. Land Suitability for Sorghum




# LAND SUITABILITY FOR SORGHUM

## Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

## KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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

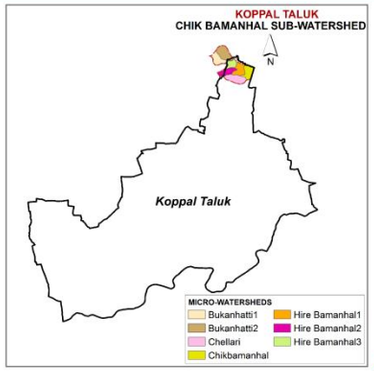
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1222 (36.66) |
| S2w | 100 (3.01) |
| S2z | 19 (0.58) |
| S2gt | 459 (13.78) |
| S2rt | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 28 (0.84) |
| S2wz | 35 (1.06) |
| S3g | 673 (20.19) |
| S3n | 57 (1.71) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.2. Land Suitability for Maize




## LAND SUITABILITY FOR MAIZE

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

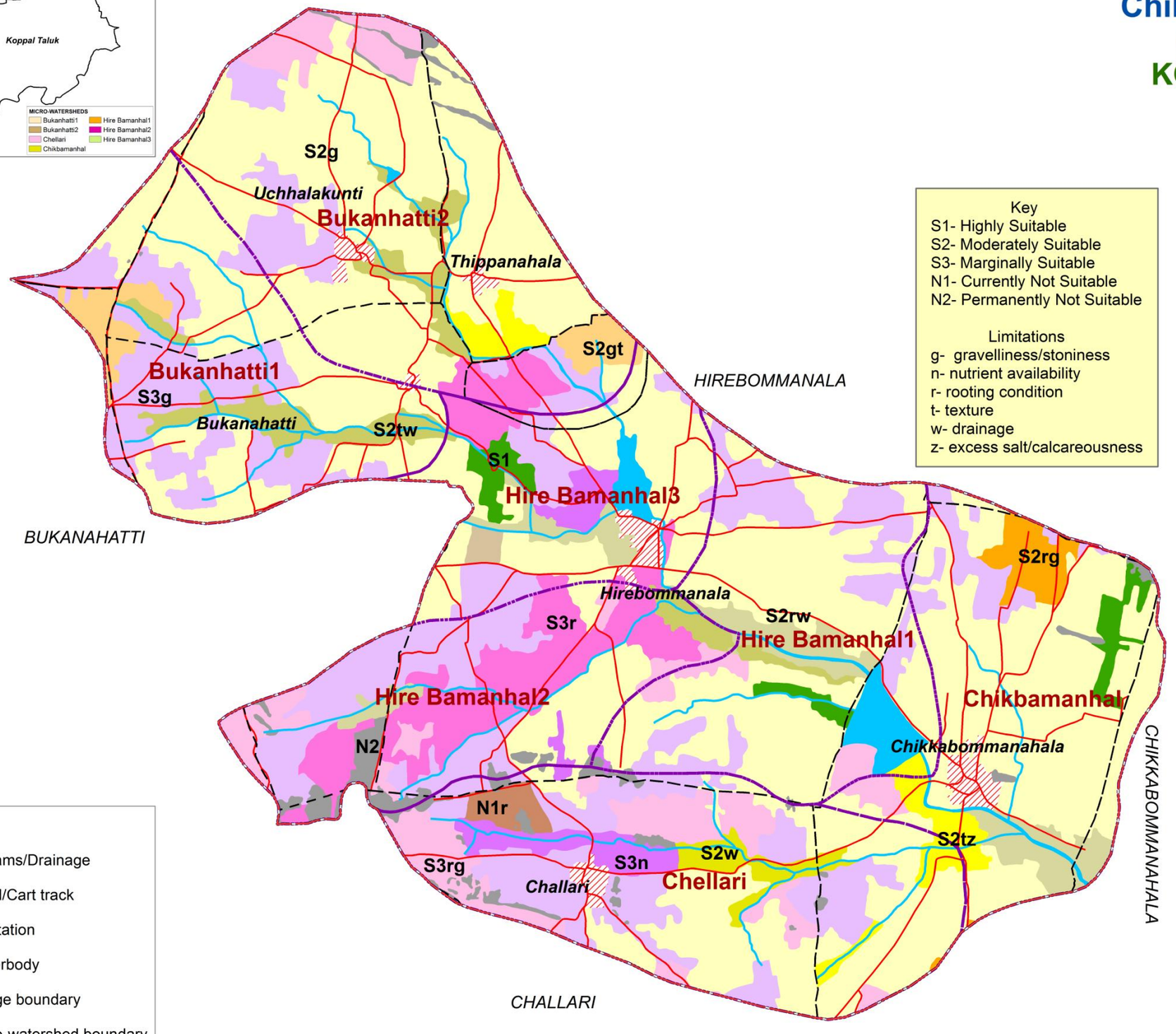
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



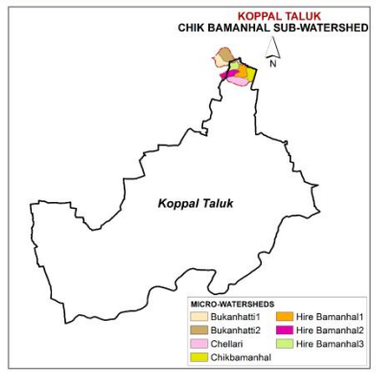

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1634 (49.01) |
| S2w | 28 (0.84) |
| S2gt | 48 (1.43) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 100 (3.01) |
| S2tz | 55 (1.64) |
| S3g | 673 (20.19) |
| S3n | 57 (1.71) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.3. Land Suitability for Redgram




## LAND SUITABILITY FOR REDGRAM

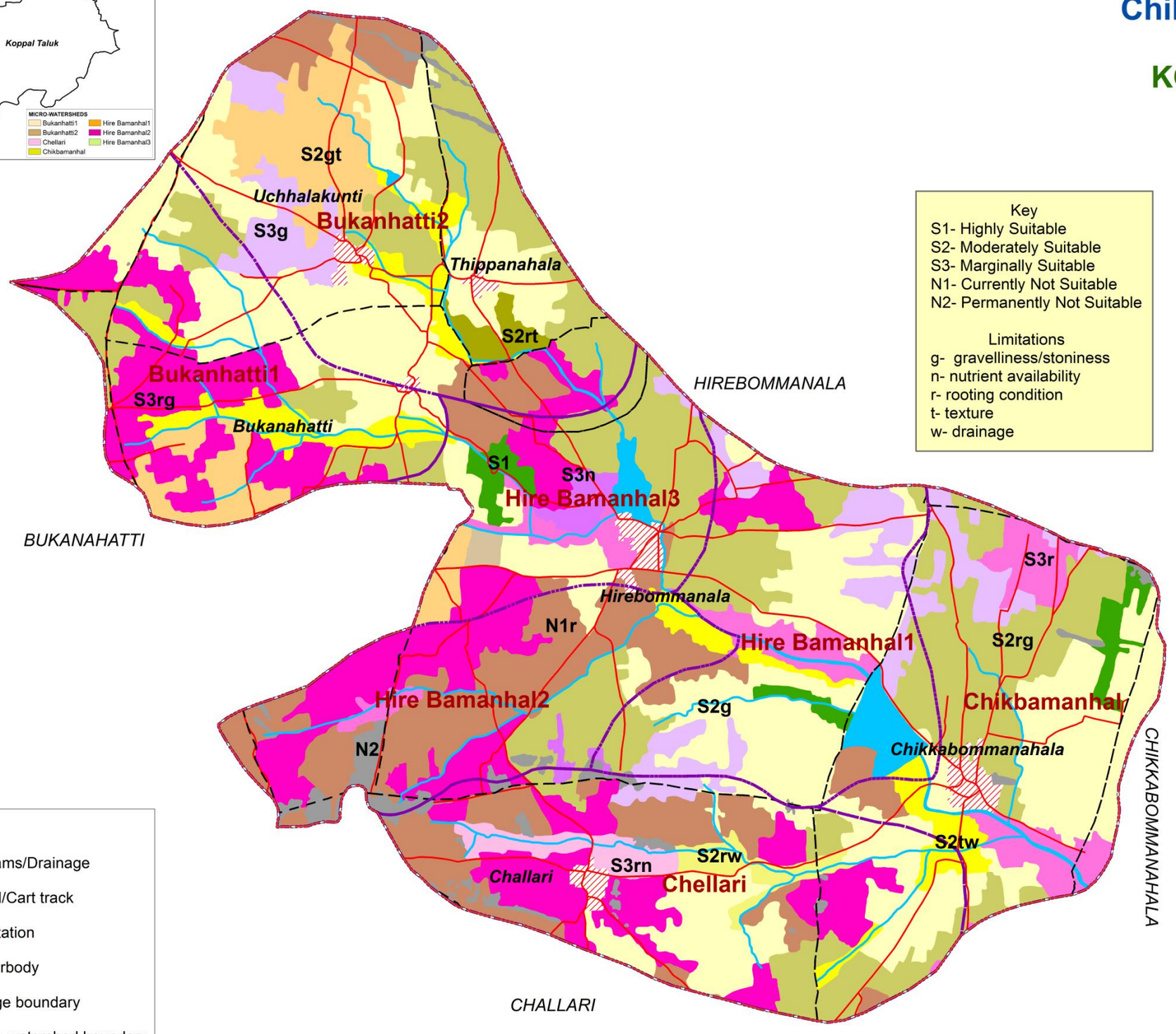
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N




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

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

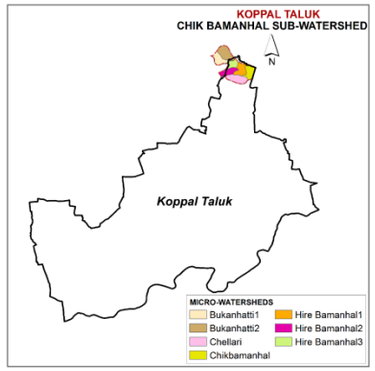
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 844 (25.33) |
| S2gt | 164 (4.93) |
| S2rg | 673 (20.18) |
| S2rt | 19 (0.58) |
| S2rw | 28 (0.84) |
| S2tw | 136 (4.07) |
| S3g | 180 (5.41) |
| S3n | 23 (0.69) |
| S3r | 126 (3.77) |
| S3rg | 493 (14.78) |
| S3rn | 34 (1.02) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.4. Land Suitability for Bajra




## LAND SUITABILITY FOR BAJRA

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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

S3g
S2g
Uchhalakunti
Bukanhatti2
Thippanahala
S2tz
Bukanhatti1
S2rg
Bukanahatti
HIREBOMMANALA
Hire Bamanhal3
BUKANAHATTI
S2r
Hirebommanala
S3r
S2rw
Hire Bamanhal1
Hire Bamanhal2
S1
Chikbamanhal
N2
Chikkabommanahala
CHIKKABOMMANAHALA
N1r
S2tw
S3rg
S2w
S3n
Challari
Chellari
CHALLARI

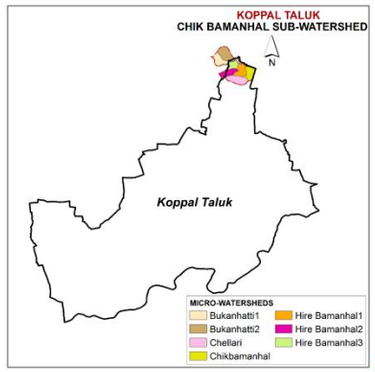
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 747 (22.42) |
| S2g | 1136 (34.08) |
| S2r | 31 (0.92) |
| S2w | 28 (0.84) |
| S2rg | 493 (14.78) |
| S2rw | 95 (2.85) |
| S2tw | 136 (4.07) |
| S2tz | 19 (0.58) |
| S3g | 21 (0.62) |
| S3n | 57 (1.71) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.5. Land Suitability for Drumstick




## LAND SUITABILITY FOR DRUMSTICK

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

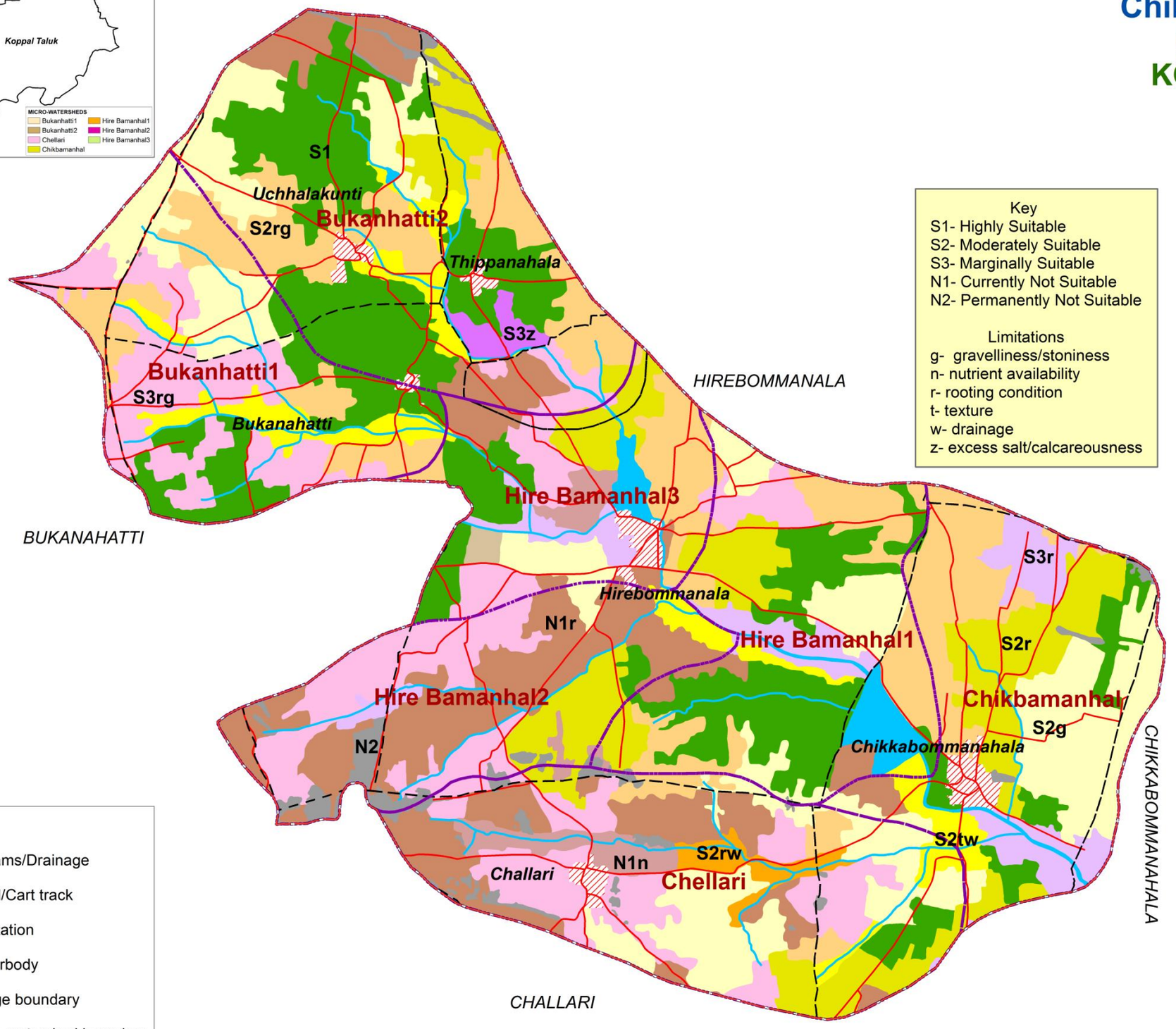
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



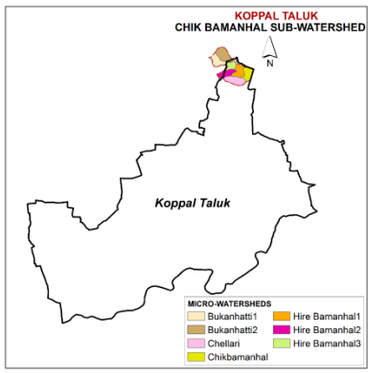

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 335 (10.05) |
| S2rg | 486 (14.59) |
| S2rw | 28 (0.84) |
| S2tw | 136 (4.07) |
| S3r | 126 (3.77) |
| S3z | 19 (0.58) |
| S3rg | 493 (14.78) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.6. Land Suitability for Sunflower




## LAND SUITABILITY FOR SUNFLOWER

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

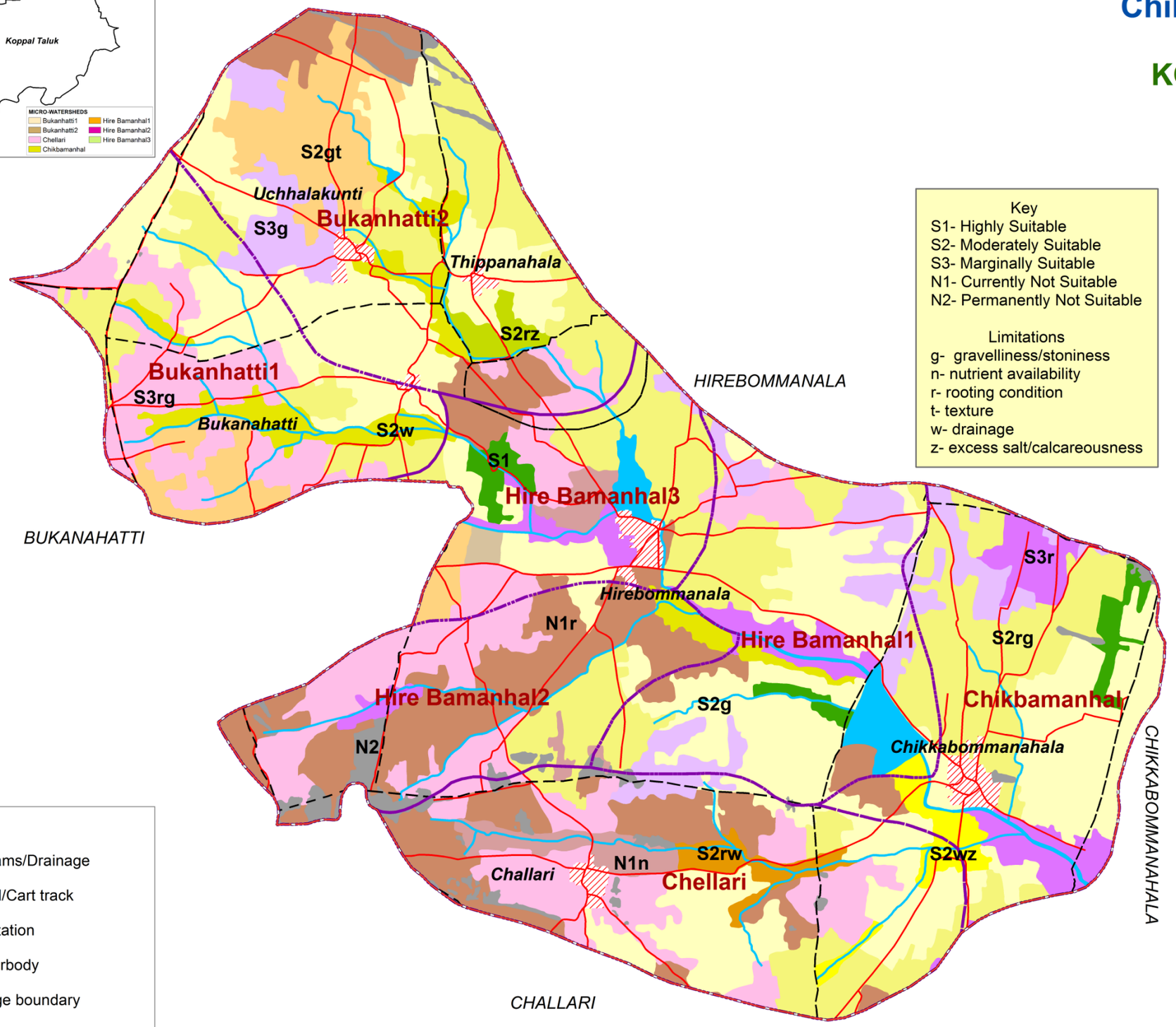
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



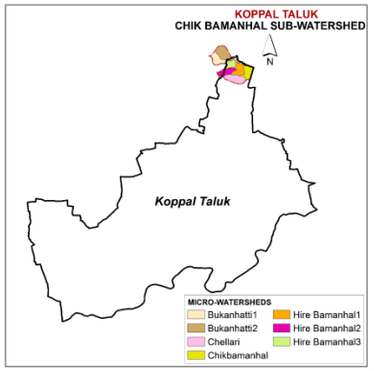

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 844 (25.33) |
| S2w | 100 (3.01) |
| S2gt | 164 (4.93) |
| S2rg | 673 (20.18) |
| S2rw | 28 (0.84) |
| S2rz | 19 (0.58) |
| S2wz | 35 (1.06) |
| S3g | 180 (5.41) |
| S3r | 126 (3.77) |
| S3rg | 493 (14.78) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.7. Land Suitability for Cotton




## LAND SUITABILITY FOR COTTON

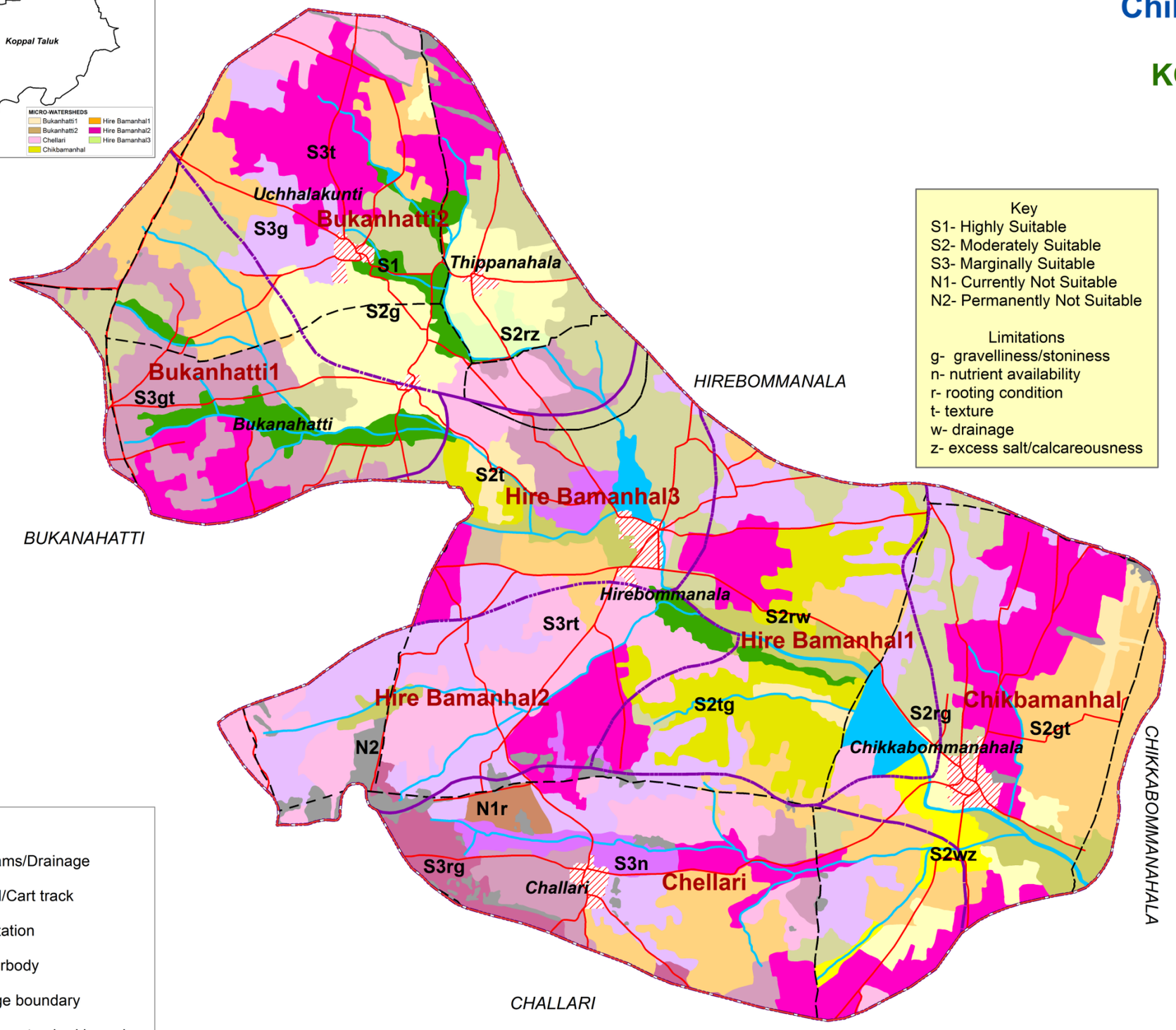
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N




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

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

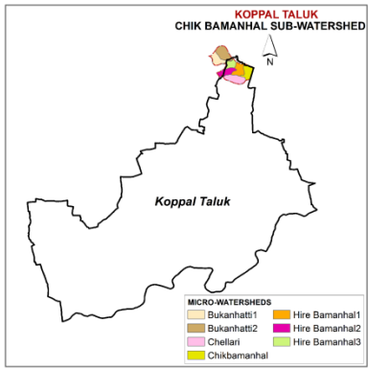
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 100 (3.01) |
| S2g | 214 (6.42) |
| S2t | 42 (1.27) |
| S2gt | 474 (14.23) |
| S2rg | 378 (11.34) |
| S2rw | 95 (2.85) |
| S2rz | 19 (0.58) |
| S2tg | 156 (4.69) |
| S2wz | 35 (1.06) |
| S3g | 413 (12.4) |
| S3n | 57 (1.71) |
| S3t | 518 (15.55) |
| S3gt | 260 (7.79) |
| S3rg | 43 (1.3) |
| S3rt | 346 (10.37) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.8. Land Suitability for Bengalgram




## LAND SUITABILITY FOR BENGALGRAM

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

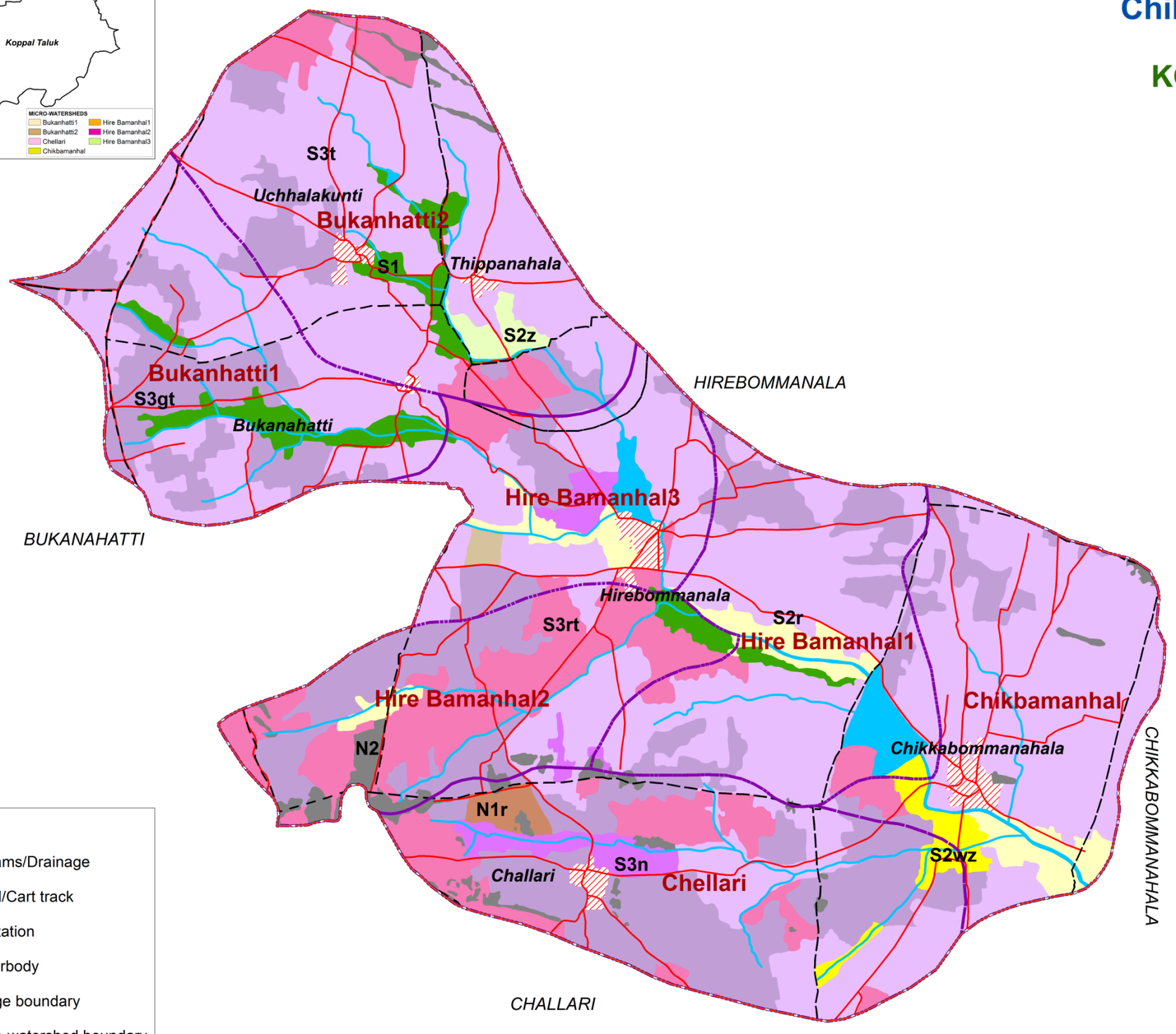
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



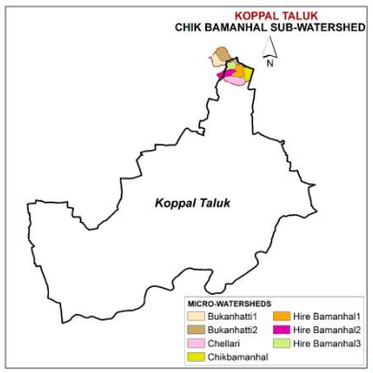

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 100 (3.01) |
| S2r | 95 (2.85) |
| S2z | 19 (0.58) |
| S2wz | 35 (1.06) |
| S3n | 57 (1.71) |
| S3t | 1667 (50.02) |
| S3gt | 788 (23.65) |
| S3rt | 389 (11.67) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.9. Land Suitability for Groundnut




## LAND SUITABILITY FOR GROUNDNUT

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

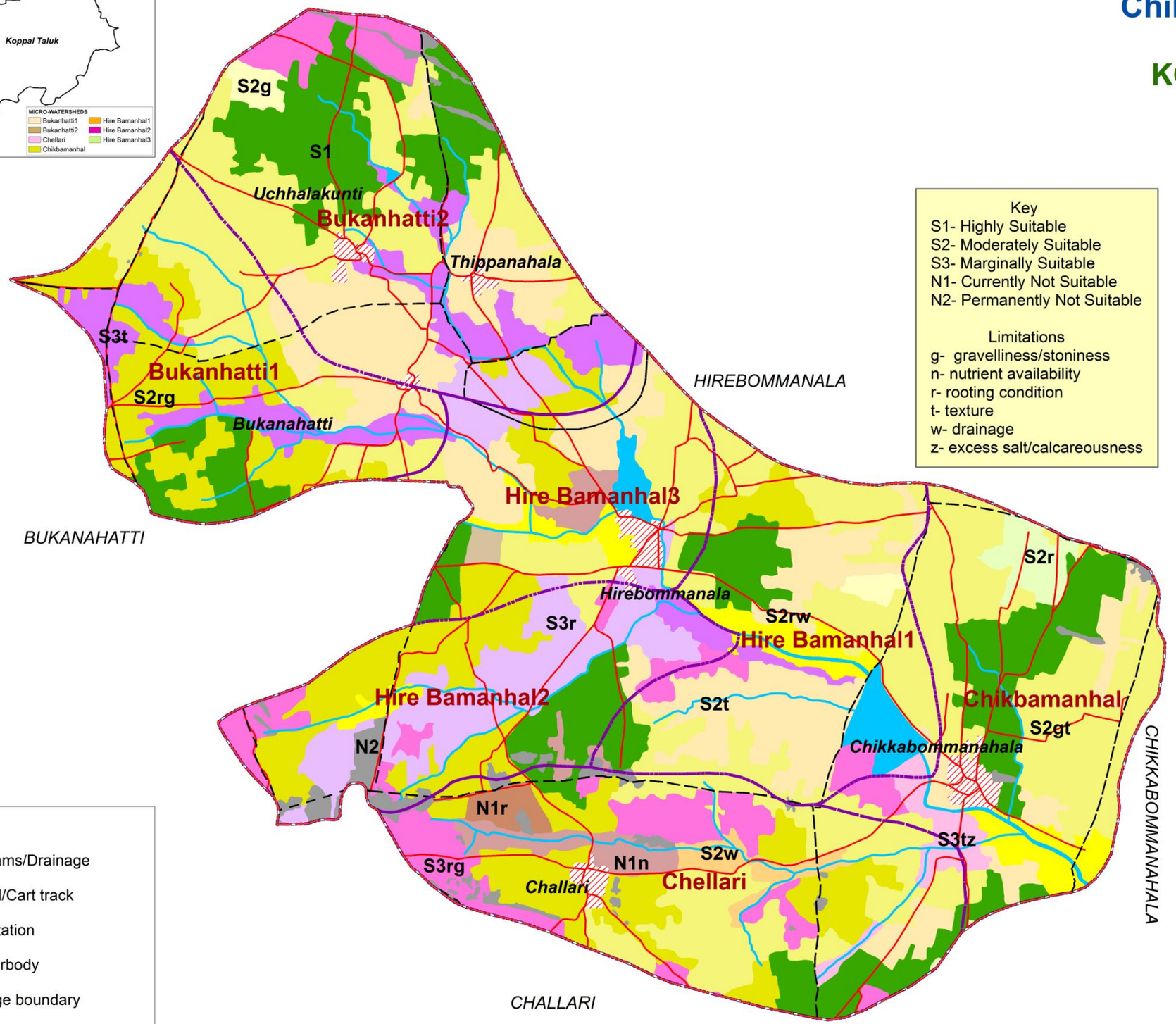
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



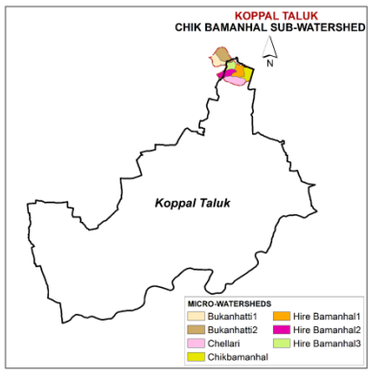

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 459 (13.78) |
| S2g | 21 (0.62) |
| S2r | 31 (0.92) |
| S2t | 452 (13.57) |
| S2w | 28 (0.84) |
| S2gt | 924 (27.71) |
| S2rg | 493 (14.78) |
| S2rw | 95 (2.85) |
| S3r | 187 (5.62) |
| S3t | 167 (5.02) |
| S3rg | 202 (6.05) |
| S3tz | 35 (1.06) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.10. Land Suitability for Chilli




## LAND SUITABILITY FOR CHILLI

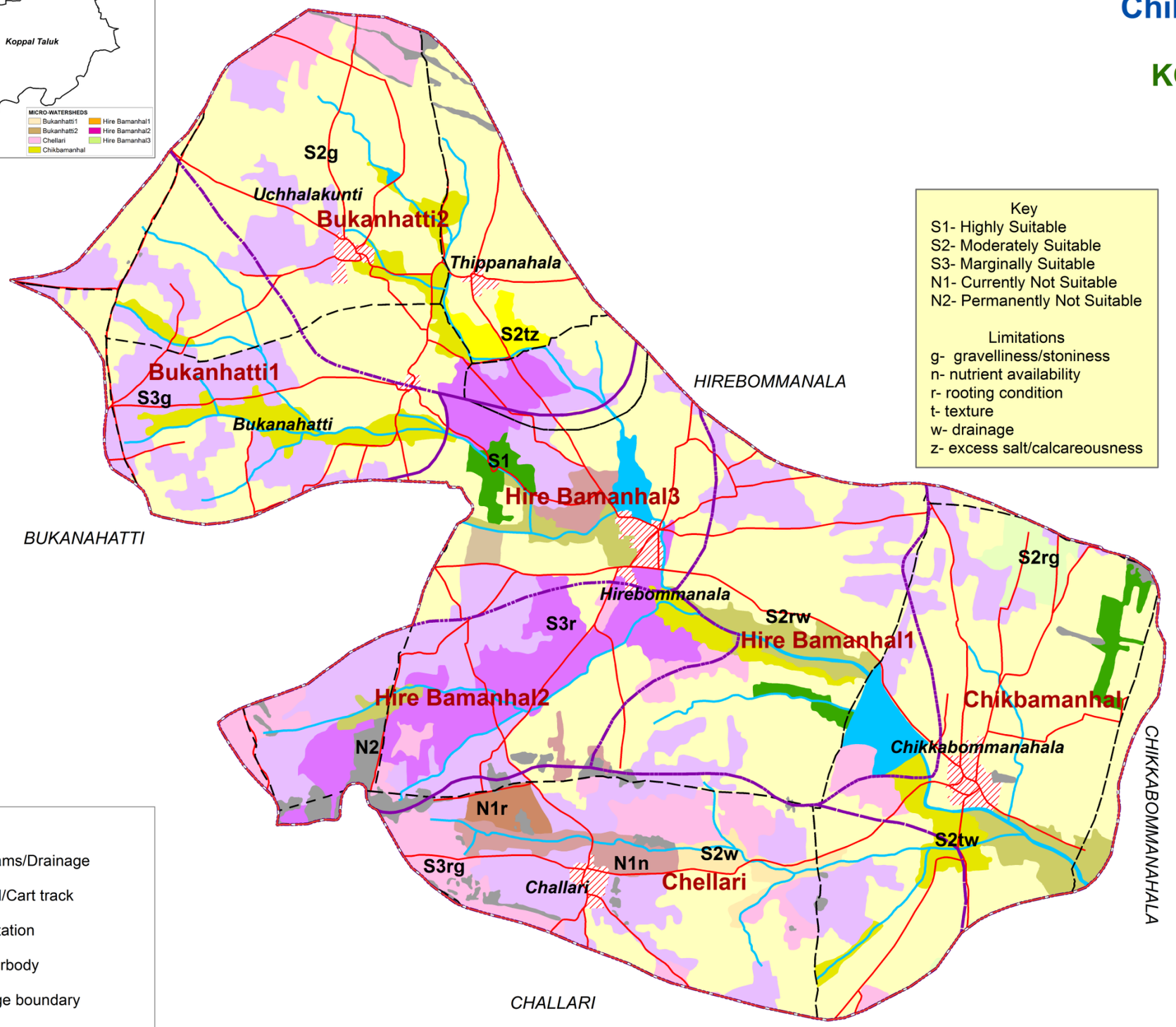
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N




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

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

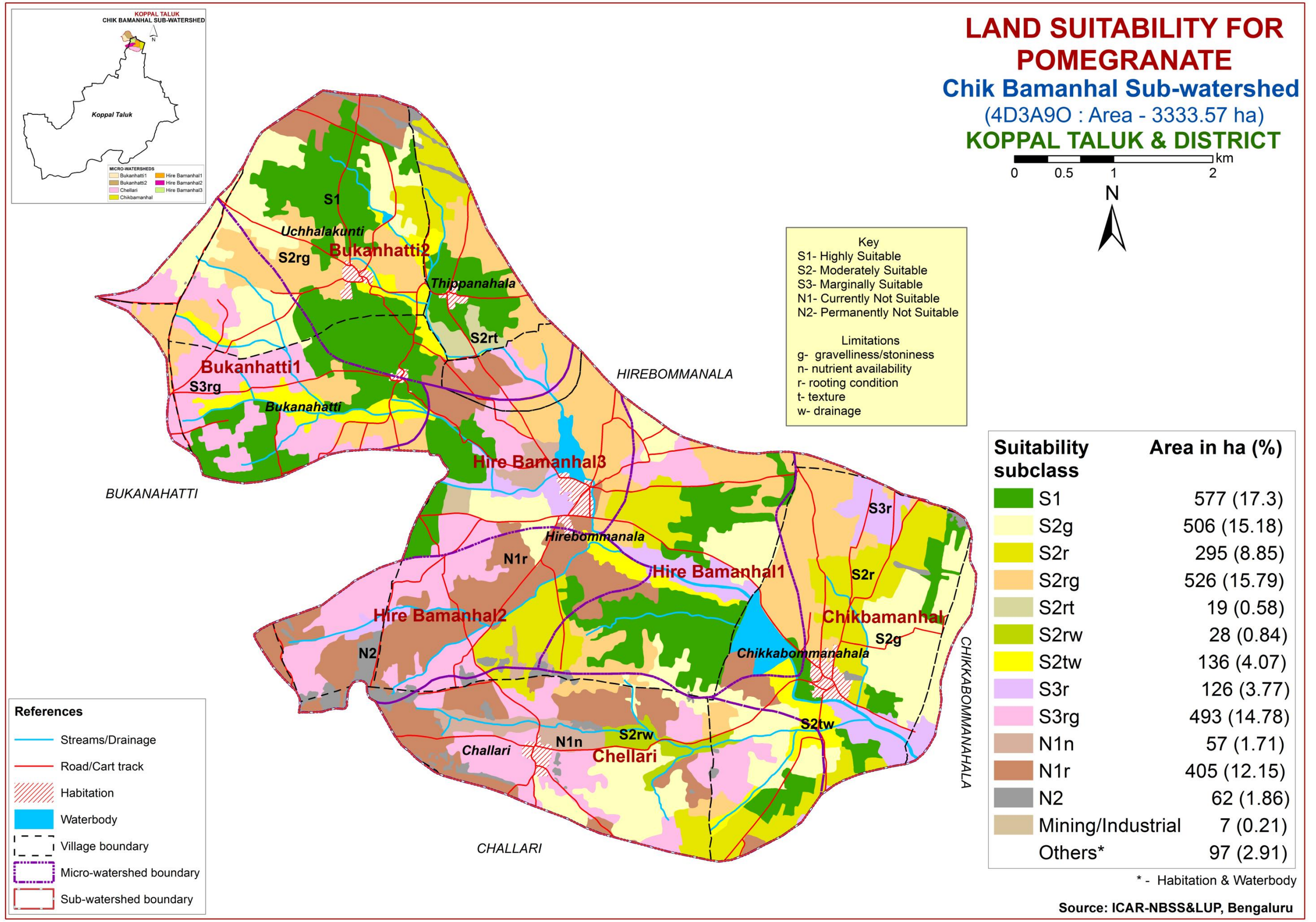
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 136 (4.07) |
| S2tz | 19 (0.58) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

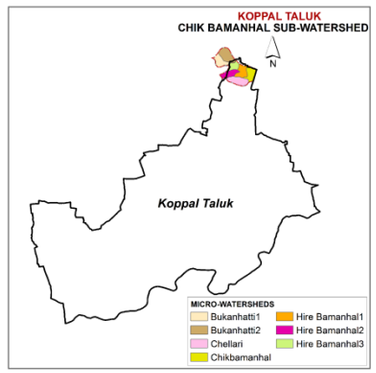
References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.11. Land Suitability for Pomegranate



# 6.12. Land Suitability for Tomato




## LAND SUITABILITY FOR TOMATO

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

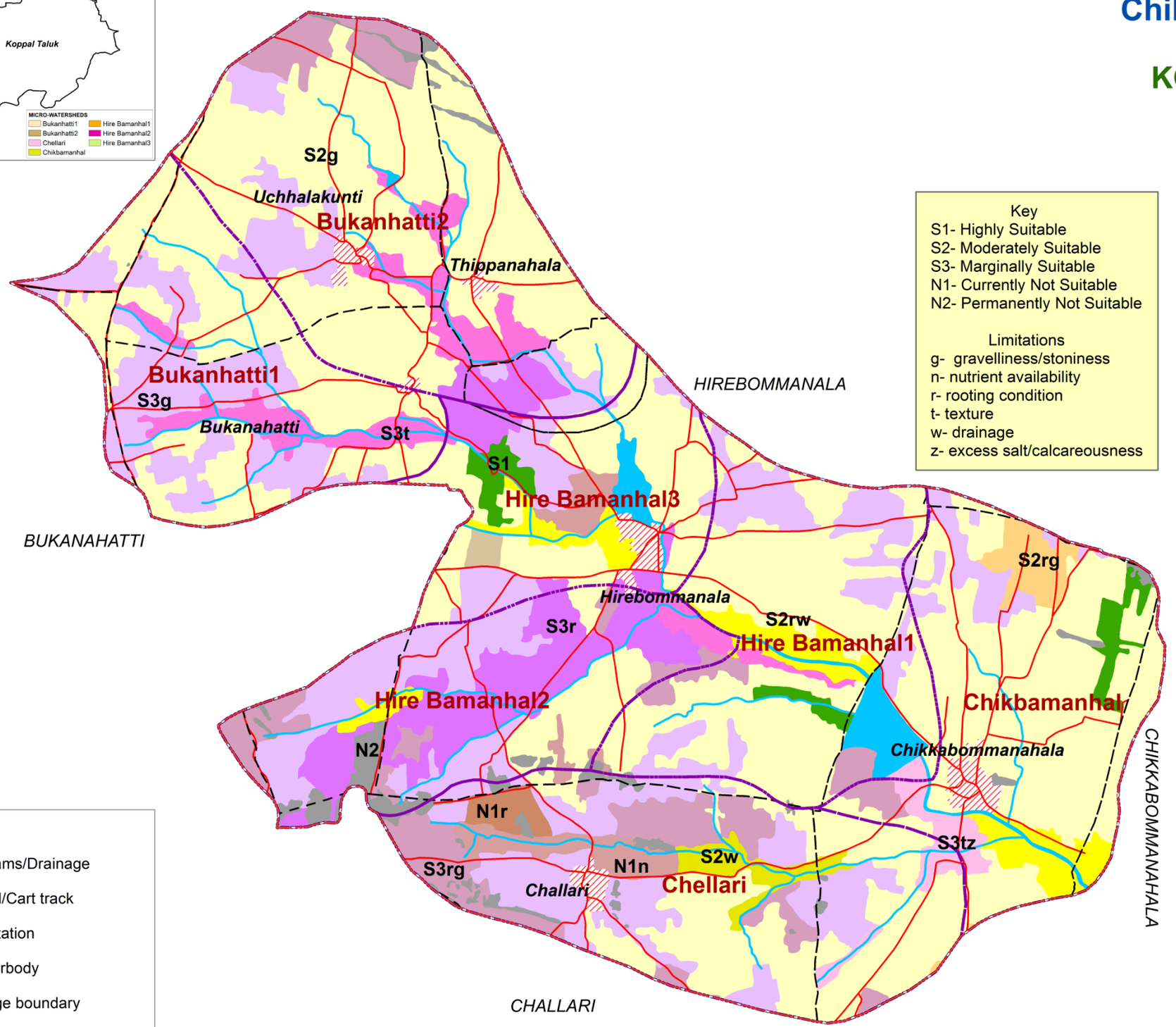
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



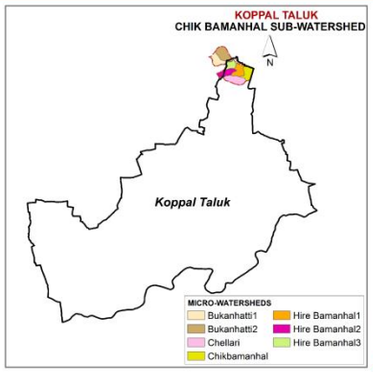

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3t | 119 (3.58) |
| S3rg | 202 (6.05) |
| S3tz | 35 (1.06) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.13. Land Suitability for Mulberry




## LAND SUITABILITY FOR MULBERRY

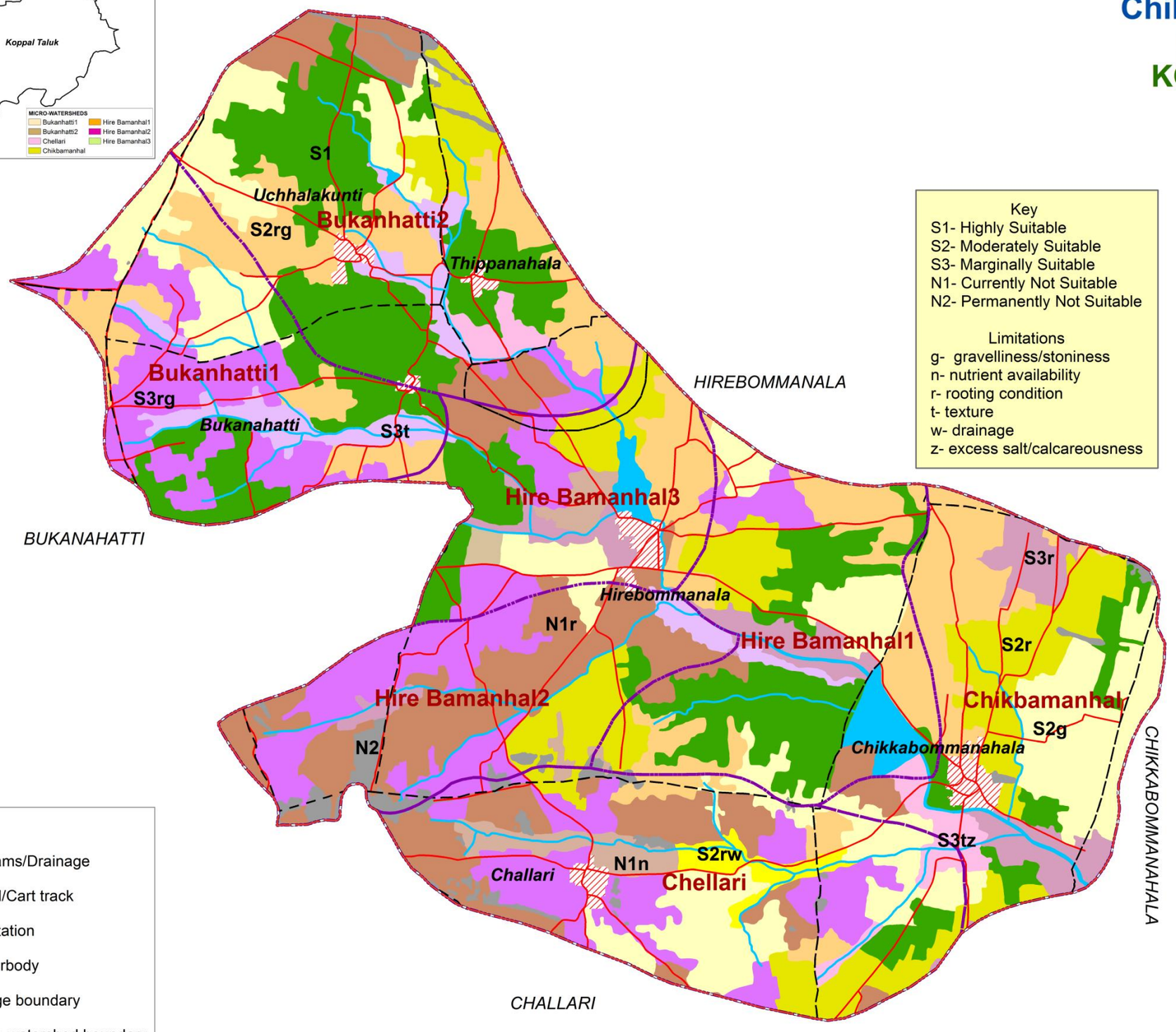
### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N




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

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

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 335 (10.05) |
| S2rg | 486 (14.59) |
| S2rw | 28 (0.84) |
| S3r | 126 (3.77) |
| S3t | 100 (3.01) |
| S3rg | 493 (14.78) |
| S3tz | 55 (1.64) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

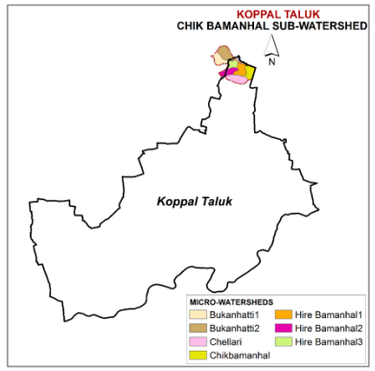
* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

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

# 6.14. Land Suitability for Bhendi




## LAND SUITABILITY FOR BHENDI

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

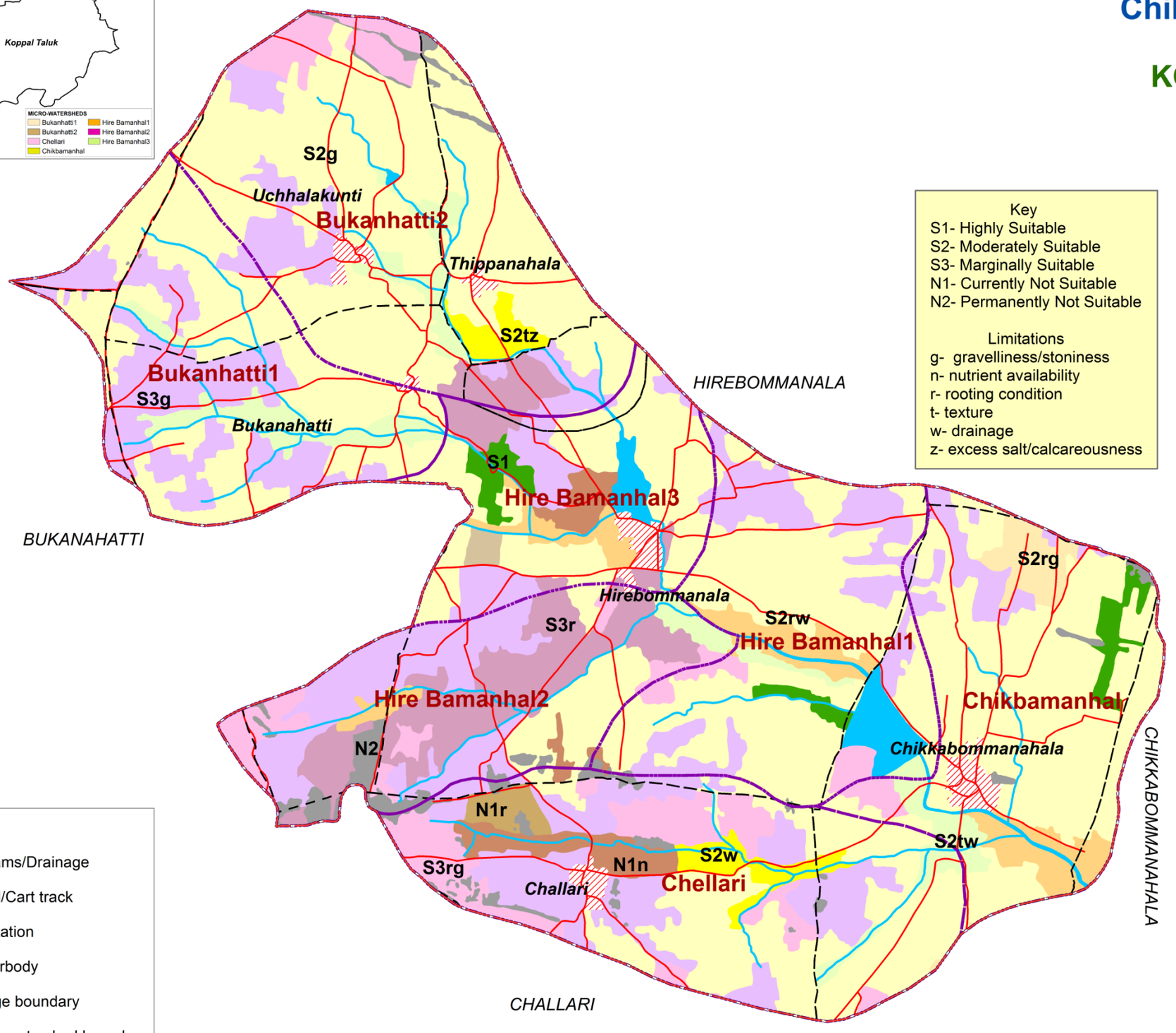
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



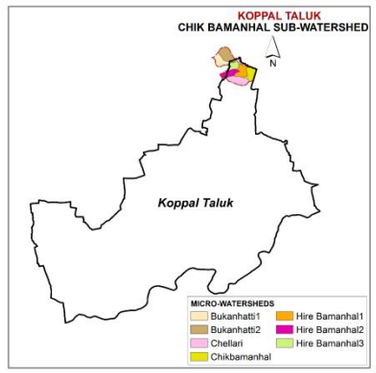

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 136 (4.07) |
| S2tz | 19 (0.58) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.15. Land Suitability for Guava




## LAND SUITABILITY FOR GUAVA

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

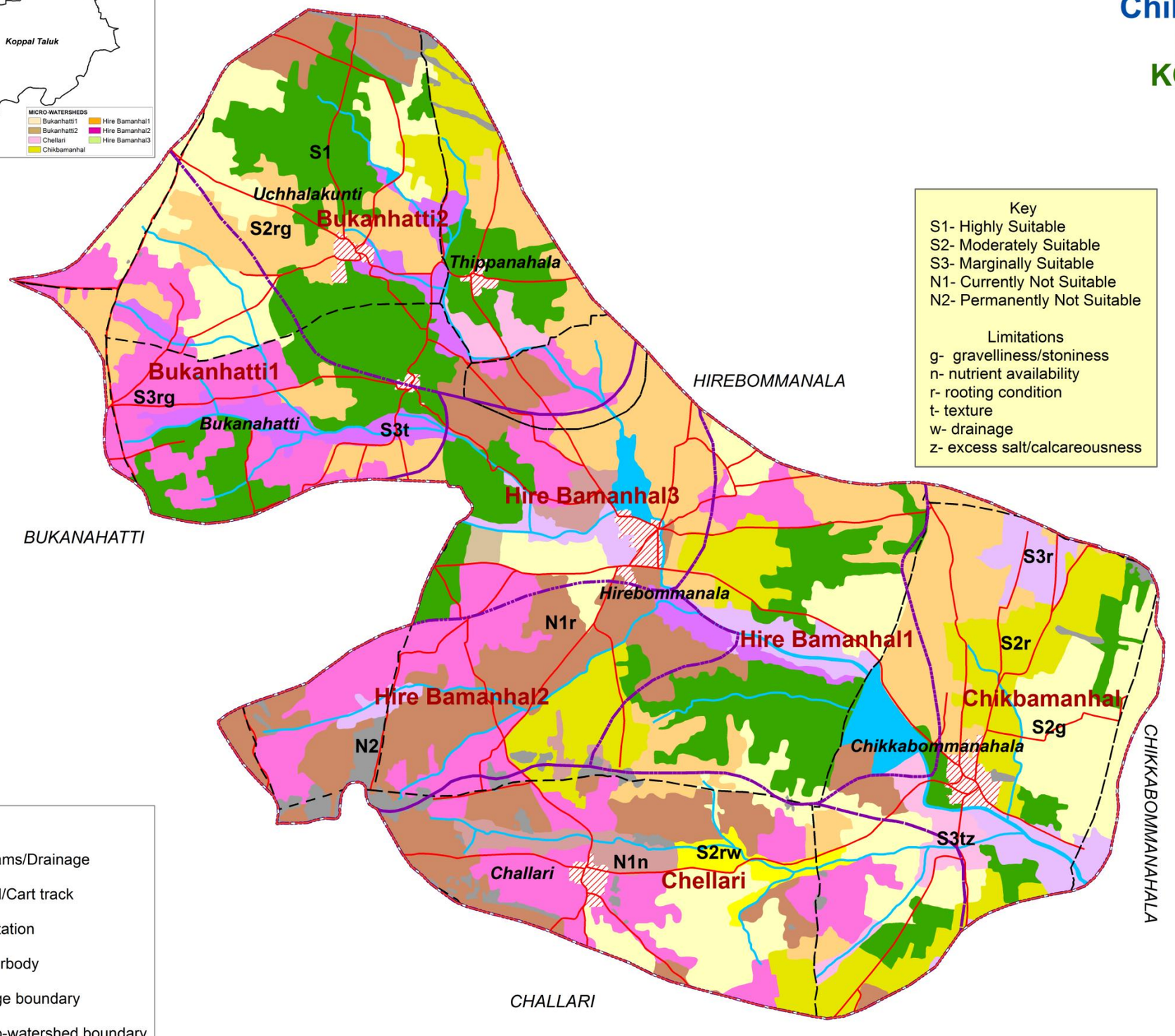
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



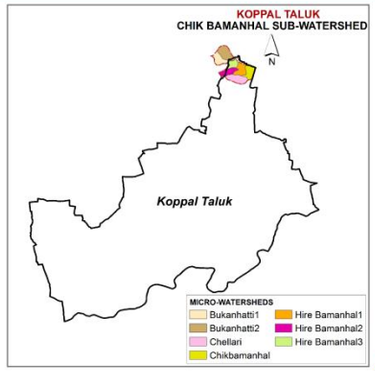

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 295 (8.85) |
| S2rg | 526 (15.79) |
| S2rw | 28 (0.84) |
| S3r | 126 (3.77) |
| S3t | 100 (3.01) |
| S3rg | 493 (14.78) |
| S3tz | 55 (1.64) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.16. Land Suitability for Mango




## LAND SUITABILITY FOR MANGO

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

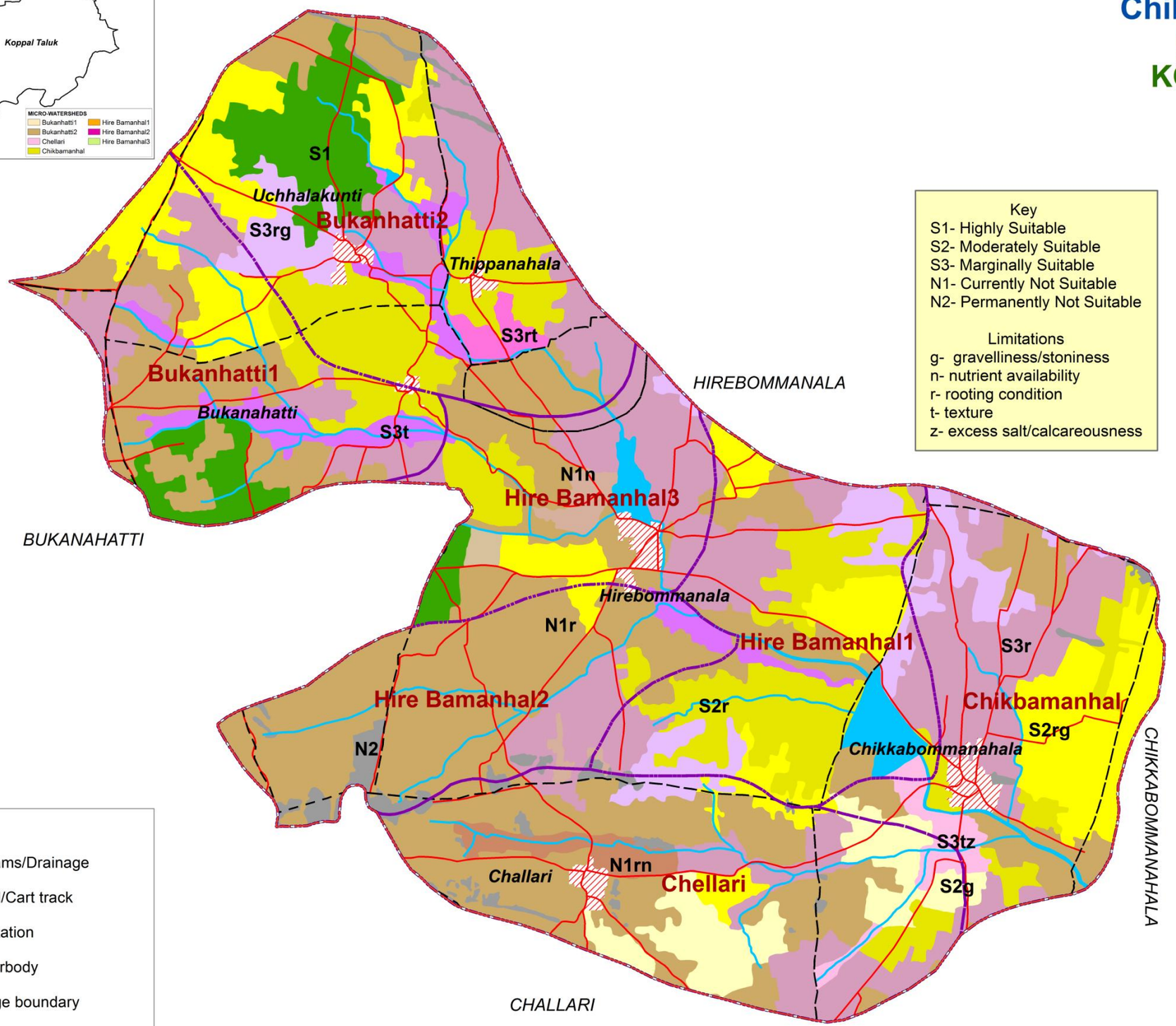
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



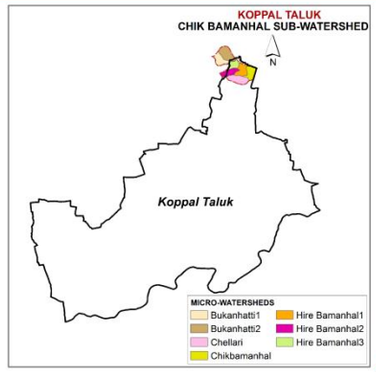

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 164 (4.93) |
| S2g | 115 (3.46) |
| S2r | 412 (12.37) |
| S2rg | 391 (11.72) |
| S3r | 701 (21.03) |
| S3t | 100 (3.01) |
| S3rg | 148 (4.45) |
| S3rt | 19 (0.58) |
| S3tz | 35 (1.06) |
| N1n | 23 (0.69) |
| N1r | 1024 (30.7) |
| N1rn | 34 (1.02) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.17. Land Suitability for Sapota




## LAND SUITABILITY FOR SAPOTA

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

S1
Uchhalakunti
S2rg
Bukanhatti2
Thippanahala
Bukanhatti1
S3rg
Bukanahatti
S3t
HIREBOMMANALA
Hire Bamanhal3
BUKANAHATTI
S3r
Hirebommanala
N1r
Hire Bamanhal1
S2r
Hire Bamanhal2
Chikbamanhal
S2g
N2
Chikkabommanahala
CHIKKABOMMANAHALA
S3tz
S2rw
N1n
Challari
Chellari
CHALLARI

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

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

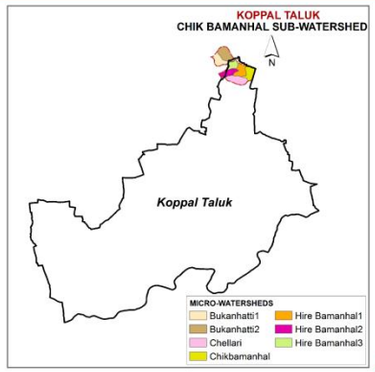
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 295 (8.85) |
| S2rg | 526 (15.79) |
| S2rw | 28 (0.84) |
| S3r | 126 (3.77) |
| S3t | 119 (3.58) |
| S3rg | 493 (14.78) |
| S3tz | 35 (1.06) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.18. Land Suitability for Jackfruit




## LAND SUITABILITY FOR JACKFRUIT

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

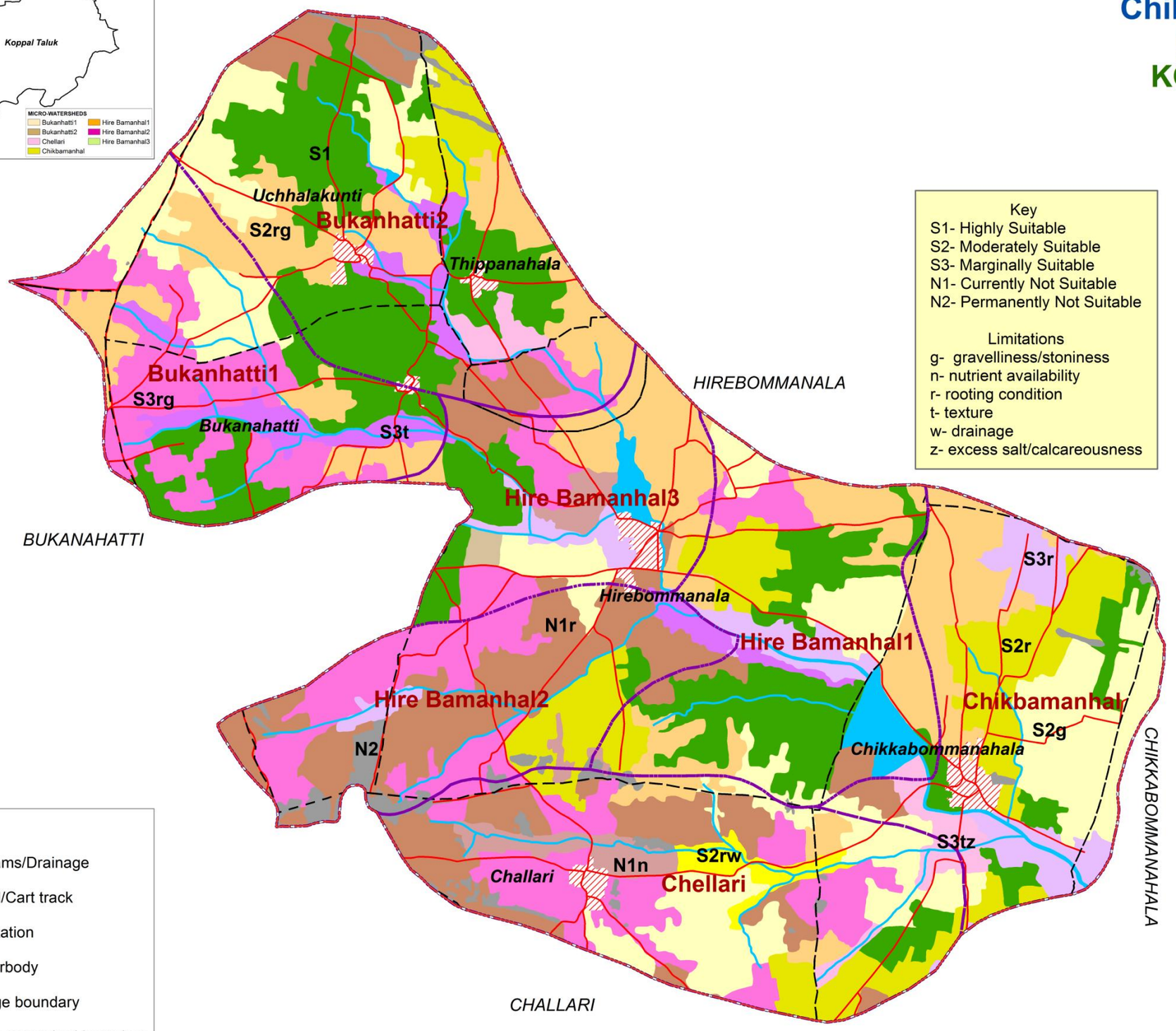
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



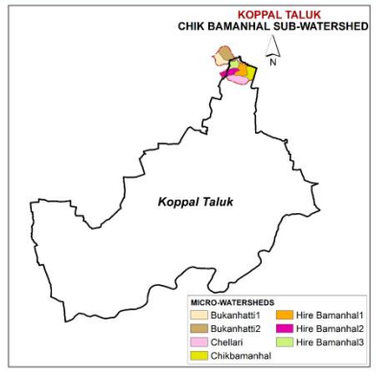

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 295 (8.85) |
| S2rg | 526 (15.79) |
| S2rw | 28 (0.84) |
| S3r | 126 (3.77) |
| S3t | 100 (3.01) |
| S3rg | 493 (14.78) |
| S3tz | 55 (1.64) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.19. Land Suitability for Jamun




## LAND SUITABILITY FOR JAMUN

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

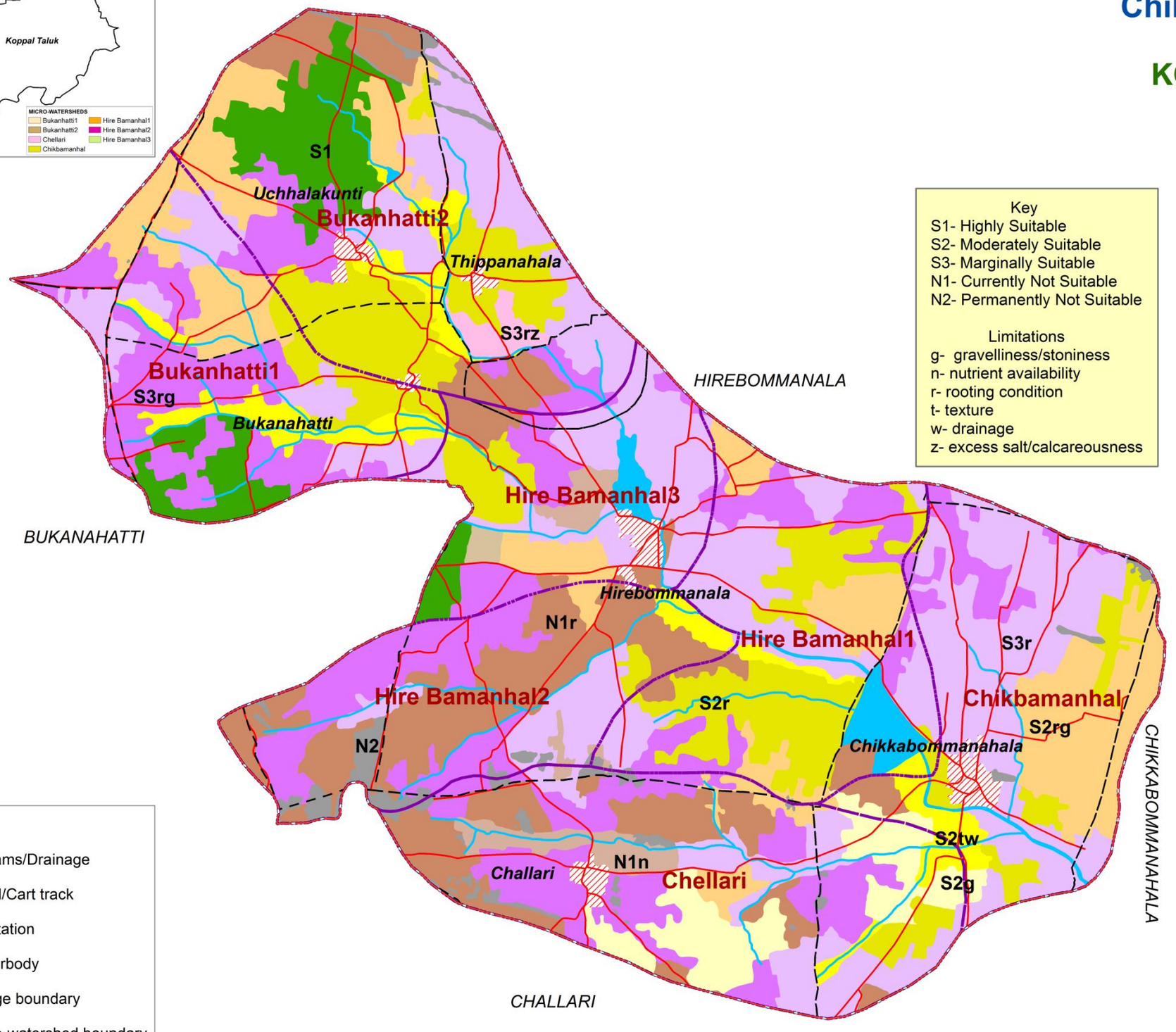
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



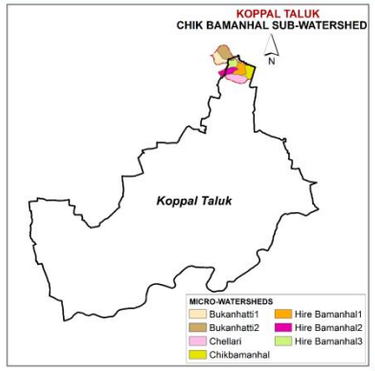

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 164 (4.93) |
| S2g | 115 (3.46) |
| S2r | 412 (12.37) |
| S2rg | 391 (11.72) |
| S2tw | 136 (4.07) |
| S3r | 827 (24.8) |
| S3rg | 641 (19.23) |
| S3rz | 19 (0.58) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.20. Land Suitability for Musambi




## LAND SUITABILITY FOR MUSAMBI

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

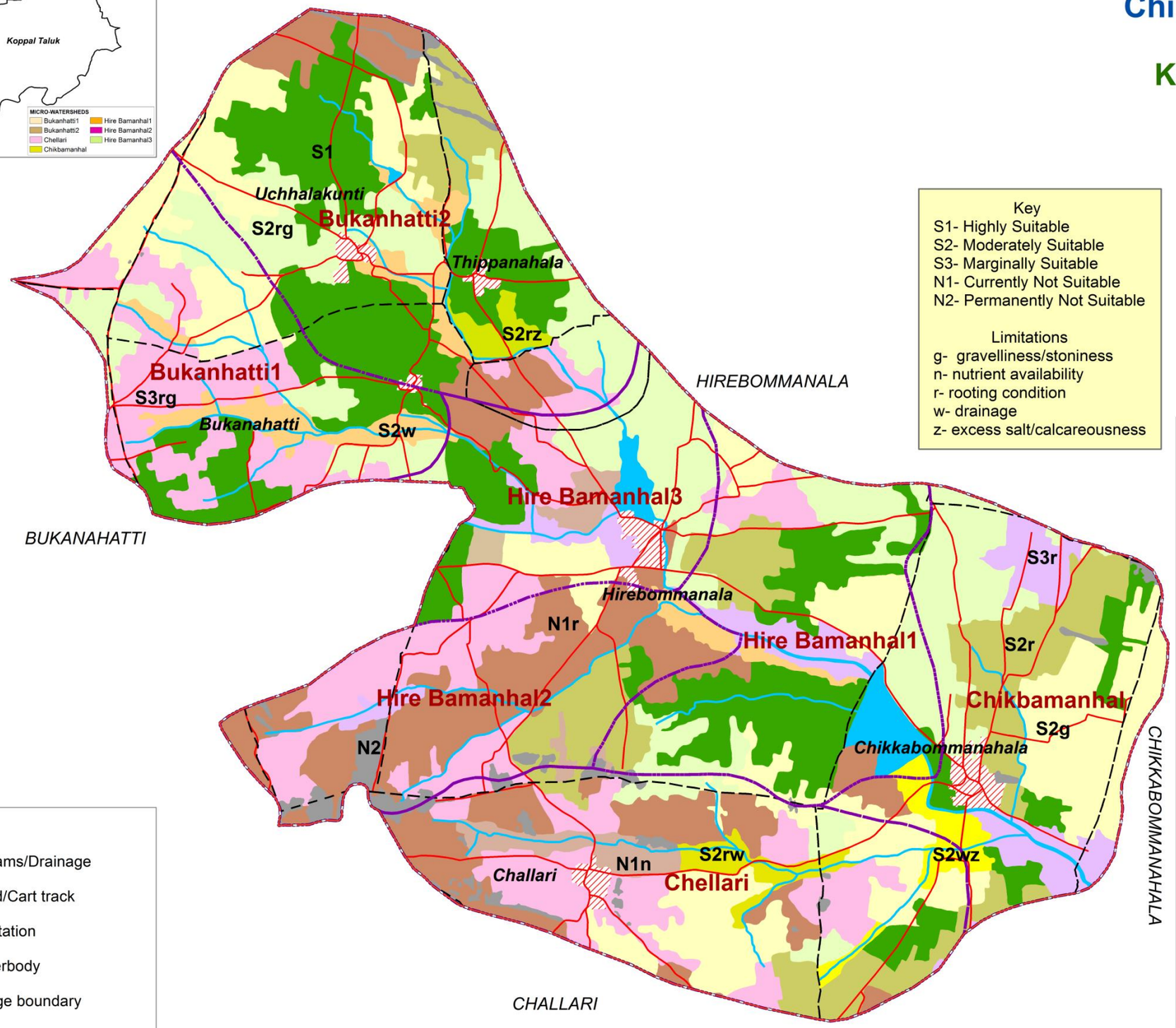
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



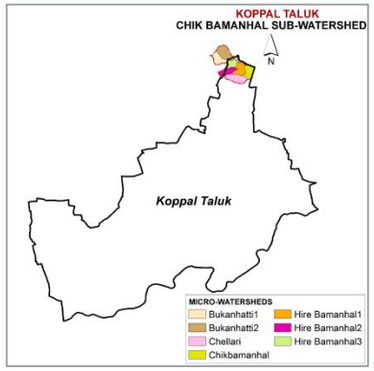

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 295 (8.85) |
| S2w | 100 (3.01) |
| S2rg | 526 (15.79) |
| S2rw | 28 (0.84) |
| S2rz | 19 (0.58) |
| S2wz | 35 (1.06) |
| S3r | 126 (3.77) |
| S3rg | 493 (14.78) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 6.21. Land Suitability for Lime




## LAND SUITABILITY FOR LIME

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

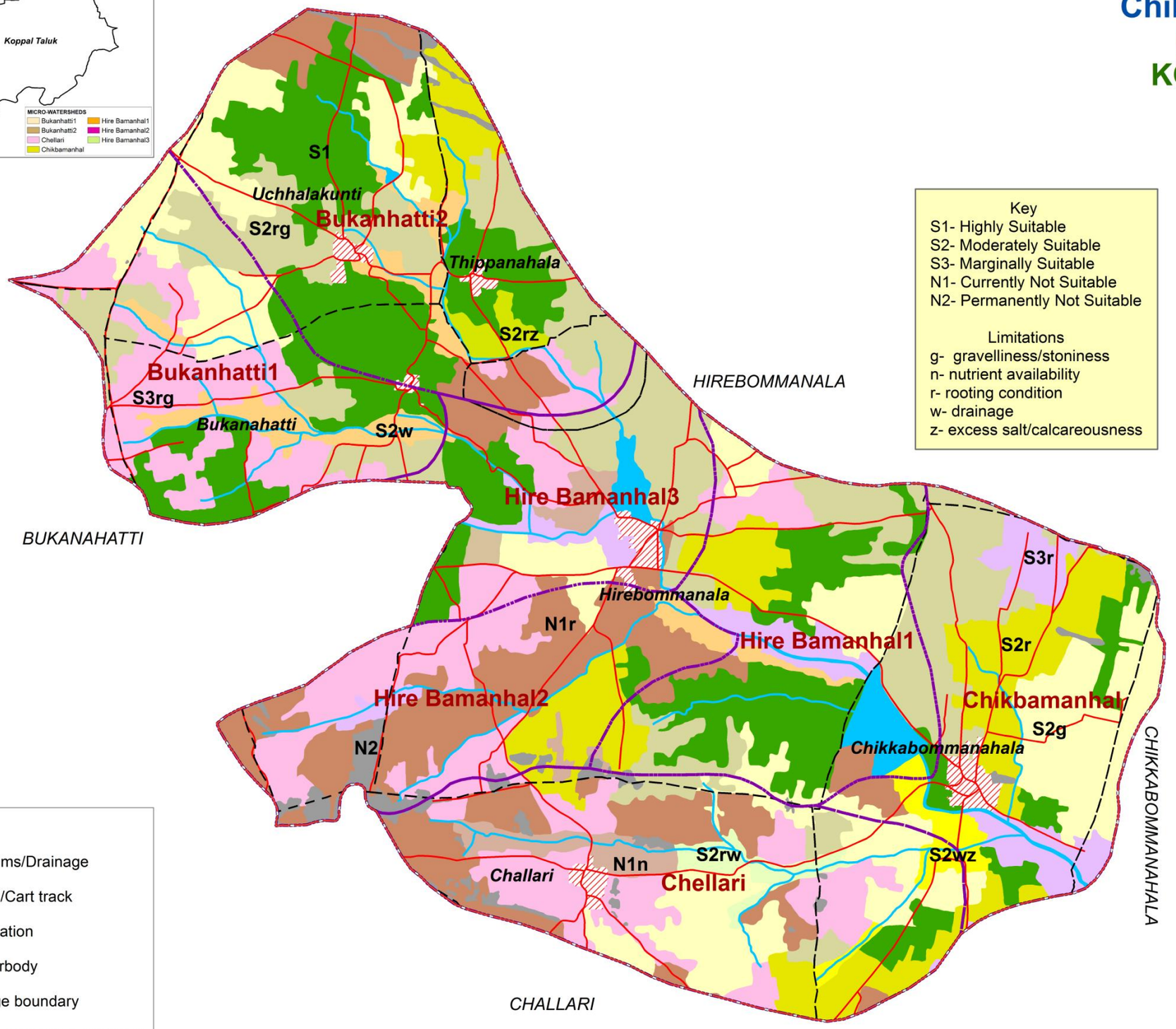
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



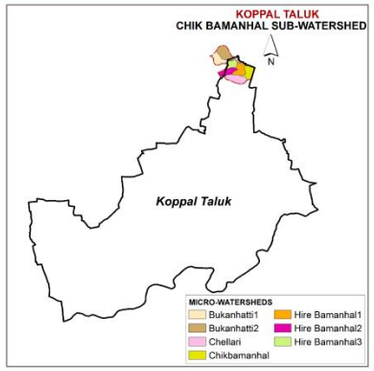

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 295 (8.85) |
| S2w | 100 (3.01) |
| S2rg | 526 (15.79) |
| S2rw | 28 (0.84) |
| S2rz | 19 (0.58) |
| S2wz | 35 (1.06) |
| S3r | 126 (3.77) |
| S3rg | 493 (14.78) |
| N1n | 57 (1.71) |
| N1r | 405 (12.15) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.22. Land Suitability for Cashew




## LAND SUITABILITY FOR CASHEW

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

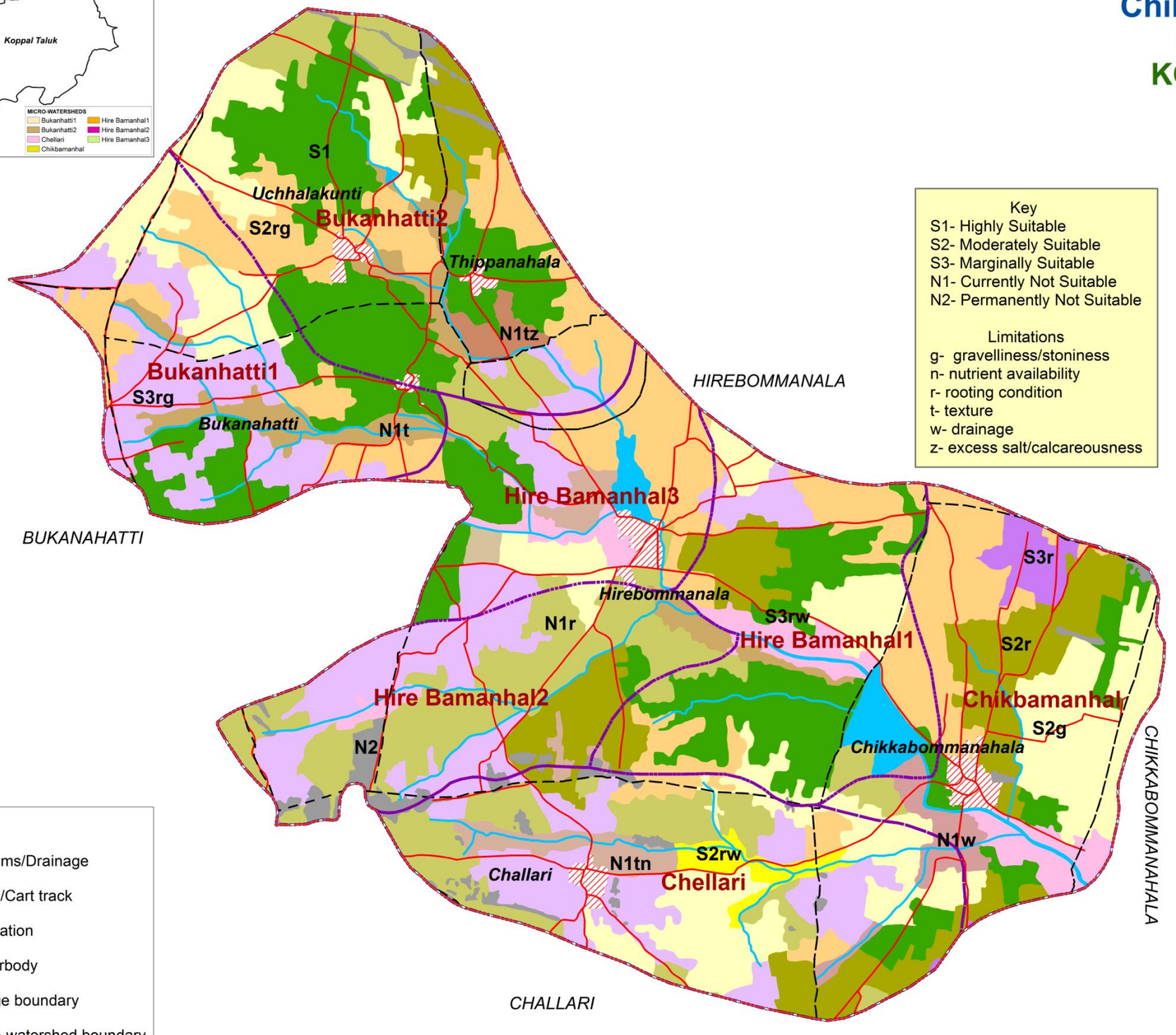
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



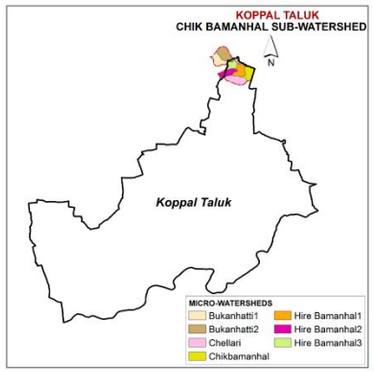

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 577 (17.3) |
| S2g | 506 (15.18) |
| S2r | 295 (8.85) |
| S2rg | 526 (15.79) |
| S2rw | 28 (0.84) |
| S3r | 31 (0.92) |
| S3rg | 493 (14.78) |
| S3rw | 95 (2.85) |
| N1r | 405 (12.15) |
| N1t | 100 (3.01) |
| N1w | 35 (1.06) |
| N1tn | 57 (1.71) |
| N1tz | 19 (0.58) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.23. Land Suitability for Custard Apple




## LAND SUITABILITY FOR CUSTARD APPLE

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

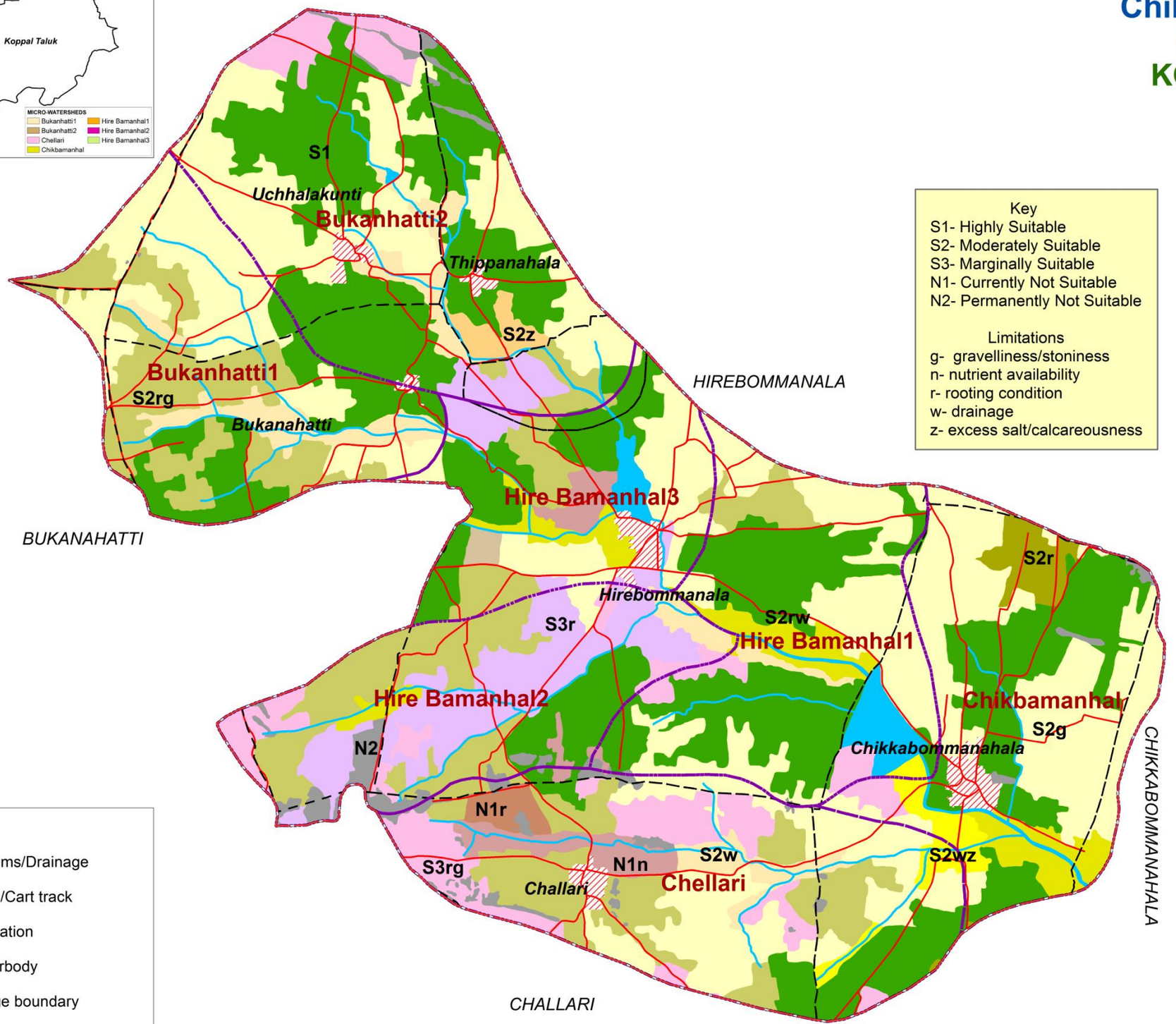
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



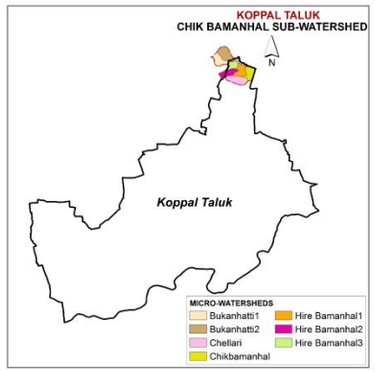

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 912 (27.35) |
| S2g | 992 (29.77) |
| S2r | 31 (0.92) |
| S2w | 128 (3.85) |
| S2z | 19 (0.58) |
| S2rg | 493 (14.78) |
| S2rw | 95 (2.85) |
| S2wz | 35 (1.06) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.24. Land Suitability for Amla




## LAND SUITABILITY FOR AMLA

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

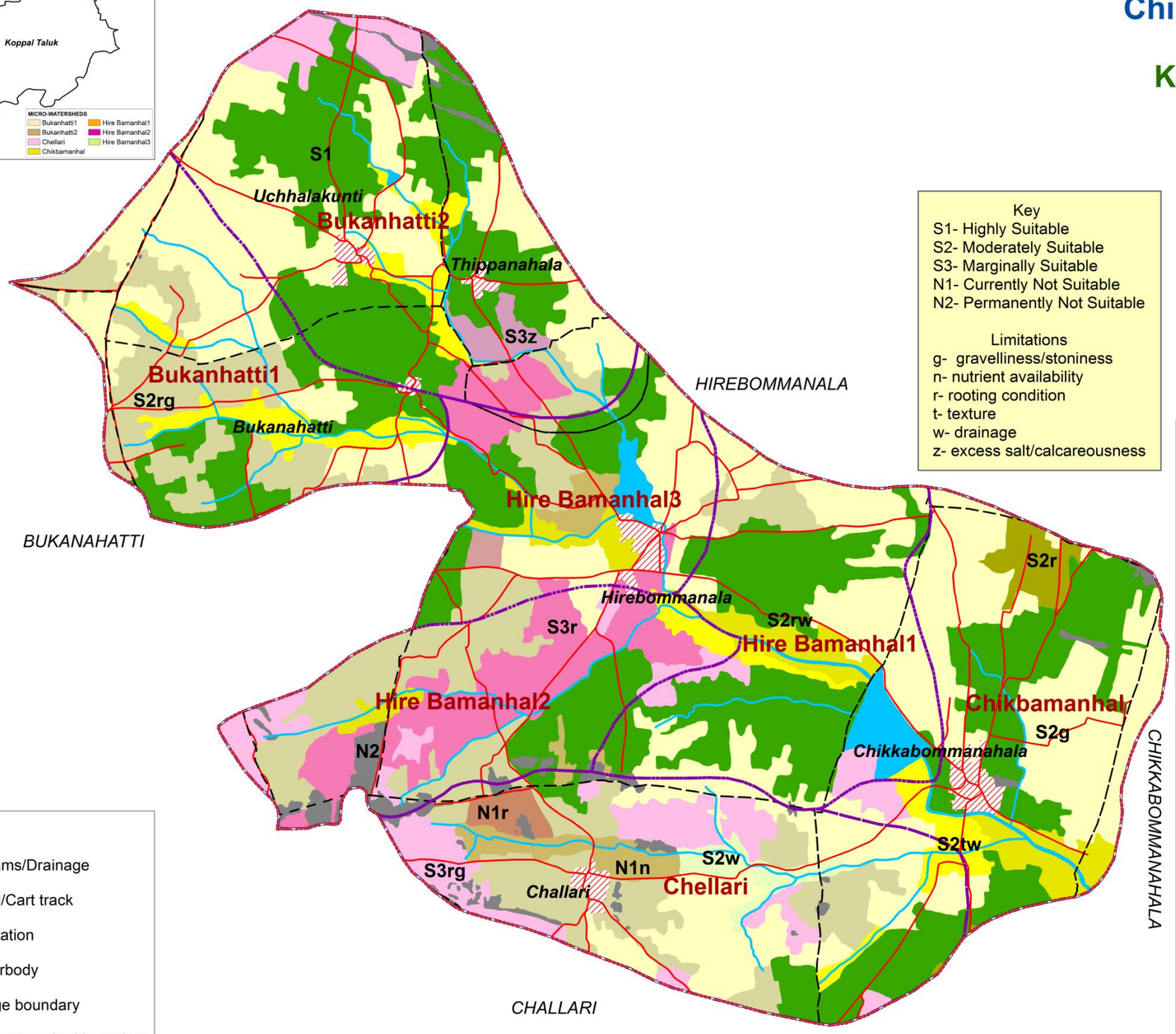
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



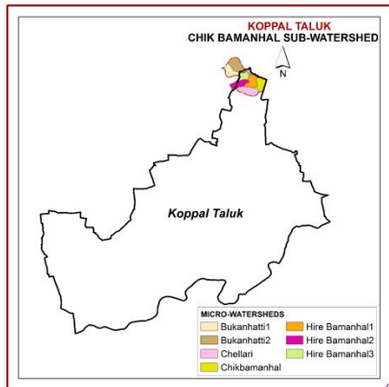

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 912 (27.35) |
| S2g | 992 (29.77) |
| S2r | 31 (0.92) |
| S2w | 28 (0.84) |
| S2rg | 493 (14.78) |
| S2rw | 95 (2.85) |
| S2tw | 136 (4.07) |
| S3r | 187 (5.62) |
| S3z | 19 (0.58) |
| S3rg | 202 (6.05) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.25. Land Suitability for Tamarind




## LAND SUITABILITY FOR TAMARIND

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

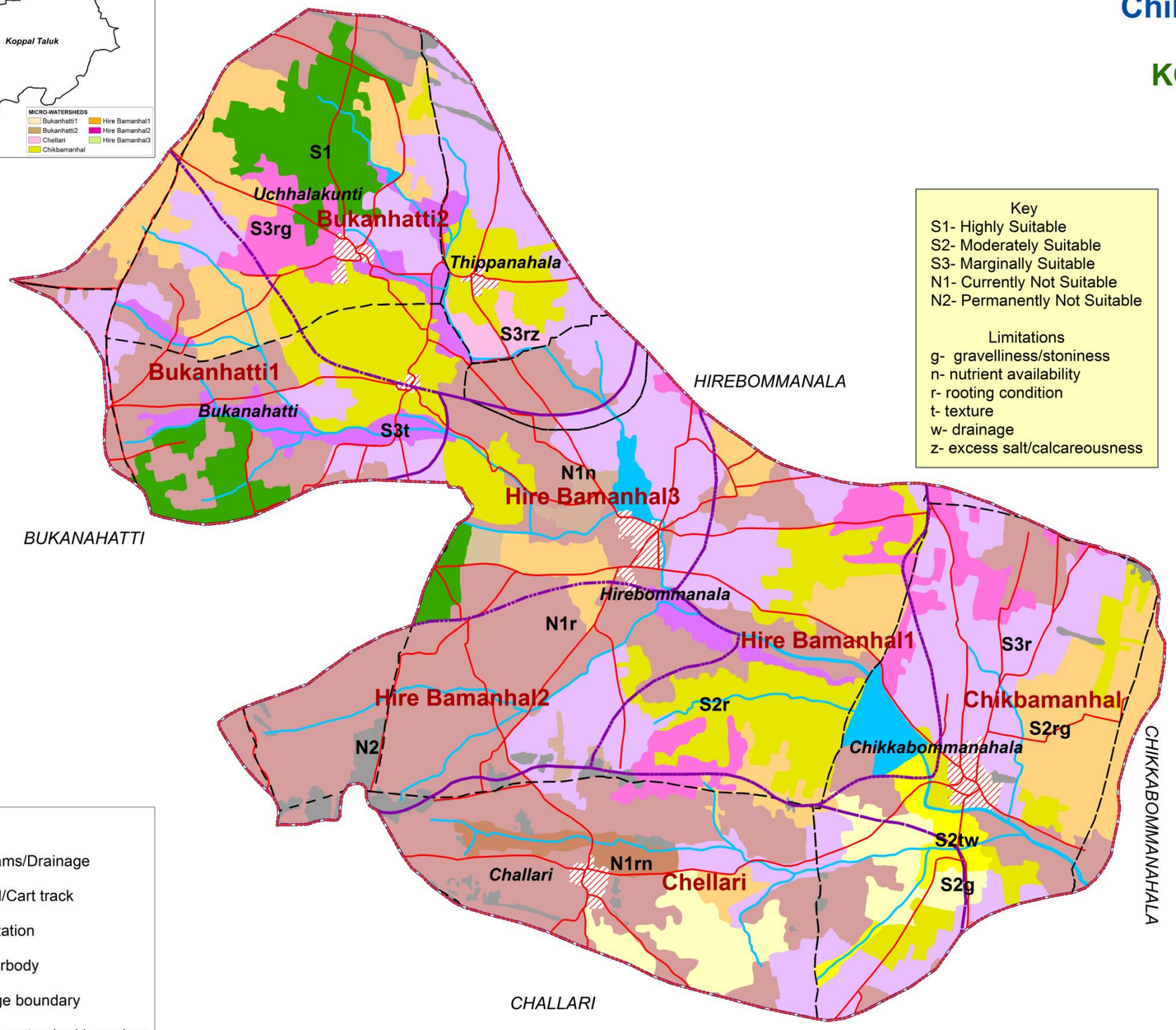
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



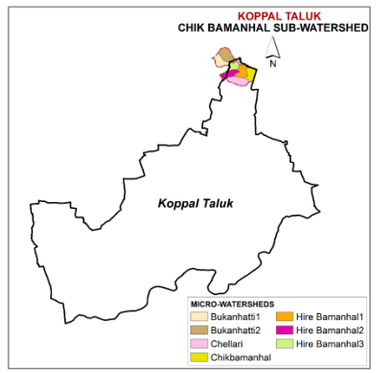

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 164 (4.93) |
| S2g | 115 (3.46) |
| S2r | 412 (12.37) |
| S2rg | 391 (11.72) |
| S2tw | 35 (1.06) |
| S3r | 701 (21.03) |
| S3t | 100 (3.01) |
| S3rg | 148 (4.45) |
| S3rz | 19 (0.58) |
| N1n | 23 (0.69) |
| N1r | 1024 (30.7) |
| N1rn | 34 (1.02) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.26. Land Suitability for Brinjal




## LAND SUITABILITY FOR BRINJAL

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

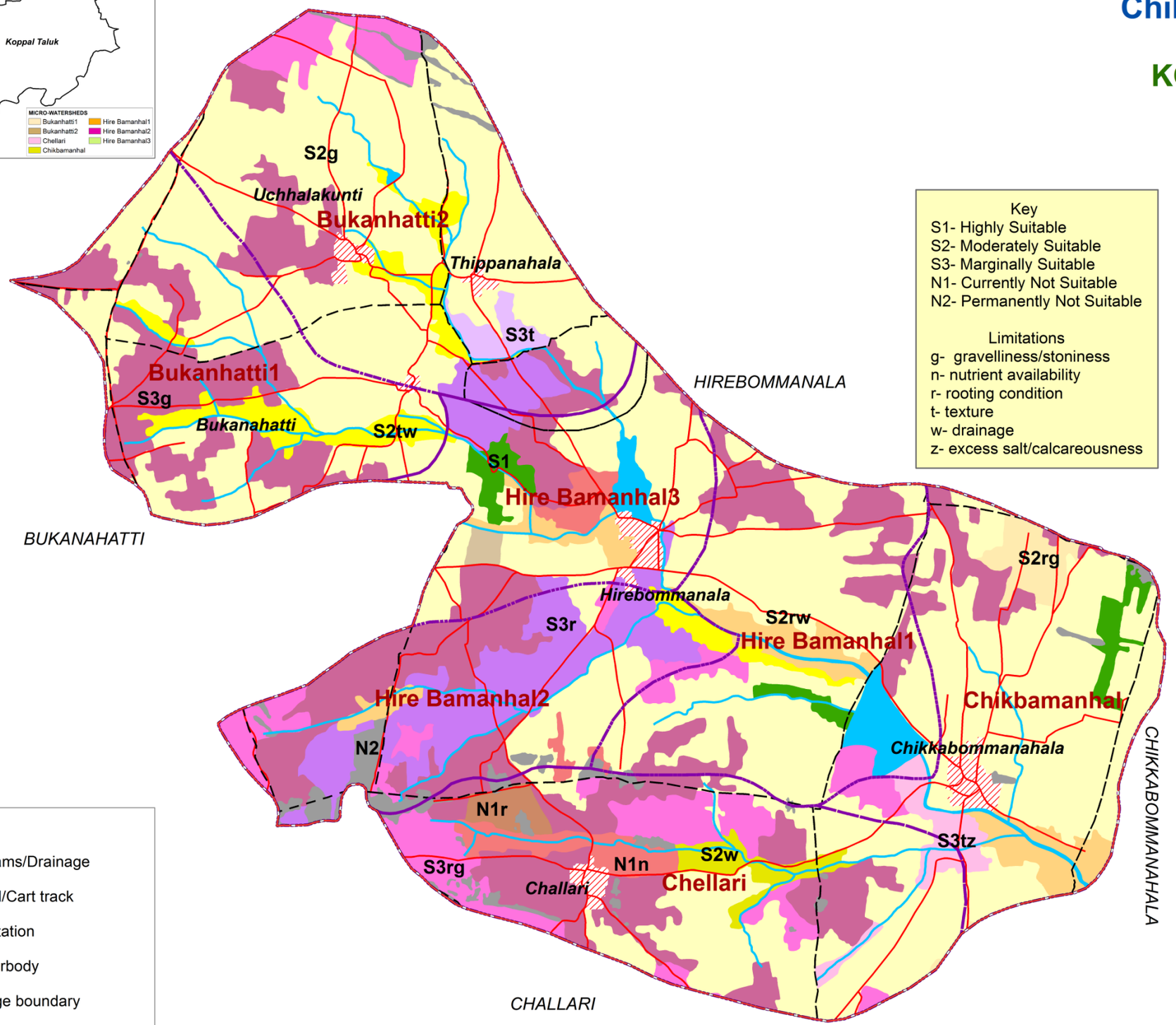
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



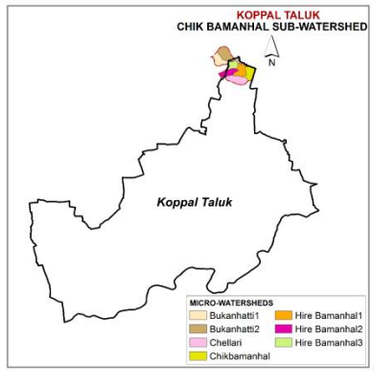

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 100 (3.01) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3t | 19 (0.58) |
| S3rg | 202 (6.05) |
| S3tz | 35 (1.06) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.27. Land Suitability for Onion




## LAND SUITABILITY FOR ONION

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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

S2g
Uchhalakunti
Bukanhatti2
Thippanahala
Bukanhatti1
S3g
Bukanahatti
S3t
S1
Hire Bamanhal3
HIREBOMMANALA
BUKANAHATTI
S2rg
Hirebommanala
S3r
S2rw
Hire Bamanhal1
Hire Bamanhal2
Chikbamanhal
N2
Chikkabommanahala
CHIKKABOMMANAHALA
N1r
S3tz
S3rg
N1n
S2w
Challari
Chellari
CHALLARI

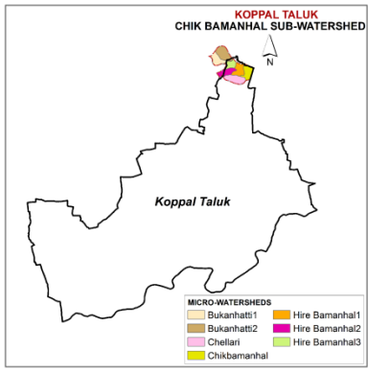
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3t | 100 (3.01) |
| S3rg | 202 (6.05) |
| S3tz | 55 (1.64) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.28. Land Suitability for Jasmine




## LAND SUITABILITY FOR JASMINE

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

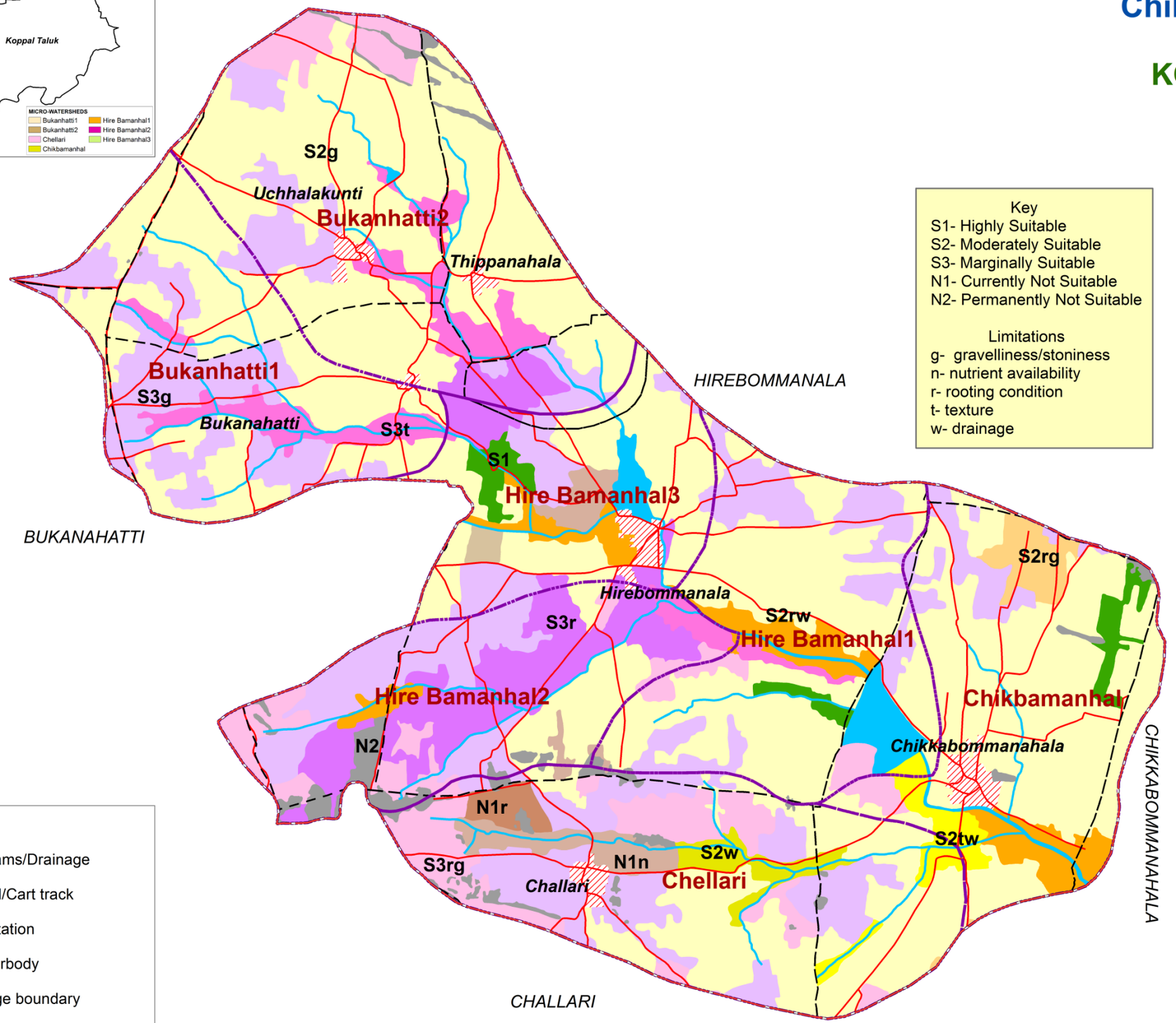
### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

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

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



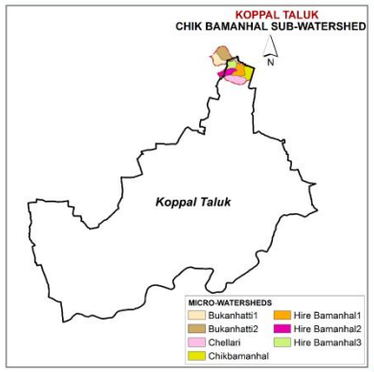

References
- Streams/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Village boundary
- Micro-watershed boundary
- Sub-watershed boundary

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 35 (1.06) |
| S3g | 655 (19.64) |
| S3r | 187 (5.62) |
| S3t | 119 (3.58) |
| S3rg | 220 (6.6) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 6.29. Land Suitability for Crossandra




## LAND SUITABILITY FOR CROSSANDRA

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

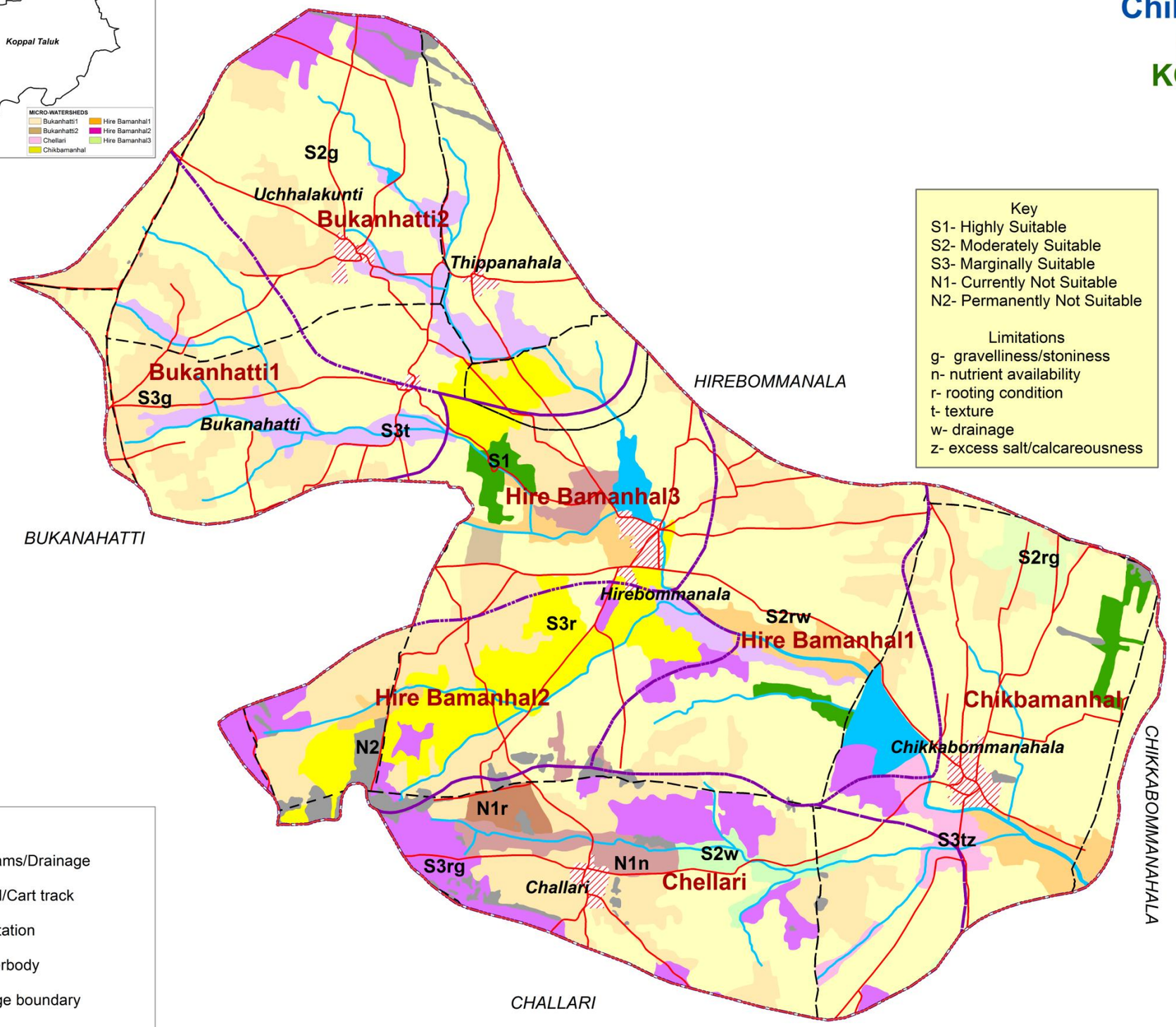
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



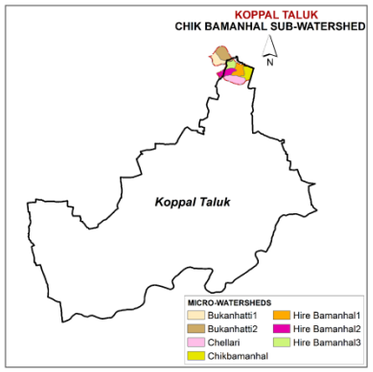

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3t | 119 (3.58) |
| S3rg | 202 (6.05) |
| S3tz | 35 (1.06) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

Source: ICAR-NBSS&LUP, Bengaluru

# 6.30. Land Suitability for Marigold




## LAND SUITABILITY FOR MARIGOLD

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

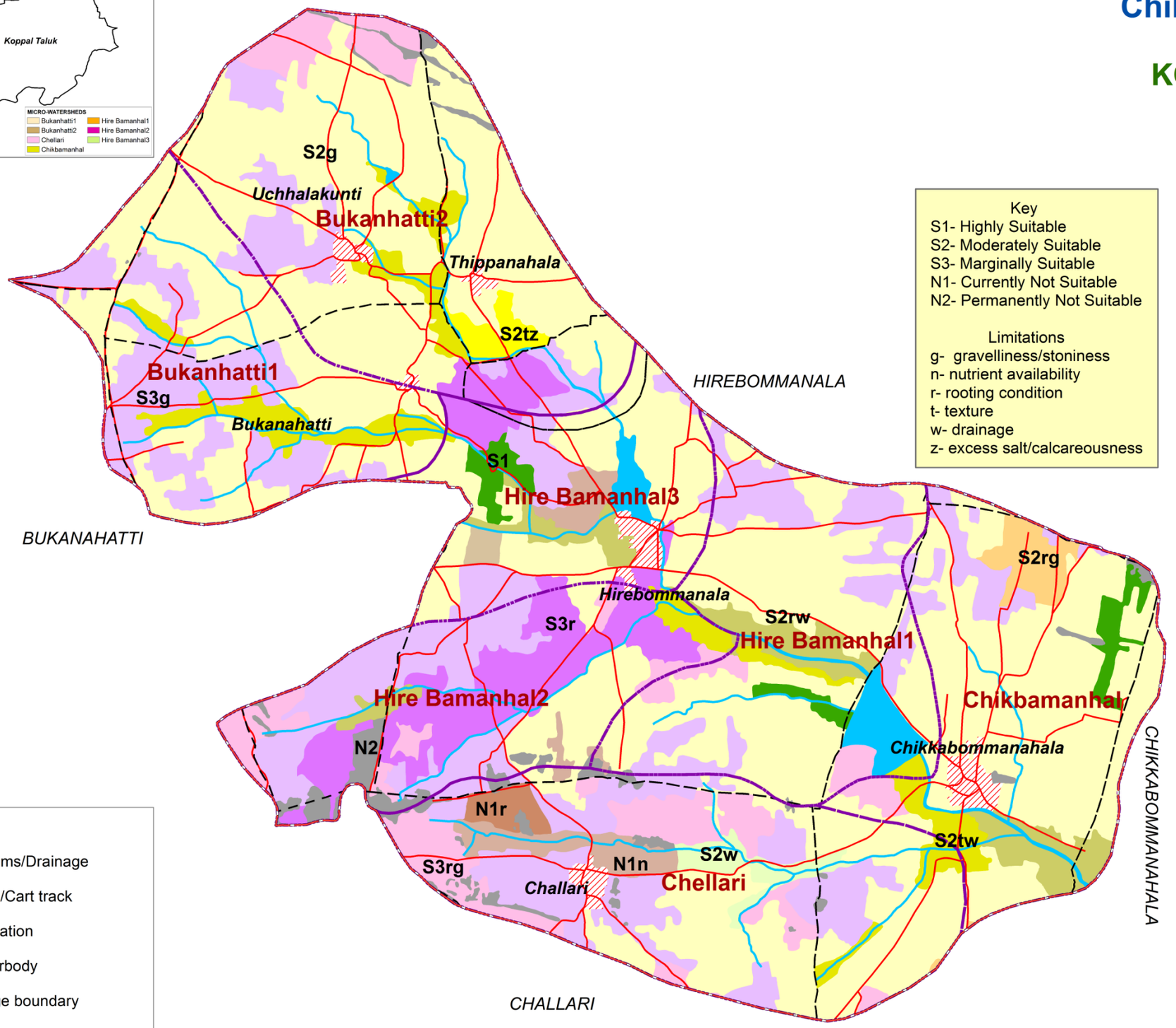
### KOPPAL TALUK & DISTRICT

km
0 0.5 1 2

N

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

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



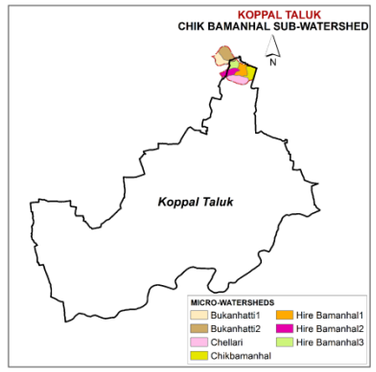

| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 136 (4.07) |
| S2tz | 19 (0.58) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

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

**Source: ICAR-NBSS&LUP, Bengaluru**

# 6.31. Land Suitability for Chrysanthemum




## LAND SUITABILITY FOR CHRYSANTHEMUM

### Chik Bamanhal Sub-watershed

(4D3A9O : Area - 3333.57 ha)

### KOPPAL TALUK & DISTRICT

0 0.5 1 2 km

N

S2g
Uchhalakunti
Bukanhatti2
Thippanahala
S2tz
Bukanhatti1
S3g
Bukanahatti
HIREBOMMANALA
S1
Hire Bamanhal3
BUKANAHATTI
S2rg
Hirebommanala
S3r
S2rw
Hire Bamanhal1
Hire Bamanhal2
Chikbamanhal
N2
Chikkabommanahala
CHIKKABOMMANAHALA
N1r
S2tw
S3rg
N1n
S2w
Challari
Chellari
CHALLARI

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

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

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

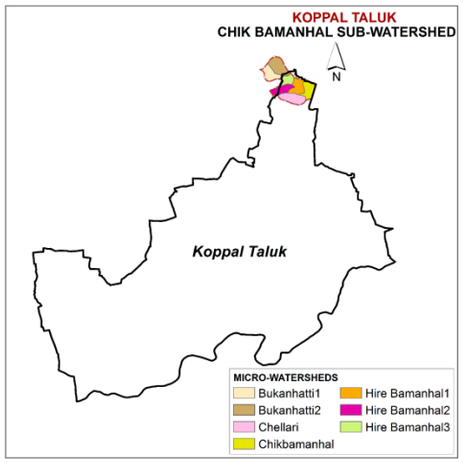
| Suitability subclass | Area in ha (%) |
|---|---|
| S1 | 42 (1.27) |
| S2g | 1682 (50.45) |
| S2w | 28 (0.84) |
| S2rg | 31 (0.92) |
| S2rw | 95 (2.85) |
| S2tw | 136 (4.07) |
| S2tz | 19 (0.58) |
| S3g | 673 (20.19) |
| S3r | 187 (5.62) |
| S3rg | 202 (6.05) |
| N1n | 57 (1.71) |
| N1r | 16 (0.48) |
| N2 | 62 (1.86) |
| Mining/Industrial | 7 (0.21) |
| Others* | 97 (2.91) |

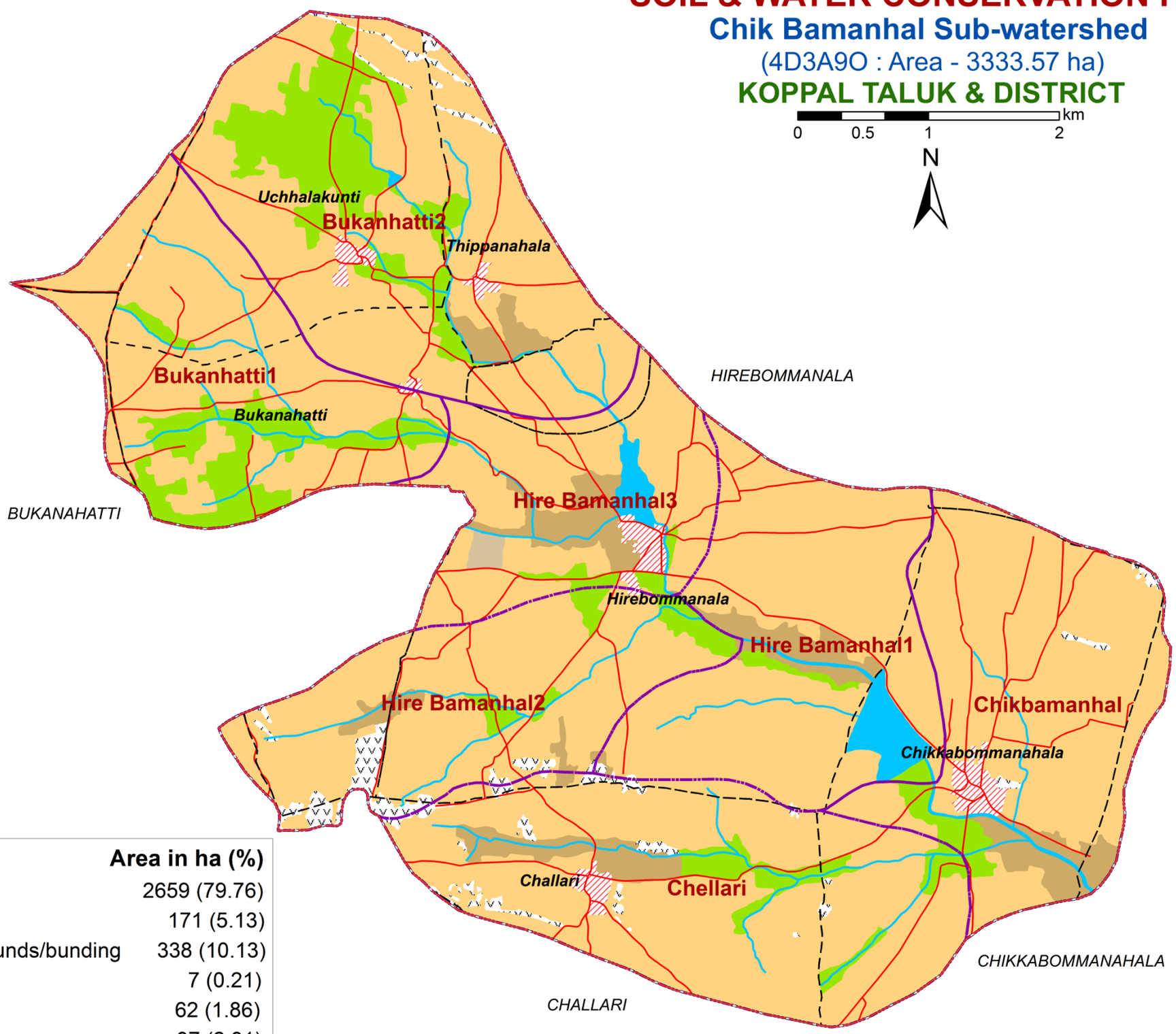
* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

# 7. Soil and Water Conservation Measures

## 7.1. Soil & Water Conservation Plan




**References**

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

| Legend | Area in ha (%) |
|---|---|
| Trench cum bunding | 2659 (79.76) |
| Graded bunding | 171 (5.13) |
| Strengthening of existing bunds/bunding | 338 (10.13) |
| Mining/Industrial | 7 (0.21) |
| Rock outcrops | 62 (1.86) |
| Others* | 97 (2.91) |

* - Habitation & Waterbody

**Source: ICAR-NBSS&LUP, Bengaluru**

## **8.Table.** Proposed Crop Plan for Chik Bamanhal Sub-watershed, Irakallagada hobli, Koppal taluk, Koppal district based on soil-site–crop suitability assessment

| LMU. No | Soil Map Units | Field Crops/Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 1 | 180.BDGcB1g1, 188.BDGhB2g1, 194.BDGiB2g1, 221.BPRcA1g1, 224.BPRcB2, 225.BPRcB2g1, 230.BPRhB2, 231.BPRhB2g1, 232.BPRhB2g2, 105.HDHbB2g1, 111.HDHcB2g1, 112.HDHcB2g2, 121.HDHhB1g2, 123.HDHhB2g1, 124.HDHhB2g2, 258.NGPhB1g1, 259.NGPhB1g2, 291NDLcB2g1 & 296NDLhB2g1<br>(Moderately deep to very deep, red gravelly, red sandy clay to clay soils) | Maize, Sorghum, Sunflower, Groundnut, Bajra, Cotton, Red gram | **Fruit crops** : Mango, Sapota, Pomegranate, Amla, Cashew, Guava, Custard apple, Jack fruit, Jamun, Lime, Musambi<br>**Vegetables:** Tomato, Chilli, Drumstick, Onion, Bhendi, Brinjal, Curry leaves<br>**Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |
| 2 | 158.BSRbB2g1<br>162.BSRhB2g1<br>138GHTcB2g1<br>140GHThB1<br>142GHThB2g1<br>195KMHbB2<br>198KMHhB1g1<br>201KMHiB2<br>204MNLcB2<br>209MNLiB2g1<br>275MRDcA1g1<br>277MRDhB1g1<br>(Moderately deep to very deep, red sandy clay to sandy clay loam soils) | Maize, Sorghum, Groundnut, Sunflower, Bajra, Mulberry, Cotton, Red gram | **Fruit crops**: Mango, Sapota, Pomegranate, Amla, Cashew, Custard apple, Guava, Jackfruit, Jamun, Lime, Musambi, Tamarind<br>**Vegetables:** Tomato, Chillies, Drumstick, Onion, Bhendi, Brinjal, Curry leaves<br>**Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |

*To be continued…*

| LMU. No | Soil Map Units | Field Crops/Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 3 | 366BWThB1<br>(Moderately deep, black calcareous gravelly sandy clay to clay soils) | Maize, Sorghum, Bajra, Sunflower, Cotton, Red gram, Bengal gram | **Fruit crops** : Pomegranate, Sapota, Amla, Custard apple, Jamun, Lime, Musambi,<br>**Vegetables:** Tomato, Drumstick, Bhendi, Brinjal<br>**Flowers:** Marigold, Chrysanthemum | Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practises |
| 4 | 368GRHiB2<br>329RNKiA1<br>333RNKmB1<br>(Sodic soils) | - | **Agri-Silvi-Pasture:** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass ,Bermuda grass | Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manures, green manures and providing subsurface drainage |
| 5 | 466HLPmA1<br>474SRRmA1<br>444TSDiA1<br>446TSDmA1<br>(Moderately deep to very deep lowland soils) | Maize, Sorghum, Sunflower, Bajra, Red gram | **Fruit crops**: Amla, Tamarind<br>**Vegetables:** Chillies, Drumstick, Bhendi, Brinjal<br>**Flowers:** Marigold, Chrysanthemum, Crossandra | Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices |
| 6 | 464HNHhB2g1<br>471HNHiB2<br>(Moderately shallow lowland sandy clay soils) | Maize, Sorghum, Sunflower, Bajra | **Fruit crops**: Amla,<br>**Vegetables:** Chillies, Drumstick, , Bhendi, Brinjal<br>**Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra | Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices |
| 7 | 43LKRcB2g1<br>44LKRcB2g2<br>452LKRhB2g1<br>47LKRhB2g2<br>54LKRiB2g1<br>77MKHcB2g1<br>85MKHhB2g1<br>86MKHhB2g2<br>88MKHiB1g1<br>(Moderately shallow, red gravelly sandy clay soils) | Bajra, Groundnut, Horse gram, Castor | **Fruit crops** : Amla, Custard apple<br>**Vegetables:** Curry leaves<br>**Flowers:** Marigold, Chrysanthemum | Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc) |

*To be continued…*

| LMU. No | Soil Map Units | Field Crops/Commercial crops | Horticulture Crops (Rainfed/Irrigated) | Suitable Interventions |
|---|---|---|---|---|
| 8 | 72.KTPhB2g1<br>(Moderately shallow, red sandy clay soils) | Maize, Sorghum, Groundnut, Bajra, Cotton, Horse gram, Castor | **Fruit crops** : Amla, Custard apple<br>**Vegetables:** Tomato, Chilli, Onion, Bhendi, Brinjal ,Curry leaves<br>**Flowers:** Marigold, Chrysanthemum, Jasmine, Crossandra | Drip irrigation, mulching, suitable soil and water conservation practises (Crescent Bunding with Catch Pit etc) |
| 9 | 472ABRiB2g2<br>2.DVHhB2g2<br>465HRVcB2g1<br>24HRVhB1g2<br>27HRVhB2g2<br>30HRViB1g2<br>31HRViB2g1<br>14KGPcB1g1<br>449KGPhA1<br>17KGPhB2g1<br>18KGPhB2g2<br>(Shallow to very shallow red soils) | - | Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra* | Use of short duration varieties, sowing across the slope |

# PART - B

# Hydrological Inventory of Chik Bamanhal Sub-watershed, Koppal Taluk, Koppal 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 Chik Bamanhal Sub-watershed, Koppal Taluk, Koppal District, Karnataka for Watershed Planning and Development


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

ICAR - NBSS & LUP

**Phone:080-23412242** **E-mail:nbssrcb@gmail.com**

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

| Name | Designation |
|---|---|
| Dr. Rajendra Hegde | Principal Scientist & Head Coordinator |
| Dr. S. Srinivas | Principal Scientist |
| Dr. K .V. Niranjana | Chief Technical Officer |
| Sh. R.S.Reddy | Consultant |
| Sh. A.G.Devendra Prasad | Consultant |
| Smt. K.Karunya Lakshmi | Research Associate |
| Ms. Seema, K.V. | Senior Research Fellow |
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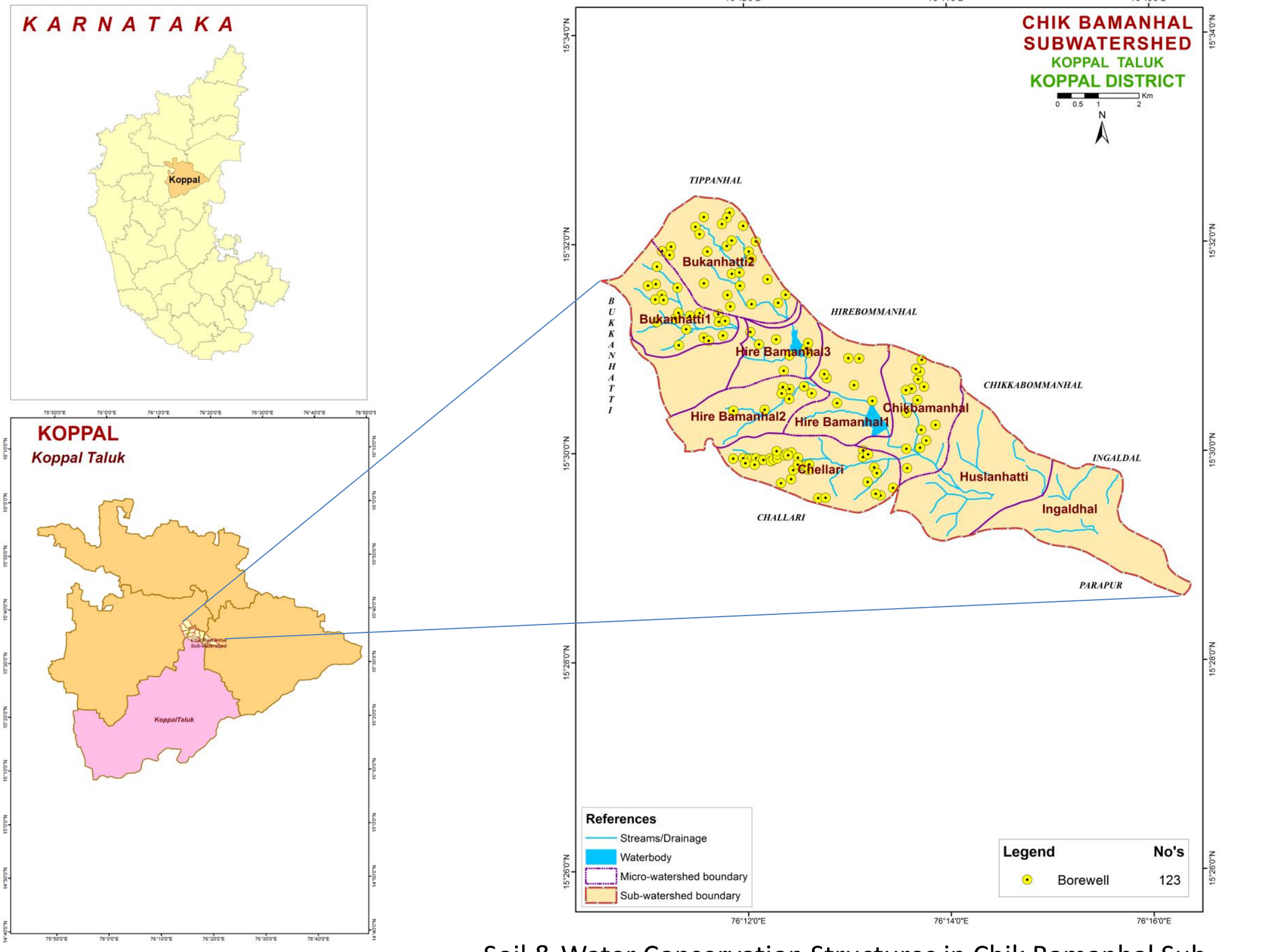
# INTRODUCTION

- The inventory and documentation of spatial and temporal changes in hydrological components of Chik Bamanhal sub-watershed (4D3A9O) in Koppal Taluk, Koppal District, has been undertaken for integrated planning, development and management.
- Chik Bamanhal sub-watershed (Koppal Taluk, Koppal District) is located between $15^0$32’ 40”–$15^0$38’ 6” North latitudes and $76^0$ 13’44”- $76^0$ 21’43” East longitudes, covering an area of about 4954 ha.
- This sub-watershed encompasses of 9 MWs namely Bukanhatti-1 (4D3A9O1b), Bukanhatti-2 (4D3A9O1a), Chellari (4D3A9O2a), Chikbamanhal (4D3A9O2b), Hire Bamanhal-1 (4D3A9O1e), Hire Bamanhal-2 (4D3A9O1d) , Hire Bamanhal-3 (4D3A9O1c) , Huslanhatti (4D3A9O2c) and Ingaldhal (4D3A9O2d). Land Resource Inventory (LRI) was generated for seven among nine micro-watersheds.
- Average annual rainfall (1960-2014) of the Hobli (Block) pertaining to the sub-watershed is 631 mm.
- In this sub-watershed major *kharif* crops are Maize, Cotton, Sunflower, Bajra, Groundnut, Redgram and major *rabi* crops are Sorghum, Bengalgram and Safflower.
- Hydrological components namely rainfall (annual, *kharif, rabi* and summer*)*, PET, AET, runoff, surface soil moisture, ground water status and water balance are presented.

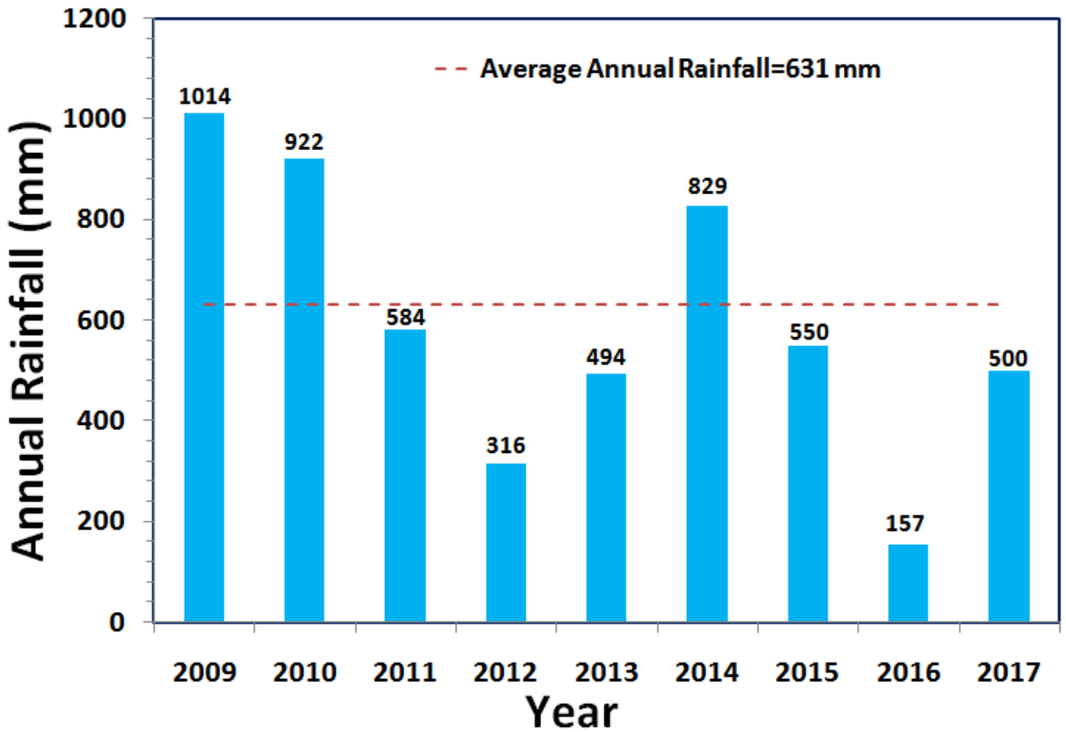
# LOCATION MAP OF CHIK BAMANHAL SUB-WATERSHED




Soil & Water Conservation Structures in Chik Bamanhal Sub-watershed, Koppal Taluk, Koppal District

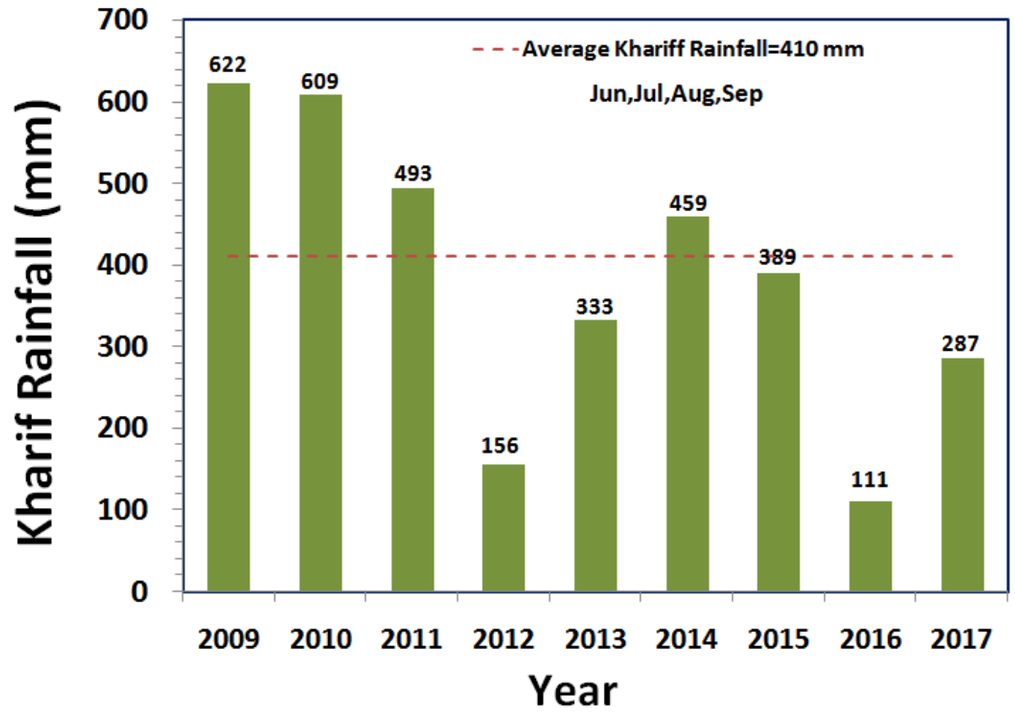
II

# RAINFALL INDEX

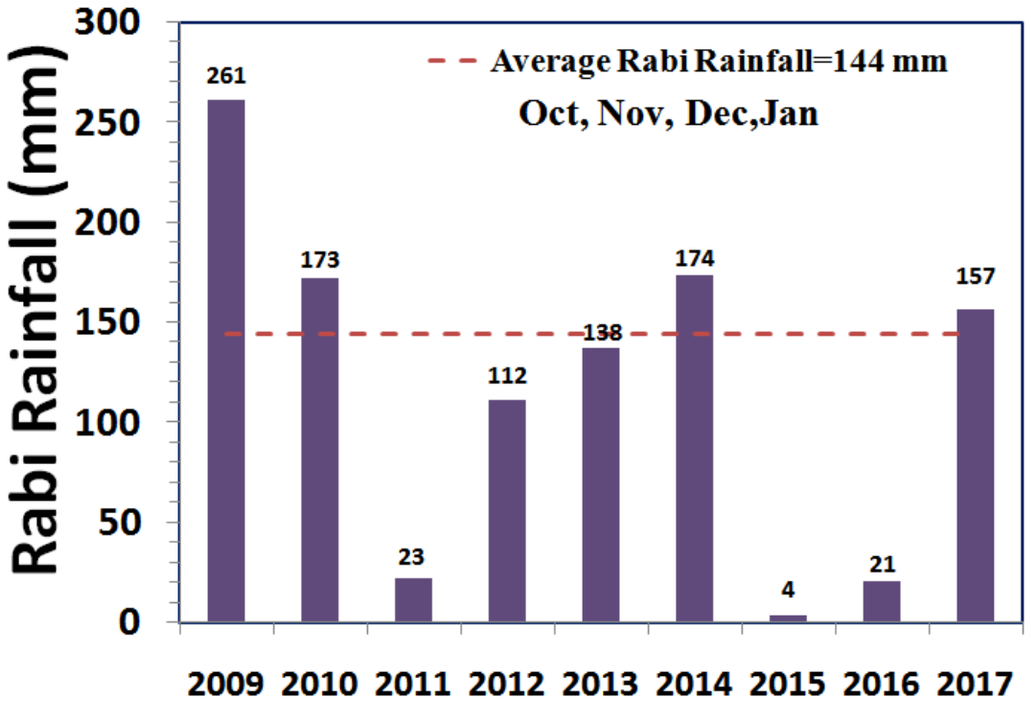



The average annual rainfall (1960-2014) recorded at the Koppal station in Koppal taluk of Koppal district is 631 mm. The annual rainfall at Koppal station (Hobli H.Q.) is presented. During the years 2011, 2012, 2013, 2015, 2016 and 2017 the annual rainfall was deficient by 7%, 50%, 22%, 13%,75% and 21% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 65% of the annual rainfall and it typically follows the annual rainfall patterns. High variability found between annual *kharif* rainfall. During the years 2012, 2013, 2015, 2016 and 2017 the *kharif* rainfall was deficient by 62%, 19%, 73% and 30% respectively.

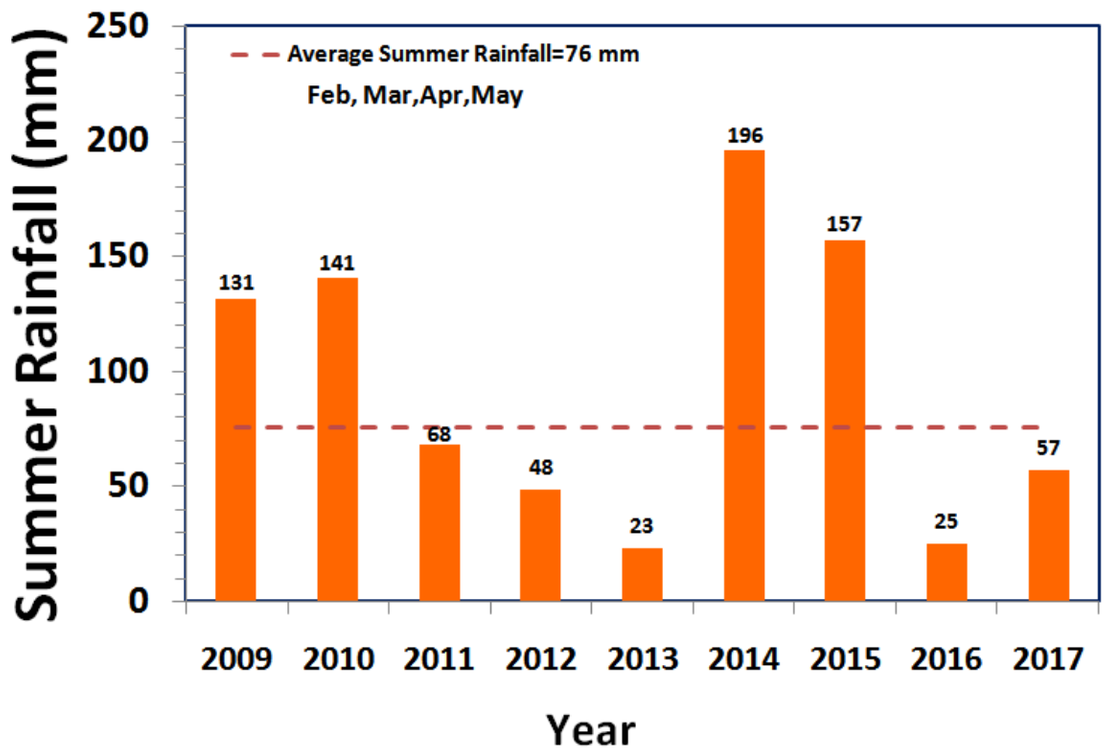


# RAINFALL INDEX

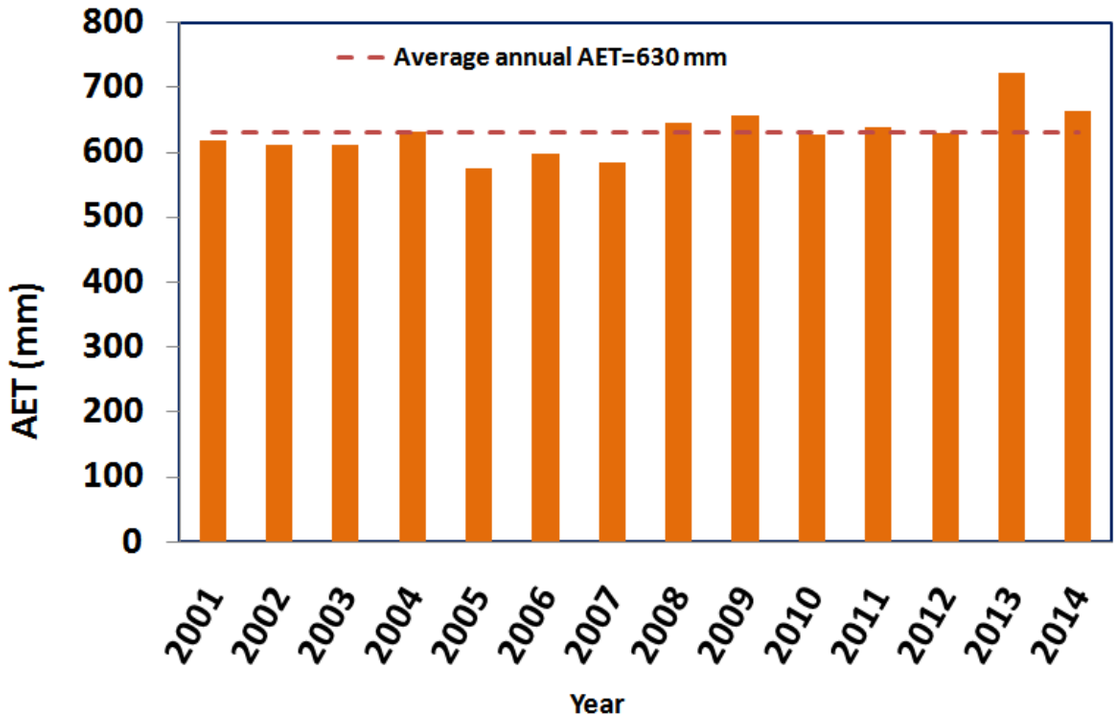


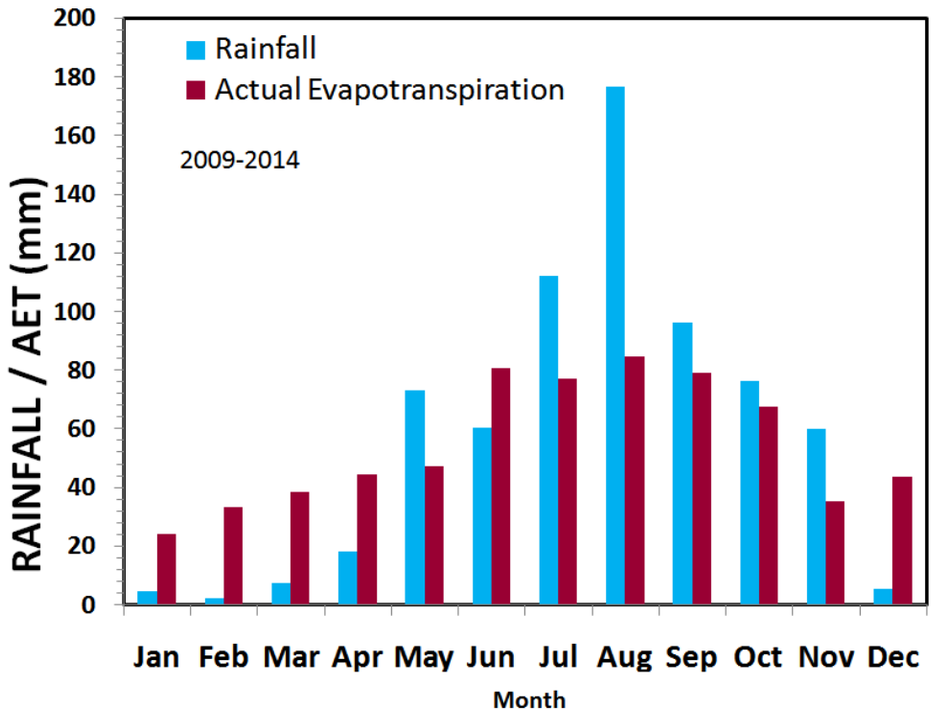

The average *rabi* rainfall (Oct-Jan) is about 20% of the Average annual rainfall. During the years 2011, 2012, 2013, 2015 and 2016 the *rabi* rainfall was deficient by 84%, 22%, 97% and 85% respectively.

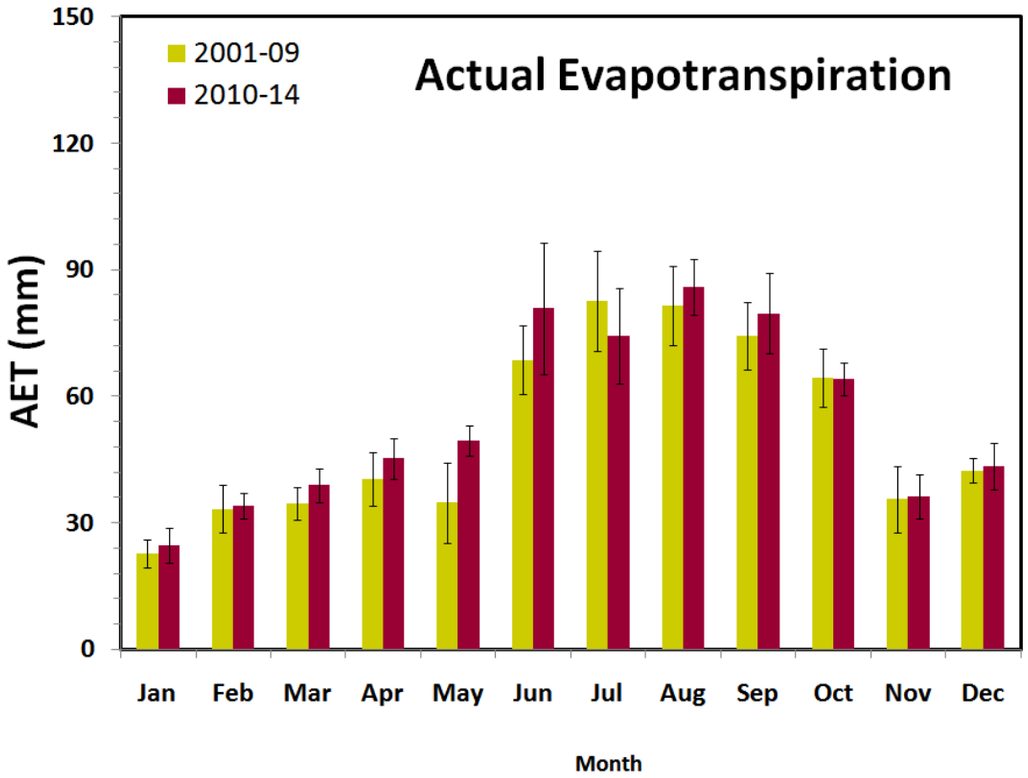
The average summer rainfall (Feb-May) is about 15% of the average annual rainfall. During the years 2009,2010, 2014 and 2015 high summer rainfall was received, where as other years showed deficient rainfall.



# EVAPOTRANSPIRATION

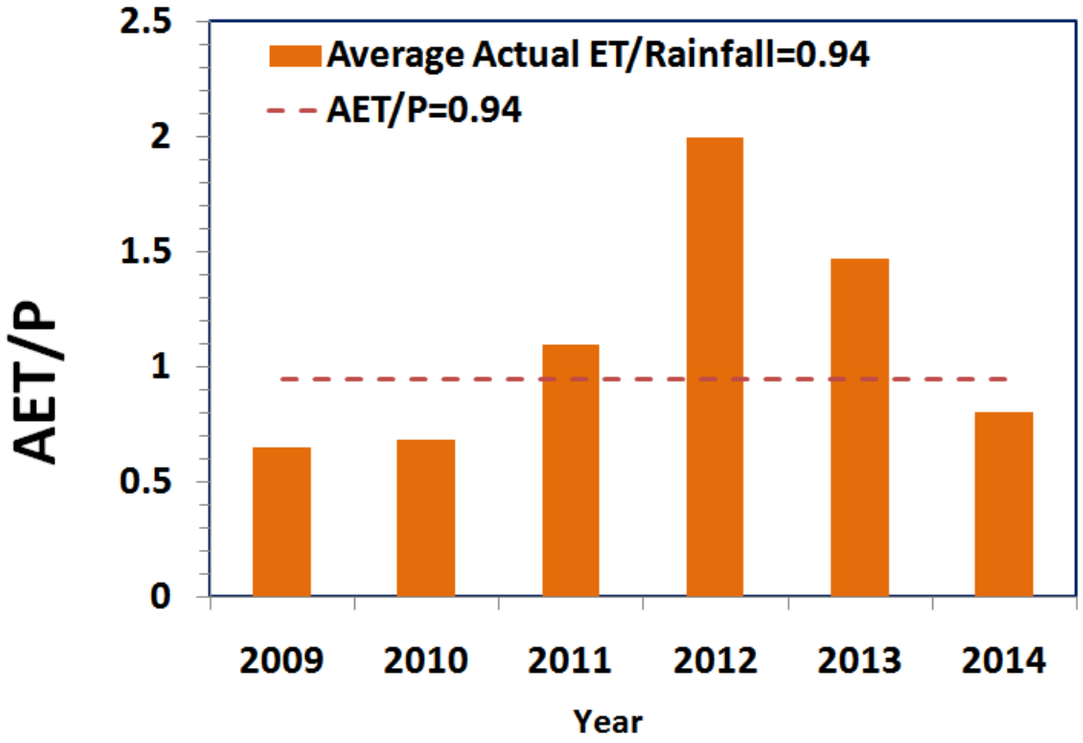


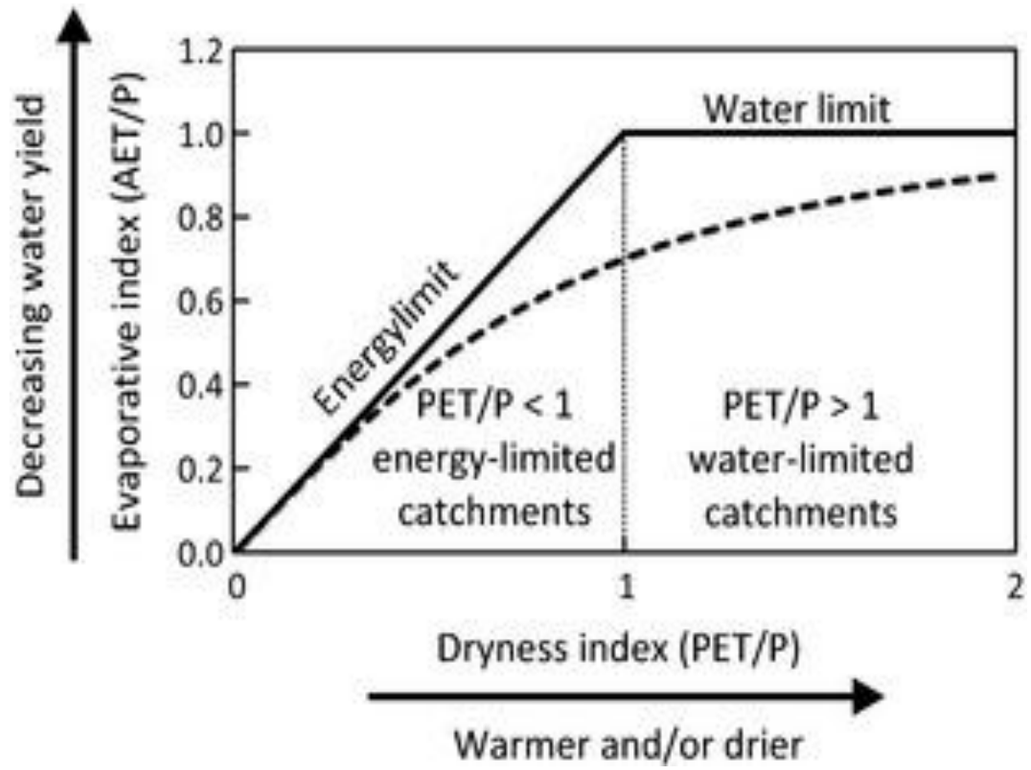



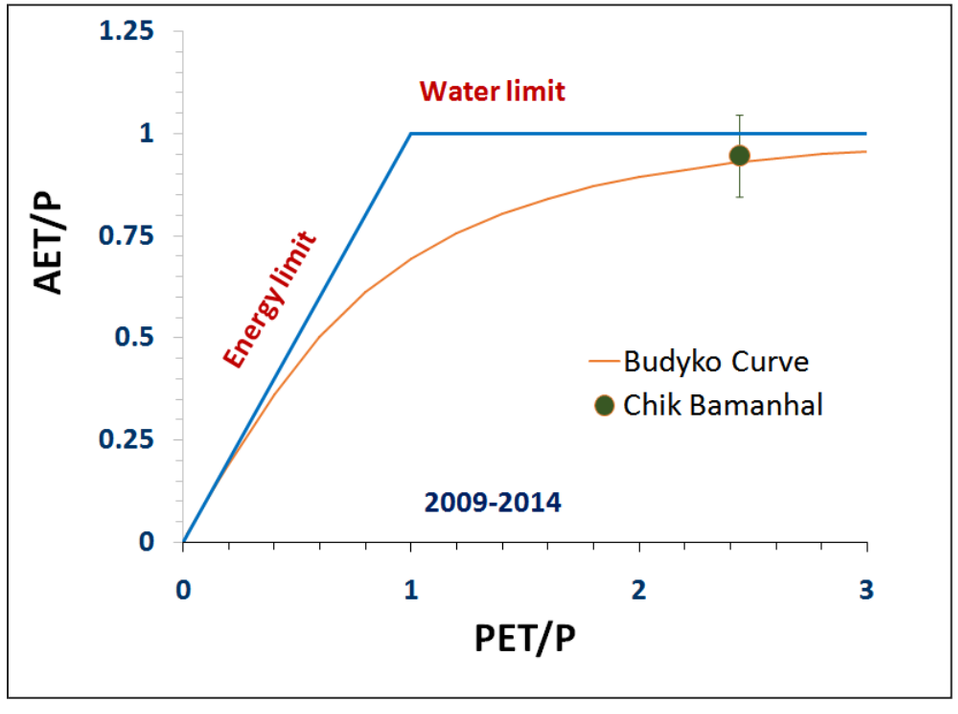

The average annual actual ET (2001-2014) and average annual rainfall found almost same. During *kharif*, average rainfall and AET were found to be 410 mm and 322 mm respectively, whereas in *rabi* it was about 144 mm and 171 mm. The annual ET increased by 6% during 2010-2014 compared to 2001-2009

# EVAPOTRANSPIRATION INDEX

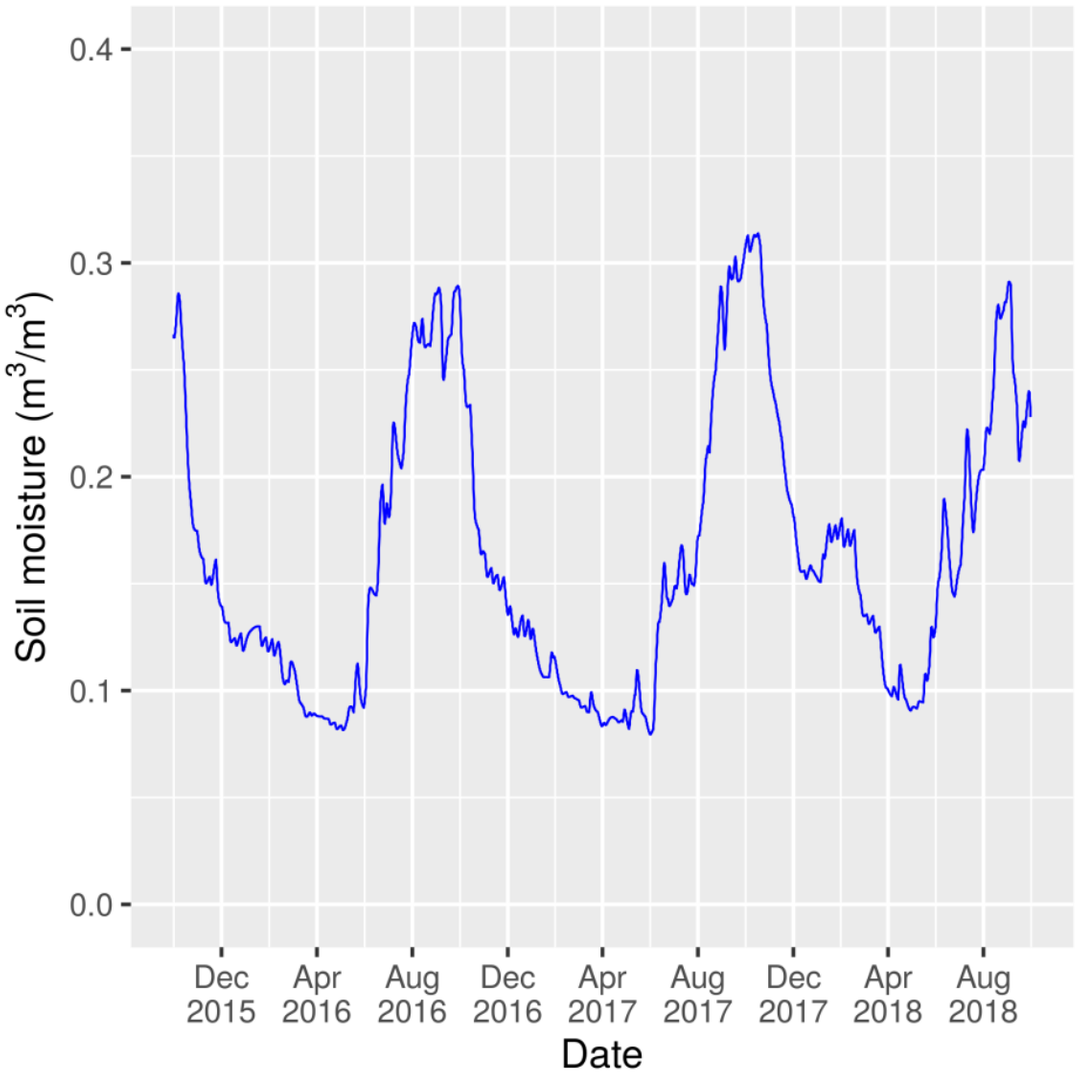


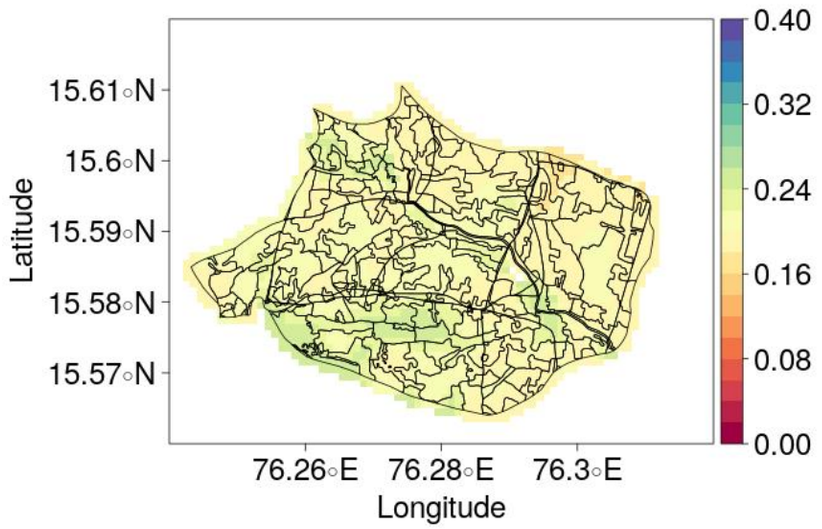

The average AET/P ratio was about 95%, which is higher than the sustainable limit of about 80%. Even during extremely lower rainfall year of 2012, AET was 630 mm. This suggests the presence of water storage and utilization from other sources such as groundwater, which buffered the lower rainfall.



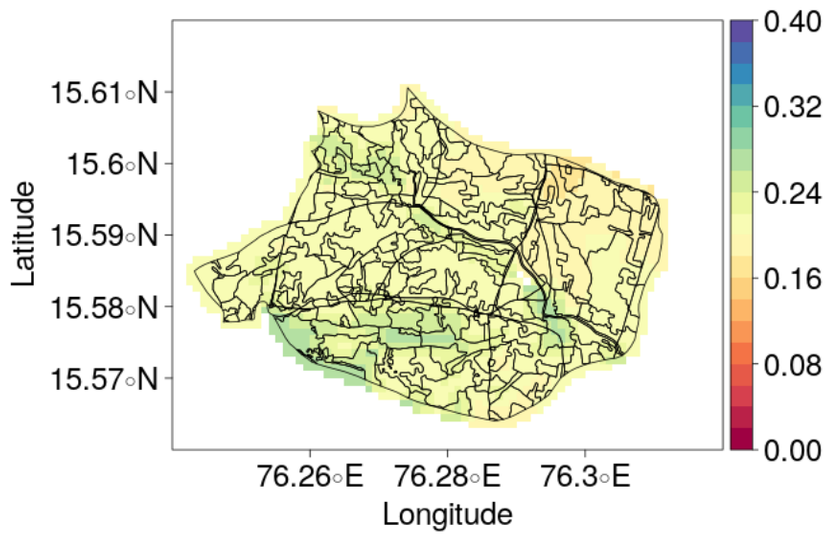
# SATELLITE RETRIEVED SOIL MOISTURE




**Chik Bamanhal– Rabi Soil Moisture**




**Chik Bamanhal– Kharif Soil Moisture**

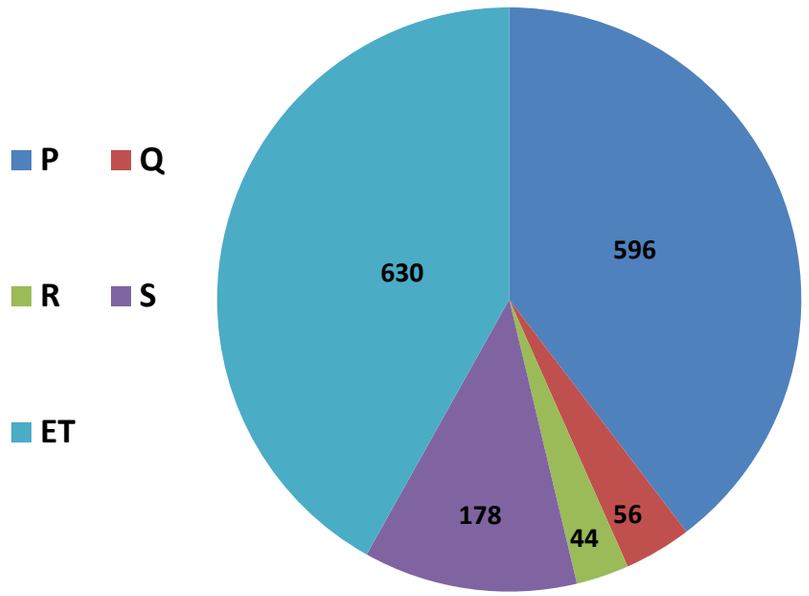



The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 15-29 % in *Kharif* and 13-29% in *Rabi* seasons of 2016 and 8-30 % in *Kharif* and 15-31% in *Rabi* seasons of 2017.

# WATER BALANCE

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

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

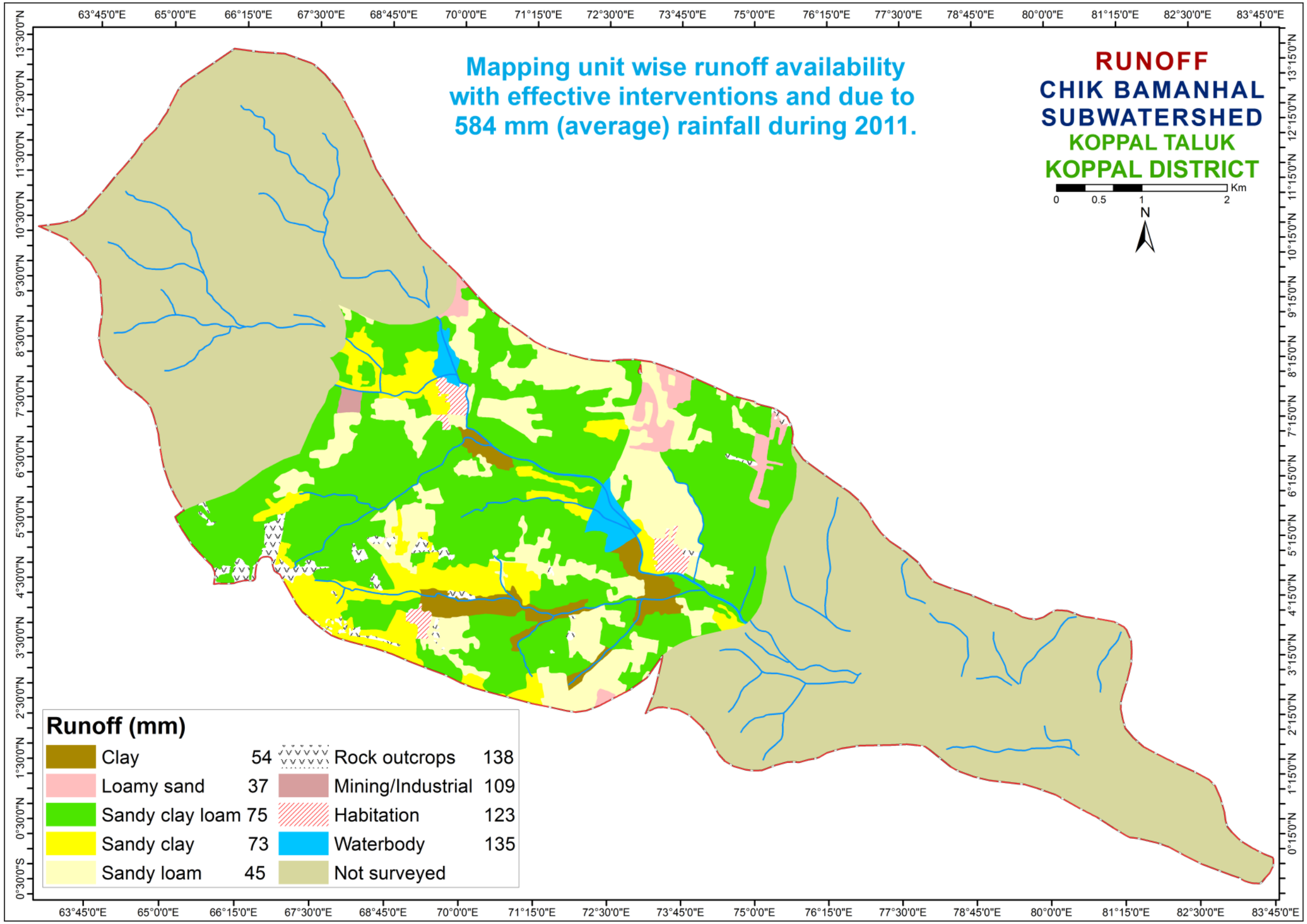



During July-Nov months, Precipitation is higher than Evapotranspiration, hence Runoff can occur in the watershed.

**P = 596 mm (average of 2009-2017) ET = 630 mm R = 44 mm S = 178 mm Q = 56 mm**

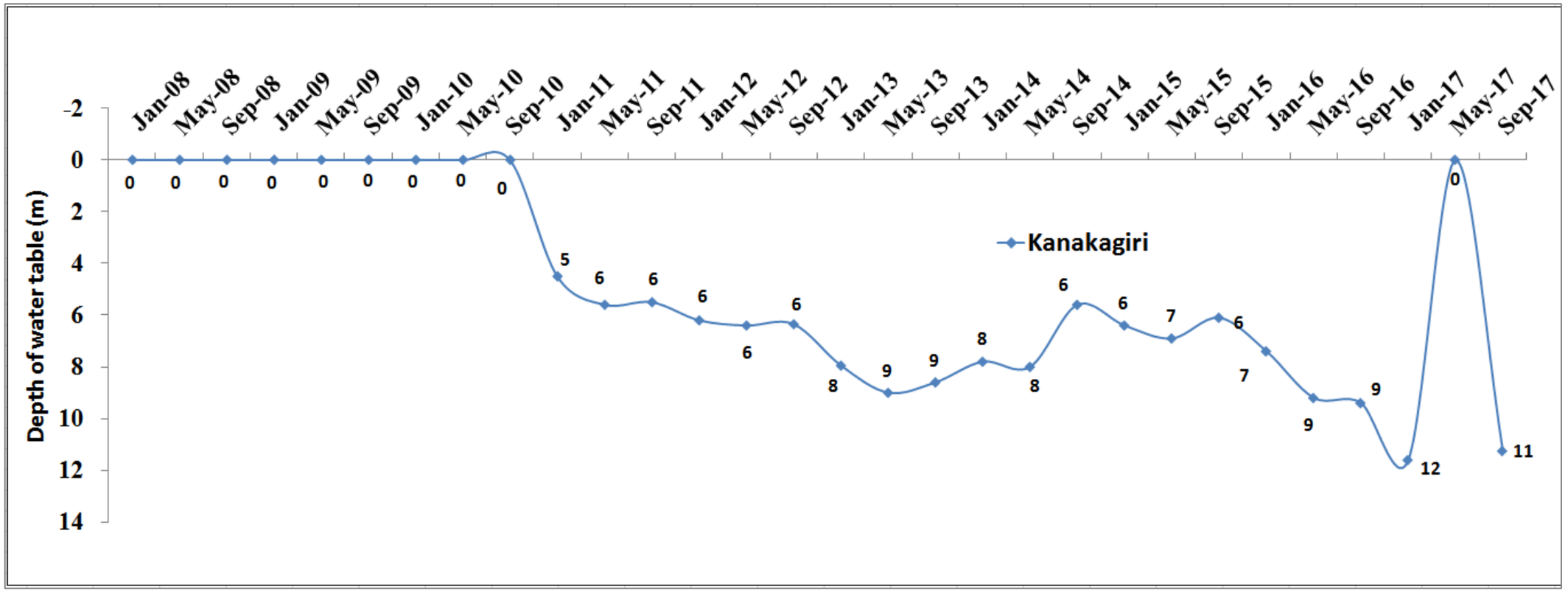
| Sl. No. | Parameters | Average_ 2011 (mm) |
|---|---|---|
| **1.** | Rainfall | 584 |
| **2.** | Runoff availability with existing conditions | 94 |
| **3.** | Runoff availability with effective interventions | 70 |
| **4.** | Runoff allowed as environmental flow at the outlet | 14 |
| **5.** | Runoff excess for harvesting by construction of structures | 56 |

# RUNOFF


Mapping unit wise runoff availability with effective interventions and due to 584 mm (average) rainfall during 2011.
RUNOFF
CHIK BAMANHAL SUBWATERSHED
KOPPAL TALUK
KOPPAL DISTRICT
0 0.5 1 2 Km
N
Runoff (mm)
Clay 54
Loamy sand 37
Sandy clay loam 75
Sandy clay 73
Sandy loam 45
Rock outcrops 138
Mining/Industrial 109
Habitation 123
Waterbody 135
Not surveyed
63°45'0"E 65°0'0"E 66°15'0"E 67°30'0"E 68°45'0"E 70°0'0"E 71°15'0"E 72°30'0"E 73°45'0"E 75°0'0"E 76°15'0"E 77°30'0"E 78°45'0"E 80°0'0"E 81°15'0"E 82°30'0"E 83°45'0"E
13°30'0"N 12°30'0"N 11°30'0"N 10°30'0"N 9°30'0"N 8°30'0"N 7°30'0"N 6°30'0"N 5°30'0"N 4°30'0"N 3°30'0"N 2°30'0"N 1°30'0"N 0°30'0"N 0°30'0"S

# GROUND WATER STATUS

## KANAKAGIRI STATION




The total number of wells present in Chik Bamanhal Sub-watershed as per LRI data is 123 (123-Borewells). The groundwater level shown above is from the data obtained from Dept. of Mines & Geology for the nearest station Kanakagiri. The graph depicts shallow groundwater levels (3-4 m) during the years 2011-2017.

# SUMMARY

- The average annual rainfall of 631 mm in the Chik Bamanhal sub-watershed as recorded from the Koppal station data.
- 65%, 20% and 15% 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 56 mm for an average annual rainfall of 596 mm (2009-2017). The utilizable groundwater is 30.8 mm (70% of 44 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (178 mm) and utilizable runoff plus recharge is 265 (=178+56+31)
- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the kharif and rabi seasons is 493 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 616 mm (i.e. 125% of AET). This demand for the two seasons is higher by 351 mm, i.e. (616-265). The AET in June-Sept months is almost 72% of rainfall. Hence, there is slightly less opportunity to harvest the excess water through watershed management practices for utilizing during rabi season.
- The total number of wells present in Chik Bamanhal Sub-watershed as per LRI data is 123 (123-Borewells). The groundwater level shown above is from the data obtained from Dept. of Mines & Geology for the nearest station Kanakagiri.