Land Resource Inventory Hodekallu Micro-watershed, Maidalakere Sub-watershed, Tumkur Taluk, Tumkur District, Karnataka for Watershed Planning

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

ICAR - NBSS & LUP

The World Bank

University of Agricultural Sciences, Bangalore
ICAR - National Bureau of Soil Survey & Land Use Planning, Bangalore
Watershed Development Department, Govt. of Karnataka, Bangalore

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How to read and use the Atlas

The Land Resource Inventory of Hodekallu micro-watershed (Tumkur taluk, Tumkur district) for Watershed Planning was undertaken to provide comprehensive site- specific cadastral level information useful for farm level planning and integrated development of the area under Sujalaï III, Karnataka Watershed Development Project- II.

This atlas contains basic information on kinds of soils, their geographic distribution, characteristics and classification. The soil map and soil based thematic maps derived from data on soil depth, soil texture, soil gravelliness, slope, erosion, land capability, land suitability for various crops and land use maps are presented. The maps on fertility status viz. soil reaction, salinity (EC), organic carbon, nitrogen, phosphorus, potassium, sulphur, exchangeable calcium and magnesium, available copper, manganese, zinc, iron and boron were derived on analysis of surface soils sampled at 320 m grid spacing within the micro watershed.

The atlas illustrates maps and tables that depict the soil resources of 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 to 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 viable and sustainable land use options for each and every land parcel.

For easy map reading and understanding information contained 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

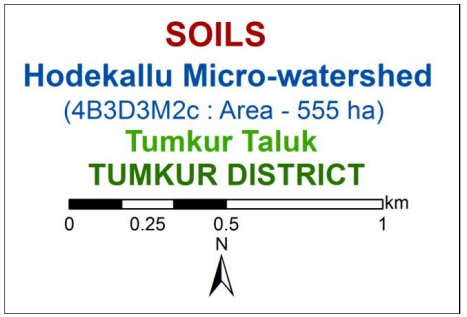
Each map in the atlas is complemented with the physical, cultural and scientific symbols to facilitate easy map reading.

Inset map

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

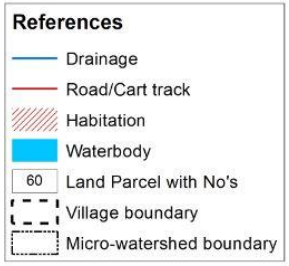
Map title

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



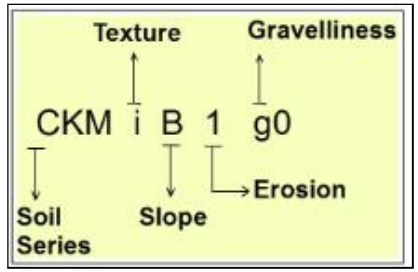
Legends and symbols

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 unit enables one to choose the legends to obtain the required information.*



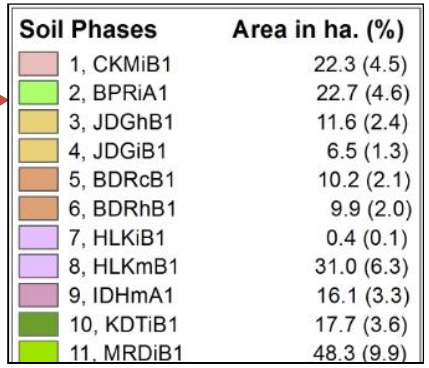
Soil Units

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

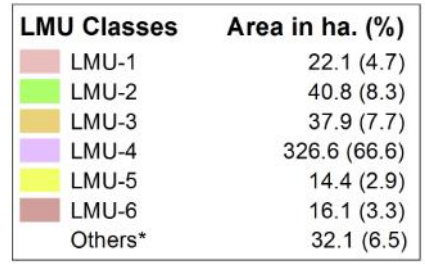
Different shades of colours are used as an aid to distinguish the different classes of soils, crop suitability and other maps.



Soil Phases	Area in ha. (%)
1, CKMiB1	22.3 (4.5)
2, BPRiA1	22.7 (4.6)
3, JDGhB1	11.6 (2.4)
4, JDGiB1	6.5 (1.3)
5, BDRcB1	10.2 (2.1)
6, BDRhB1	9.9 (2.0)
7, HLKiB1	0.4 (0.1)
8, HLKmB1	31.0 (6.3)
9, IDHmA1	16.1 (3.3)
10, KDTiB1	17.7 (3.6)
11, MRDiB1	48.3 (9.9)

Land Management Units (LMU)

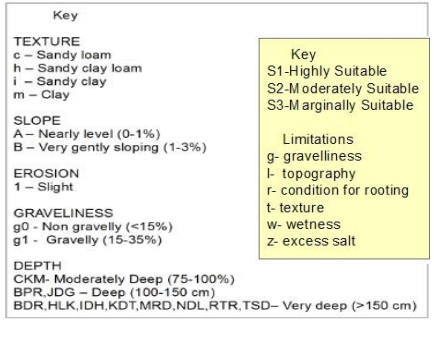
Grouping of similar soil areas based on their soil-site characteristics into management units that respond similarly for a given level of management are designated as land management units



LMU Classes	Area in ha. (%)
LMU-1	22.1 (4.7)
LMU-2	40.8 (8.3)
LMU-3	37.9 (7.7)
LMU-4	326.6 (66.6)
LMU-5	14.4 (2.9)
LMU-6	16.1 (3.3)
Others*	32.1 (6.5)

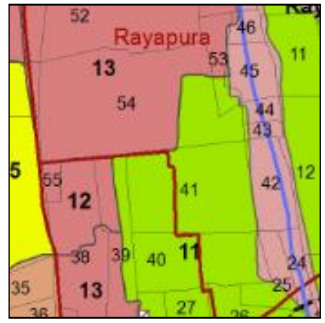
Map key

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.



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.



Land resource inventory of Hodekallu micro-watershed Tumkur taluk, Tumkur district for micro-watershed planning- A study by UAS, Bangalore

Introduction

Soil and water are the two precious natural resources which are essential for crop production and existence of life on earth. Rainfed agriculture is under severe stress due to various constraints related to agriculture like uneven and erratic distribution of rainfall, indiscriminate use of fertilizers, chemicals and pesticides, adoption of improper land management practices, soil erosion, decline in soil fertility, decline in ground water resources leading to low crop productivity.

The area under rainfed agriculture has to be managed effectively using the best available practices to enhance the production of food, fodder and fuel. This is possible if the land resources are characterized at each parcel of land through detailed land resource inventory using the best available techniques of remote sensing, GPS and GIS.

The watershed development programs are aimed at the sustainable distribution of its resources and the process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the plant, animal and human communities within a watershed boundary.

An appropriate Natural Resources Management (NRM) plan has been prepared. It is essential to assist in the planning for future land use, particularly agriculture, because it assesses the land resource and its potential for sustainable agricultural production. Land Resource Inventory (LRI) has been carried out based on five physical factors rock, soil, slope, erosion type & severity and vegetation, which is the basis of assessing land resources. LRI helps in grouping together areas where similar land resource exists on ground, which require the same kind of management, the same kind and intensity of conservation treatment and same kind of crops, pasture or forestry species, with similar yield potentials.

Tumkur district is located in the southern half of the State, lies between the latitudinal parallels of 12^0 45ôNorth and 14^0 22ô North and the longitudinal parallels of 76^0 24ôEast and 77^0 30ô East with an area of 10,598 km^2. The shape of the district is irregular and has a peculiar feature in that the north-eastern portion is totally detached from the remaining areas of the district. This portion constituting Pavagada taluk is almost surrounded on all sides by territories belonging to Andhra Pradesh, but for the fact that on its western border for a very short stretch it touches Chitradurga district, Pavagada would have been an enclave territory. Tumkur district is bounded on the north by Ananthpur district of Andhra Pradesh on the east by the districts of Kolar and Bangalore, on the south by Mandya district and on the west and north-west by the districts of Hassan and Chitradurga. In the mid-west, Chikmagalur district too touches this district and shares a common border though only for a very short distance. Major crops grown in Tumkur district are Paddy, Ragi, Maize, Cereals, Minor Millets, Pulses, Groundnut and Coconut.

The University of Agricultural Sciences, Bangalore carried out Land Resource Inventory of Hodekallu micro-watershed, Maidalkere sub-watershed in Tumkur taluk, Tumkur district. It was selected for data base generation under Sujala III project. Hodekallu micro-watershed (codeï 4B3D3M2c) is a part of Maidalkere sub-watershed covering an area of 555 ha and spread across Hodekallu, Pemmanahalli, Byatha, Aregujjanahalli and Madhagondanahalli villages.

The major landforms identified in the micro-watershed are undulating uplands, mid lands and low lands. The database was generated using cadastral map of the village as a base along with high resolution **0.5 mts** satellite imagery **[Quickbird].**

The objectives of the land resource inventory, carried out in Hodekallu micro watershed during the year 2018 are indicated below.

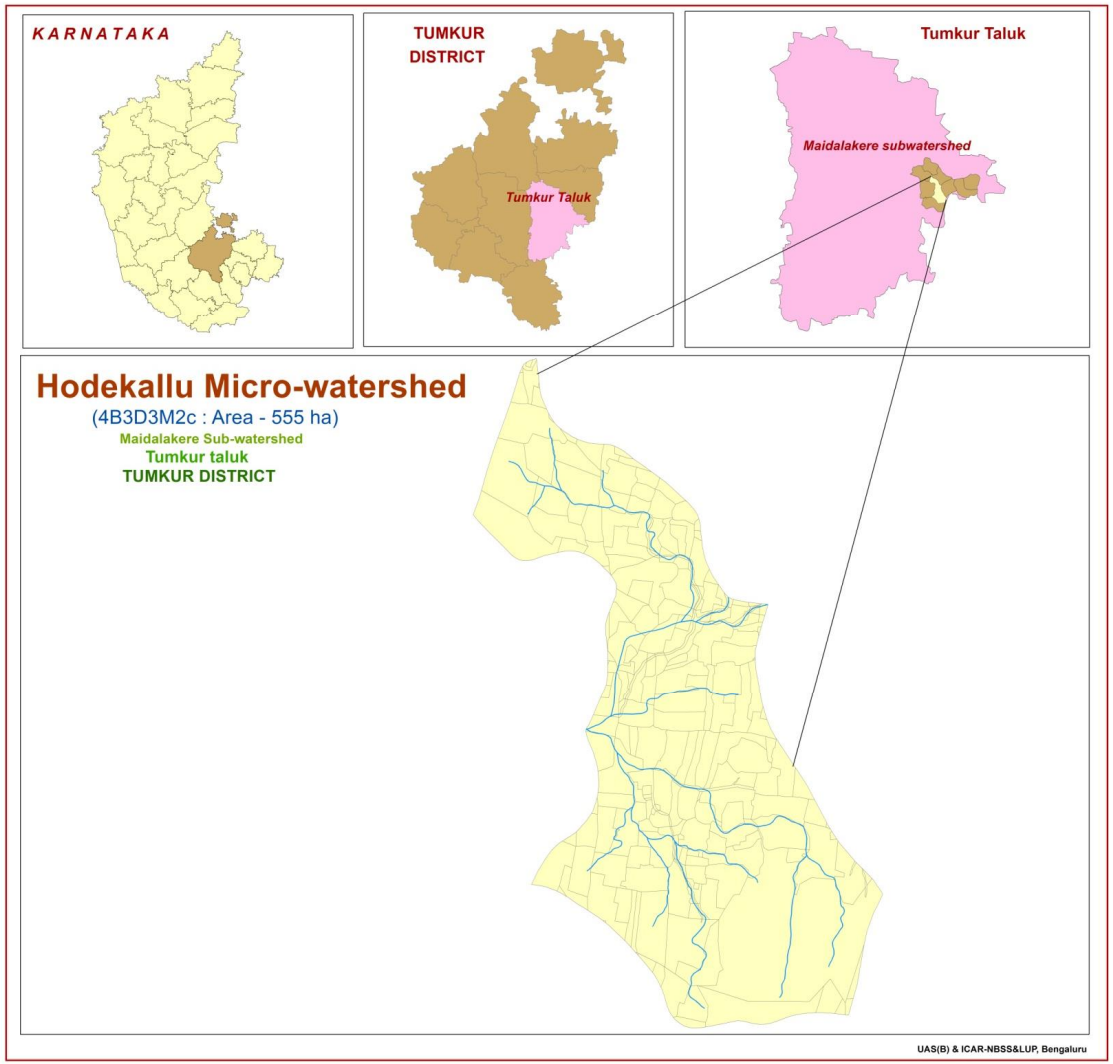
- Detailed characterization of all the land resources like soil, water, land use, cropping pattern and other resources available at parcel level in the village.
- Delineation of homogenous areas based on soil-site characteristics into management units.
- Collection and interpretation of climatic and 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 action plan for the integrated development of the watershed.

General Description of the micro-watershed

Location and Extent

Hodekallu micro-watershed (Maidalkere sub-watershed, Tumkur taluk, Tumkur District) is located at North latitude 13^0 18ô31.463ò and 13^0 20ô11.036ò and East longitude 77^0 11ô59.195ò and 77^0 13ô31.113ò covering an area of about 555 ha and spread across Hodekallu, Pemmanahalli, Byatha, Aregujjanahalli and Madhagondanahalli villages.

LOCATION MAP OF HODEKALLU MICRO-WATERSHED



Agro Ecological Sub Region (AESR) 6.2:
The micro-watershed is located in Central Karnataka plateau, hot, moist, semi-arid eco-sub region, Southern Plateau and Hill Region.

Agro-climatic Zone 4: Eastern Dry Zone
The agroclimatic zone 4 (Tumkur, Madhugiri, Pavagada, Kortagere, Chikkanayakanahalli and Sira) extends over all the six taluks of Tumkur district and four districts of Chitradurga, Davangere, Chickmagalur and Hassan. The total geographical area of the zone is about 19,43,830 ha of which 12,93,011 ha is under cultivation with 2,51,270 ha under irrigation. Most of the zone is at an elevation of 800-900m msl in major areas, in remaining areas 450-800m msl. Average annual rainfall of the zone ranges from 455.5 to 717.4 mm. The major soils are red sandy loams and shallow to deep black soil. The main cropping season is Kharif.

Geology

Exposure of granite Gneiss in Maidalakere sub watershed

Geology – Tumkur [Arechean Complex]

Tumkur district is situated right on the arechaean complex and the geology of the area is fairly simple the rock formations belonging to the archaean complex are represented by the crysalline schist, the granitic gneisses and the newer granites. The crysalline schist on the district from the southern extension of the well-defined chitradurga schist belt of the dharwar system which are the oldest members of the archaean complex. Apart from the main central schist belt formed to the east of the district and the many patches of schist scattered in the gneissic complex and some patches are highly metamorphosed and formation is extension to the west of the district. The schist belt is composed of chloritic schist, micaceous schist, quartzites, limestones and ferruginous quartzites, these are basic and intermediate types of volcanic rocks. One of the interesting happening are flows and minor intrusions. Lately, a pillow structure has been recognised in some of the flows in the district. Diopside, hyperthene, varieties of garnets, cordierite, silliminate and corundum have developed giving rise to several interesting rock types. These rock types are highly metamorphosed phases of impure agrillitic sediments. The major portion of the district is covered by this complex of granitic gneisses which are classes under separate group named peninsular gneiss. These are composed of major components like banded gneisses, granitic gneisses, Gneissic granites and granites, Grano-diorites, diorites and other varieties. Large parts of the granitic gneisses are found to be the granitised phases of older rocks, which are mostly agrillites, grits and quartzites. The younger granites constitute a well-defined narrow range of hills and south eastern portions of the tumkur district. These granites are usually coarse-grained and coarsely porphyritic,and they represent the northern extension of the younger 'closepet' granites and these are intrude all eaelier formations.

Geology - Karnataka state

The geology of Karnataka lay widespread in 5 major eras, namely the Archean, Proterozoic, Mesozoic and the Ceonzoic. The geology of Karnataka is largely confined to the two oldest eras; the Archean and the Proterozic. The rest of the great periods from Cambian to recent are hardly represented but for minor sediments of recent age exposed along the coastal margin to the West. A substantial part of North Karnataka is covered by Deccan trap, representing phenomenal outburst of volcanic activity at the dawn of the Cenozoic era.

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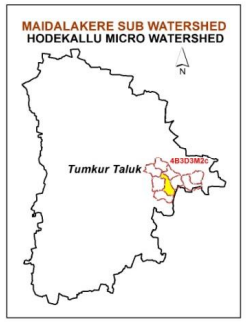
Exposure of Granitic Gneiss in Maidalakere sub watershed



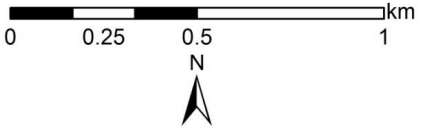
SATELLITE IMAGE

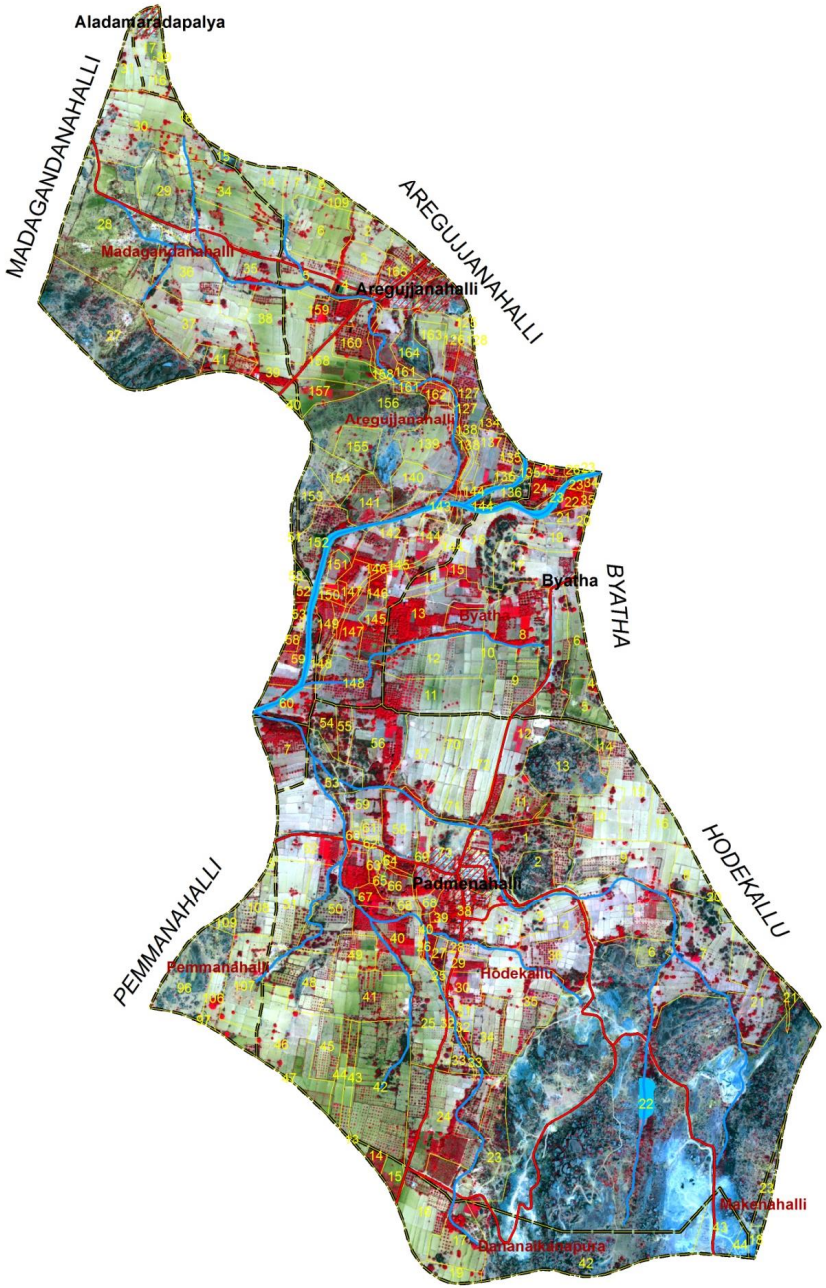
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT

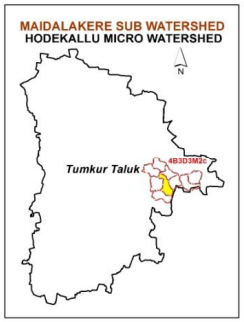




Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



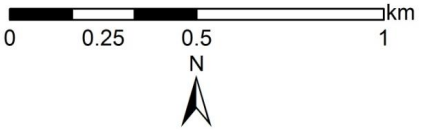
GRIDS OVERLAID ON CADASTRAL

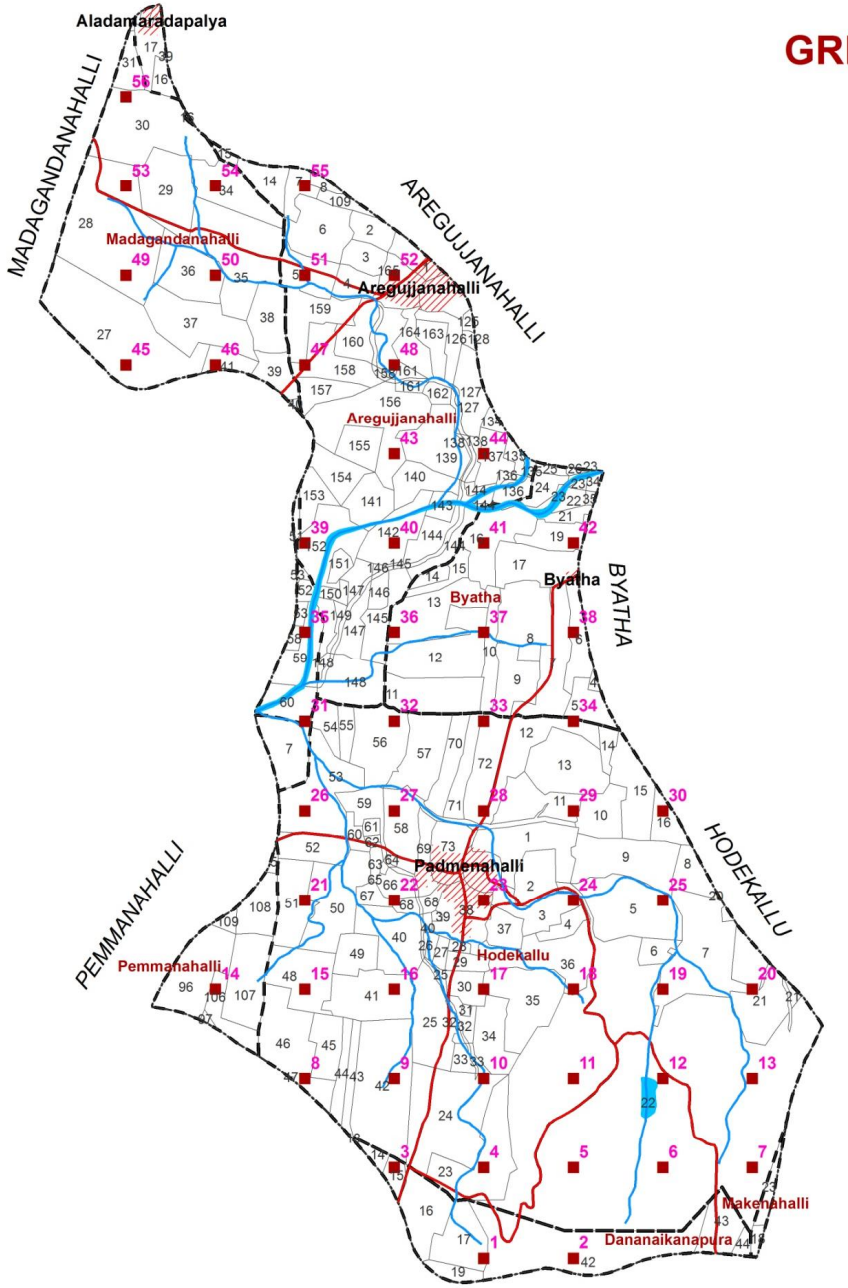
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





Reference

- Grid
- Streams/Drainage
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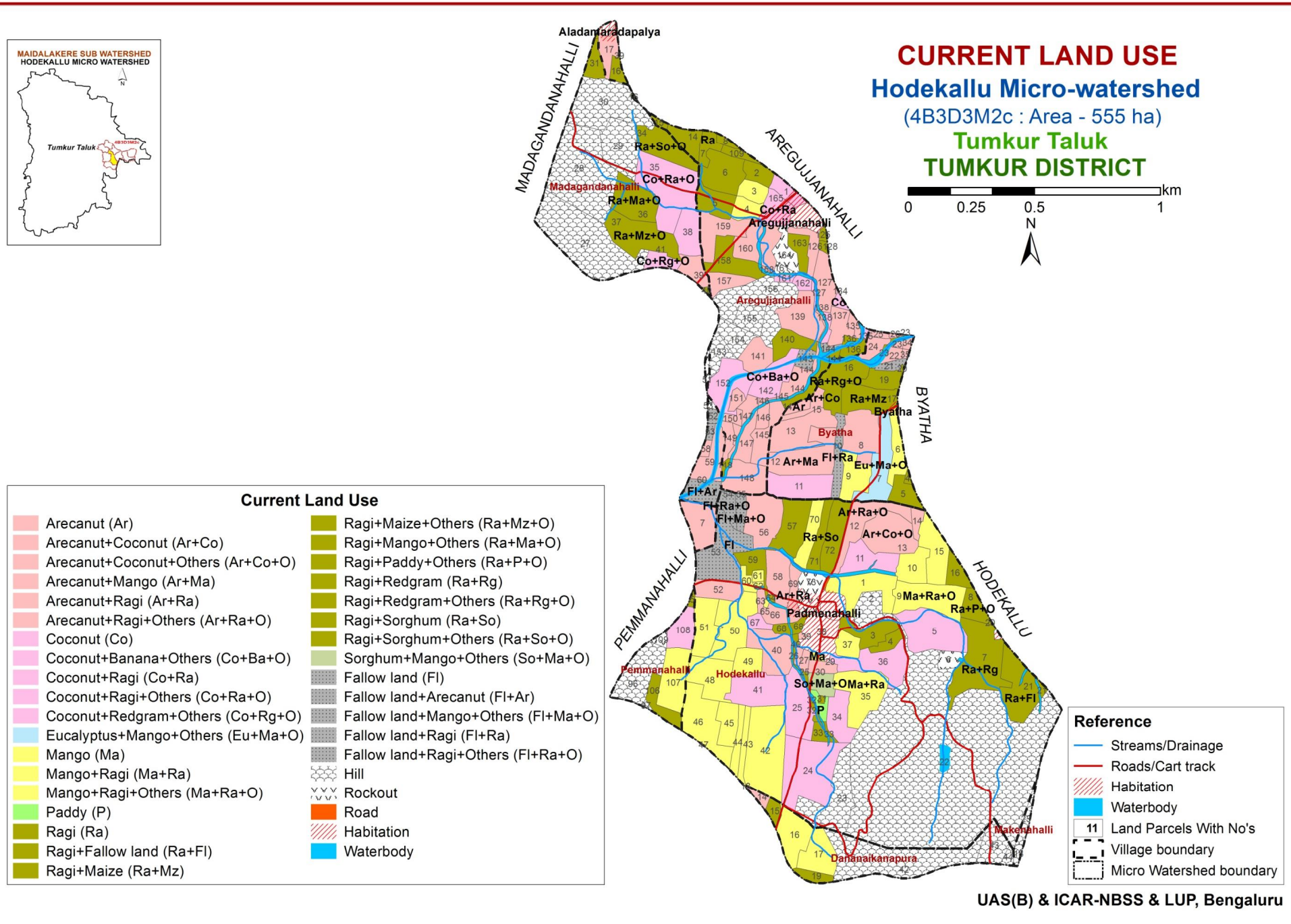
UAS(B) & ICAR-NBSS & LUP, Bengaluru

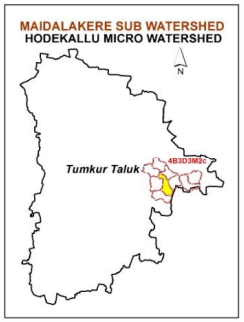

MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
CURRENT LAND USE
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Byatha
Padmenahalli
Pemmanahalli
Hodekallu
Makenahalli
Dananaikanapura
Ra
Ra+So+O
Co+Ra+O
Ra+Ma+O
Ra+Mz+O
Co+Rg+O
Co+Ra
Co+Ba+O
Ra+Rg+O
Ar+Co
Ra+Mz
Ar
Ar+Ma
Fl+Ra
Eu+Ma+O
Fl+Ar
Fl+Ra+O
Fl+Ma+O
Fl
Ar+Ra+O
Ar+Co+O
Ra+So
Ar+Ra
Ma+Ra+O
Ra+P+O
Ma
So+Ma+O
Ma+Ra
P
Ra+Rg
Ra+Fl
Current Land Use
Arecanut (Ar)
Arecanut+Coconut (Ar+Co)
Arecanut+Coconut+Others (Ar+Co+O)
Arecanut+Mango (Ar+Ma)
Arecanut+Ragi (Ar+Ra)
Arecanut+Ragi+Others (Ar+Ra+O)
Coconut (Co)
Coconut+Banana+Others (Co+Ba+O)
Coconut+Ragi (Co+Ra)
Coconut+Ragi+Others (Co+Ra+O)
Coconut+Redgram+Others (Co+Rg+O)
Eucalyptus+Mango+Others (Eu+Ma+O)
Mango (Ma)
Mango+Ragi (Ma+Ra)
Mango+Ragi+Others (Ma+Ra+O)
Paddy (P)
Ragi (Ra)
Ragi+Fallow land (Ra+Fl)
Ragi+Maize (Ra+Mz)
Ragi+Maize+Others (Ra+Mz+O)
Ragi+Mango+Others (Ra+Ma+O)
Ragi+Paddy+Others (Ra+P+O)
Ragi+Redgram (Ra+Rg)
Ragi+Redgram+Others (Ra+Rg+O)
Ragi+Sorghum (Ra+So)
Ragi+Sorghum+Others (Ra+So+O)
Sorghum+Mango+Others (So+Ma+O)
Fallow land (Fl)
Fallow land+Arecanut (Fl+Ar)
Fallow land+Mango+Others (Fl+Ma+O)
Fallow land+Ragi (Fl+Ra)
Fallow land+Ragi+Others (Fl+Ra+O)
Hill
Rockout
Road
Habitation
Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

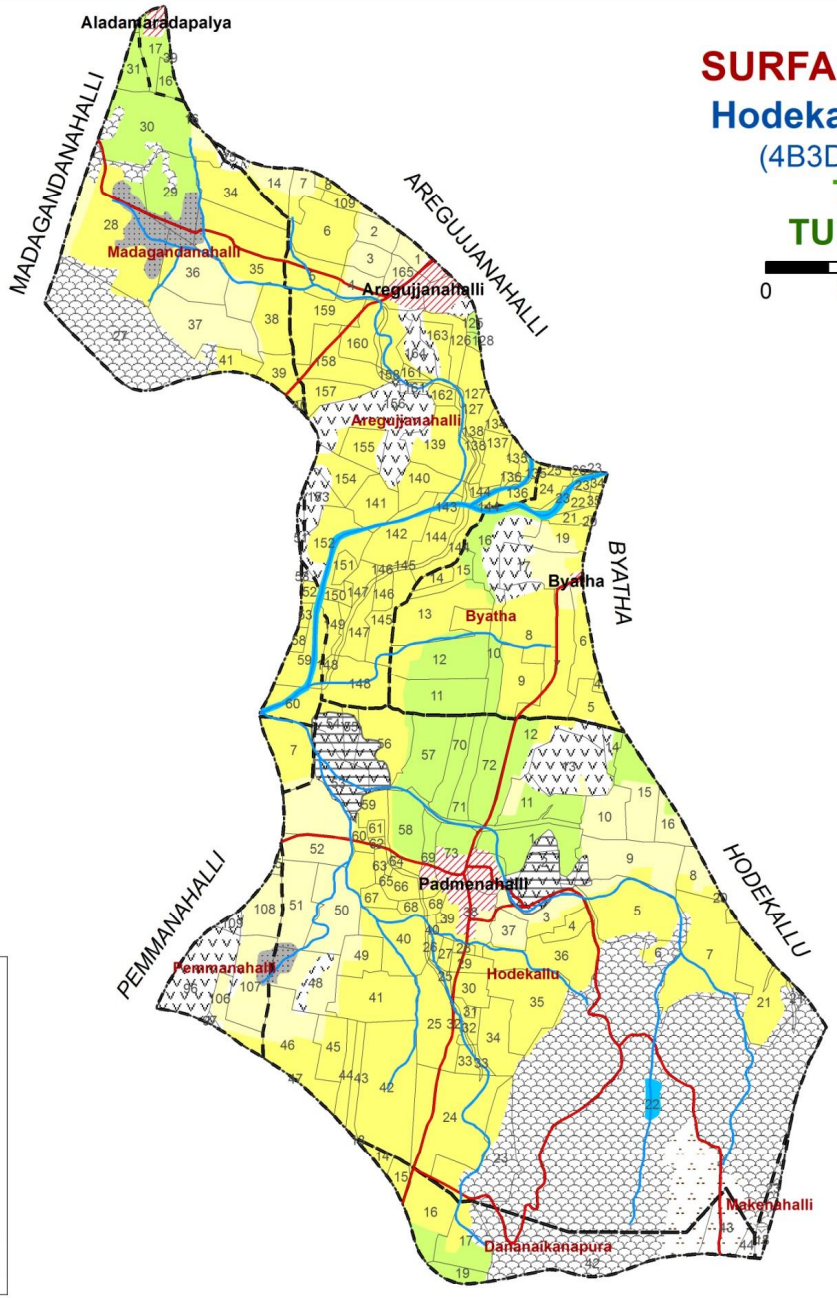
Survey methodology
Sequence of activities in generation of Land Resource Inventory (LRI)

- 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 at 320 m grid intervals covering most of the management units for macro and micro-nutrient analysis has been carried out. Further processing of data at analytical and GIS lab were carried out to generate various thematic maps for each of the study area.

SOIL SURVEY INTERPRETATION





SURFACE SOIL TEXTURE

Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT

0 0.25 0.5 1 km

N

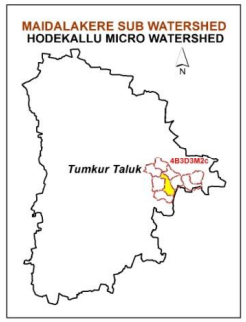
Texture Class	Area in ha. (%)
Sandy loam	70.3 (12.7)
Sandy clay loam	58.5 (10.5)
Sandy clay	240.0 (43.2)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



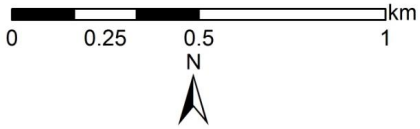
SLOPE

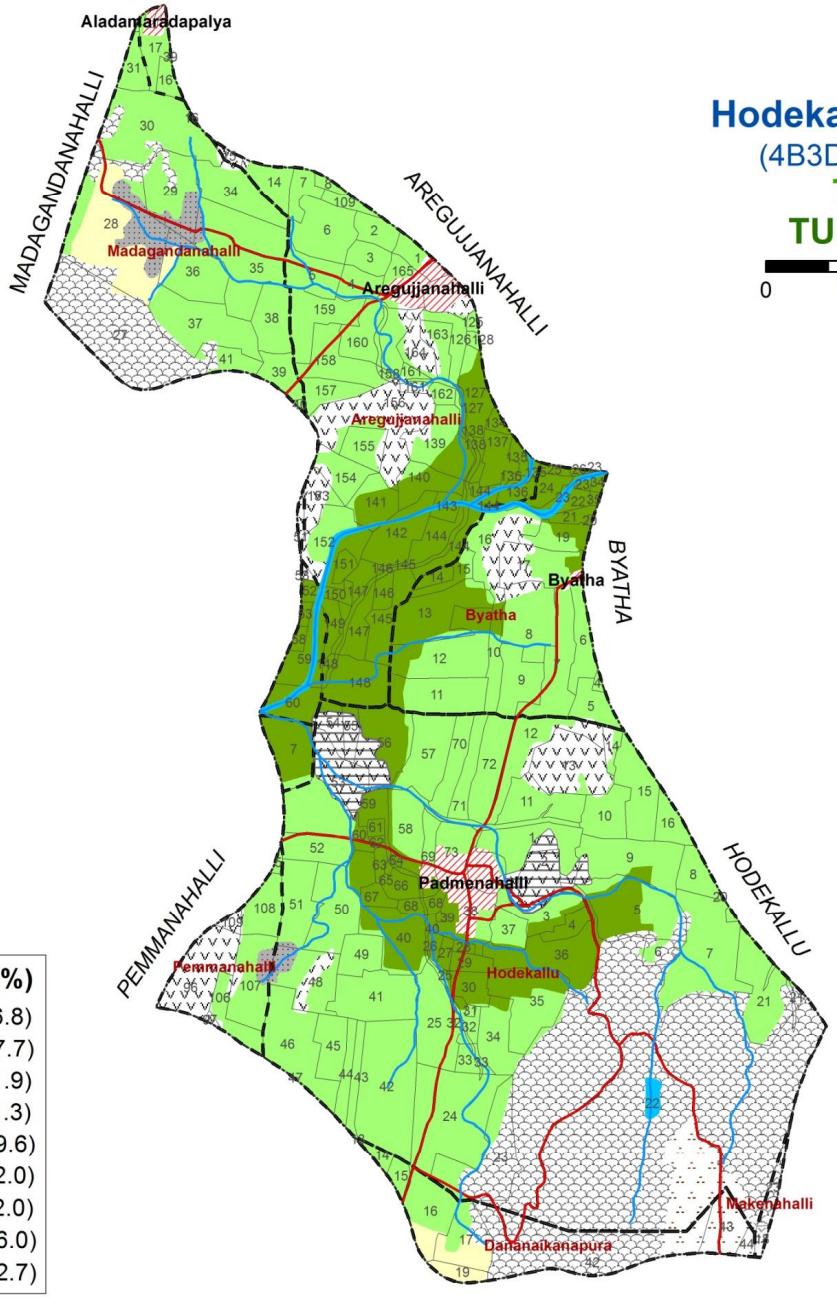
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





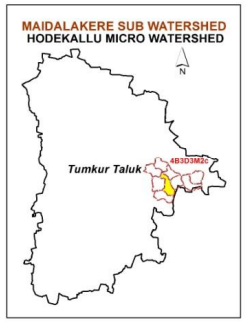
Slope Class	Area in ha. (%)
Nearly level (0-1%)	93.1 (16.8)
Very gently sloping (1-3%)	265.0 (47.7)
Gently sloping (3-5%)	10.7 (1.9)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



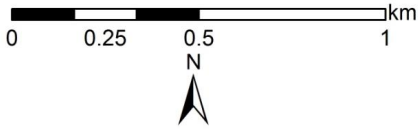
SOIL EROSION

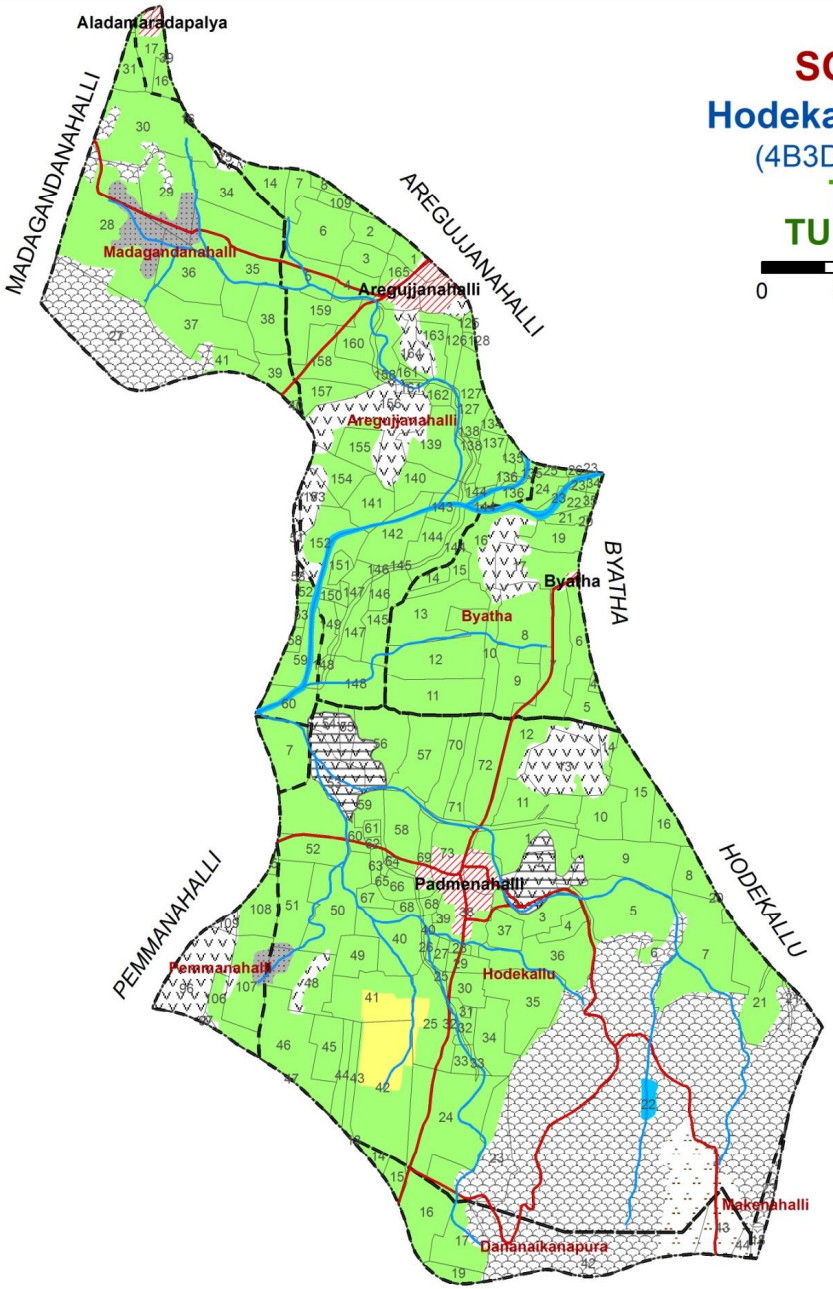
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





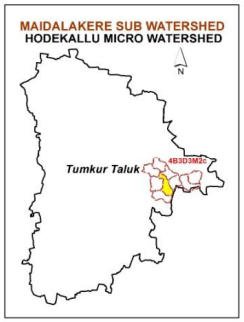
Erosion Class	Area in ha. (%)
Slight	362.2 (65.2)
Moderate	6.6 (1.2)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



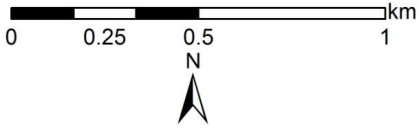
SOIL GRAVELLINESS

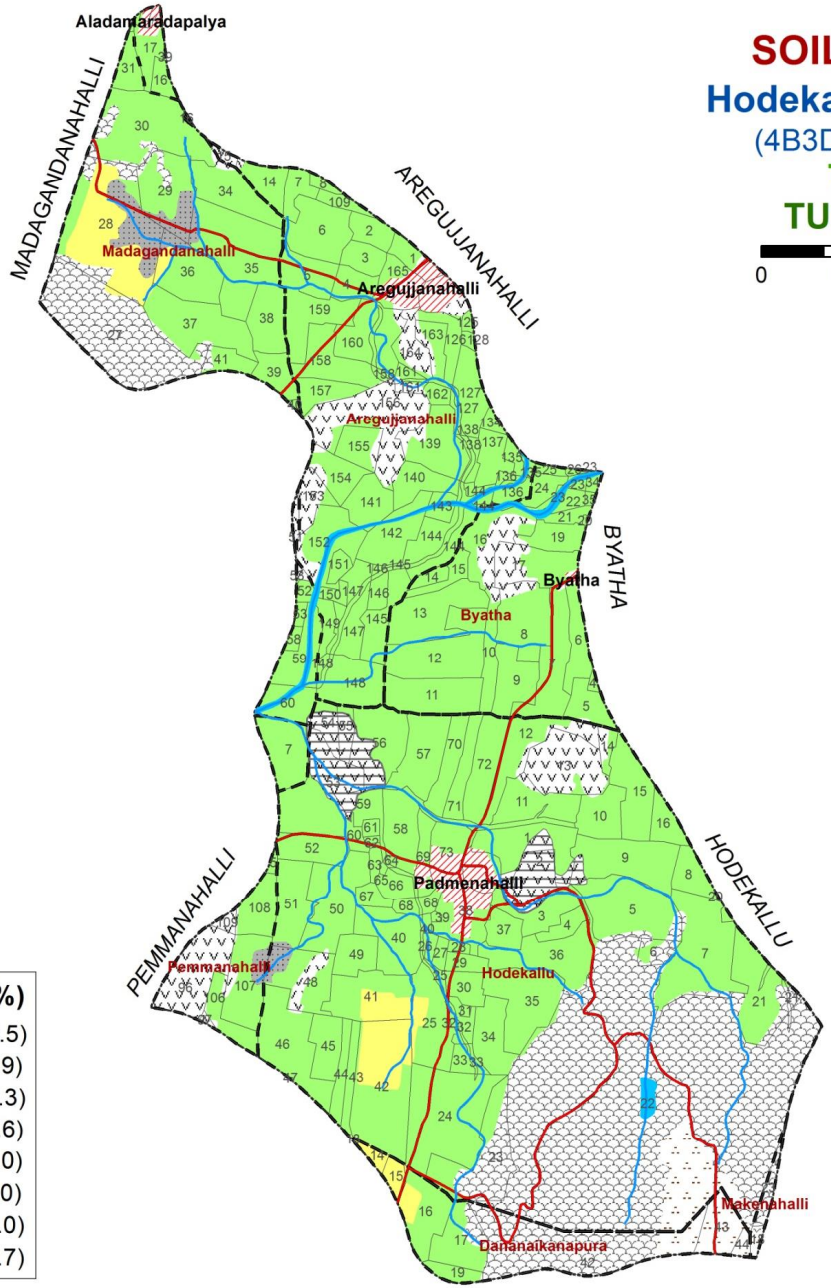
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





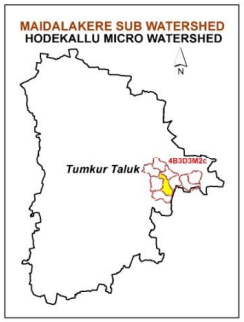
Gravelliness Class	Area in ha. (%)
Non gravelly (<15%)	352.5 (63.5)
Gravelly (15-35%)	16.3 (2.9)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



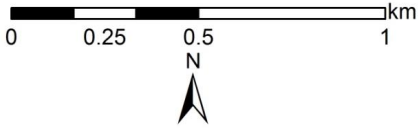
SOIL DEPTH

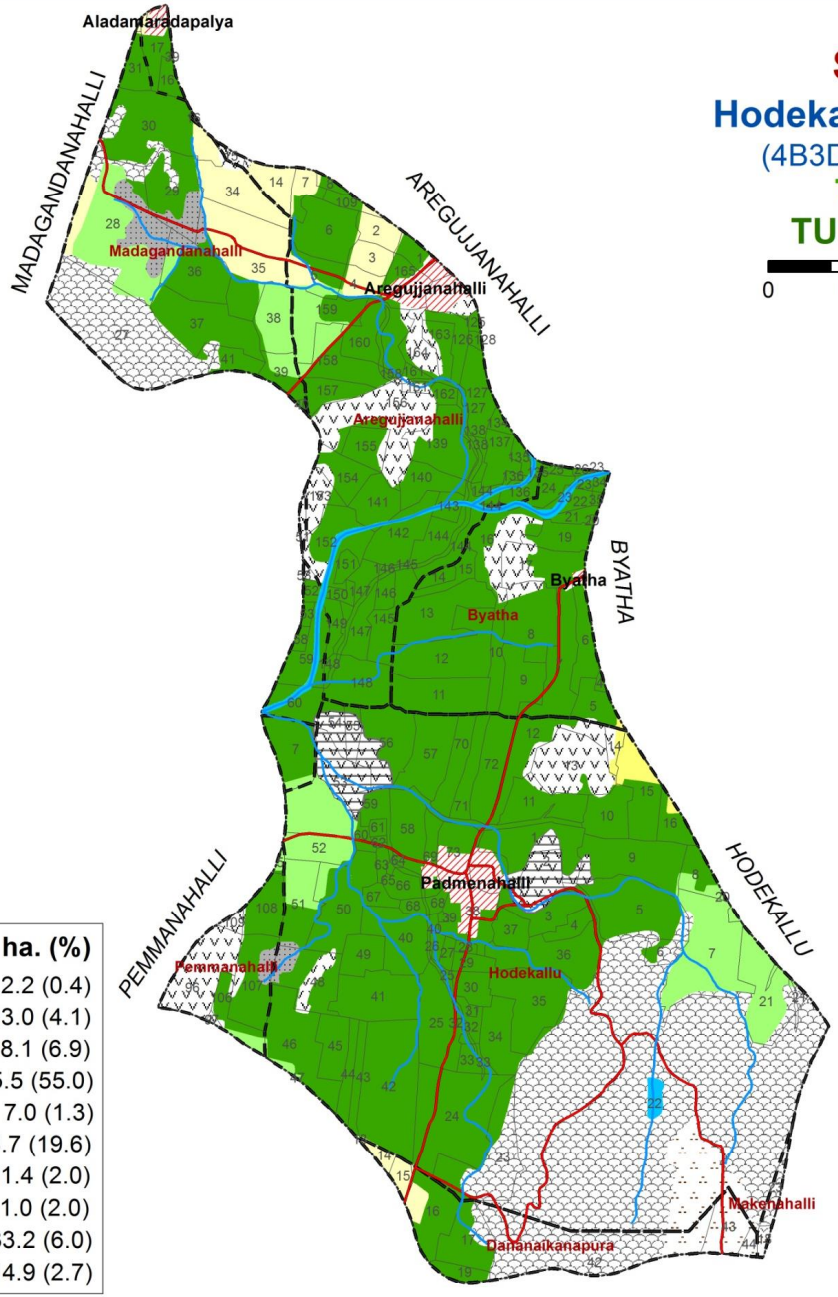
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





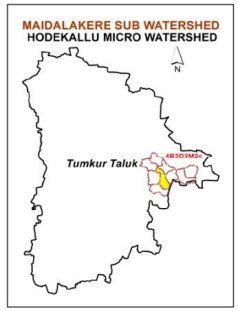
Depth Class	Area in ha. (%)
Moderately shallow (50-75 cm)	2.2 (0.4)
Moderately deep (75-100 cm)	23.0 (4.1)
Deep (100-150 cm)	38.1 (6.9)
Very deep (>150 cm)	305.5 (55.0)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



SOILS

Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT

0 0.25 0.5 1 km

N

Key

TEXTURE
c – Sandy loam
h – Sandy clay loam
i – Sandy clay

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

EROSION
1 – Slight
2 – Moderate

GRAVELLINESS
g1 – Gravelly (15-35%)

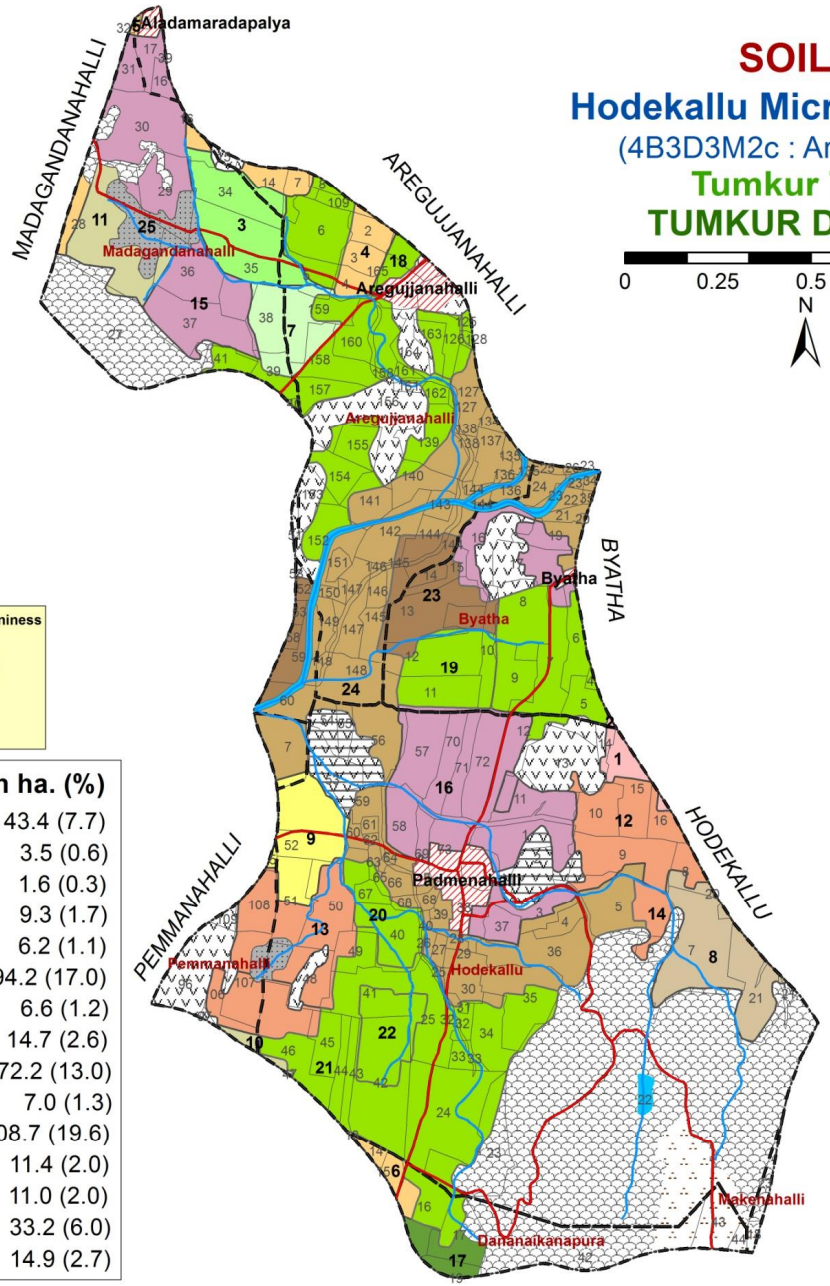
STONINESS
St1 - Stony (0.01-0.1% of the surface area covered by stones)

DEPTH
TDH – Moderately shallow (50-75 cm)
BDG, CKM – Moderately Deep (75-100 cm)
BPR, GLR, JDG, KMH – Deep (100-150 cm)
BDK, HLK, NDL, RTR, TDG, TSD – Very deep (>150 cm)

Texture Gravelliness Stoniness
CKM i B 1 g1 St1
Soil Series Slope Erosion

Soil Phase	Area in ha. (%)	Soil Phase	Area in ha. (%)
1, TDHhB1	2.1 (0.4)	16, HLKhB1	43.4 (7.7)
2, TDHiB1	0.2 (0.1)	17, NDLhC1	3.5 (0.6)
3, BDGiB1St1	12.3 (2.2)	18, RTRcB1	1.6 (0.3)
4, CKMcB1	8.2 (1.5)	19, RTRhB1	9.3 (1.7)
5, CKMhB1	0.2 (0.1)	20, RTRiA1	6.2 (1.1)
6, CKMiB1g1St1	2.3 (0.4)	21, RTRiB1	94.2 (17.0)
7, BPRiB1St1	7.5 (1.4)	22, RTRiB2g1St1	6.6 (1.2)
8, GLRiB1	13.2 (2.4)	23, TDGiA1	14.7 (2.6)
9, JDGcB1	9.1 (1.6)	24, TSDiA1	72.2 (13.0)
10, KMHiB1	0.9 (0.2)	25, Eroded land	7.0 (1.3)
11, KMHiC1g1St1	7.4 (1.3)	26, Hill	108.7 (19.6)
12, BDKcB1	12.9 (2.3)	27, Hill/Rockout	11.4 (2.0)
13, BDKcB1St1	19.5 (3.5)	28, Quarry	11.0 (2.0)
14, BDKiB1	2.4 (0.4)	29, Rockout	33.2 (6.0)
15, HLKcB1	18.9 (3.4)	30, Others*	14.9 (2.7)

*- Habitation & Waterbody



Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

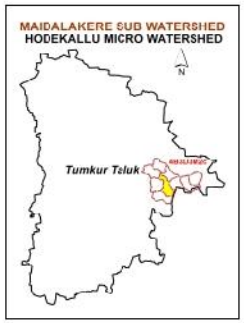
UAS(B) & ICAR-NBSS & LUP, Bengaluru

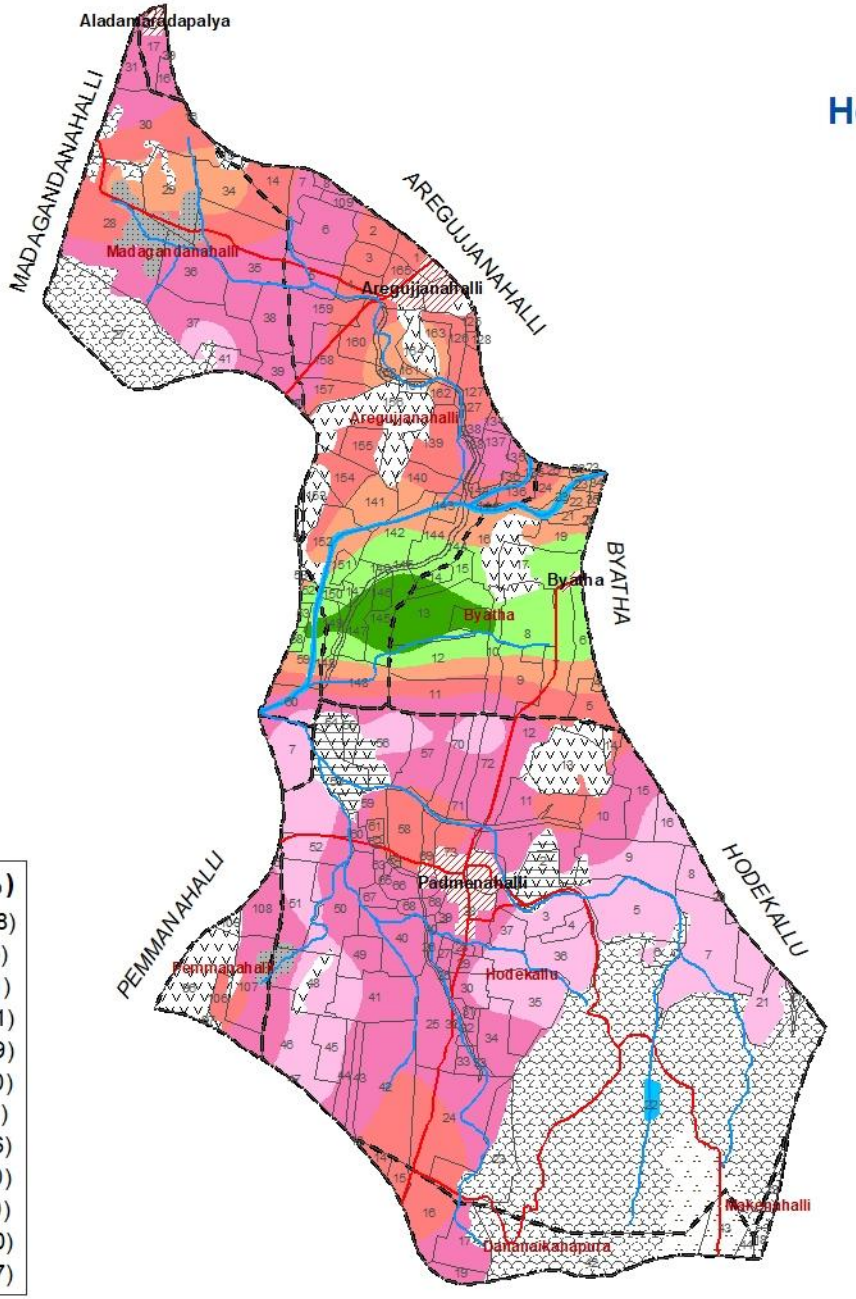
Mapping unit description of Hodekallu Micro-watershed in Tumkur taluk of Tumkur district

Sl.No	Soil Phase	Description	Area (ha.)
1	TDHhB1	Moderately shallow, well drained, sandy clay loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	2.1
2	TDHiB1	Moderately shallow, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	0.2
3	BDGiB1St1	Moderately deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent, slight erosion with 0.01-0.1 per cent surface area covered with stones	12.3
4	CKMcB1	Moderately deep, well drained, sandy loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	8.2
5	CKMhB1	Moderately deep, well drained, sandy clay loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	0.2
6	CKMiB1g1St1	Moderately deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent, slight erosion, 15-35 per cent gravels with 0.01-0.1 per cent surface area covered with stones	2.3
7	BPRiB1St1	Deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent, slight erosion with 0.01-0.1 per cent surface area covered with stones	7.5
8	GLRiB1	Deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	13.2
9	JDGcB1	Deep, well drained, sandy loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	9.1
10	KMHiB1	Deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	0.9
11	KMHiC1g1St1	Deep, well drained, sandy clay, derived from granite gneiss, occurring on gently sloping land, slope 3-5 per cent, slight erosion, 15-35 per cent gravels with 0.01-0.1 per cent surface area covered with stones	7.4
12	BDKcB1	Very deep, well drained, sandy loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	12.9
13	BDKcB1St1	Very deep, well drained, sandy loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent, slight erosion with 0.01-0.1 per cent surface area covered with stones	19.5

Sl.No	Soil Phase	Description	Area (ha.)
14	BDKiB1	Very deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	2.4
15	HLKcB1	Very deep, well drained, sandy loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	18.9
16	HLKhB1	Very deep, well drained, sandy clay loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	43.4
17	NDLhC1	Very deep, well drained, sandy clay loam, derived from granite gneiss, occurring on gently sloping land, slope 1-3 per cent with slight erosion	3.5
18	RTRcB1	Very deep, well drained, sandy loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	1.6
19	RTRhB1	Very deep, well drained, sandy clay loam, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	9.3
20	RTRiA1	Very deep, well drained, sandy clay, derived from granite gneiss, occurring on nearly level land, slope 0-1 per cent with slight erosion	6.2
21	RTRiB1	Very deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent with slight erosion	94.2
22	RTRiB2g1St1	Very deep, well drained, sandy clay, derived from granite gneiss, occurring on very gently sloping land, slope 1-3 per cent, moderate erosion, 15-35 per cent gravels with 0.01-0.1 per cent surface area covered with stones	6.6
23	TDGiA1	Very deep, well drained, sandy clay, derived from granite gneiss, occurring on nearly level land, slope 0-1 per cent with slight erosion	14.7
24	TSDiA1	Very deep, well drained, sandy clay, derived from granite gneiss, occurring on nearly level land, slope 0-1 per cent with slight erosion	72.2
25	Eroded Land		7.0
26	Hill		108.7
27	Hill/Rockout		11.4
28	Quarry		11.0
29	Rockout		33.2
30	Others*		14.9
		Total	555

SOIL FERTILITY STATUS





SOIL REACTION

Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT

0 0.25 0.5 1 km

N

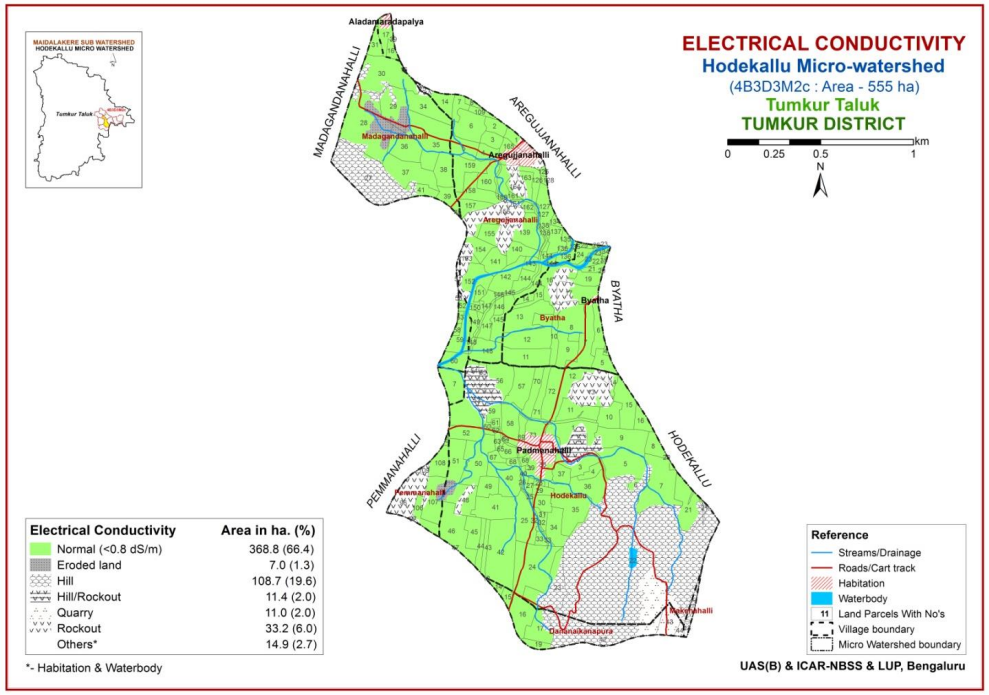
pH Class	Area in ha. (%)
Extremely acidic (3.5-4.5)	71.1 (12.8)
Very strongly acidic (4.5-5.0)	142.2 (25.5)
Strongly acidic (5.0-5.5)	83.7 (15.1)
Moderately acidic (5.5-6.0)	33.8 (6.1)
Slightly acidic (6.0-6.5)	27.2 (4.9)
Neutral (6.5-7.3)	10.8 (2.0)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

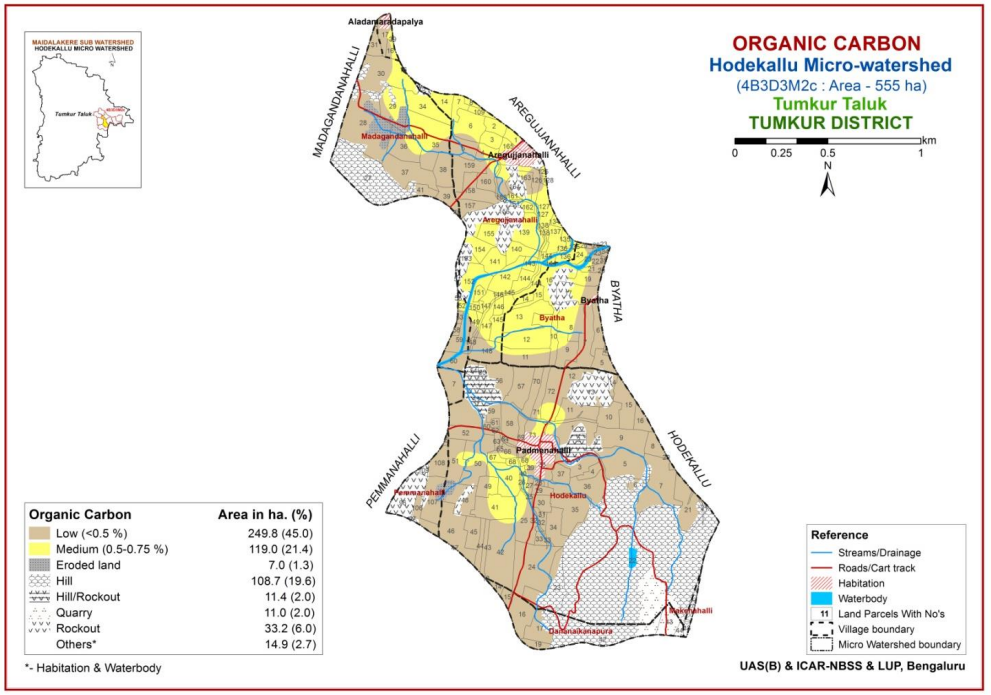
*- Habitation & Waterbody

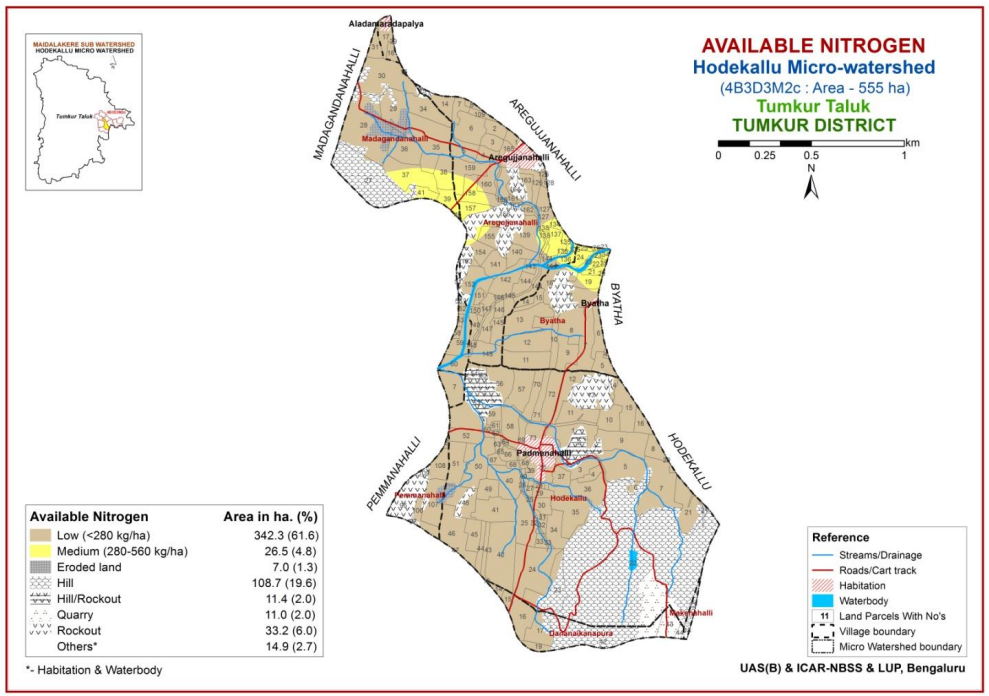
Reference

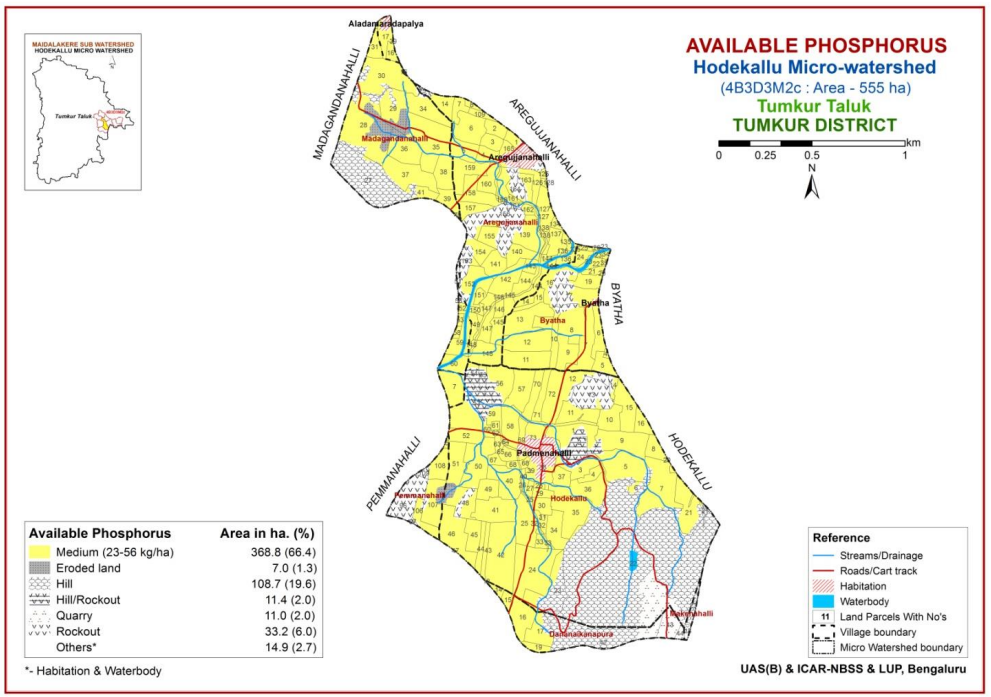
- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

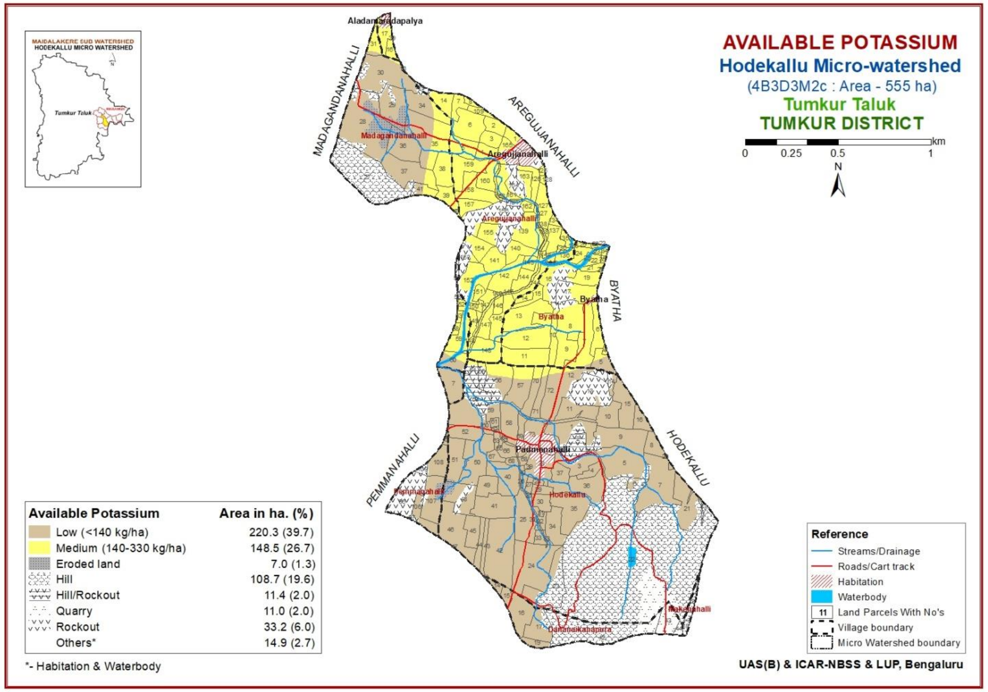
UAS(B) & ICAR-NBSS & LUP, Bengaluru

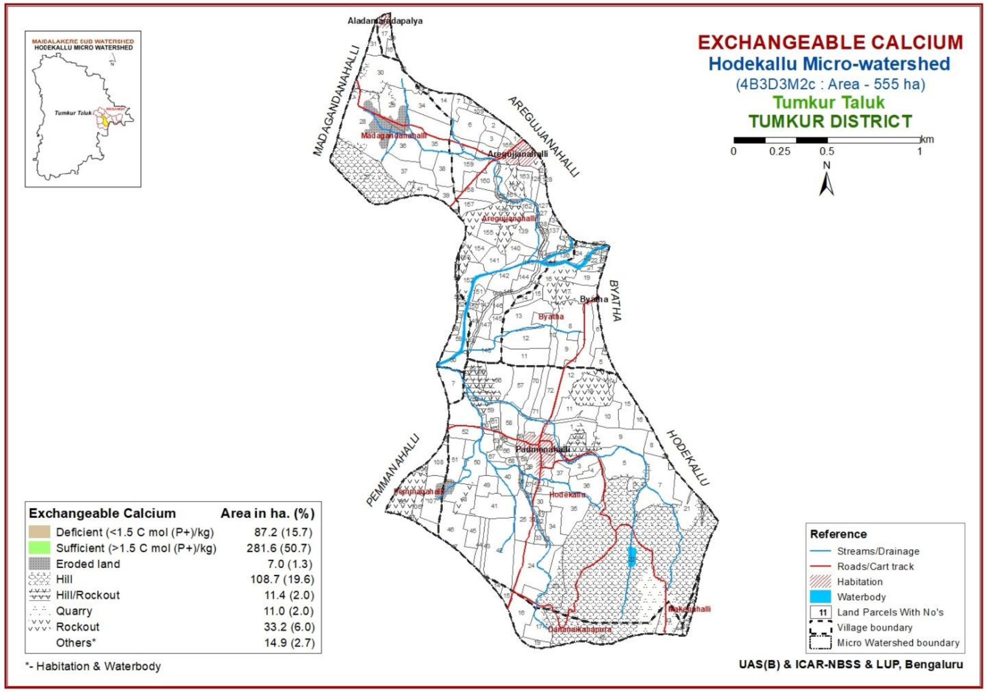

MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
TUMKUR
Aladankaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregejjonahalli
Byatha
Padmondahalli
Hemmanahalli
Hodekallu
Dalavanakanapura
Bakanahalli
ELECTRICAL CONDUCTIVITY
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Electrical Conductivity | Area in ha. (%)
Normal (<0.8 dS/m) | 368.8 (66.4)
Eroded land | 7.0 (1.3)
Hill | 108.7 (19.6)
Hill/Rockout | 11.4 (2.0)
Quarry | 11.0 (2.0)
Rockout | 33.2 (6.0)
Others* | 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

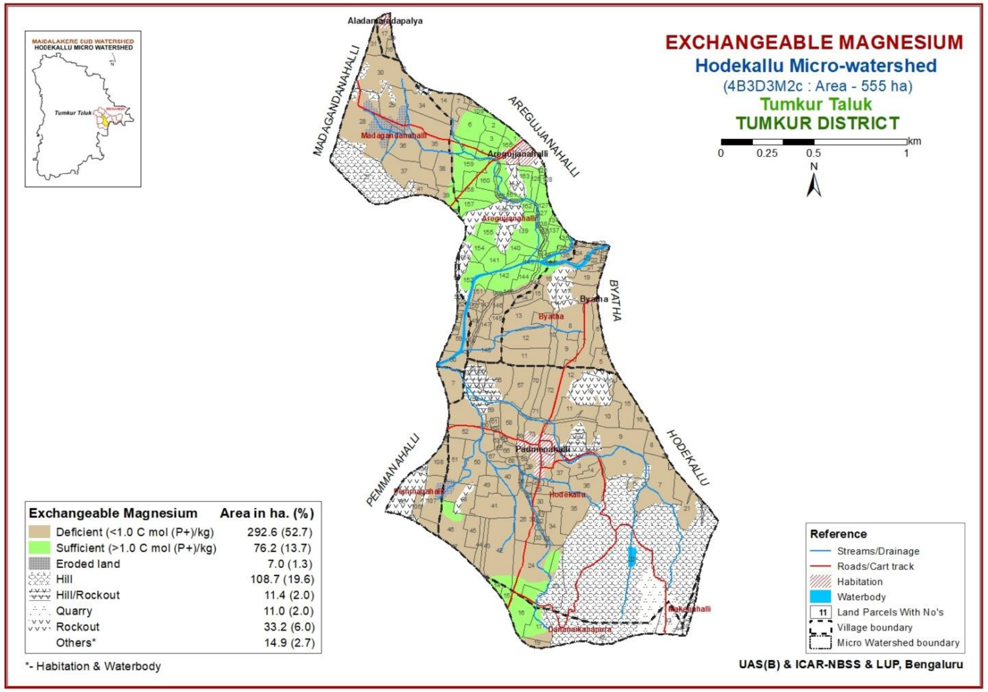

MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
TUMKUR
Aladankaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregejjonahalli
Byatha
Padmondahalli
Hemmanahalli
Hodekallu
Dalavanakanapura
Bakanahalli
ORGANIC CARBON
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Organic Carbon | Area in ha. (%)
Low (<0.5 %) | 249.8 (45.0)
Medium (0.5-0.75 %) | 119.0 (21.4)
Eroded land | 7.0 (1.3)
Hill | 108.7 (19.6)
Hill/Rockout | 11.4 (2.0)
Quarry | 11.0 (2.0)
Rockout | 33.2 (6.0)
Others* | 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

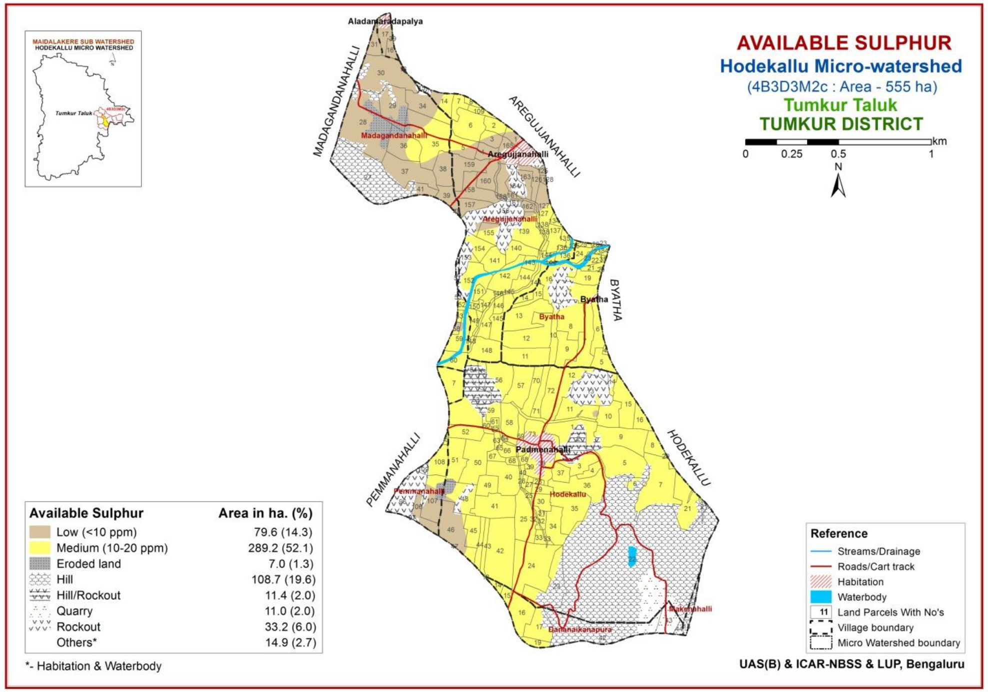

MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
TUMKUR
Aladankaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregejjonahalli
Byatha
Padmondahalli
Hemmanahalli
Hodekallu
Dalavanakanapura
Bakanahalli
AVAILABLE NITROGEN
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Available Nitrogen | Area in ha. (%)
Low (<280 kg/ha) | 342.3 (61.6)
Medium (280-560 kg/ha) | 26.5 (4.8)
Eroded land | 7.0 (1.3)
Hill | 108.7 (19.6)
Hill/Rockout | 11.4 (2.0)
Quarry | 11.0 (2.0)
Rockout | 33.2 (6.0)
Others* | 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

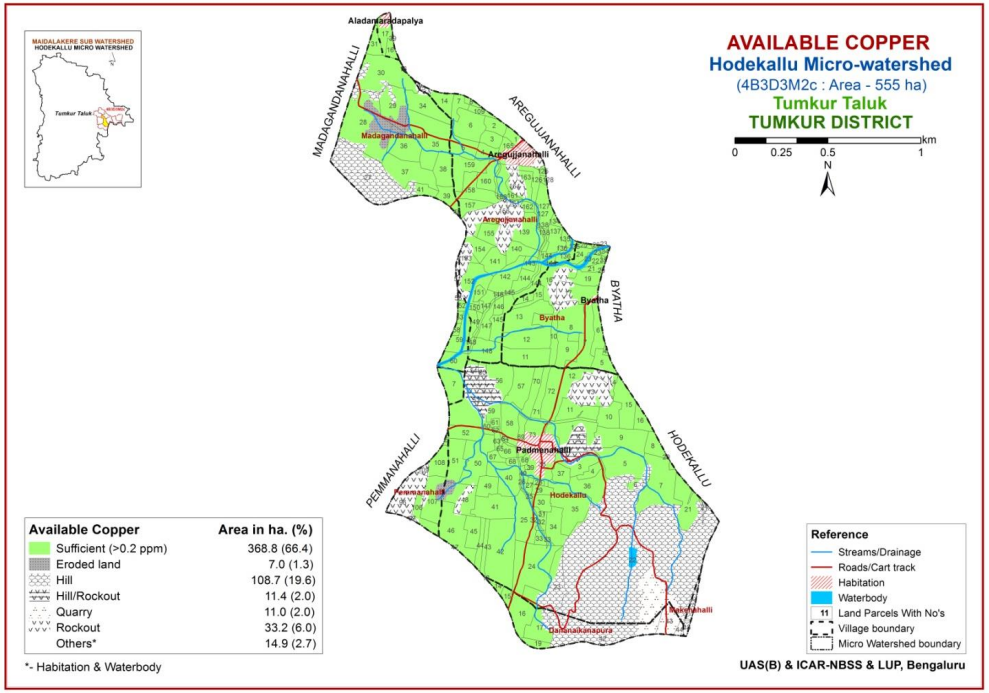

MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
TUMKUR
Aladankaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregejjonahalli
Byatha
Padmondahalli
Hemmanahalli
Hodekallu
Dalavanakanapura
Bakanahalli
AVAILABLE PHOSPHORUS
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Available Phosphorus | Area in ha. (%)
Medium (23-56 kg/ha) | 368.8 (66.4)
Eroded land | 7.0 (1.3)
Hill | 108.7 (19.6)
Hill/Rockout | 11.4 (2.0)
Quarry | 11.0 (2.0)
Rockout | 33.2 (6.0)
Others* | 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

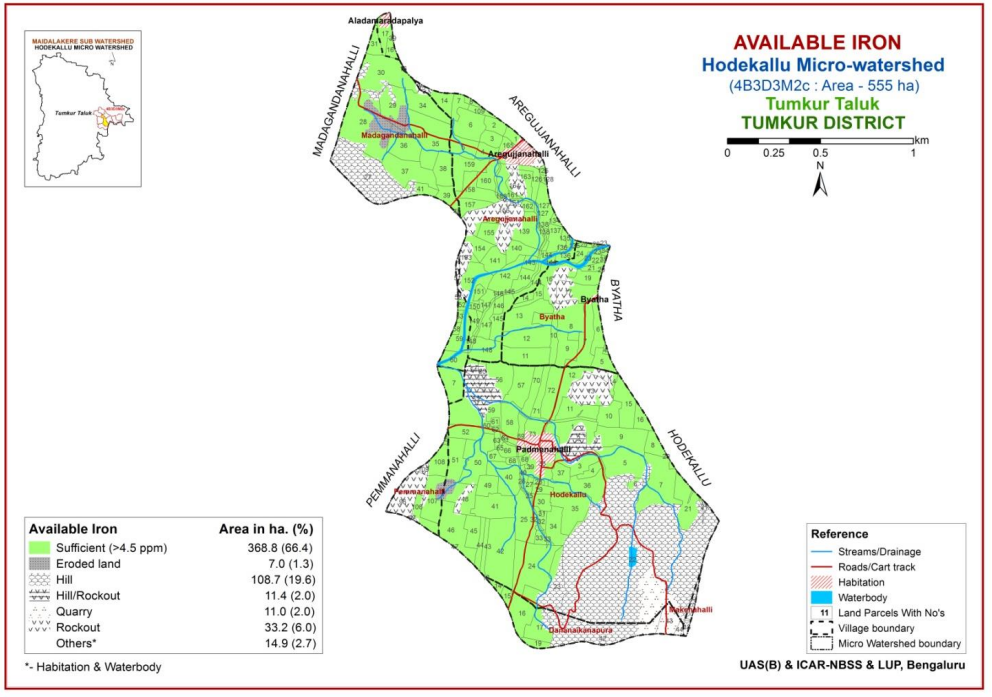

AVAILABLE POTASSIUM
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Available Potassium | Area in ha. (%)
Low (<140 kg/ha) 220.3 (39.7)
Medium (140-330 kg/ha) 148.5 (26.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

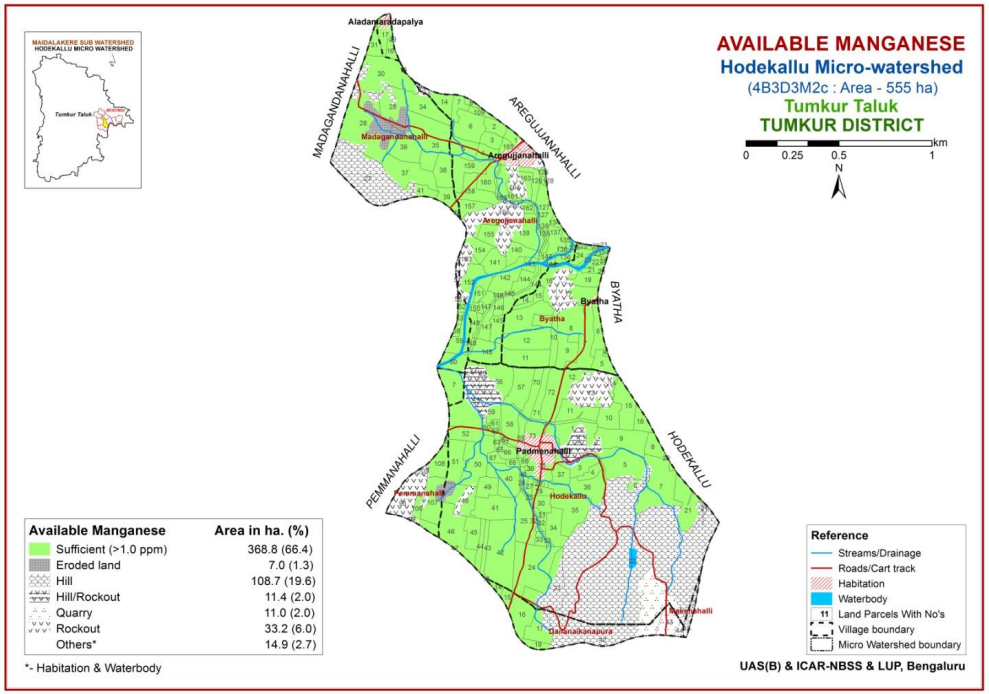

EXCHANGEABLE CALCIUM
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Exchangeable Calcium | Area in ha. (%)
Deficient (<1.5 C mol (P+)/kg) 87.2 (15.7)
Sufficient (>1.5 C mol (P+)/kg) 281.6 (50.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

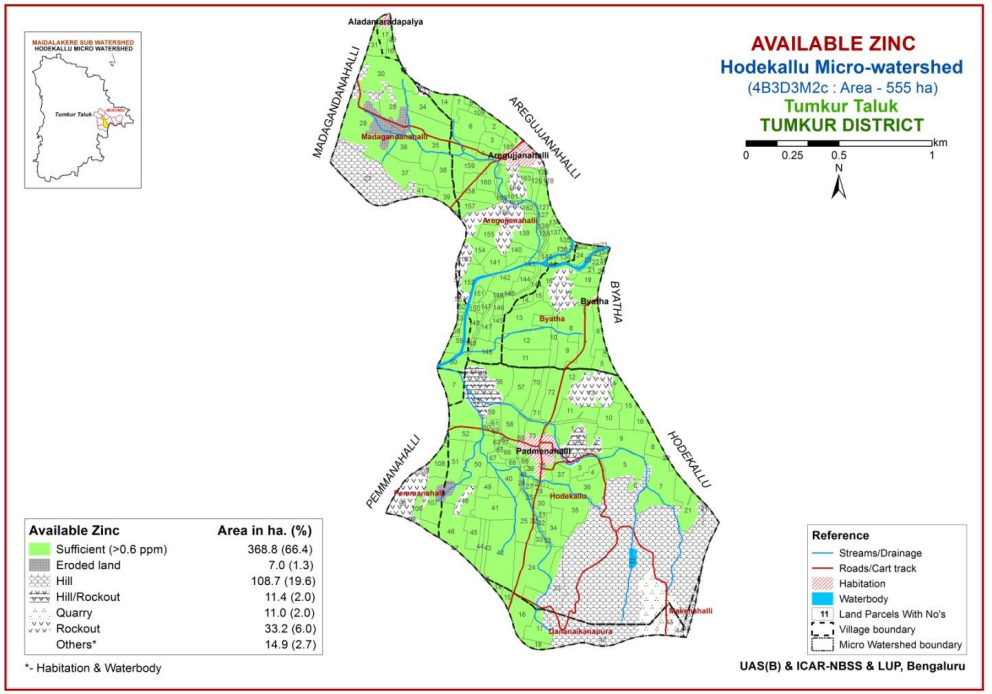

EXCHANGEABLE MAGNESIUM
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Exchangeable Magnesium | Area in ha. (%)
Deficient (<1.0 C mol (P+)/kg) 292.6 (52.7)
Sufficient (>1.0 C mol (P+)/kg) 76.2 (13.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru

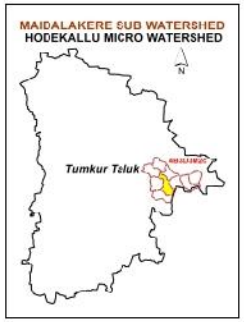

AVAILABLE SULPHUR
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Available Sulphur | Area in ha. (%)
Low (<10 ppm) 79.6 (14.3)
Medium (10-20 ppm) 289.2 (52.1)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


AVAILABLE COPPER
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregojjonahalli
Byatha
Padmenahalli
Hodekallu
Dalavanakkanapura
Available Copper | Area in ha. (%)
Sufficient (>0.2 ppm) 368.8 (66.4)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


AVAILABLE IRON
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregojjonahalli
Byatha
Padmenahalli
Hodekallu
Dalavanakkanapura
Available Iron | Area in ha. (%)
Sufficient (>4.5 ppm) 368.8 (66.4)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


AVAILABLE MANGANESE
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregojjonahalli
Byatha
Padmenahalli
Hodekallu
Dalavanakkanapura
Available Manganese | Area in ha. (%)
Sufficient (>1.0 ppm) 368.8 (66.4)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


AVAILABLE ZINC
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
PEMMANAHALLI
HODEKALLU
Madagandanahalli
Aregujjanahalli
Aregojjonahalli
Byatha
Padmenahalli
Hodekallu
Dalavanakkanapura
Available Zinc | Area in ha. (%)
Sufficient (>0.6 ppm) 368.8 (66.4)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru



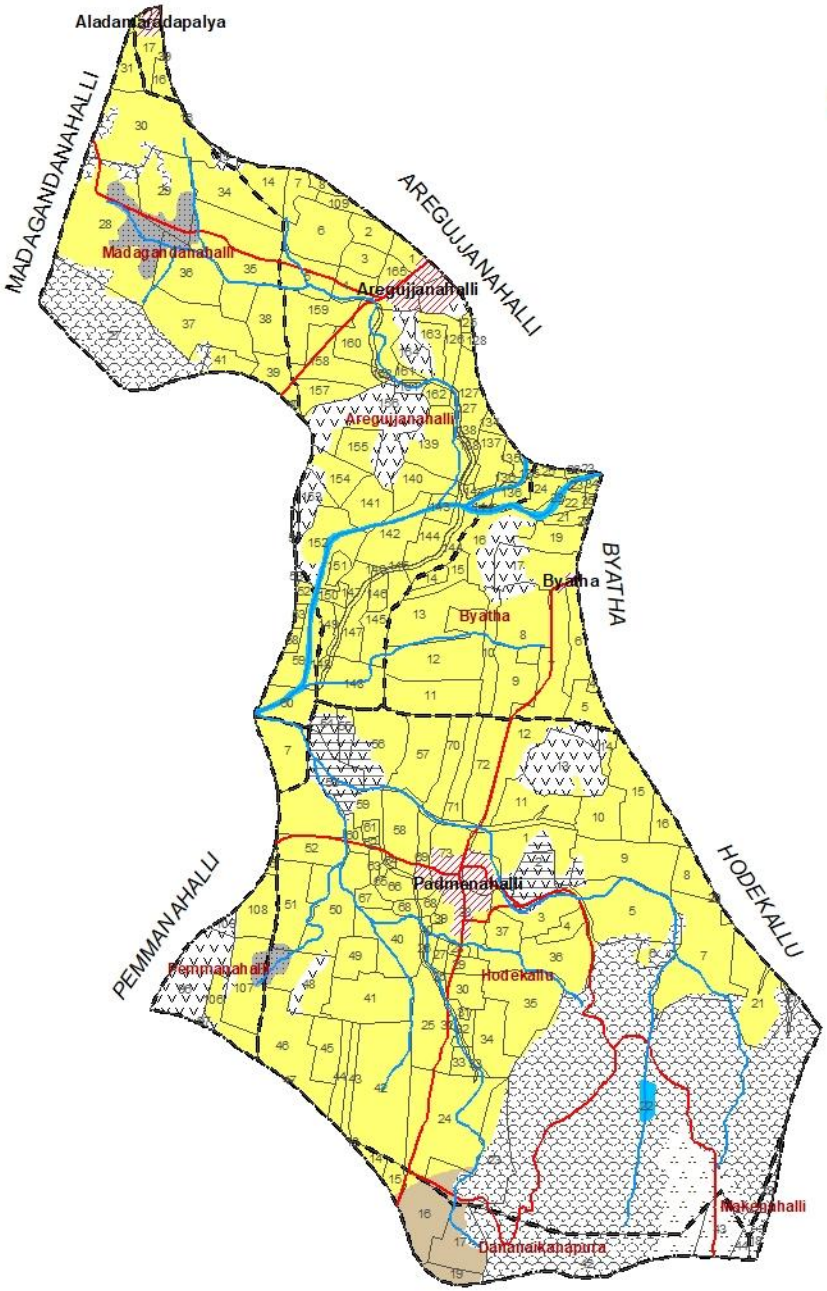
AVAILABLE BORON

Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT



0 0.25 0.5 1 km

N

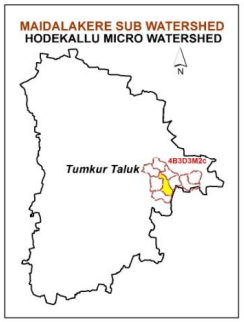
Available Boron	Area in ha. (%)
Low (<0.5 ppm)	8.2 (1.4)
Medium (0.5-1.0 ppm)	360.6 (65.0)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru



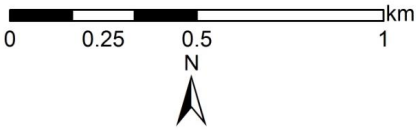
LAND CAPABILITY

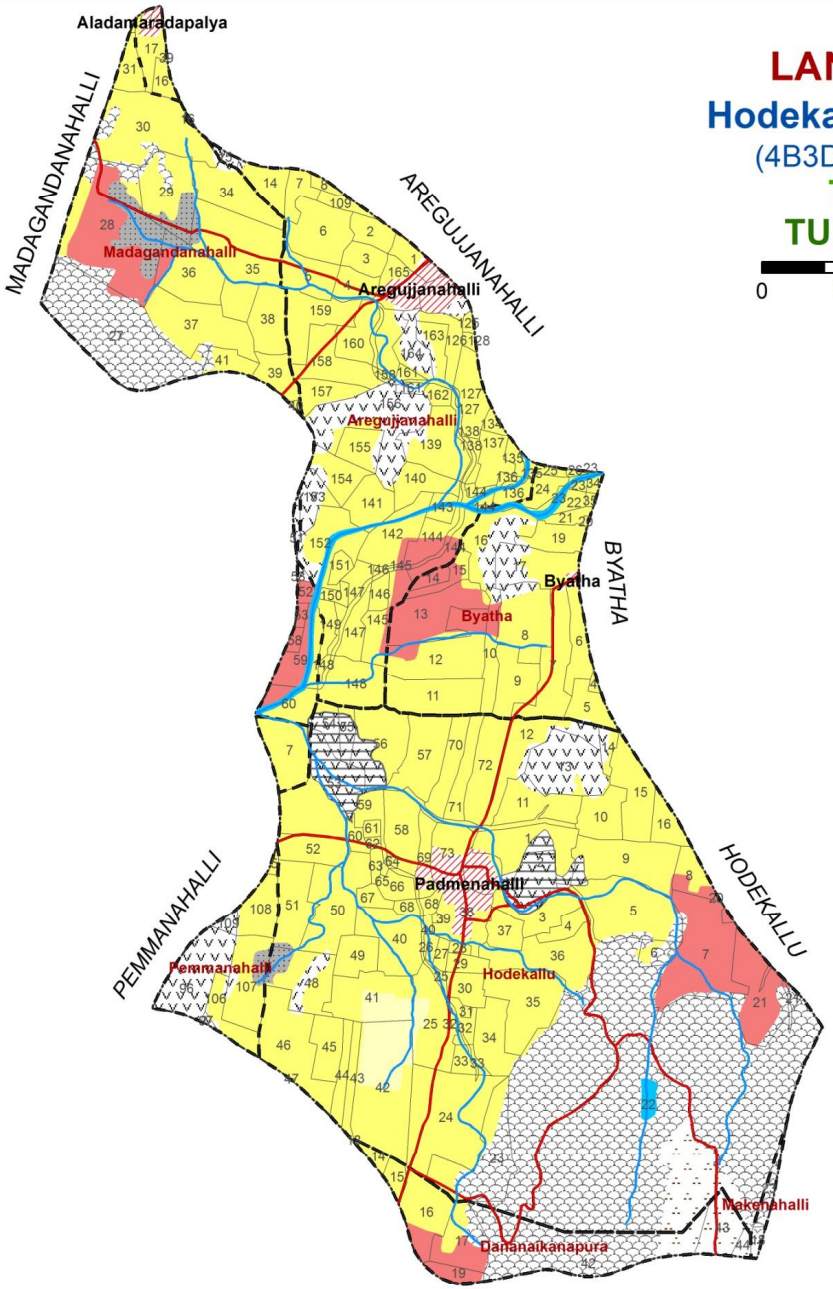
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





Key

II- Good cultivable land

III- Moderately good cultivable land

Limitations

e - erosion/run off limitation

s- soil limitation

(depth, gravelliness, texture, salinity/alkalinity)

Classes	Area in ha. (%)
IIes	6.6 (1.2)
IIs	323.5 (58.2)
IIIs	38.7 (7.0)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

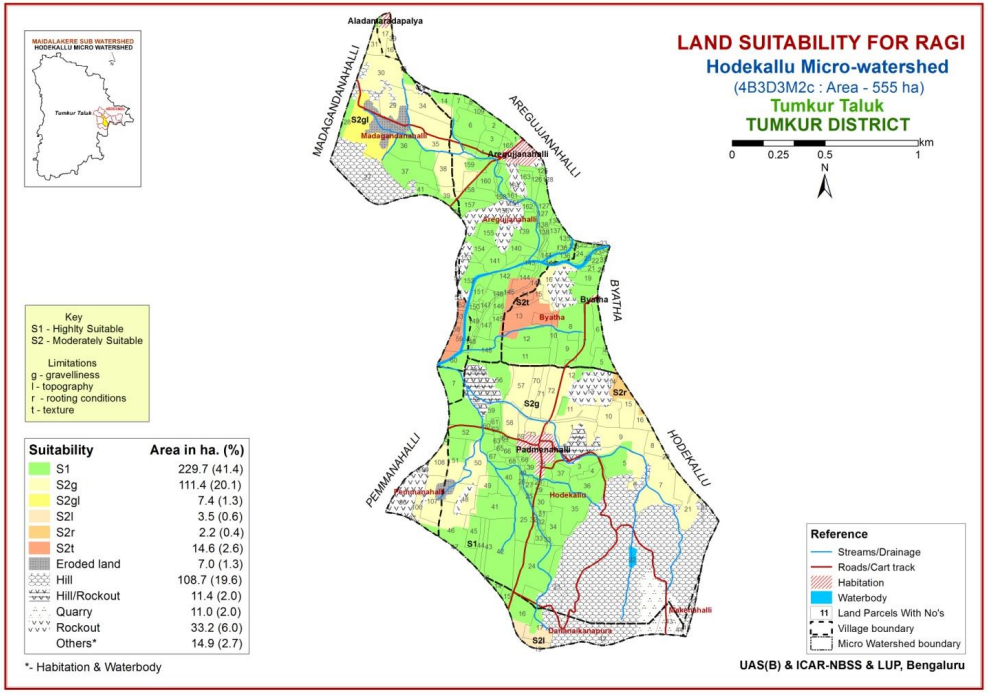
*- Habitation & Waterbody

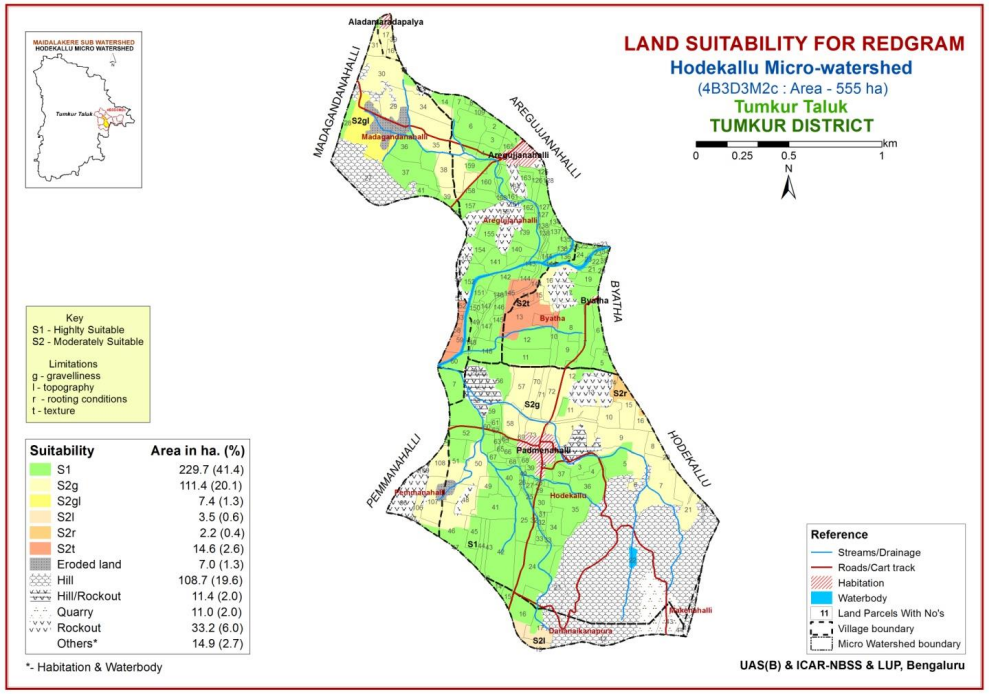
Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

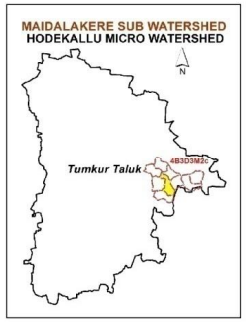
UAS(B) & ICAR-NBSS & LUP, Bengaluru

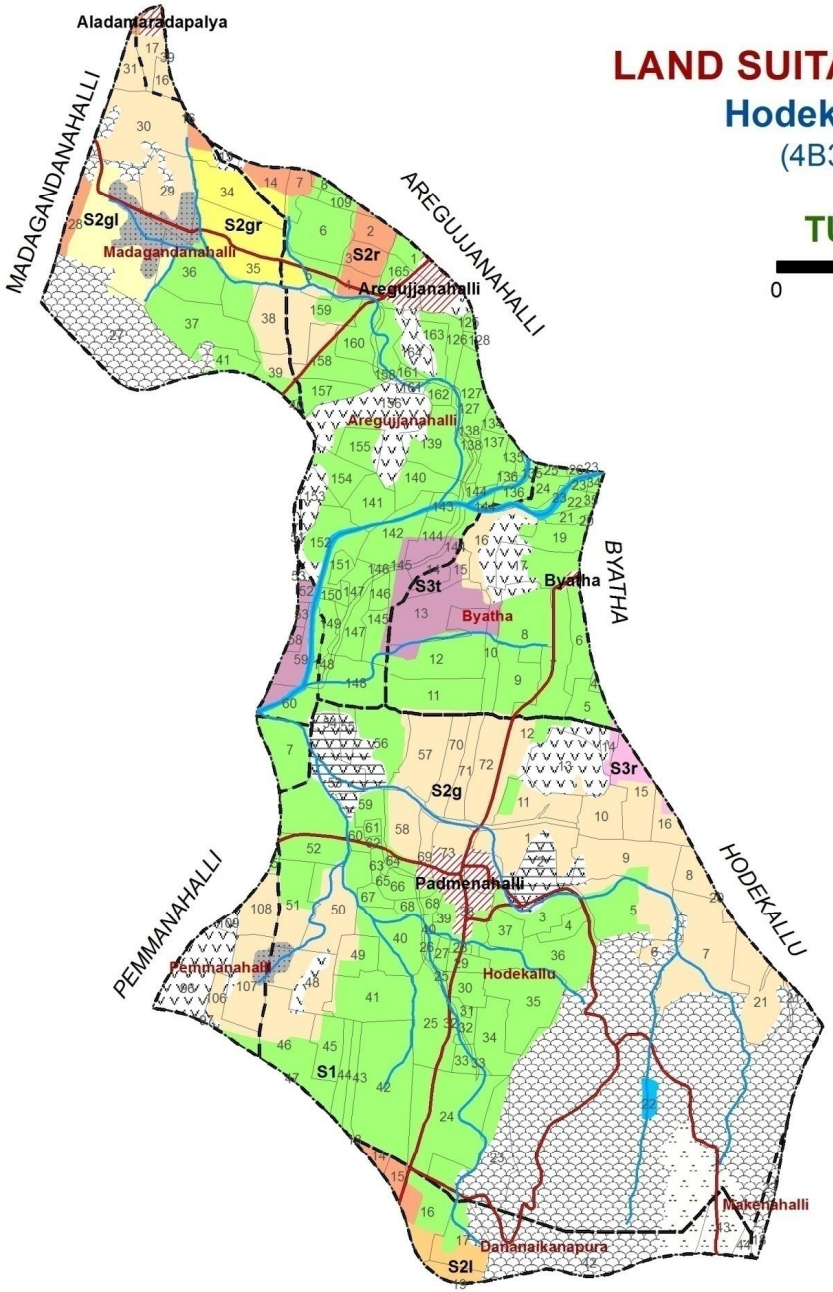
LAND SUITABILITY FOR MAJOR AGRICULTURAL CROPS





LAND SUITABILITY FOR COMMERCIAL CROPS





LAND SUITABILITY FOR MULBERRY

Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT

0 0.25 0.5 1 km

N

Key
S1 - Highlty Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable

Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture

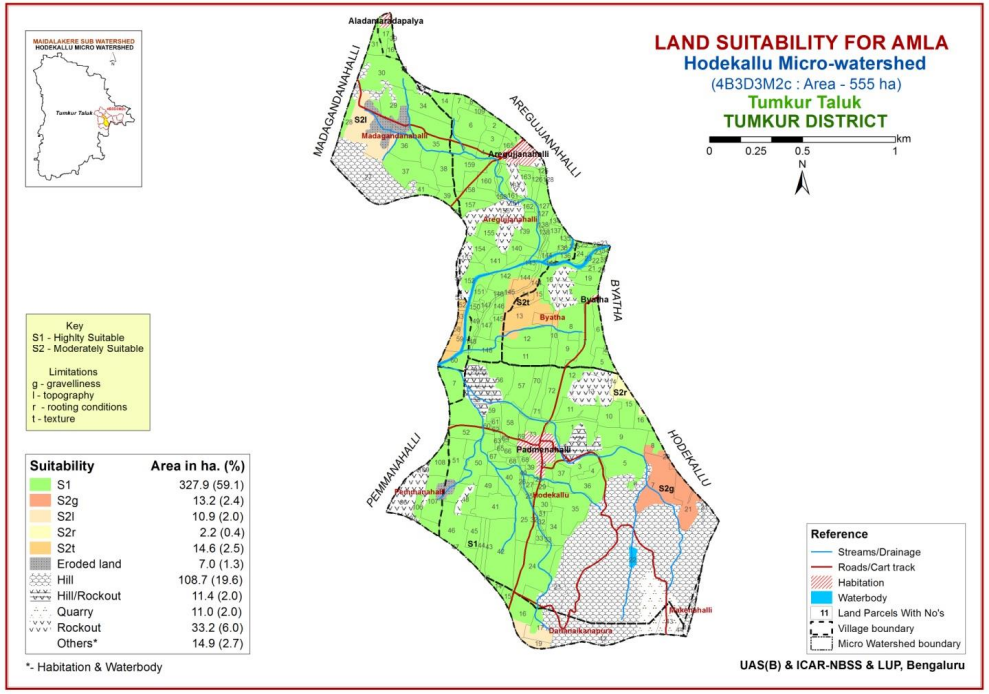
Suitability	Area in ha. (%)
S1	219.0 (39.5)
S2g	99.0 (17.8)
S2gl	7.4 (1.3)
S2gr	12.3 (2.2)
S2l	3.5 (0.6)
S2r	10.7 (1.9)
S3r	2.2 (0.4)
S3t	14.7 (2.7)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

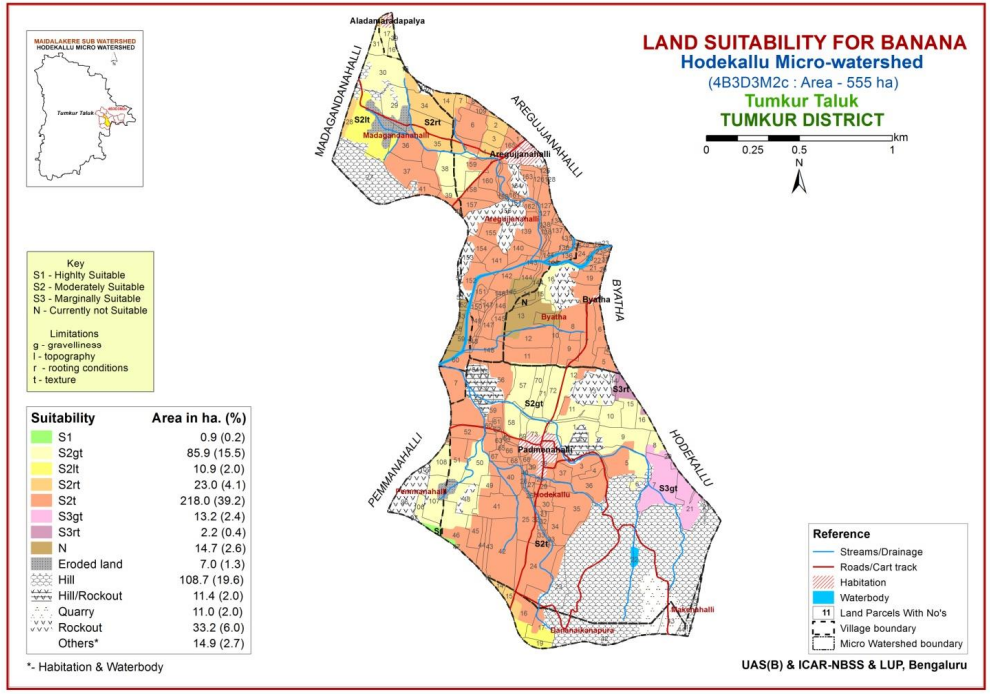
*- Habitation & Waterbody

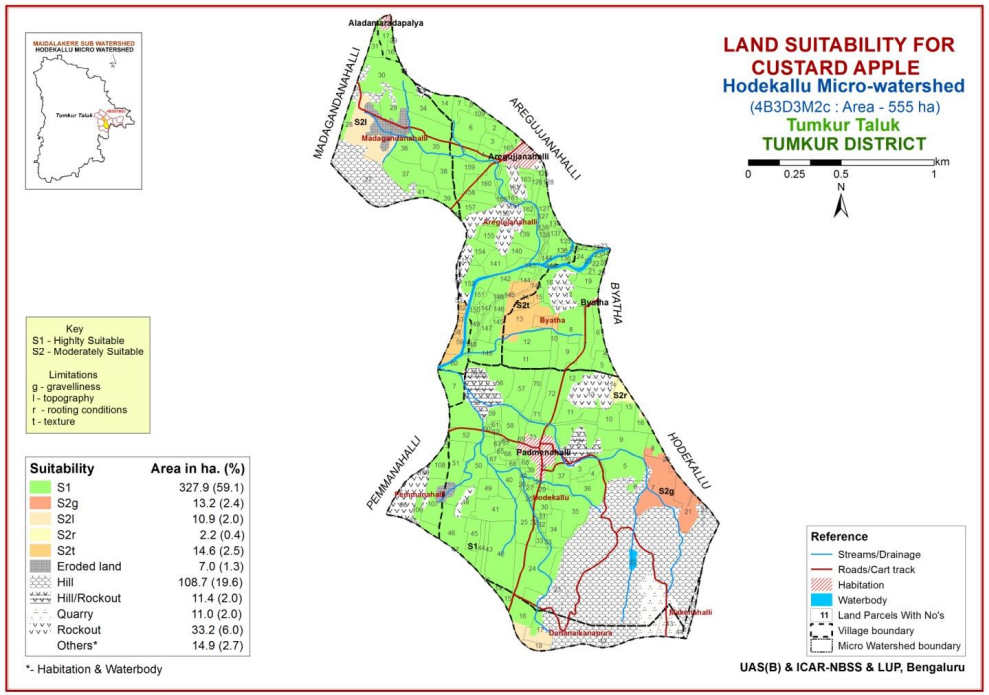
Reference
- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

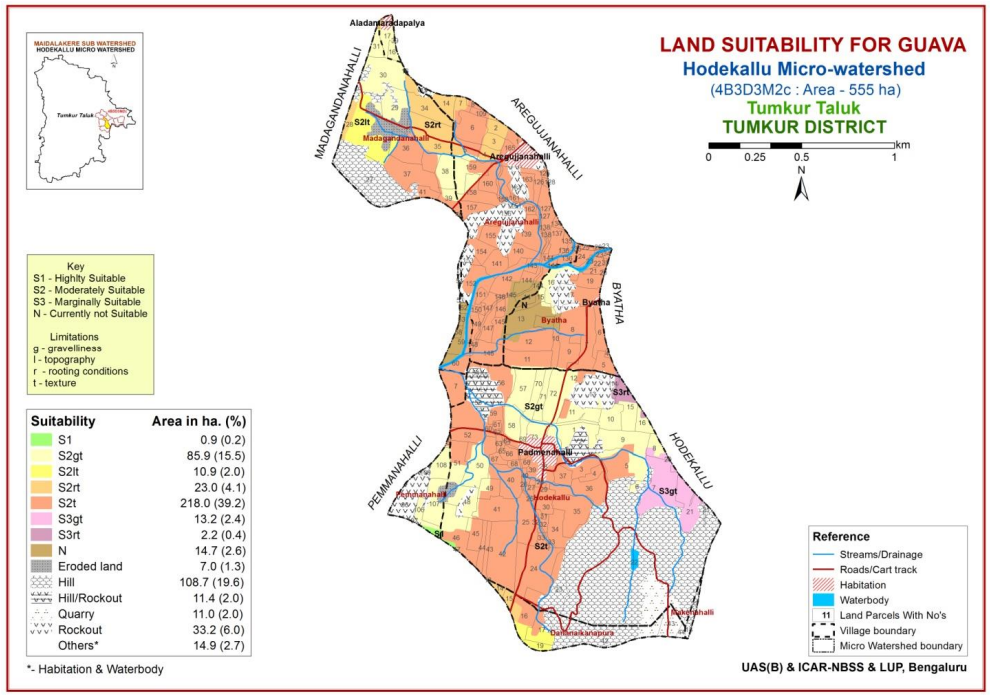
UAS(B) & ICAR-NBSS & LUP, Bengaluru

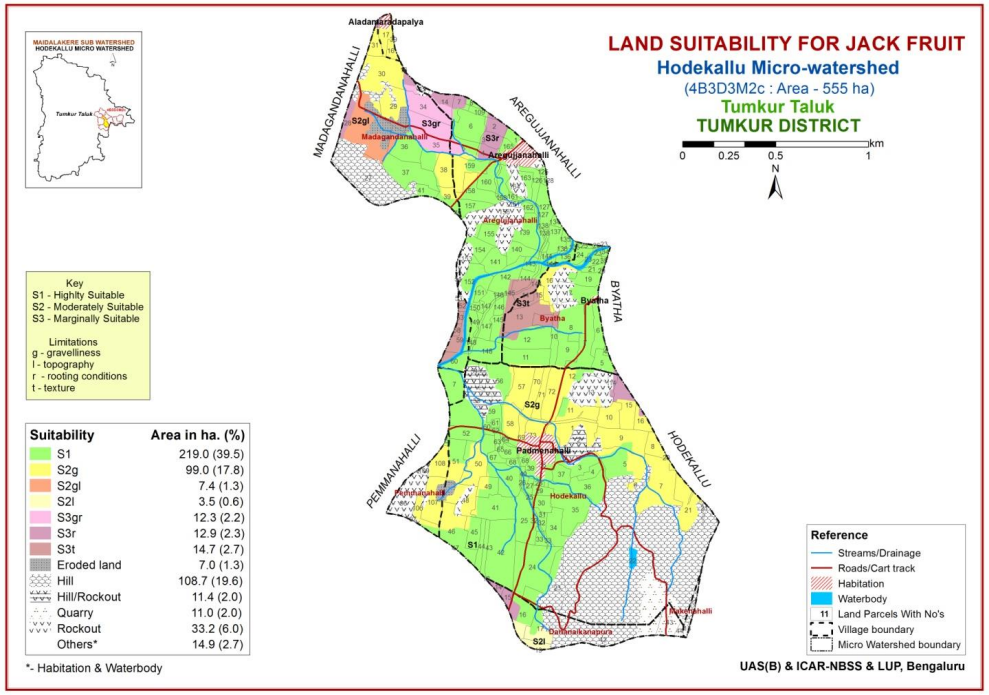
LAND SUITABILITY FOR MAJOR HORTICULTURAL CROPS

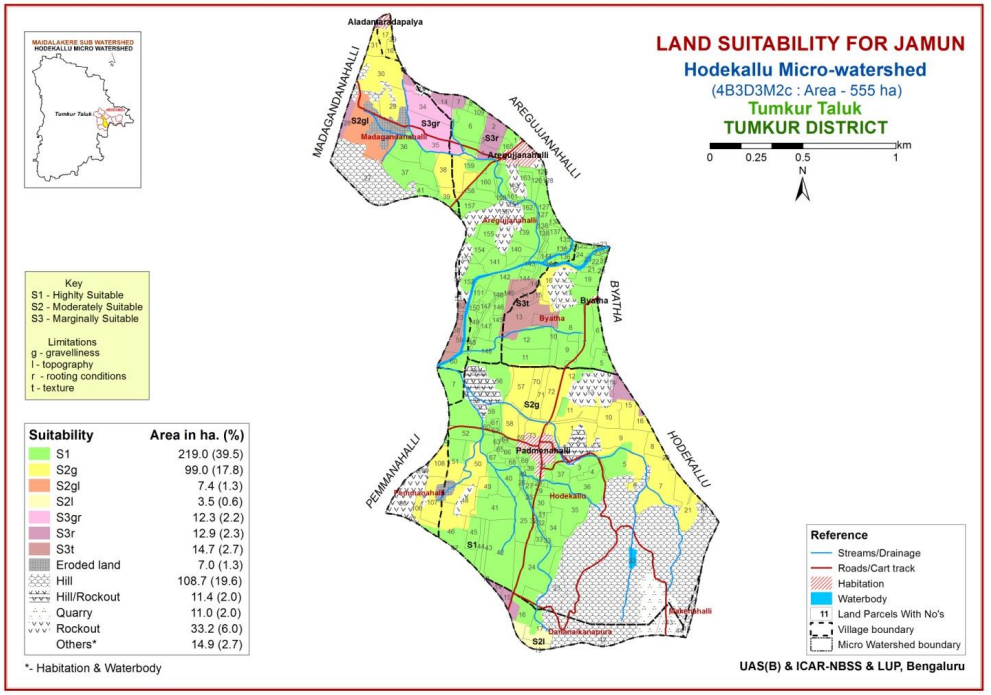


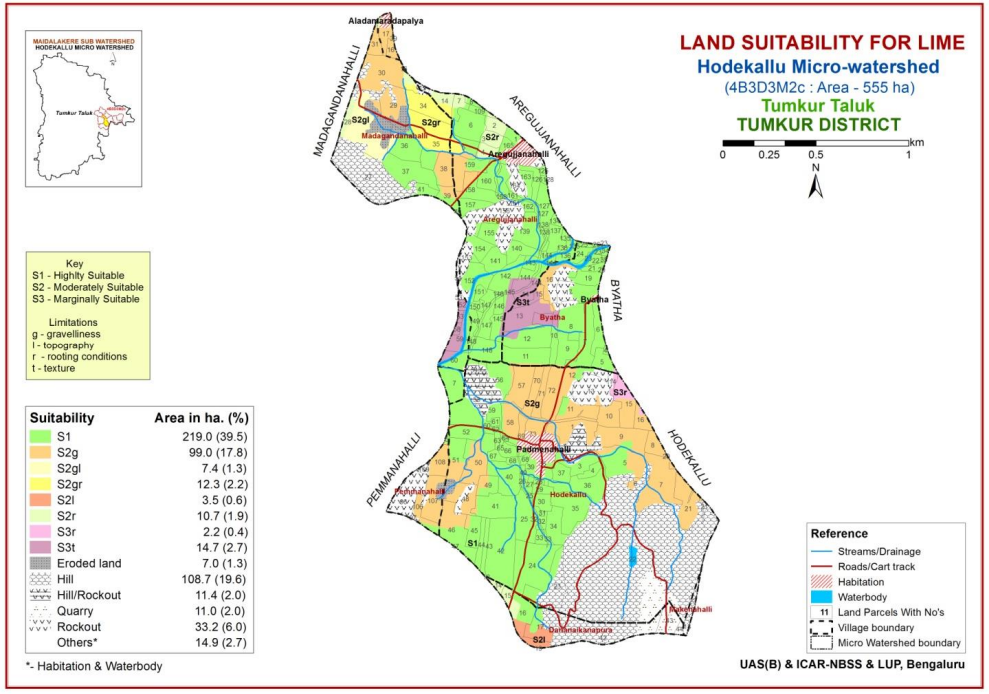


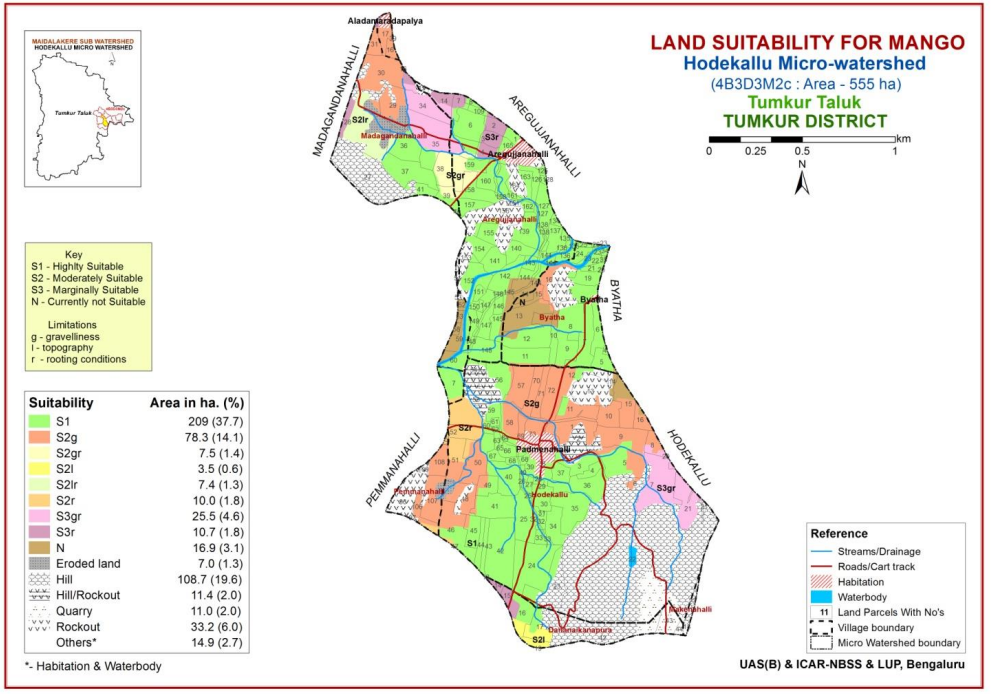


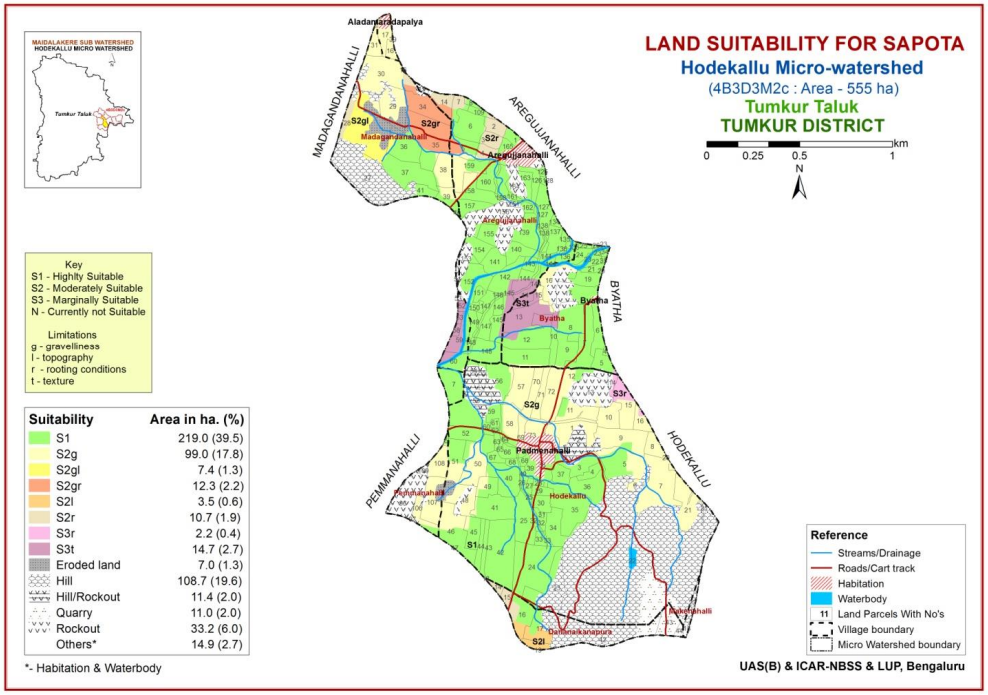


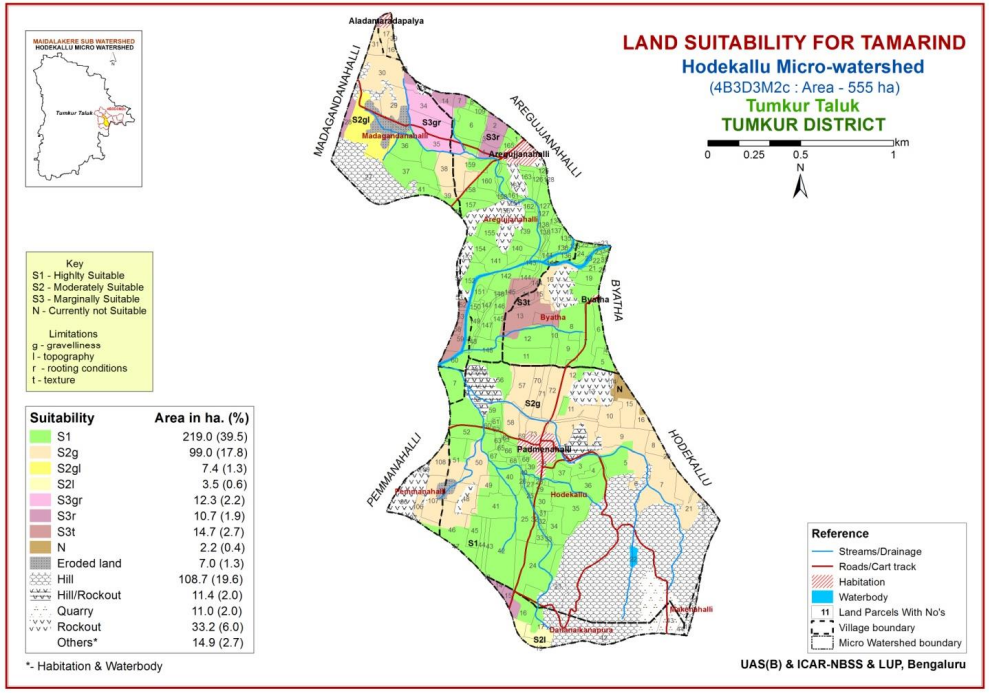

LAND SUITABILITY FOR JACK FRUIT
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability | Area in ha. (%)
S1 219.0 (39.5)
S2g 99.0 (17.8)
S2gl 7.4 (1.3)
S2l 3.5 (0.6)
S3gr 12.3 (2.2)
S3r 12.9 (2.3)
S3t 14.7 (2.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Areguljjanahalli
Byatha
Padmondnahalli
Hodekallu
Dalitanakanapura
S1
S2g
S2gl
S2l
S3gr
S3r
S3t
0 0.25 0.5 1 km
N

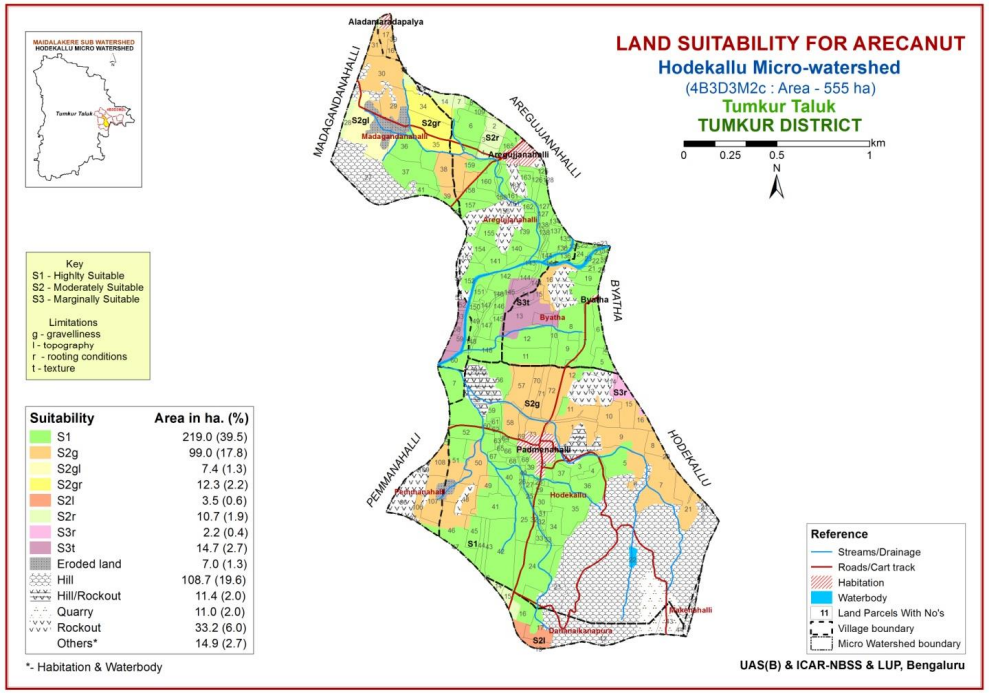

LAND SUITABILITY FOR JAMUN
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability | Area in ha. (%)
S1 219.0 (39.5)
S2g 99.0 (17.8)
S2gl 7.4 (1.3)
S2l 3.5 (0.6)
S3gr 12.3 (2.2)
S3r 12.9 (2.3)
S3t 14.7 (2.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Areguljjanahalli
Byatha
Padmondnahalli
Hodekallu
Dalitanakanapura
S1
S2g
S2gl
S2l
S3gr
S3r
S3t
0 0.25 0.5 1 km
N

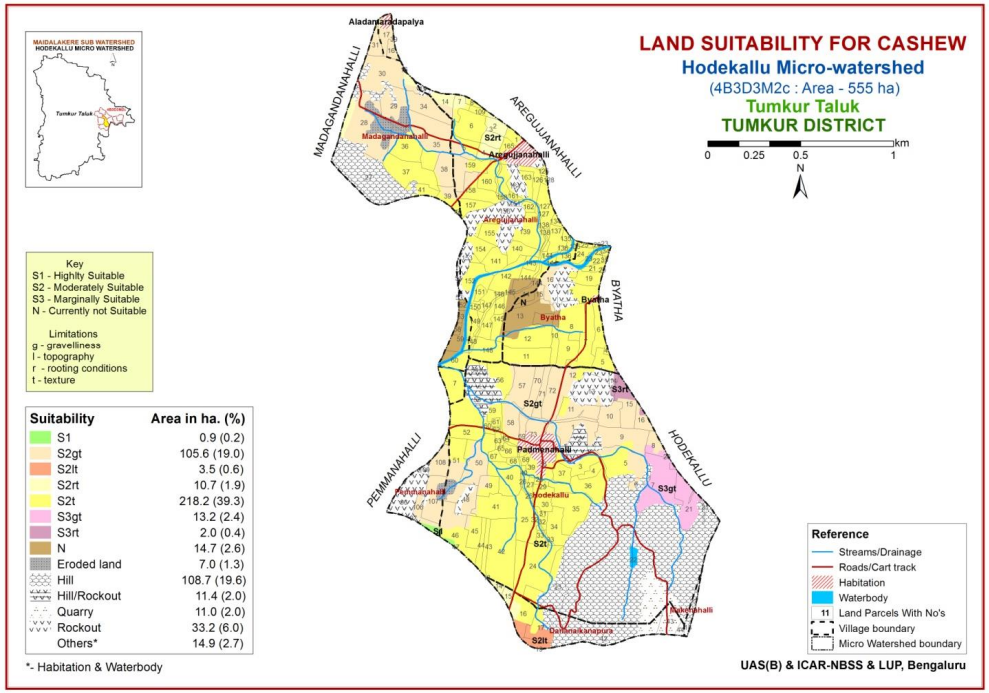

LAND SUITABILITY FOR LIME
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability | Area in ha. (%)
S1 219.0 (39.5)
S2g 99.0 (17.8)
S2gl 7.4 (1.3)
S2gr 12.3 (2.2)
S2l 3.5 (0.6)
S2r 10.7 (1.9)
S3r 2.2 (0.4)
S3t 14.7 (2.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Areguljjanahalli
Byatha
Padmondnahalli
Hodekallu
Dalitanakanapura
S1
S2g
S2gl
S2gr
S2l
S2r
S3r
S3t
0 0.25 0.5 1 km
N

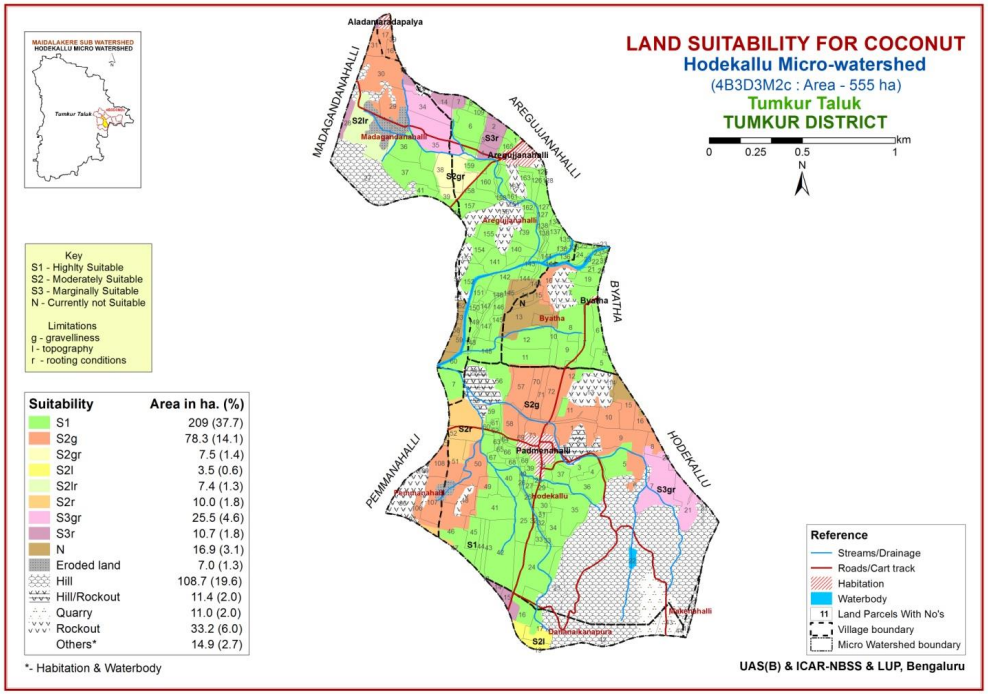

LAND SUITABILITY FOR MANGO
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
N - Currently not Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
Suitability | Area in ha. (%)
S1 209 (37.7)
S2g 78.3 (14.1)
S2gr 7.5 (1.4)
S2l 3.5 (0.6)
S2lr 7.4 (1.3)
S2r 10.0 (1.8)
S3gr 25.5 (4.6)
S3r 10.7 (1.8)
N 16.9 (3.1)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Areguljjanahalli
Byatha
Padmondnahalli
Hodekallu
Dalitanakanapura
S1
S2g
S2l
S2r
S3gr
S3r
N
0 0.25 0.5 1 km
N

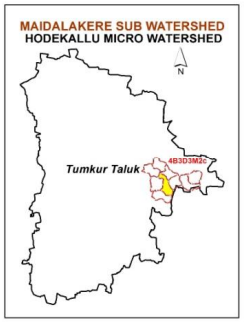

MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
TUMKUR
LAND SUITABILITY FOR SAPOTA
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
N - Currently not Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability Area in ha. (%)
S1 219.0 (39.5)
S2g 99.0 (17.8)
S2gl 7.4 (1.3)
S2gr 12.3 (2.2)
S2l 3.5 (0.6)
S2r 10.7 (1.9)
S3r 2.2 (0.4)
S3t 14.7 (2.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagani-Jamalahalli
Aregujjanahalli
Byatha
Padmanabhalli
Hodekallu
Dyavarakanapura
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
TUMKUR
LAND SUITABILITY FOR TAMARIND
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
N - Currently not Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability Area in ha. (%)
S1 219.0 (39.5)
S2g 99.0 (17.8)
S2gl 7.4 (1.3)
S2l 3.5 (0.6)
S3gr 12.3 (2.2)
S3r 10.7 (1.9)
S3t 14.7 (2.7)
N 2.2 (0.4)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Aladamaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagani-Jamalahalli
Aregujjanahalli
Byatha
Padmanabhalli
Hodekallu
Dyavarakanapura
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
LAND SUITABILITY FOR ARECANUT
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Aregujjanahalli
Byatha
Padmanahalli
Hodekallu
Pemmanahalli
Dattanaikanapura
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability | Area in ha. (%)
S1 219.0 (39.5)
S2g 99.0 (17.8)
S2gl 7.4 (1.3)
S2gr 12.3 (2.2)
S2l 3.5 (0.6)
S2r 10.7 (1.9)
S3r 2.2 (0.4)
S3t 14.7 (2.7)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
LAND SUITABILITY FOR CASHEW
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Aregujjanahalli
Byatha
Padmanahalli
Hodekallu
Pemmanahalli
Dattanaikanapura
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
N - Currently not Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
t - texture
Suitability | Area in ha. (%)
S1 0.9 (0.2)
S2gt 105.6 (19.0)
S2lt 3.5 (0.6)
S2rt 10.7 (1.9)
S2t 218.2 (39.3)
S3gt 13.2 (2.4)
S3rt 2.0 (0.4)
N 14.7 (2.6)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru


MAIDALAKERE SUB WATERSHED
HODEKALLU MICRO WATERSHED
Tumkur Taluk
LAND SUITABILITY FOR COCONUT
Hodekallu Micro-watershed
(4B3D3M2c : Area - 555 ha)
Tumkur Taluk
TUMKUR DISTRICT
0 0.25 0.5 1 km
N
Aladanaradapalya
MADAGANDANAHALLI
AREGUJJANAHALLI
BYATHA
HODEKALLU
PEMMANAHALLI
Madagandanahalli
Aregujjanahalli
Byatha
Padmanahalli
Hodekallu
Pemmanahalli
Dattanaikanapura
Key
S1 - Highly Suitable
S2 - Moderately Suitable
S3 - Marginally Suitable
N - Currently not Suitable
Limitations
g - gravelliness
l - topography
r - rooting conditions
Suitability | Area in ha. (%)
S1 209 (37.7)
S2g 78.3 (14.1)
S2gr 7.5 (1.4)
S2l 3.5 (0.6)
S2lr 7.4 (1.3)
S2r 10.0 (1.8)
S3gr 25.5 (4.6)
S3r 10.7 (1.8)
N 16.9 (3.1)
Eroded land 7.0 (1.3)
Hill 108.7 (19.6)
Hill/Rockout 11.4 (2.0)
Quarry 11.0 (2.0)
Rockout 33.2 (6.0)
Others* 14.9 (2.7)
*- Habitation & Waterbody
Reference
Streams/Drainage
Roads/Cart track
Habitation
Waterbody
11 Land Parcels With No's
Village boundary
Micro Watershed boundary
UAS(B) & ICAR-NBSS & LUP, Bengaluru



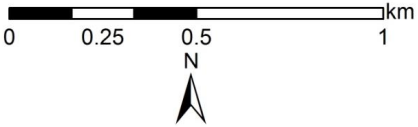
LAND MANAGEMENT UNITS

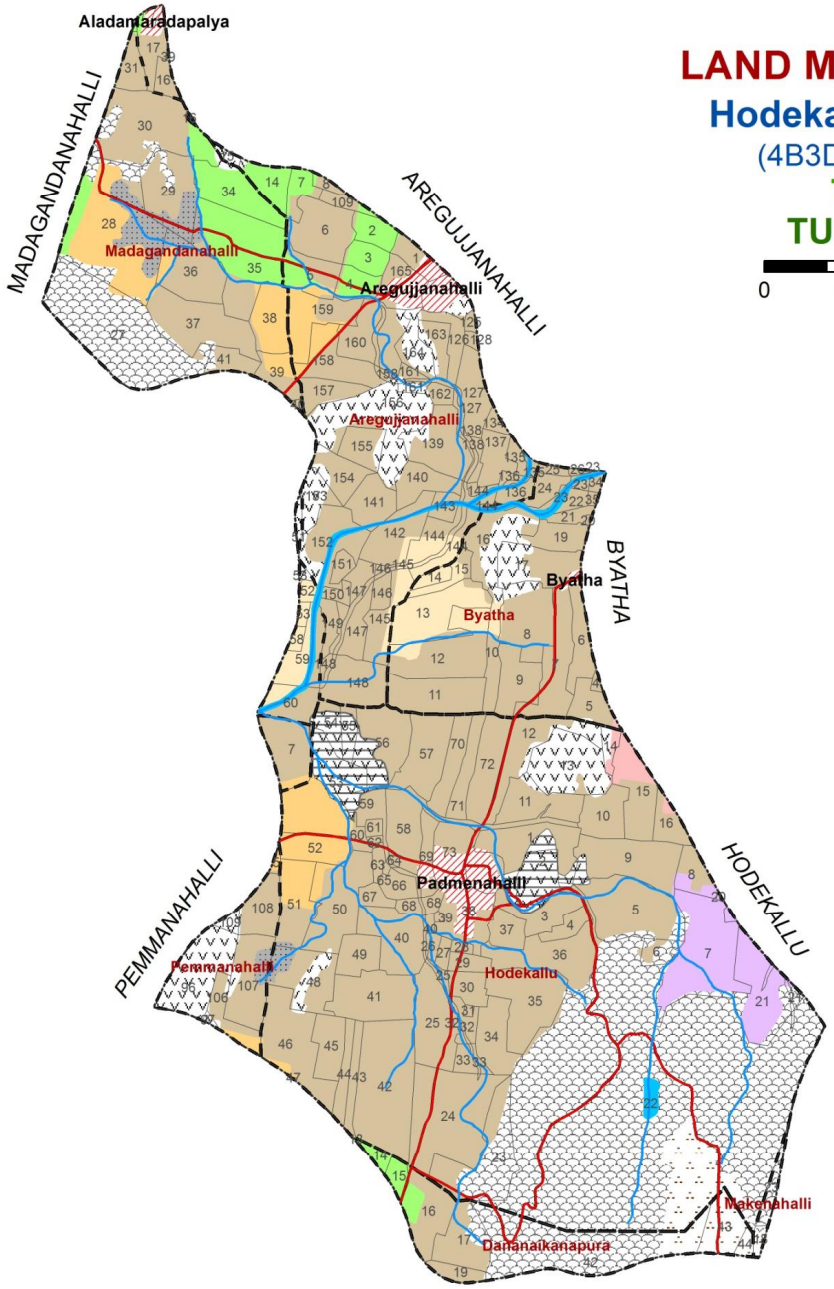
Hodekallu Micro-watershed

(4B3D3M2c : Area - 555 ha)

Tumkur Taluk

TUMKUR DISTRICT





LMU	Area in ha. (%)
LMU-1	2.2 (0.4)
LMU-2	23.0 (4.1)
LMU-3	24.9 (4.5)
LMU-4	13.2 (2.4)
LMU-5	290.8 (52.4)
LMU-6	14.7 (2.6)
Eroded land	7.0 (1.3)
Hill	108.7 (19.6)
Hill/Rockout	11.4 (2.0)
Quarry	11.0 (2.0)
Rockout	33.2 (6.0)
Others*	14.9 (2.7)

*- Habitation & Waterbody

Reference

- Streams/Drainage
- Roads/Cart track
- Habitation
- Waterbody
- 11 Land Parcels With No's
- Village boundary
- Micro Watershed boundary

UAS(B) & ICAR-NBSS & LUP, Bengaluru

Proposed crop plan of Hodekallu micro-watershed, Tumkur Taluk, Tumkur District based on soil-site–crop suitability assessment

LMU No.	Mapping unit	Survey numbers	Characters	Field crops	Forestry crop/Grasses	Horticulture crops (Rainfed condition)	Horticulture crops with suitable intervention	Suitable Intervention
LMU-1	TDHhB1 TDHiB1	Byatha: 5 Hodhekallu: 10, 13-16	Moderately shallow (50-75 cm), sandy clay loam, sandy clay texture, very gently sloping, slope 1-3% with slight erosion	**Sole crops:** Ragi, Redgram, Mulberry, Cowpea **Intercropping:** Ragi+Cowpea (4:2), Ragi+ Redgram (8:2), Mulberry+ Cowpea (2:2)	Glyricidia, **Grasses** *Stylosanthes hamata*	**Fruit crop:** Custard apple, Amla	**Fruit crops** Jamun, Sapota, Lime **Vegetables** Curry leaf, Drumstick	Application of Tank silt, addition of organic manures, Summer ploughing, formation of ridges and furrows, sowing on ridges.
LMU-2	BDGiB1St1 CKMcB1 CKMhB1 CKMiB1g1St1	Aregujjanahalli: 1-8, 14-18, 109, 165 Dananaikanapura: 13-16 Hodhekallu: 24, 42, 43 Madhagondanahalli: 28-32, 34-36, 38	Moderately deep (75-100 cm), sandy loam, sandy clay loam, sandy clay texture, very gently sloping, slope 1-3%, slight erosion, 15-35% gravels with 0.01-0.1 % of the surface area covered by stones	**Sole crops:** Ragi, Redgram, Mulberry, Cowpea **Intercropping:** Ragi+Cowpea (4:2), Ragi+ Redgram (8:2), Mulberry+ Cowpea (2:2)	Glyricidia, Hebbevu, Neem **Grasses:** *Stylosanthes hamata,* Hybrid napier	**Fruit crop:** Custard apple, Amla, Sapota, Lime,	**Fruits:** Guava, Tamarind, Jamun, Jackfruit, Arecanut, Banana **Vegetables:** Tomato, Brinjal **Flowers:** Marigold	Addition of tank silt, summer ploughing during pre-monsoon, addition of organic manures, intercropping instead of sole cropping, nitrogen fertilizer should be applied in split doses.

LMU No.	Mapping unit	Survey numbers	Characters	Field crops	Forestry crop/Grasses	Horticulture crops (Rainfed condition)	Horticulture crops with suitable intervention	Suitable Intervention
LMU-3	KMHiC1g1St1 BPRiB1St1 JDGcB1 KMHiB1	Aregujjanahalli: 4, 5, 158-160 Hodhekallu: 46, 47, 50-53,60 Madhagondanahalli: 27, 28, 35-39 Pemmanahalli: 5, 7, 97, 106	Deep (100-150cm), sandy loam, sandy clay texture, very gently to gently sloping, slope 1-5%, slight erosion, 15-35% gravels with 0.01-0.1 % of the surface area covered by stones	**Sole crops:** Ragi, Redgram, Mulberry, Cowpea **Intercropping:** Ragi+Cowpea (4:2), Ragi+ Redgram (8:2), Mulberry+ Cowpea (2:2)	Glyricidia, Neem, Hebbevu **Grasses**: *Stylosanthes hamata,* Hybrid napier	**Fruit crops:** Custard apple, Amla, Sapota, Lime, Jamun, Tamarind **Vegetables:** Drumstick, Curry Leaf	**Fruits:** Guava, Arecanut, Banana **Vegetables:** Tomato, Brinjal, Cucumber **Flowers:** Marigold Chrysanthemum	Addition of tank silt, dead furrows between crops, intercropping instead of sole cropping, nitrogen fertilizer should be applied in split doses, trench cum-bund, crescent bund for horticulture crops, cultivation across slope.
LMU-4	GLRiB1	Hodhekallu: 5-9, 20-22	Deep (100-150cm), sandy clay texture, very gently sloping, slope 1-3% with slight erosion	**Sole crops:** Ragi, Redgram, Mulberry, Cowpea **Intercropping:** Ragi+Cowpea (4:2), Ragi+ Redgram (8:2), Mulberry+ Cowpea (2:2)	Glyricidia, Neem, Hebbevu **Grasses**: *Stylosanthes hamata,* Hybrid napier	**Fruit crops:** Custard apple, Amla, Lime, Tamarind **Vegetables:** Drumstick, Curry Leaf	**Fruits:** Arecanut, Jamun, Banana, Sapota, **Vegetables:** Tomato, Brinjal, Cucumber **Flowers:** Marigold Chrysanthemum	Addition of tank silt, dead furrows between crops, intercropping instead of sole cropping, nitrogen fertilizer should be applied in split doses.

LMU No.	Mapping unit	Survey numbers	Characters	Field crops	Forestry crop/Grasses	Horticulture crops (Rainfed condition)	Horticulture crops with suitable intervention	Suitable Intervention
LMU-5	NDLhC1 BDKcB1 BDKcB1St1 BDKiB1 HLKhB1 HLKcB1 RTRcB1 RTRhB1 RTRiA1 RTRiB1 RTRiB2g1St1 TSDiA1	Aregujjanahalli: 1-8, 16, 17, 39, 109, 125-128, 134-165 Byatha: 4-13, 15-17, 19-26, 34, 35 Dananaikanapura: 15-17, 19, 42 Hodhekallu: 1-6, 8-16, 22-73 Madhagondanahalli: 27-31, 34-41, 59, 60 Pemmanahalli: 5, 7, 96, 97, 106-108	Very deep (>150cm), sandy loam, sandy clay loam, sandy clay texture, nearly level to gently sloping, slope 0-5%, slight erosion, 15-35% gravels with 0.01-0.1 % of the surface area covered by stones	**Sole crops:** Ragi, Redgram, Mulberry, Cowpea **Intercropping:** Ragi+Cowpea (4:2), Ragi+ Redgram (8:2), Mulberry+ Cowpea (2:2)	Glyricidia, Neem, Hebbevu **Grasses**: *Stylosanthes hamata,* Hybrid napier	**Fruit crops:** Mango, Amla Sapota, Jamun, Lime, Jackfruit, Tamarind, Custard apple, **Vegetables:** Drumstick, Curry Leaf	**Fruits:** Guava, Banana, Arecanut, Coconut **Vegetables:** Tomato, Cucumber, Brinjal **Flowers:** Marigold Chrysanthemum	Addition of organic manures, green manure crops in plantation, use of slow releasing fertilizers, , trench cum-bund, crescent bund for horticulture crops, cultivation across slope.
LMU-6	TDGiA1	Aregujjanahalli: 142, 144, 145, 152 Byatha: 8, 10, 12-16 Madhagondanahalli: 51-53, 58-60	Very deep (>150cm), sandy clay texture, nearly level lands, slope 0-1% with slight erosion	**Sole crops:** Ragi, Redgram, Cowpea **Intercropping:** Ragi+Cowpea (4:2), Ragi+ Redgram (8:2)	Glyricidia, Neem, Hebbevu **Grasses**: *Stylosanthes hamata,* Hybrid napier	**Fruit crops:** Custard apple, Amla **Vegetables:** Drumstick	**Fruits:** Sapota, Papaya, Banana, Lime, Tamarind **Vegetables:** Tomato, chilli	Dead furrow at regular interval, addition of FYM and organic manure, split application of nitrogen, ridge and furrow formation, sowing on ridges, safe removal of excess water

Note: Part of Soil phases (3, 4, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22 and 24) are found to be strongly, very strongly and extremely acidic. Application of lime is recommended for reclamation

General Interventions

a. Summer ploughing during pre monsoon

b. Seed hardening

c. Seed treatment with biofertilizers

Conclusion

- Hodekallu (4B3D3M2c) micro-watershed covers an area of 555 ha, of which 368.8 ha is suitable for cultivation. Soil depth varies from moderately shallow to very deep, wherein very deep soils (> 150 cm) are spread in 305.5 ha (55.0 %) of total area followed by deep soils (100-150 cm) in 38.1 ha (6.9 %) of area. Moderately shallow soils are spread in 2.2 ha (0.4 %) which need *in-situ* management practices to conserve soil and water. The agricultural land is non gravelly to gravelly in nature, non gravelly soils occur in 352.2 ha (63.5 %) of area followed by gravelly soils in 16.3 ha (2.9%) of area.

- Soil texture vary from sandy loam to sandy clay. Sandy clay soils are found to be predominant in this micro watershed occupying an area of 240.0 ha (43.2 %) of area. Very gently sloping (1-3 %) land is noticed in 265.0 ha (47.7%) with slight erosion in 362.2 ha (65.2 %) and moderate erosion in 6.6 ha (1.2 %) of area

- Neutral to extremely acidic soil reaction is observed in Hodekallu micro watershed. Moderately acidic soils occurs in 33.8 ha (6.1 %) of area. Whereas strongly, very strongly and extremely acidic soil reaction is observed in 83.7 ha (15.1 %), 142.2 ha (25.5 %) and 71.1 ha (12.8 ha) of area respectively which requires urgent attention for reclamation with lime. Electrical conductivity is normal in 368.8 ha (66.4 %) of area.

- Organic carbon, Available nitrogen and potassium is low in 249.8 ha (45.0 %), 342.3 ha (61.6 %) and 220.3 ha (39.7 %) of area respectively. Available phosphorous is medium in 368.8 ha (66.4 %) of area. Available sulphur is low in 79.6 ha (14.3 %) and medium in 289.2 ha (52.1) ha of area. Exchangeable calcium and magnesium are deficient in 87.2 ha (15.7 %) and 292.6 ha (52.7 %) of area. Among micro nutrients manganese, copper, iron and zinc are found to be sufficient in 368.8 ha (66.4 %) of area. The boron content is medium in 360.6 ha (65.0 %) and low in 8.2 ha (1.4 %) of area.

- The areas which are low in organic carbon, nitrogen, potassium and boron need to be applied with FYM, nitrogenous fertilizers, MOP and borax as per the recommendation.

Sujala - III
Karnataka Watershed Development Project-II
Watershed Development Department
Government of Karnataka

THE WORLD BANK

Hydrological Inventory of Maidalakere Sub-watershed of Tumkur Taluk, Tumkur District, Karnataka for Watershed Planning and Development

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Email: uasbsujala@gmail.com

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INTRODUCTION

➢The inventory and documentation of spatial and temporal changes in hydrological components of Maidalakere (4B3D3M) sub-watershed (SWS) in Tumkur Taluk of Tumkur District has been undertaken for Integrated planning, development and management at level the of soil mapping units (scale 1:8000).

➢Maidalakere Sub-Watershed is located within the boundary of 13° 21' 37.70" – 13^0 16' 50.61" North latitudes and 77° 10' 9.6" – 77^0 16' 20.5" East longitudes covering an area of about 4503 ha.

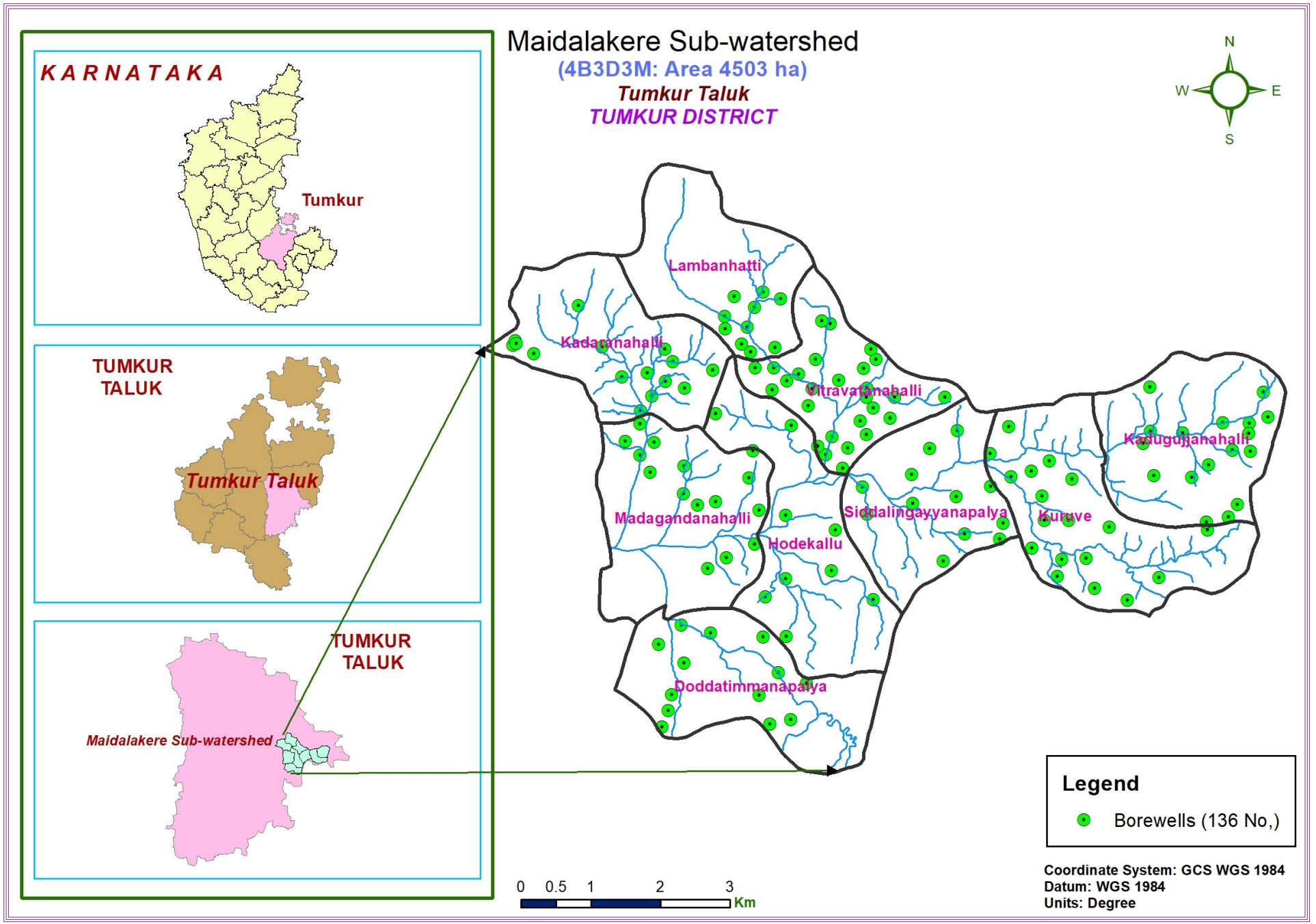
➢The sub-watershed comprises of 9 MWS namely Doddatimmanapalya (4B3D3M2d), Hodekallu (4B3D3M2c), Kadaranahalli (4B3D3M2e), Kadugujjanahalli (4B3D3M1a), Kuruve (4B3D3M1b), Lambanhatti (4B3D3M2a), Madagandanahalli (4B3D3M2f), Siddalingayyanapalya (4B3D3M1d) and Vitravatanahalli (4B3D3M2b).

➢Average annual rainfall of the area is 921 mm. The SWS is comprised of soil with textures namely, Sandy loam (418.5 ha), Sandy clay loam (1055.2 ha), Sandy clay (1250.05 ha) and Clay (18.6).

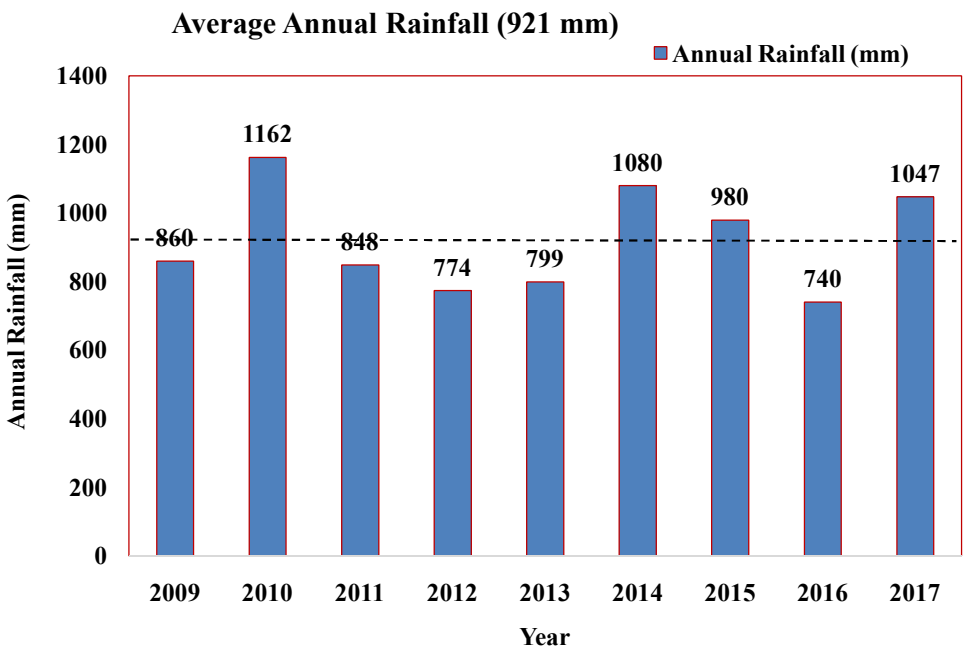
➢Major field crops such as Maize, Ragi, Arecanut, Coconut, Sorghum and Castor are cultivated.

➢Hydrological outputs namely, annual, *Kharif, Rabi* and *Summer* rainfall pattern, relations among PET, AET and Rainfall, mapping unit wise runoff generation, annual soil moisture change, change in ground water status and water balance are presented herewith:

LOCATION AND EXTENT



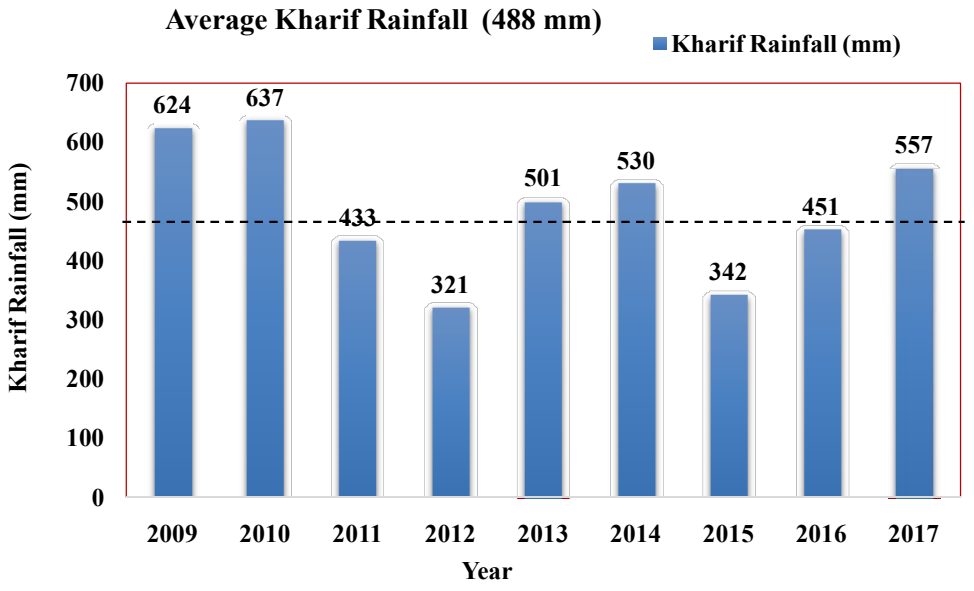
RAINFALL INDEX



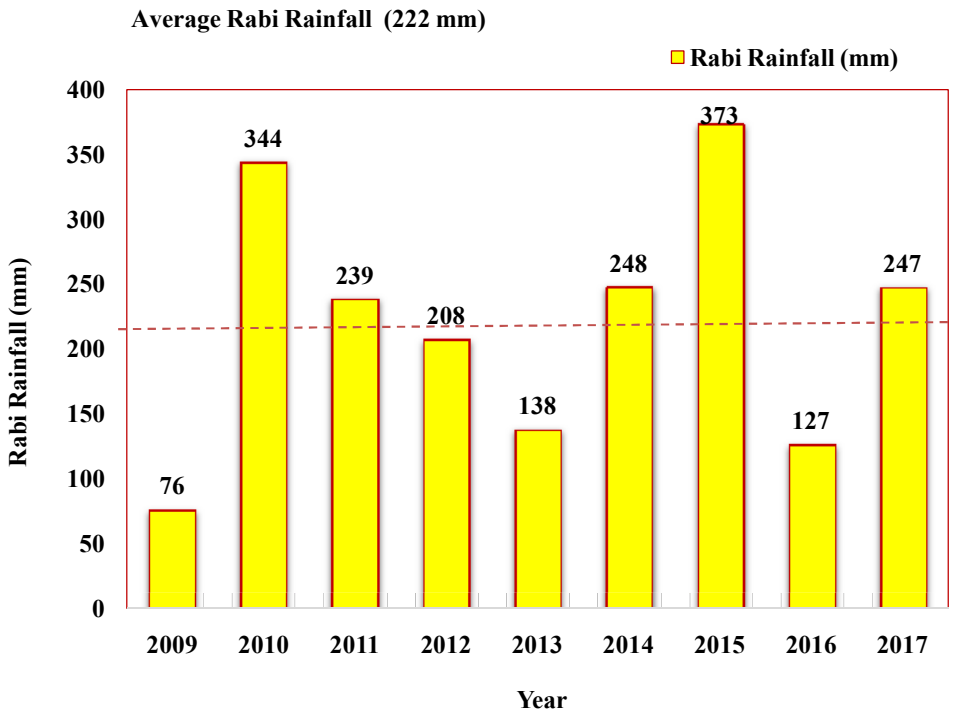
The average annual rainfall observed from the Uradigere rain gauge station found near to Maidalakere SWS in Tumkur taluk was 921.0 mm. 2009 (6.6%), 2011 (7.9%), 2012 (16.0%), 2013 (13.3%) and 2016 (19.7%) were recorded as deficient years during the period 2009-2017.

The *kharif* rainfall (June-Sept) is about 53.0% of the average annual rainfall and it typically follows the annual rainfall patterns.

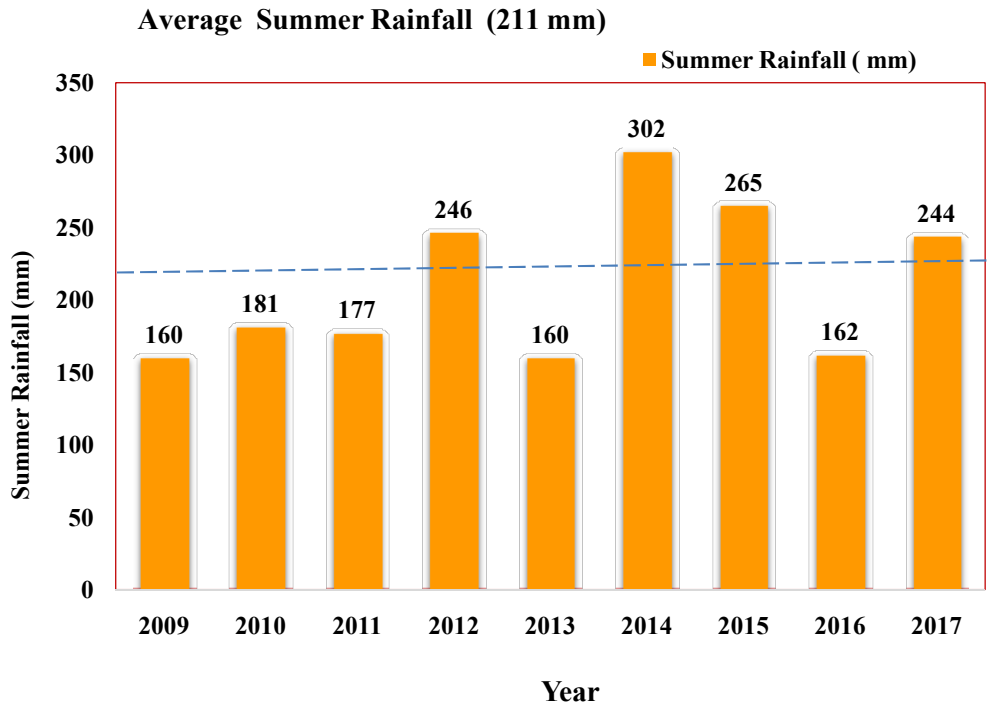
The years 2009 (21.7%), 2010 (23.4%), 2013 (2.5%), 2014 (7.8%) and 2017 (12.3%) had received excessive rainfall.



RAINFALL INDEX

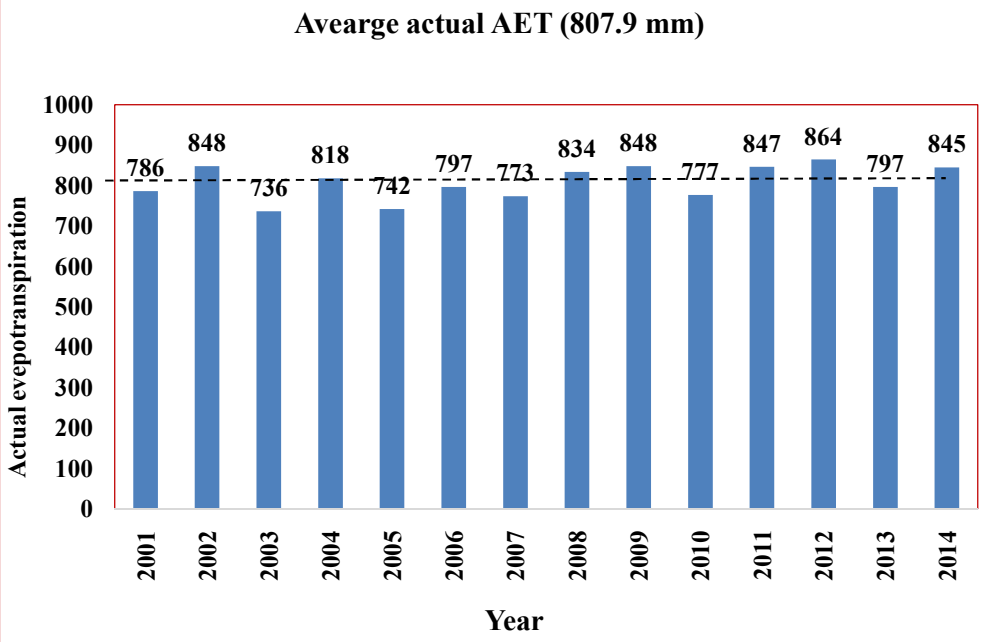


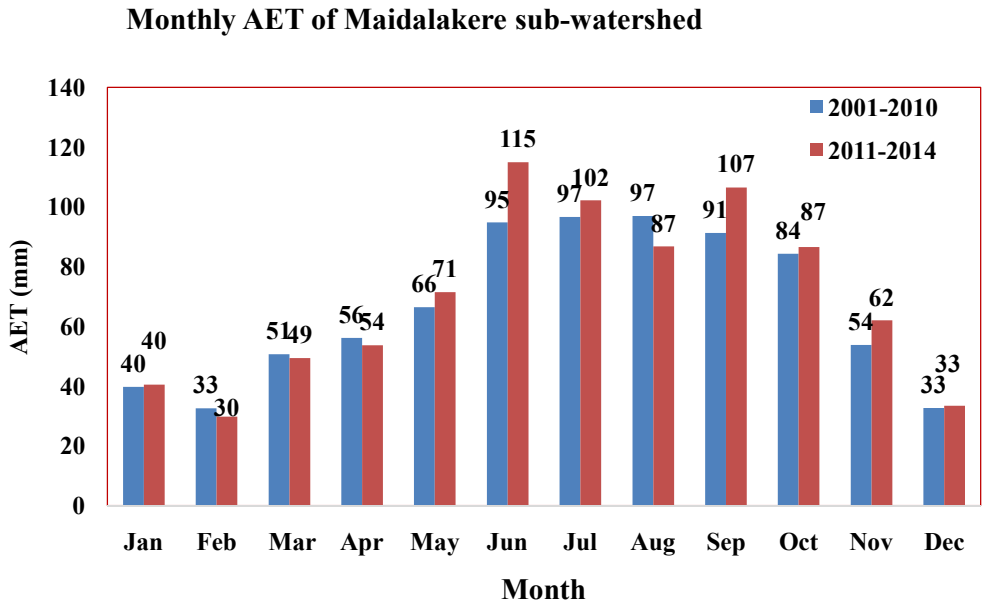
The *Rabi* rainfall (Oct-Jan) is about 24.1% of the annual rainfall. 2009 (65.7%) recorded lowest and 2015 (40.5%) year recorded high rainfall. Four years recorded low *Rabi rainfall*.

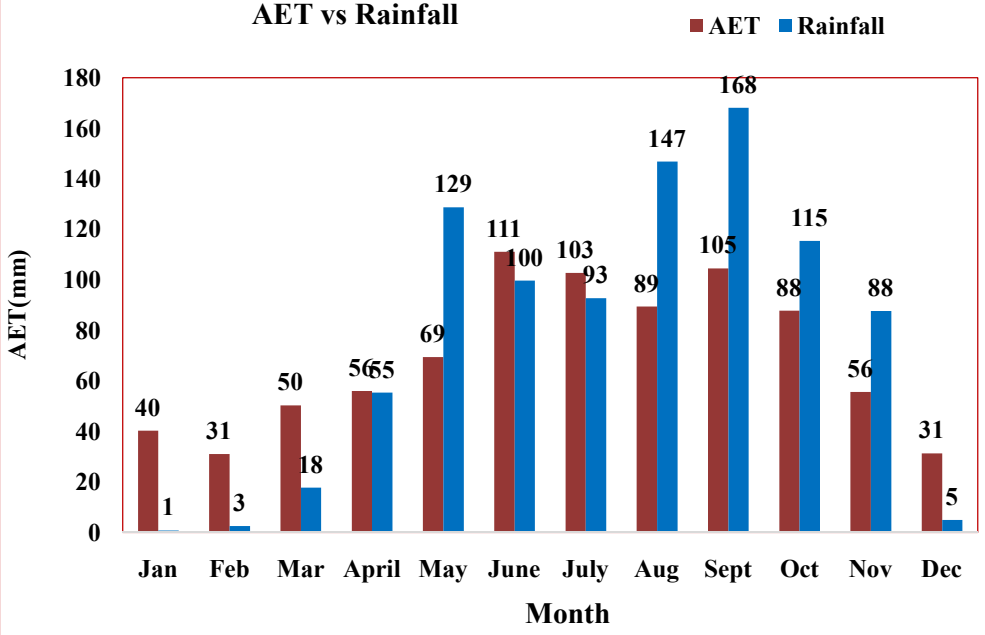


The *Summer* rainfall (Feb-May) is about 22.8% of the average annual rainfall. 2009, 2010, 2011, 2013 and 2016 found very low rainfall. While 2012, 2014, 2015 and 2017 years had received the higher rainfall than average.

EVAPOTRANSPIRATION

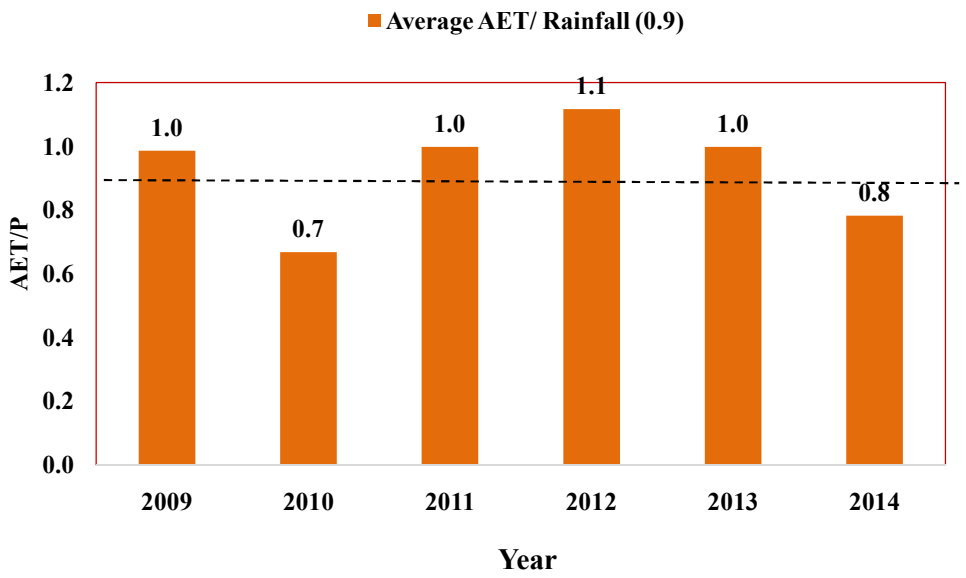


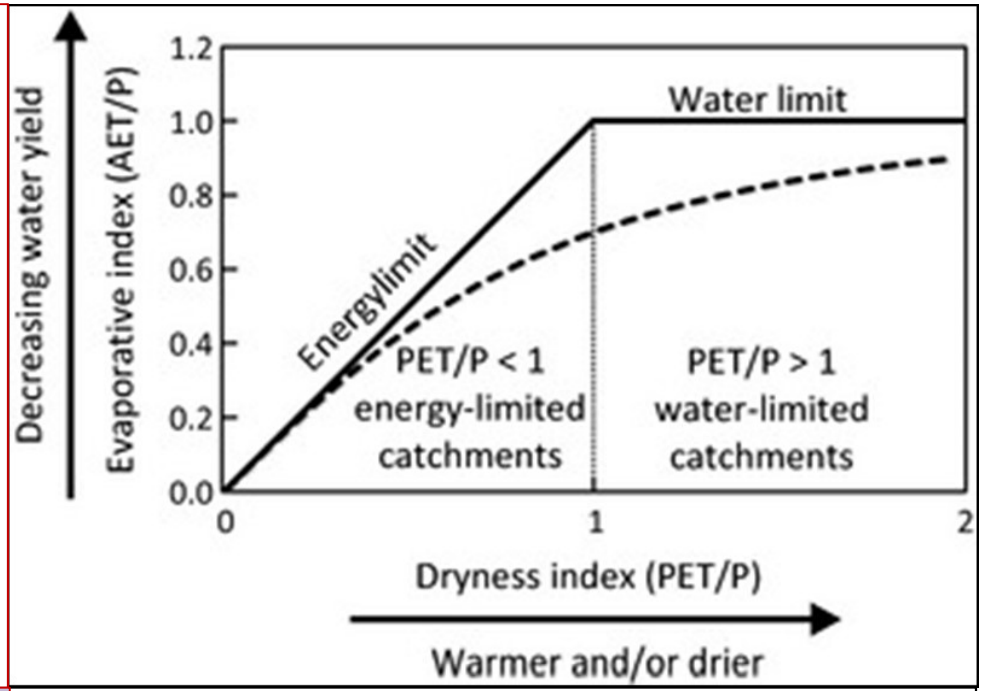


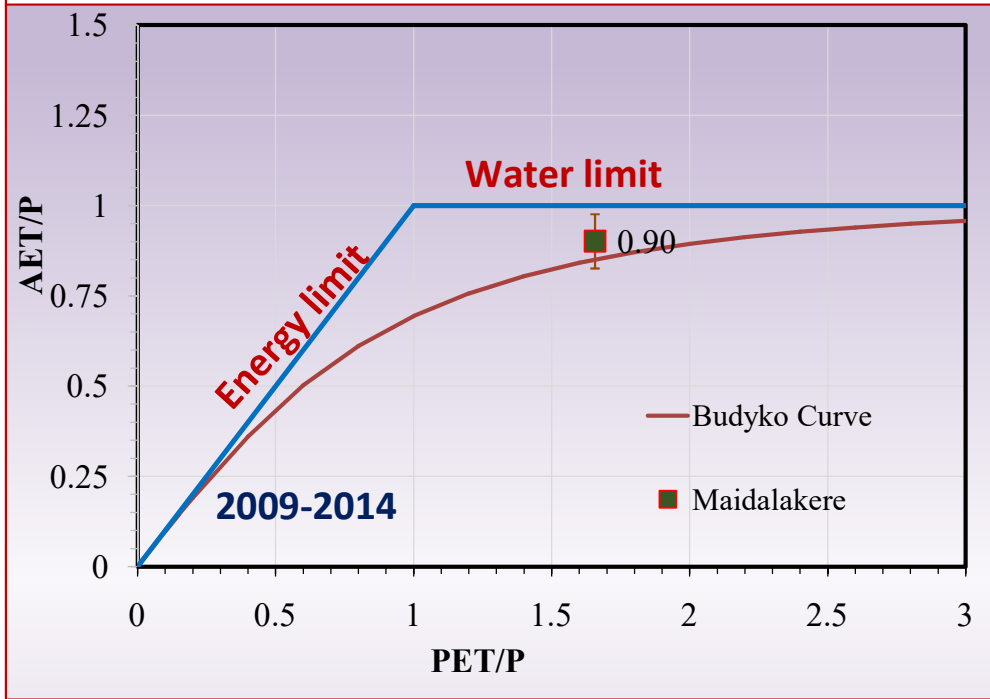


During 2009 to 2014 the average annual AET (829.4 mm) is lower than the average rainfall (920.4 mm). Hence runoff can occur in the watershed. It indicates to change the cropping pattern to maintain AET. During *Kharif*, average rainfall and AET found to be 507.3 mm and 407.7 mm respectively, whereas in *Rabi,* they were 208.7 mm and 215.0 mm. During May, August, September, October and November month AET is less than Rainfall.

EVAPOTRANSPIRATION INDEX MAP

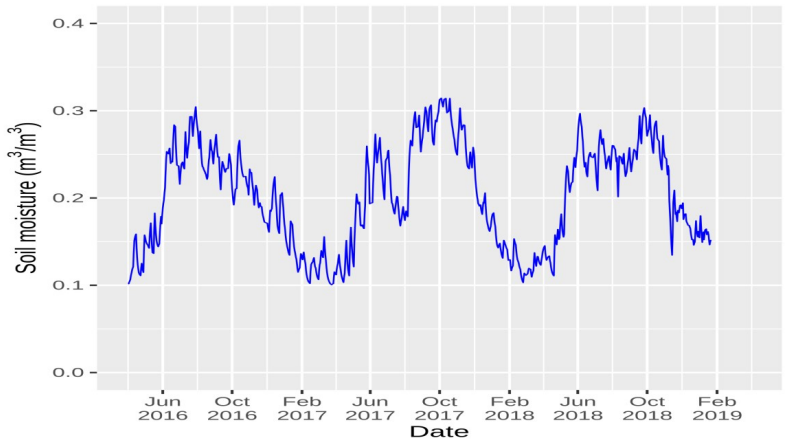




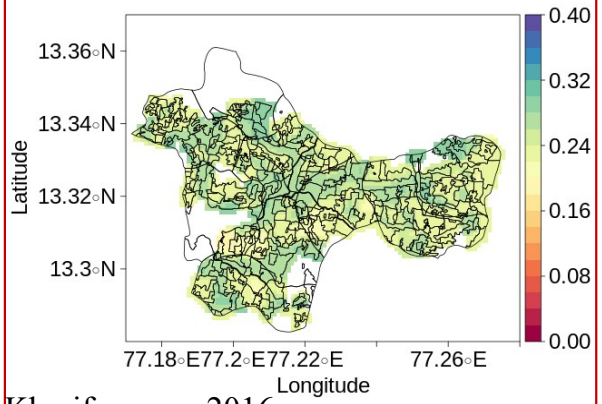


The AET/P suggests severe water deficit during 2010 and 2014. The location value (0.9) on budyko curve shows watershed comes under sustainable condition. The suggested crops would be Maize, Ragi, Arecanut, Coconut, Sorghum and Castor.

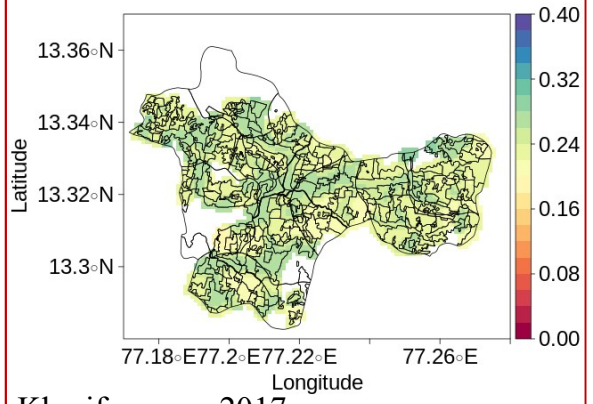
SATELLITE RETRIEVED SOIL MOISTURE



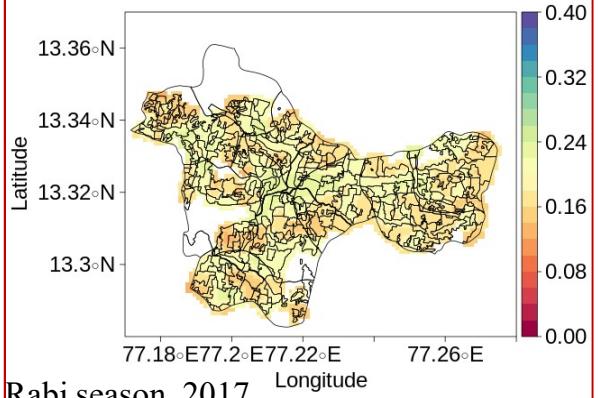
The method developed for retrieving soil moisture from multi-satellite observations helps to map surface soil moisture behavior in the micro-watershed. From June there is increase in soil moisture indicates onset of monsoon and sowing operation can be carried in this month, during November month soil moisture observation found to be decreasing indicates retrieval of monsoon harvesting operation can be carried for some of field crops.



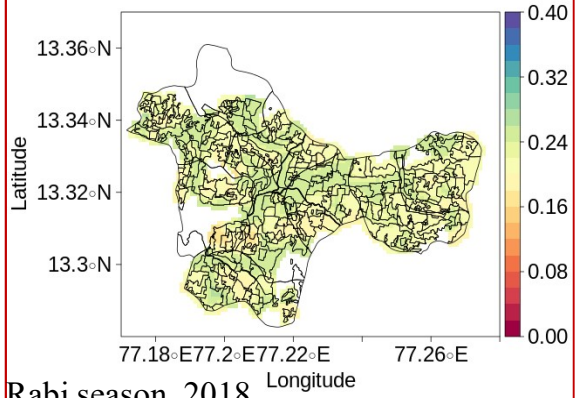
Kharif season, 2016



Kharif season, 2017

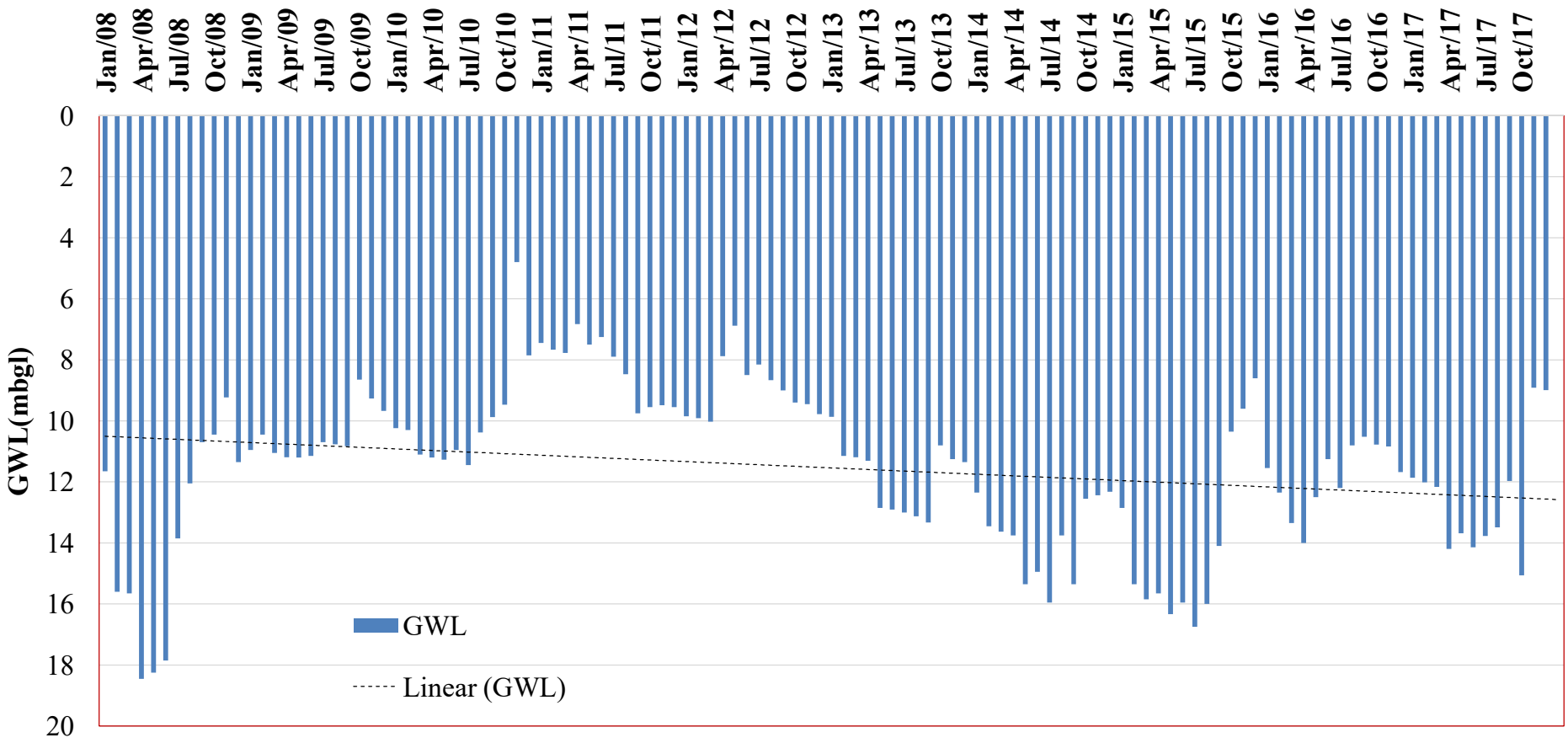


Rabi season, 2017



Rabi season, 2018

GROUNDWATER STATUS

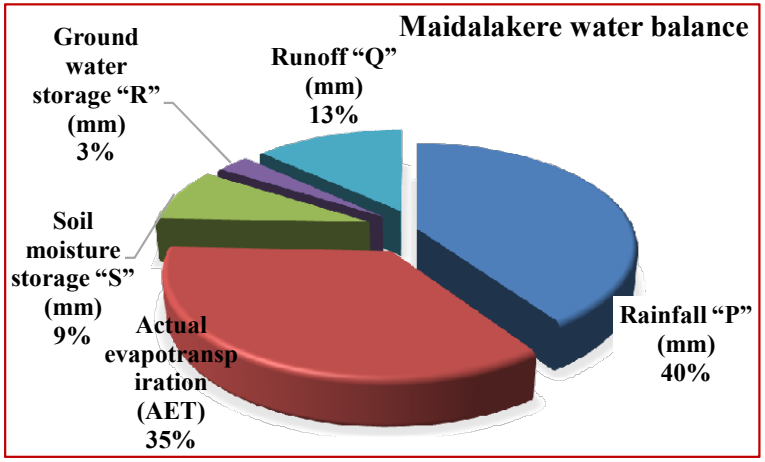


The borewells in Hirehalli representing Maidalakere sub watershed groundwater status. Based on available data obtained from Department of mines and geology (DMG). There was falling trend of depth to water table in the watershed during 2008 to 2017, as these years were lower rainfall years and indicates utilization of groundwater to buffer the lower rainfall years. Moreover, the groundwater use is relatively higher and there is scope to reduce the use by utilizing the marginally under-utilized runoff through harvesting and conservation practices.

WATER BUDGET

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

1	Rainfall "P" (mm)	921.0
2	Actual evapotranspiration (AET)	807.9
3	Soil moisture storage "S" (mm)	192.1
4	Ground water Recharge "R" (mm)	64.5
5	Runoff "Q" (mm)	300.3



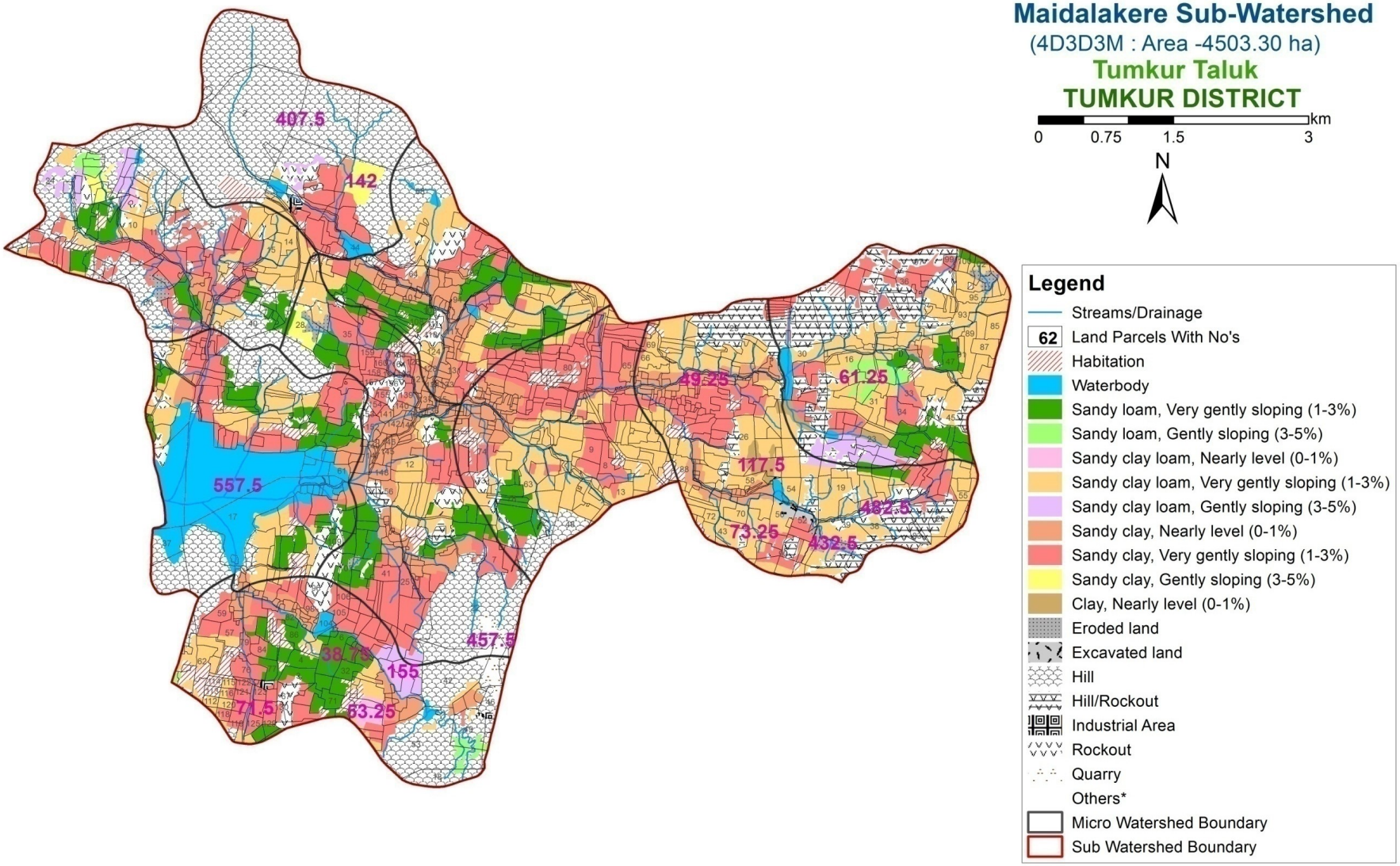
During May, August, September, October and November months the Precipitation is higher than Evapotranspiration. Hence, Runoff (300.3 mm) can occur in the watershed.

Runoff distribution in SWS

Sl. No	Particulars	Runoff distribution (mm)
1	Rainfall (2015)	980.0
2	Runoff availability with existing conditions	300.3
3	Runoff availability with effective interventions	216.3
4	Runoff excess for harvesting by construction of structures	173.0
5	Runoff allowed as environmental flow at the outlet	43.3

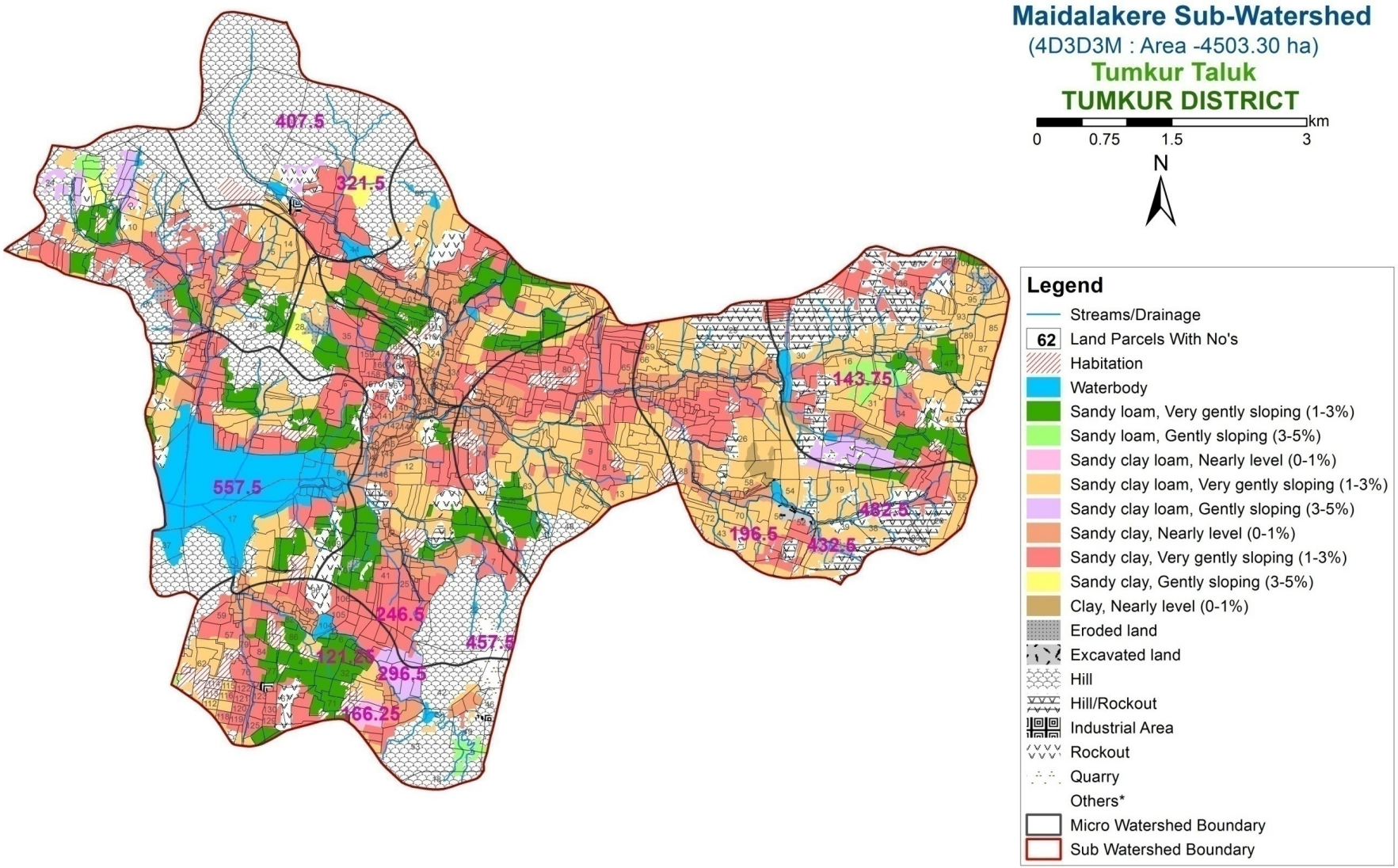
RUNOFF

Mapping unit wise runoff availability with effective interventions and due to 980 mm (Average) rainfall during 2015.



RUNOFF

Mapping unit wise runoff availability with Existing conditions and due to 980 mm (Average) rainfall during 2015.



SUMMARY

- The average annual rainfall of 921.0 mm in the Maidalakere Sub-watershed as recorded from the Uradigere Station data.

- 53.0 percent, 24.1 percent and 22.8 percent of the annual rainfall occurs during *Kharif*, *Rabi* and *Summer* seasons respectively and exhibited a higher temporal variability.

- The evapotranspiration estimated indicates that the watershed water balance is in sustainable condition.

- The estimated runoff available to use is 173.0 mm for an average annual rainfall of 921.0 mm (2009-2017). The utilizable groundwater is 45.1 mm (70% of 68.6 mm recharge estimated). This means the total available water resource combining the soil moisture store for *Kharif* & *Rabi* (192.1 mm) and utilizable runoff plus recharge is 410.2 (= 192.1+173.0+ 45.1).

- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the *Kharif* and *Rabi* seasons is 602.2 mm. Hence the amount of water use for *Kharif* and *Rabi* seasons may be estimated as 752.8 mm (i.e 125% of AET). This demand for the two seasons is higher by 342.5 mm. The AET in June-Sept months is only 42.1% of rainfall. Hence, there is a good opportunity to harvest the excess water through watershed management practices for utilizing during *Rabi* season.

- The total number of borewells present in Maidalakere Sub-watershed as per LRI data is 136. The groundwater level depicts deep groundwater (5-19 m) during the years 2008-2017.