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

Sujala – III

- Karnataka Watershed Development Project- II
Funded by World Bank



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

About ICAR - NBSS&LUP

The National Bureau of Soil Survey and Land Use Planning (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 optimising 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 Matki Sub-watershed for Watershed Planning and Development Aland Taluk, Kalaburagi District, Karnataka (AESR 6.2)

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How to read and use the Atlas

The Land Resource Inventory of Matki Sub-watershed (Aland Taluk, Gulbarga District) for Watershed Planning (AESR 6.2) was undertaken to provide comprehensive site-specific cadastral level information useful for farm level planning and integrated development of the area under Sujala – III, Karnataka Watershed Development Project- II.

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

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

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

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

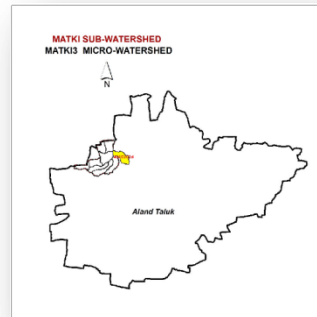
For easy map reading and understanding the information contain in different maps, the physical, cultural and scientific symbols used in the maps are illustrated in the form of colors, graphics and tables.

Physical, Cultural and Scientific symbols used in the Atlas

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

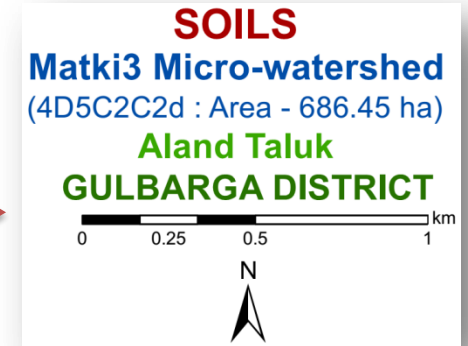
Inset map

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



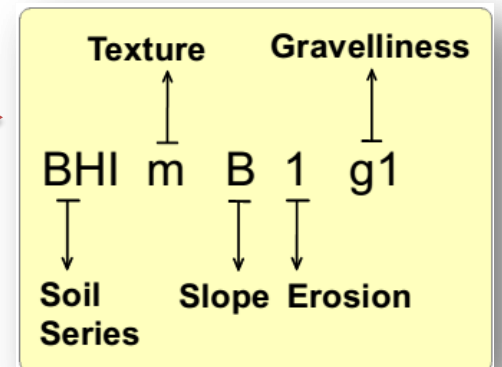
Legends and symbols

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 enables one to go to the legends to obtain the required information.

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

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, MGTIB2g2	4 (0.53)
2, MGTIC3g3	18 (2.62)
3, MGTID3g3	14 (2.08)
4, MGTmA1	8 (1.14)
5, MGTmB1	66 (9.56)
6, MGTmB1g1	18 (2.58)
7, MGTmB1g2	20 (2.89)
8, MGTmB2g1	50 (7.28)
9, MGTmB2g2	31 (4.53)
10, MGTmC3g1	6 (0.84)
11, MGTmC3g2	15 (2.13)
12, MGTmC3g3	17 (2.48)
13, BHImB1	16 (2.37)
14, BHImB1g1	130 (18.99)
15, BHImB1g2	11 (1.55)
16, KGIImB2g2	23 (3.38)
17, NHAmB1g1	33 (4.84)
18, NHAmB2g1	4 (0.52)
19, GTTmB1	46 (6.74)
20, GTTmB1g1	9 (1.38)
21, GTTmB2	6 (0.91)
22, KMPmB1	9 (1.38)
23, KMPmB1g1	16 (2.36)
24, RNLMB1	89 (12.99)
25, Others*	27 (3.92)

Land Management Units (LMU)

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

LMU	Area in ha (%)
LMU-1	70 (10.14)
LMU-2	196 (28.52)
LMU-3	217 (31.64)
LMU-4	88 (12.77)
LMU-5	89 (12.99)
Others*	27 (3.92)

Map key

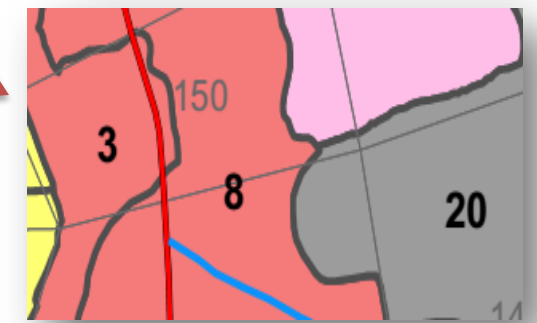
There are many thematic types to be differentiated on the map solely based on colour. Therefore soils and suitability types and their limitations are distinguished by colours with a combination of alpha-numeric characters.

KEY	
TEXTURE	
i	- Sandy clay
m	- Clay
SLOPE	
A	- Nearly level (0-1%)
B	- Very gently sloping (1-3%)
C	- Gently sloping (3-5%)
D	- Moderately sloping (5-10%)
EROSION	
1	- Slight
2	- Moderate
3	- Severe
GRAVELLINESS	
g0	- Non gravelly (<15%)
g1	- Gravelly (15-35%)
g2	- Very gravelly (35-60%)
g3	- Extremely gravelly (60-80%)
DEPTH	
MGT	- Very shallow (<25 cm)
BHI, KGI, NHA	- Shallow (25-50 cm)
GTT	- Moderately shallow (50-75 cm)
KMP	- Moderately deep (75-100 cm)
RNL	- Deep (100-150 cm)

Key	
S1	- Highly Suitable
S2	- Moderately Suitable
S3	- Marginally Suitable
N	- Not Suitable
Limitations	
g	- gravelliness
r	- rooting condition

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.



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.

Gulbarga popularly known as Kalaburgi is located in the Northern part of the state and lies between 17° 35' and 17° 45' North latitude and between 76° 10' and 77° 45' east longitude. The district is biggest district in the state covering 8.49 % of the area. It has Bijapur district and Sholapur district of Maharashtra on the West, Bidar district and Osmanabad district of Maharashtra on the North, Raichur district on the South. The district has total geographical area of 16174 sq. kms. Major food crops grown in the district are pigeon pea, sorghum, bajra, and paddy. Commercial crops are sugarcane and cotton. Oilseed crops are groundnut and sunflower. The district economy is dominantly agricultural and nearly 75 per cent of population living in the rural areas are dependent on agriculture. Major geology in the district comprise of Deccan trap (basalt), followed by limestone. Laterite and shale were also noticed in patches.

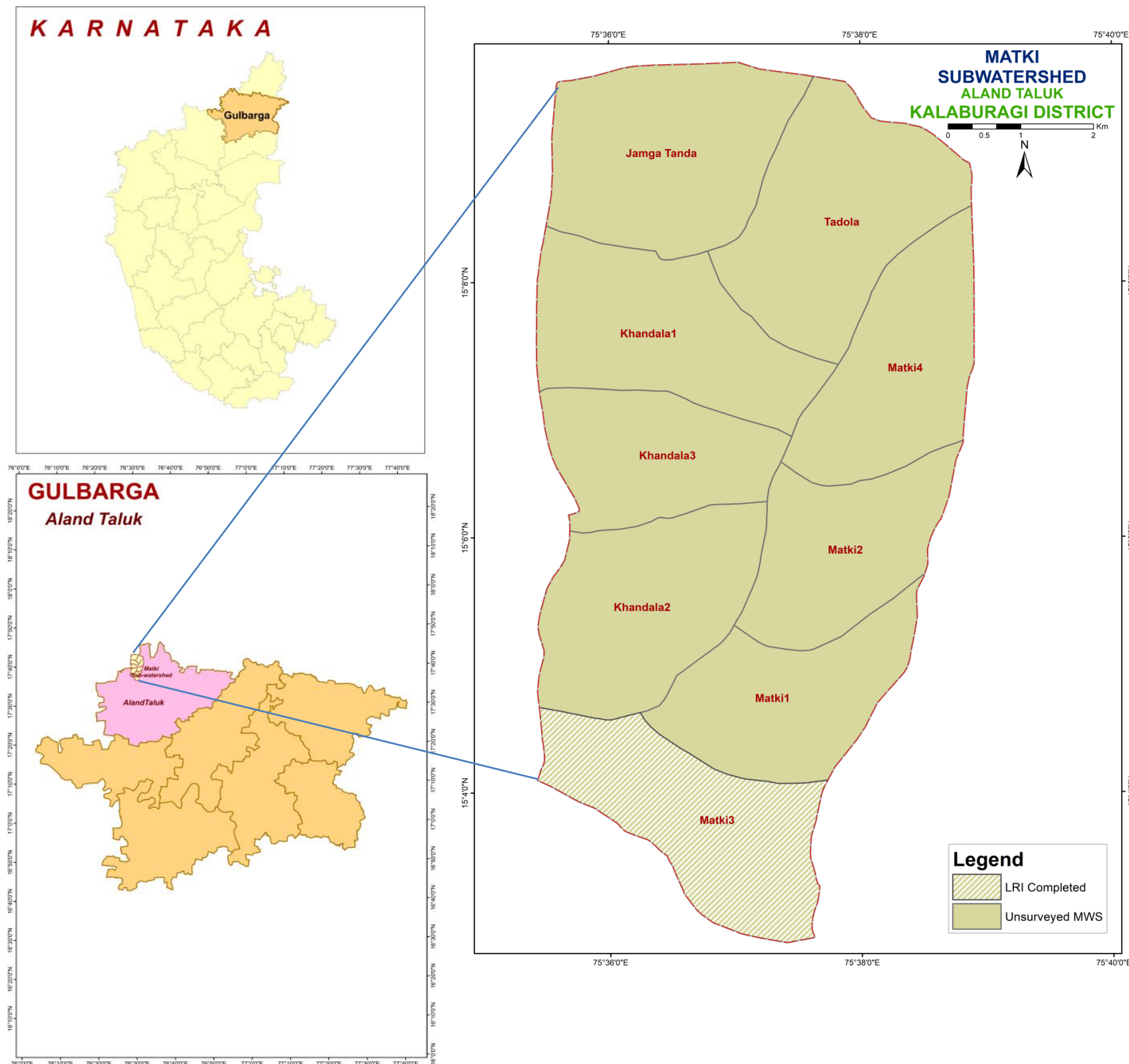
As a pilot study, **ICAR- NBSSLUP, Bangalore** carried out the generation of LRI for the Matki-3 micro-watershed, Matki sub-watershed in Aland taluk, Gulbarga district. It was selected for data base generation under batch V of Sujala III project. This sub-watershed encompasses of 9 MWs namely, Jamga Tanda (4D5C2C1a), Tadola (4D5C2C1b), Matki-4 (4D5C2C2a), Khandala-1 (4D5C2C1c), Khandala-3 (4D5C2C1d), Matki-2 (4D5C2C2b), Khandala-2 (4D5C2C1e), Matki-1 (4D5C2C2c) and Matki-3 (4D5C2C2d) micro watersheds. Land Resource Inventory (LRI) was generated for one micro-watershed (Matki 3 - 4D5C2C2d) among the nine micro-watersheds.

The major landforms identified in the micro-watershed (Matki 3 - 4D5C2C2d) of Matki 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 Matki 3 (4D5C2C2d) micro-watershed in the Matki sub-watershed during February-March 2015 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.

LOCATION AND EXTENT

LOCATION MAP OF MATKI SUB-WATERSHED



Matki sub-watershed (Aland taluk, Kalaburagi district) is located between $17^{\circ}36'24''$ – $17^{\circ}42'33''$ North latitudes and $76^{\circ}27'49''$ – $76^{\circ}33'32''$ East longitudes, covering an area of about 5730.52 ha.

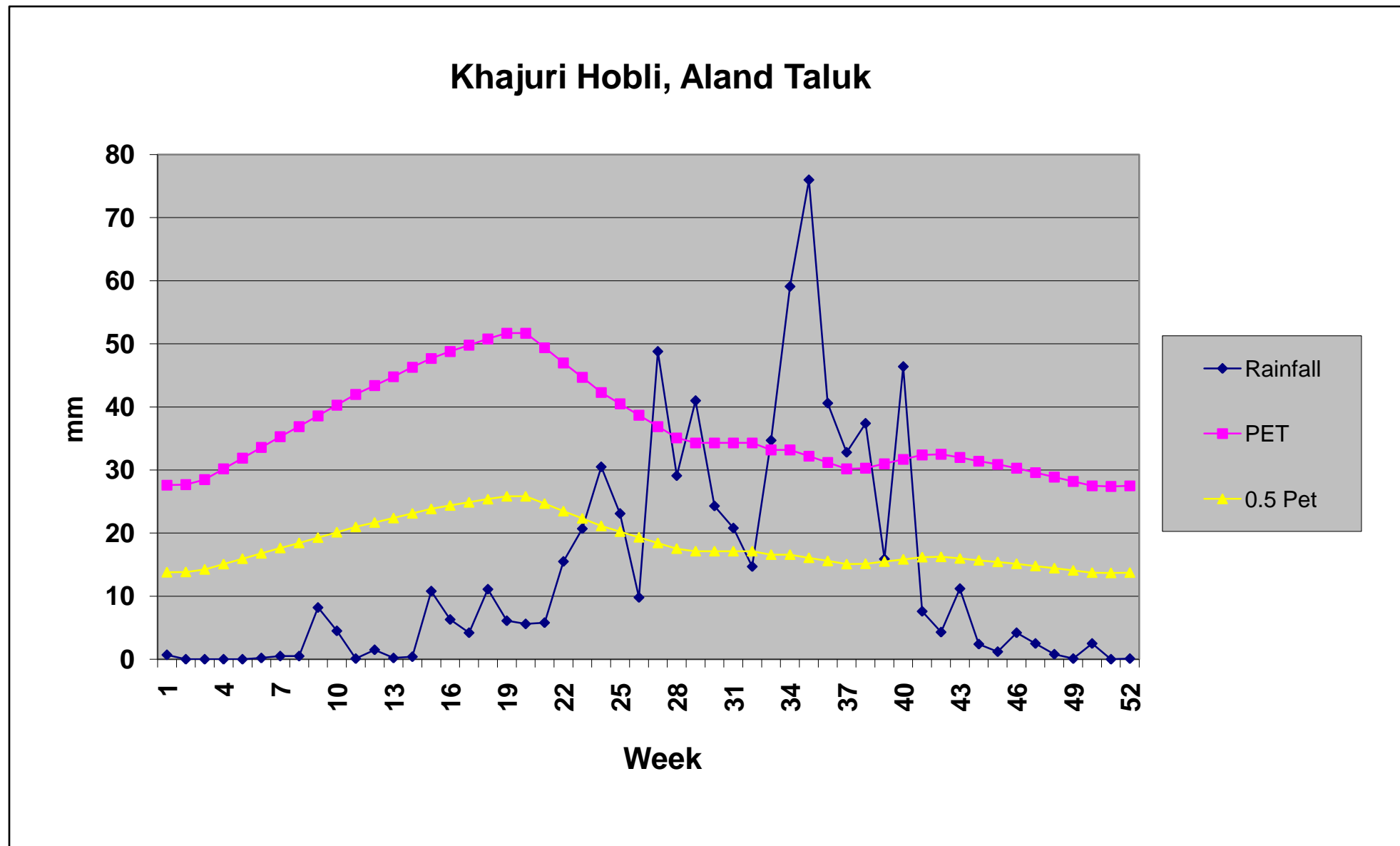
The Matki-3 micro-watershed (Matki sub-watershed, Aland taluk, Gulbarga district) is located in between $17^{\circ}36'24''$ – $17^{\circ}42'33''$ North latitudes and $76^{\circ}27'49''$ – $76^{\circ}33'32''$ East longitudes, covering an area of about 686.45 ha, bounded by Nirgudi, Padasavali, Tirth and Hubli villages.

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

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

NOTE: In this Sub-Watershed, Land Resource Inventory (LRI) was generated for one micro-watershed (Matki 3 - 4D5C2C2d) among the nine micro-watersheds.

Climate



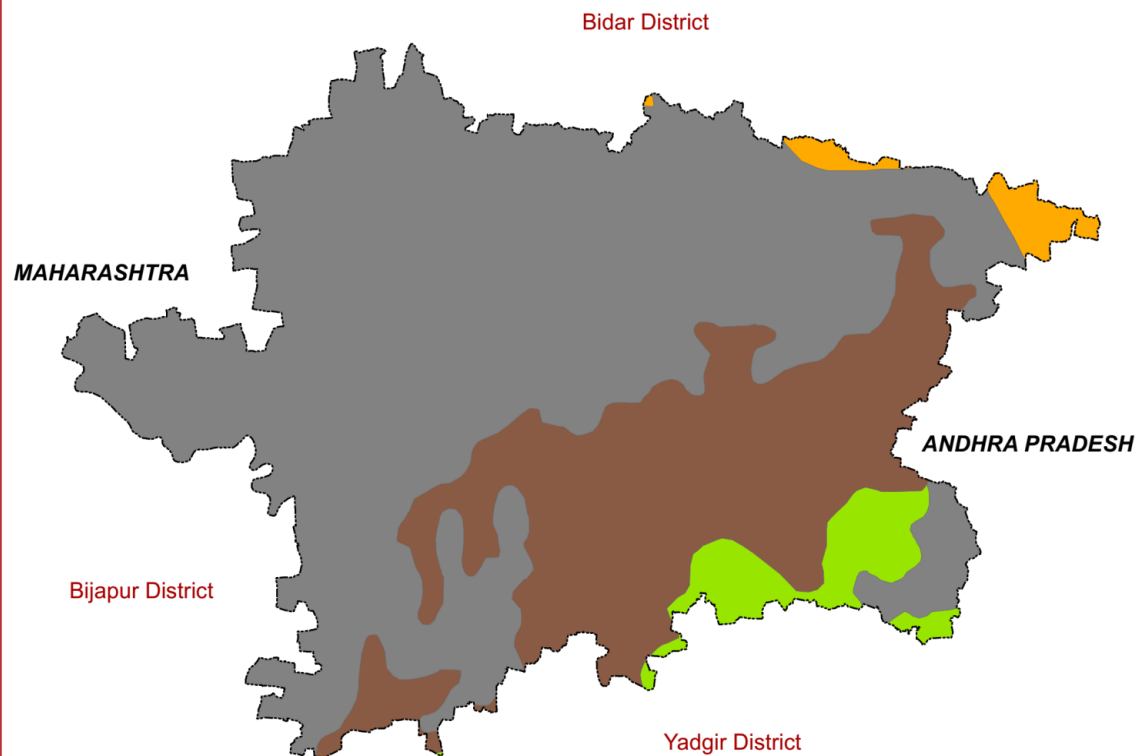
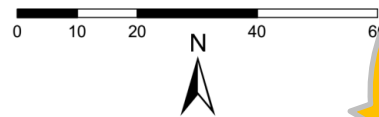
Length of Growing Period (LGP) is varying from June 2nd Week to 1st week of October (120-150 days)

Annual Rainfall : 725 mm. in the Aland taluk, Gulbarga district

Source: KSNMDC (1980-2011)

Geology

GEOLOGY GULBARGA DISTRICT

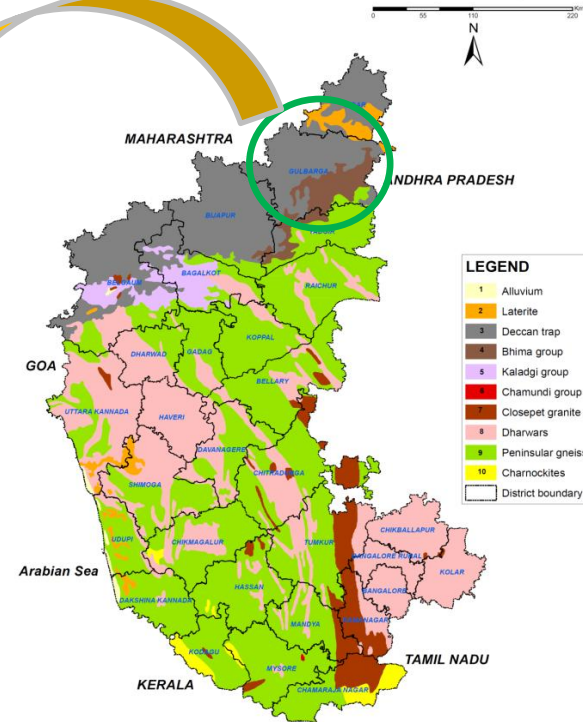


LEGEND

- 2 Laterite
- 3 Deccan trap
- 4 Bhima group
- 9 Peninsular gneiss

Source: Geological Survey of India, 1981

GEOLOGY KARNATAKA STATE



Source: Geological Survey of India, 1981.

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, late Cretaceous 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 - GULBARGA DISTRICT

Cainozoic Group

The Palaeocene and Recent formations of Karnataka are the laterites and alluvium of marine and riverine origin

Laterite: Laterite is a porous, pitted, clay-like rock with yellow, red, brown, grey and mottled colours, and is composed mainly of hydrated oxides of iron and aluminium.

Mesozoic Group

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

Deccan Trap: The Deccan Trap covers the whole of Bidar district, and parts of Gulbarga, Bijapur and Belgaum districts, occupying an area of 25,000 sq. km.

Upper Proterozoic Group

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

Bhima series: This series, equivalent to the Kurnool formations, is named after the Bhima river and occurs in Bijapur and Gulbarga districts.

Archaean Group

The important formations of this group are Peninsular Gneiss, Dharwar schists, and Charnockites.

Peninsular Gneiss: Exposed over a large area of Karnataka in all the districts except Bidar is the Peninsular Gneiss which includes granites of all shades with varying composition.

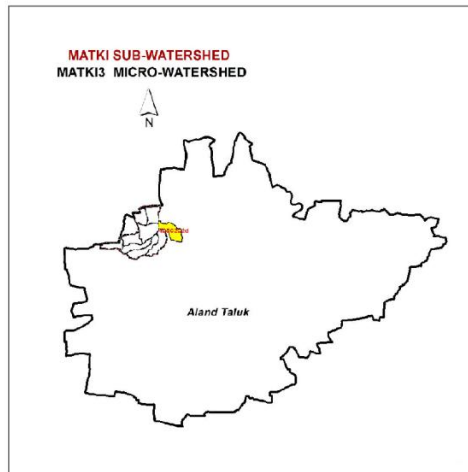
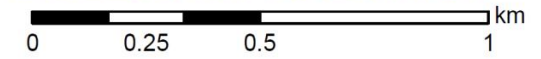
SURVEY METHODOLOGY

Sequence of activities in generation of LRI

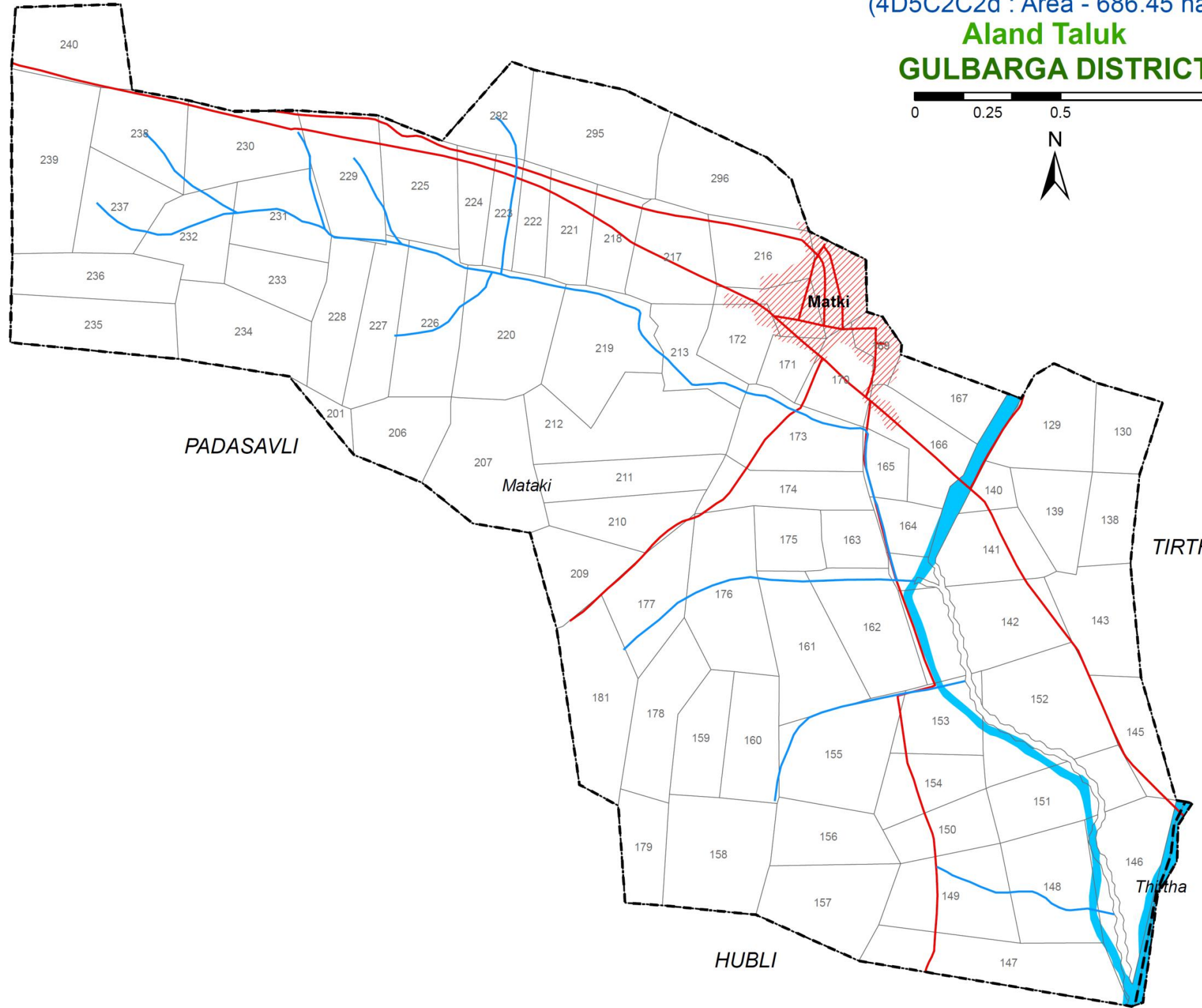
- Traversing the watershed using cadastral maps and imagery as base
- Identifying landforms, geology, land use and other features
- Selecting fields representing land units
- Opening profiles to 2 m depth
- Studying soil and site characteristics
- Grouping similar areas based on their soil-site characteristics 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 (250m 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.








Matki3 Micro-watershed
 (4D5C2C2d : Area - 686.45 ha)
Aland Taluk
GULBARGA DISTRICT



NIRGUDI



References

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

Source: ICAR-NBSS&LUP, Bengaluru

SATELLITE IMAGE
Matki3 Micro-watershed
 (4D5C2C2d : Area - 686.45 ha)
Aland Taluk
GULBARGA DISTRICT

0 0.25 0.5 1 km



NIRGUDI

MATKI

Matki

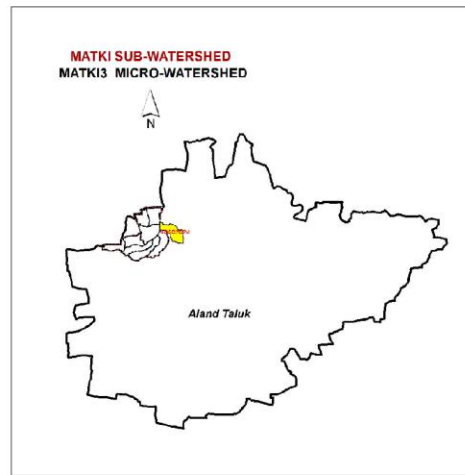
Mataki

TIRTH

Thirtha

PADASAVLI

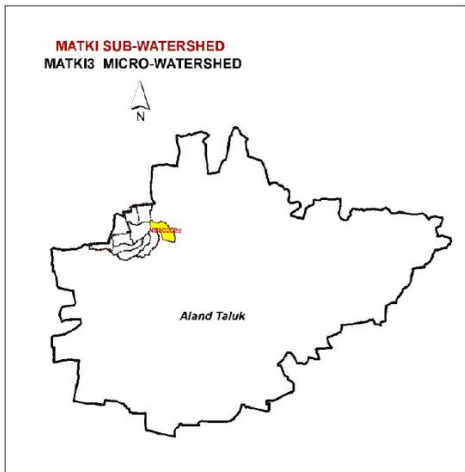
HUBLI



References

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

Source: ICAR-NBSS&LUP, Bengaluru



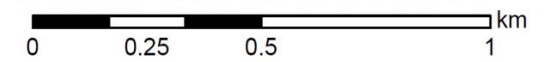
CURRENT LANDUSE (2014)

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

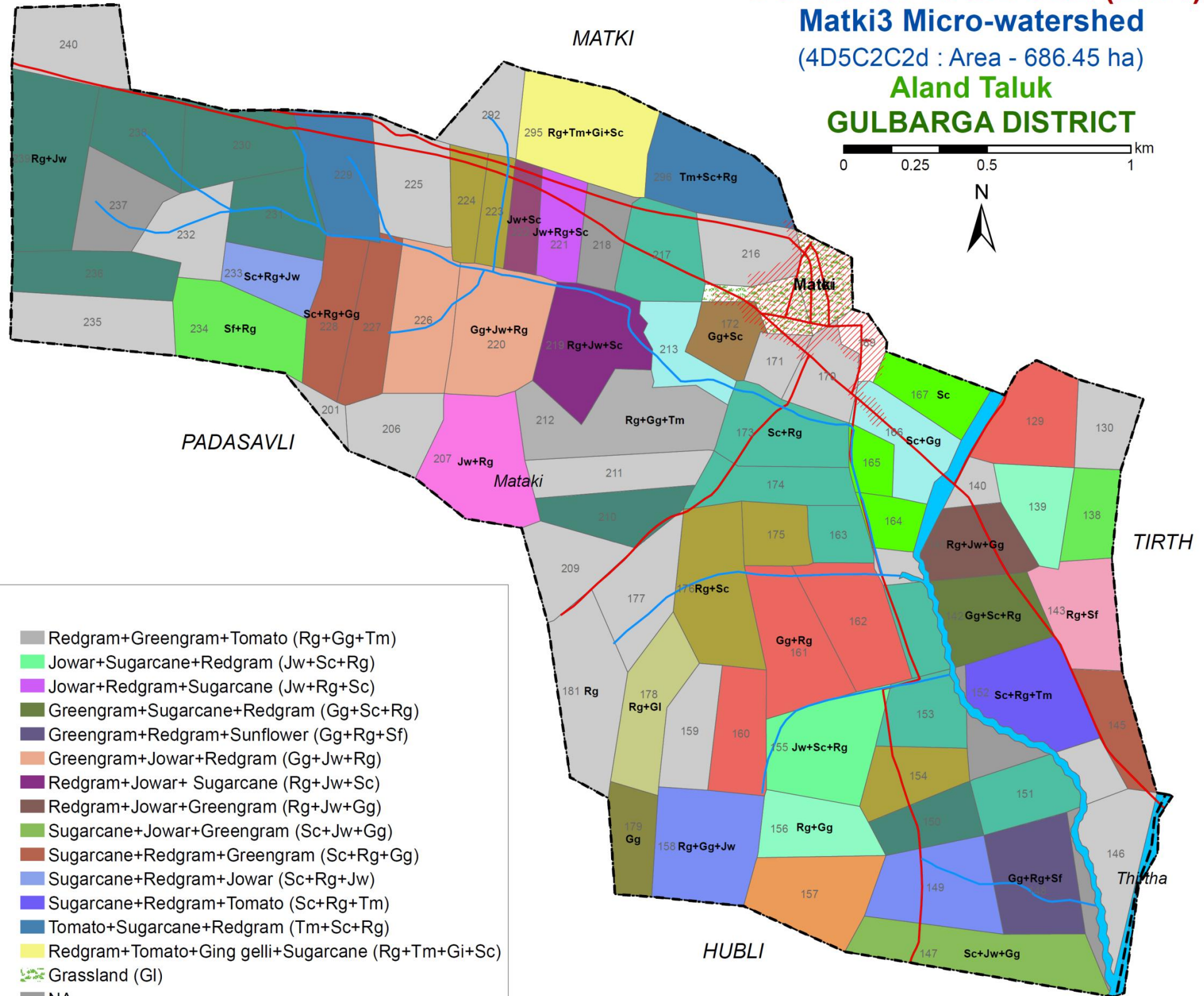
Aland Taluk

GULBARGA DISTRICT



NIRGUDI

MATKI



References

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

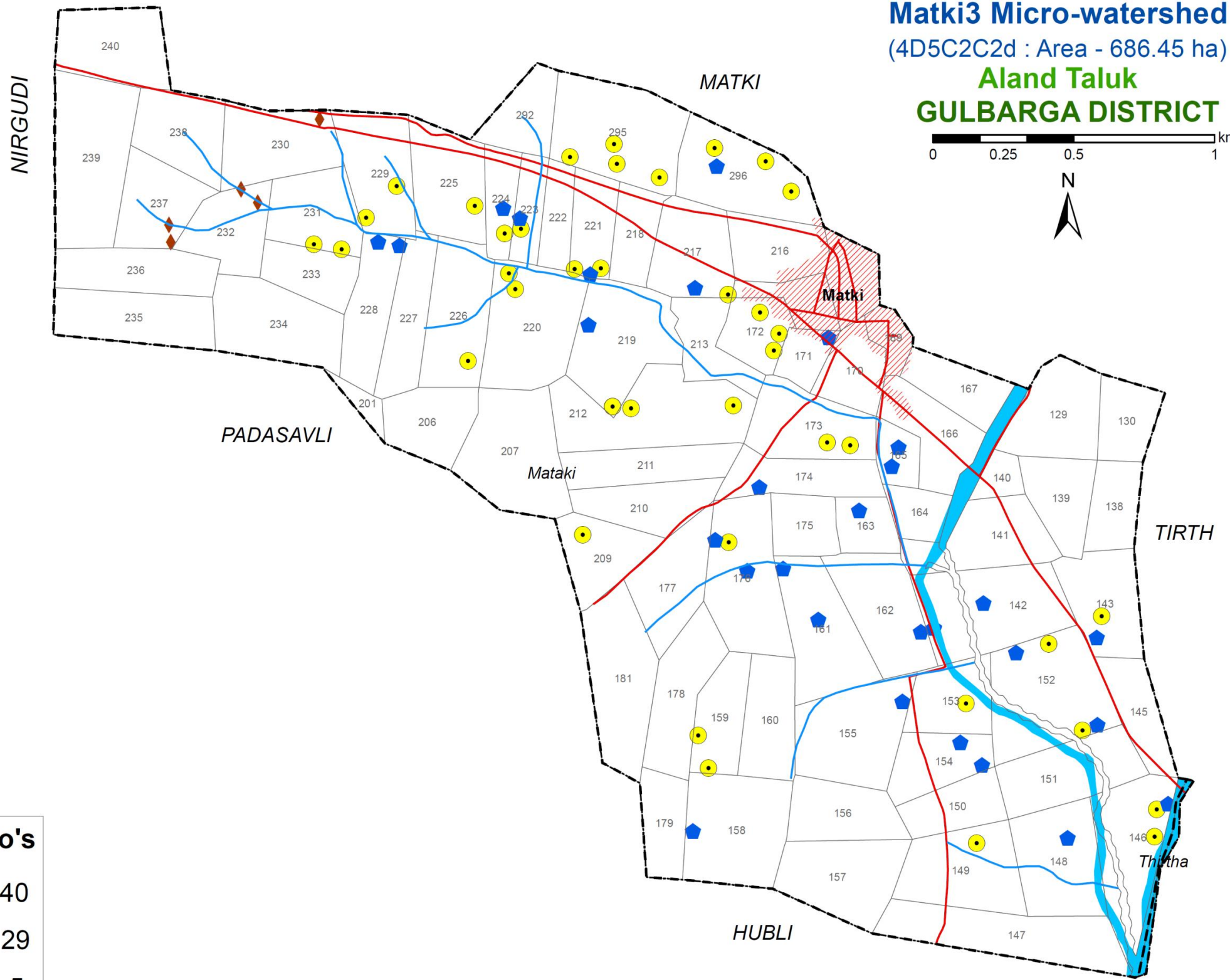
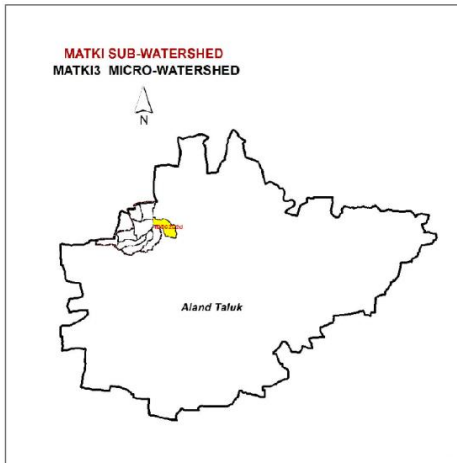
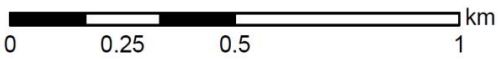
Current Landuse

- | | |
|------------------------------------|---|
| Greengram (Gg) | Redgram+Greengram+Tomato (Rg+Gg+Tm) |
| Redgram (Rg) | Jowar+Sugarcane+Redgram (Jw+Sc+Rg) |
| Sugarcane (Sc) | Jowar+Redgram+Sugarcane (Jw+Rg+Sc) |
| Greengram+Redgram (Gg+Rg) | Greengram+Sugarcane+Redgram (Gg+Sc+Rg) |
| Greengram+Redgram (Gg+Rg) | Greengram+Redgram+Sunflower (Gg+Rg+Sf) |
| Greengram+Sugarcane (Gg+Sc) | Greengram+Jowar+Redgram (Gg+Jw+Rg) |
| Jowar+Redgram (Jw+Rg) | Redgram+Jowar+ Sugarcane (Rg+Jw+Sc) |
| Jowar+Sugarcane (Jw+Sc) | Redgram+Jowar+Greengram (Rg+Jw+Gg) |
| Redgram+Grassland (Rg+Gl) | Sugarcane+Jowar+Greengram (Sc+Jw+Gg) |
| Redgram+Greengram (Rg+Gg) | Sugarcane+Redgram+Greengram (Sc+Rg+Gg) |
| Sunflower+Redgram (Sf+Rg) | Sugarcane+Redgram+Jowar (Sc+Rg+Jw) |
| Redgram+Jowar (Rg+Jw) | Sugarcane+Redgram+Tomato (Sc+Rg+Tm) |
| Redgram+Sugarcane (Rg+Sc) | Tomato+Sugarcane+Redgram (Tm+Sc+Rg) |
| Redgram+Sunflower (Rg+Sf) | Redgram+Tomato+Ging gelli+Sugarcane (Rg+Tm+Gi+Sc) |
| Sugarcane+Greengram (Sc+Gg) | Grassland (Gl) |
| Sugarcane+Redgram (Sc+Rg) | NA |
| Redgram+Greengram+Jowar (Rg+Gg+Jw) | Others* |

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

LOCATION OF WELLS
Matki3 Micro-watershed
 (4D5C2C2d : Area - 686.45 ha)
Aland Taluk
GULBARGA DISTRICT



- References**
- Stream/Drainage
 - Road/Cart track
 - Habitation
 - Waterbody
 - Land parcel with No's
 - Village boundary
 - Micro-watershed boundary

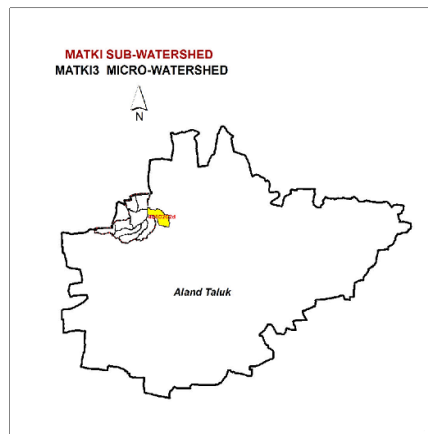
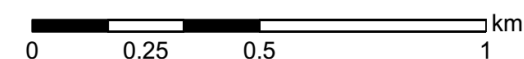
Legend		No's
	Borewell	40
	Openwell	29
	Checkdam	5

Source: ICAR-NBSS&LUP, Bengaluru

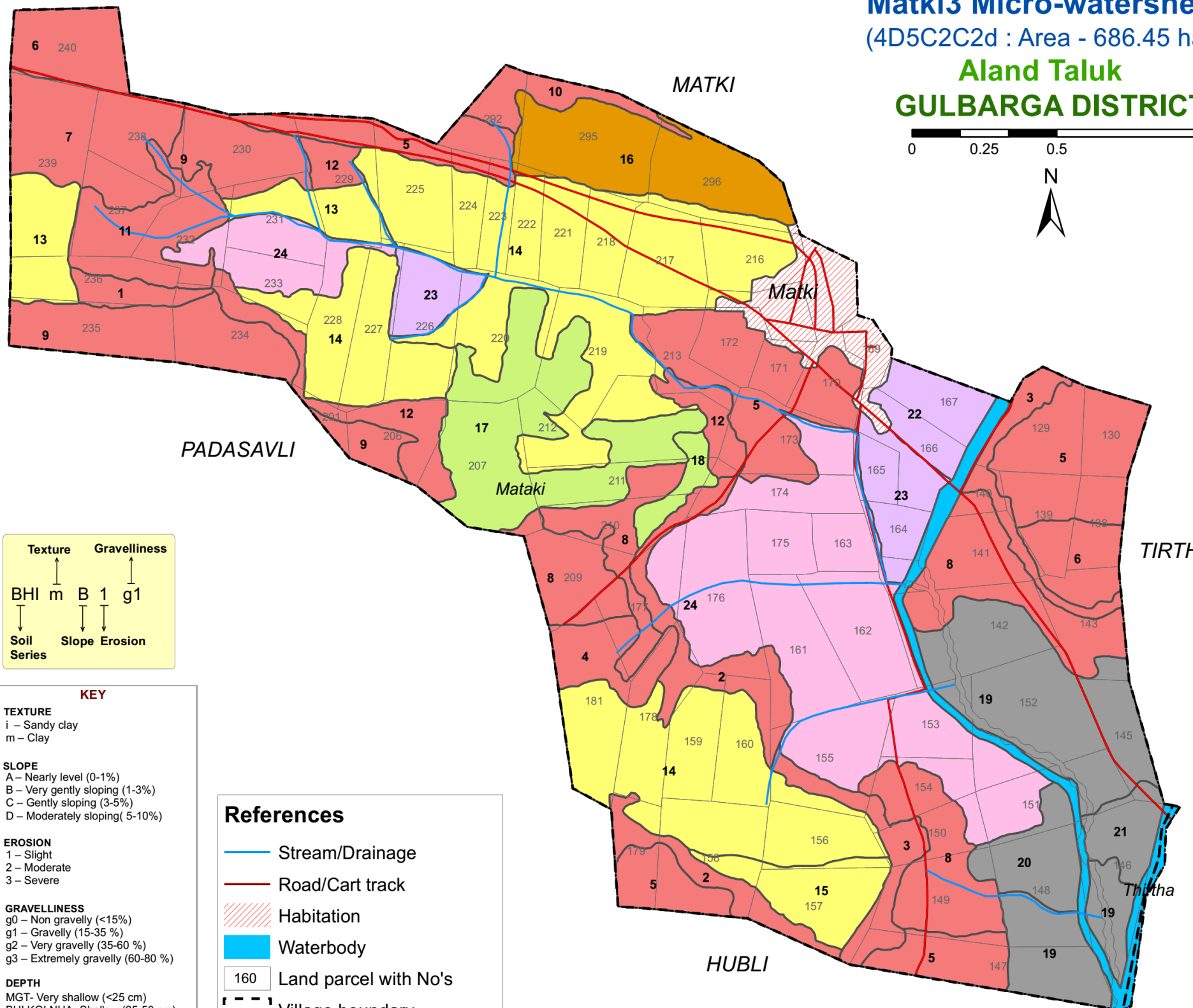
SOILS

Matki3 Micro-watershed
(4D5C2C2d : Area - 686.45 ha)

Aland Taluk
GULBARGA DISTRICT

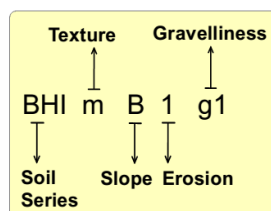


NIRGUDI



Soil Phases Area in ha (%)

1, MGTiB2g2	4 (0.53)
2, MGTiC3g3	18 (2.62)
3, MGTiD3g3	14 (2.08)
4, MGTmA1	8 (1.14)
5, MGTmB1	66 (9.56)
6, MGTmB1g1	18 (2.58)
7, MGTmB1g2	20 (2.89)
8, MGTmB2g1	50 (7.28)
9, MGTmB2g2	31 (4.53)
10, MGTmC3g1	6 (0.84)
11, MGTmC3g2	15 (2.13)
12, MGTmC3g3	17 (2.48)
13, BHImB1	16 (2.37)
14, BHImB1g1	130 (18.99)
15, BHImB1g2	11 (1.55)
16, KGImB2g2	23 (3.38)
17, NHAmB1g1	33 (4.84)
18, NHAmB2g1	4 (0.52)
19, GTTmB1	46 (6.74)
20, GTTmB1g1	9 (1.38)
21, GTTmB2	6 (0.91)
22, KMPmB1	9 (1.38)
23, KMPmB1g1	16 (2.36)
24, RNLmB1	89 (12.99)
25, Others*	27 (3.92)



KEY

TEXTURE
i - Sandy clay
m - Clay

SLOPE
A - Nearly level (0-1%)
B - Very gently sloping (1-3%)
C - Gently sloping (3-5%)
D - Moderately sloping (5-10%)

EROSION
1 - Slight
2 - Moderate
3 - Severe

GRAVELLINESS
g0 - Non gravelly (<15%)
g1 - Gravelly (15-35%)
g2 - Very gravelly (35-60%)
g3 - Extremely gravelly (60-80%)

DEPTH
MGT - Very shallow (<25 cm)
BHI, KGI, NHA - Shallow (25-50 cm)
GTT - Moderately shallow (50-75 cm)
KMP - Moderately deep (75-100 cm)
RNL - Deep (100-150 cm)

References

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

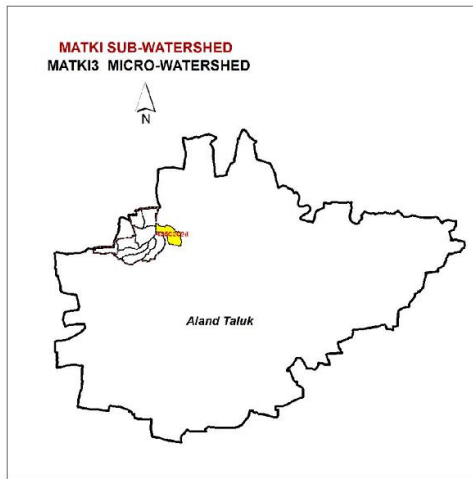
Mapping unit description of Matki-3 Micro-watershed in Aland taluk, Gulbarga district

Sl.No	Map unit	Description	Area in ha (%)
1	MGTiB2g2	Very shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; sandy clay surface on 1-3 % slope, moderately eroded, moderately gravelly, 35-60 per cent gravels.	3.67 (0.53)
2	MGTiC3g3	Very shallow, black gravelly clay soils developed from weathered basalt on gently sloping uplands; sandy clay surface on 3-5 % slope, severely eroded, highly gravelly, more than 60 per cent gravels.	18.00 (2.62)
3	MGTiD3g3	Very shallow, black gravelly clay soils developed from weathered basalt on moderately sloping uplands; sandy clay surface on 5-10 % slope, severely eroded, highly gravelly, more than 60 per cent gravels.	14.24 (2.08)
4	MGTmA1	Very shallow, black gravelly clay soils developed from weathered basalt on nearly level uplands; clay surface on 0-1% slope, slightly eroded	7.84 (1.14)
5	MGTmB1	Very shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3 % slope, slightly eroded	65.65 (9.56)
6	MGTmB1g1	Very shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3 % slope, slightly eroded, slightly gravelly, 15-35 per cent gravels.	17.70 (2.58)
7	MGTmB1g2	Very shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3 % slope, slightly eroded, moderately gravelly, 35-60 per cent gravels.	19.84 (2.89)
8	MGTmB2g1	Very shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3 % slope, moderately eroded, slightly gravelly, 15-35 per cent gravels.	49.98 (7.28)
9	MGTmB2g2	Very shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3 % slope, moderately eroded, slightly gravelly, 35-60 per cent gravels.	31.11 (4.53)
10	MGTmC3g1	Very shallow, black gravelly clay soils developed from weathered basalt on gently sloping uplands; clay surface on 3-5 % slope, severely eroded, slightly gravelly, 15-35 per cent gravels.	5.78 (0.84)

Sl.No	Map unit	Description	Area in ha (%)
11	MGTmC3g2	Very shallow, black gravelly clay soils developed from weathered basalt on gently sloping uplands; clay surface on 3-5 % slope, severely eroded, moderately gravelly, 35-60 per cent gravels.	14.59 (2.13)
12	MGTmC3g3	Very shallow, black gravelly clay soils developed from weathered basalt on gently sloping uplands; clay surface on 3-5 % slope, severely eroded, highly gravelly, more than 60 per cent gravels.	17.04 (2.48)
13	BHImB1	Shallow, black clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded	16.30 (2.37)
14	BHImB1g1	Shallow, black clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded, slightly gravelly, 15-35 per cent gravels.	130.34 (18.99)
15	BHImB1g2	Shallow, black clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded, moderately gravelly, 35-60 per cent gravels.	10.64 (1.55)
16	KGImB2g2	Shallow, black gravelly clay soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, moderately eroded, moderately gravelly, 35-60 per cent gravels.	23.17 (3.38)
17	NHAmB1g1	Shallow, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded, slightly gravelly, 15-35 per cent gravels.	33.20 (4.84)
18	NHAmB2g1	Shallow, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded, moderately gravelly, 15-35 per cent gravels.	3.55 (0.52)
19	GTTmB1	Moderately shallow, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded	46.25 (6.74)
20	GTTmB1g1	Moderately shallow, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded , slightly gravelly, 15-35 per cent gravels.	9.48 (1.38)

Sl.No	Map unit	Description	Area in ha (%)
21	GTTmB2	Moderately shallow, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, moderately eroded	6.27 (0.91)
22	KMPmB1	Moderately deep, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded	9.46 (1.38)
23	KMPmB1g1	Moderately deep, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3% slope, slightly eroded, slightly gravelly, 15-35 per cent gravels.	16.23 (2.36)
24	RNLmB1	Deep, black clayey soils developed from weathered basalt on very gently sloping uplands; clay surface on 1-3 % slope, slightly eroded	89.18 (12.99)
25	Habitation		26.92 (3.92)

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



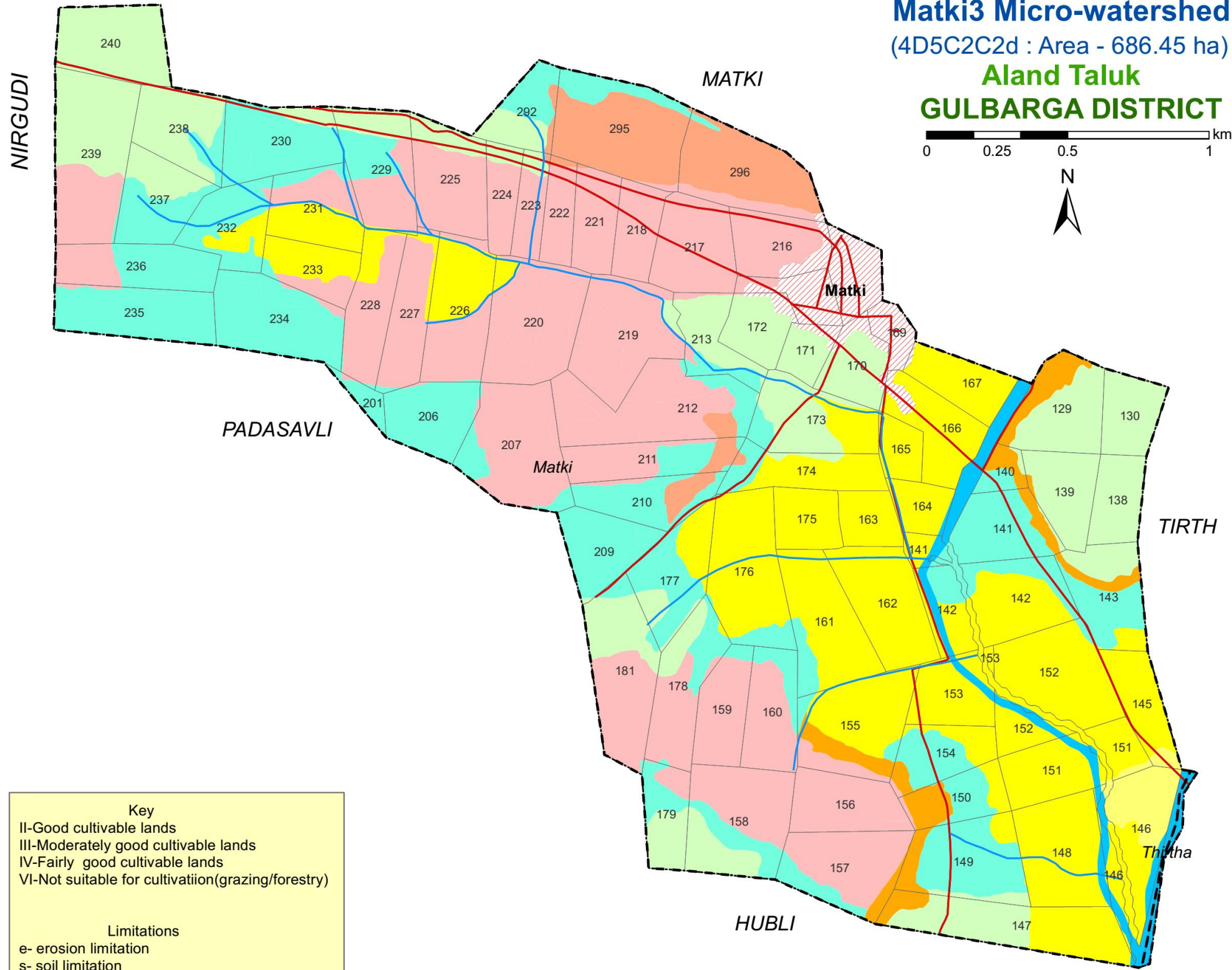
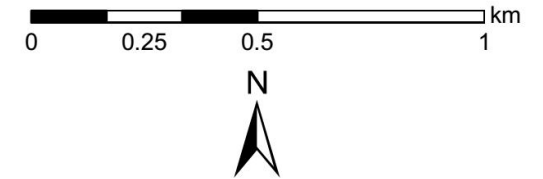
LAND CAPABILITY

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Classes Area in ha (%)

	IIs	171 (24.85)
	IIse	6 (0.91)
	IIIs	190 (27.75)
	IIIse	27 (3.89)
	IVs	111 (16.18)
	IVse	140 (20.42)
	VI	14 (2.08)
	Others*	27 (3.92)

Key	
II	Good cultivable lands
III	Moderately good cultivable lands
IV	Fairly good cultivable lands
VI	Not suitable for cultivation (grazing/forestry)

Limitations	
e-	erosion limitation
s-	soil limitation
	(depth, gravelliness, texture, salinity/alkalinity)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

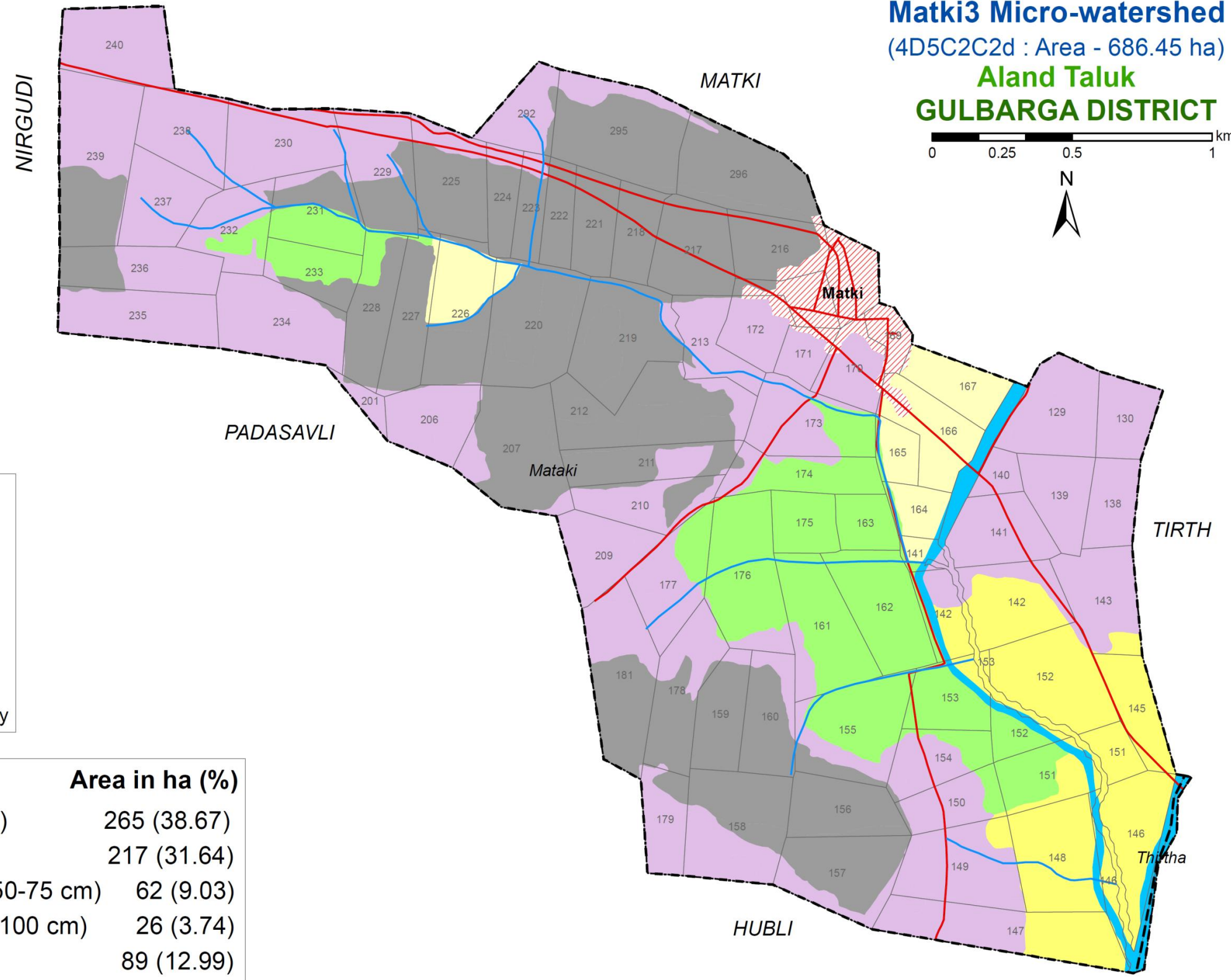
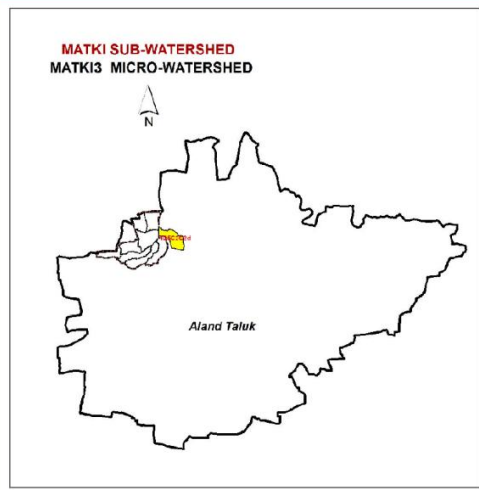
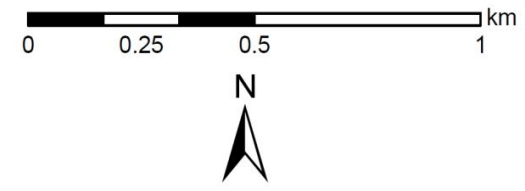
SOIL DEPTH

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT

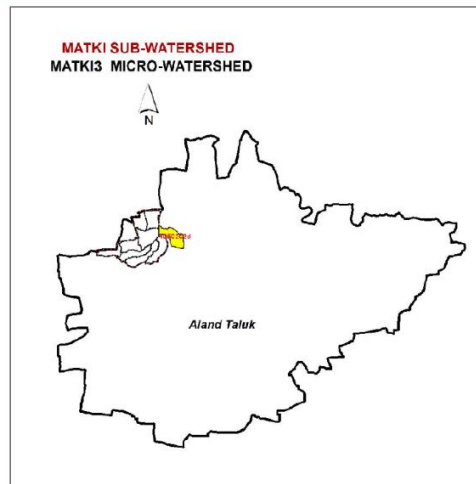


- References**
- Stream/Drainage
 - Road/Cart track
 - Habitation
 - Waterbody
 - Land parcel with No's
 - Village boundary
 - Micro-watershed boundary

Depth Class	Area in ha (%)
Very shallow (<25 cm)	265 (38.67)
Shallow (25-50 cm)	217 (31.64)
Moderately shallow (50-75 cm)	62 (9.03)
Moderately deep (75-100 cm)	26 (3.74)
Deep (100-150 cm)	89 (12.99)
Others *	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru



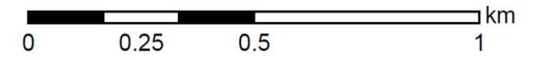
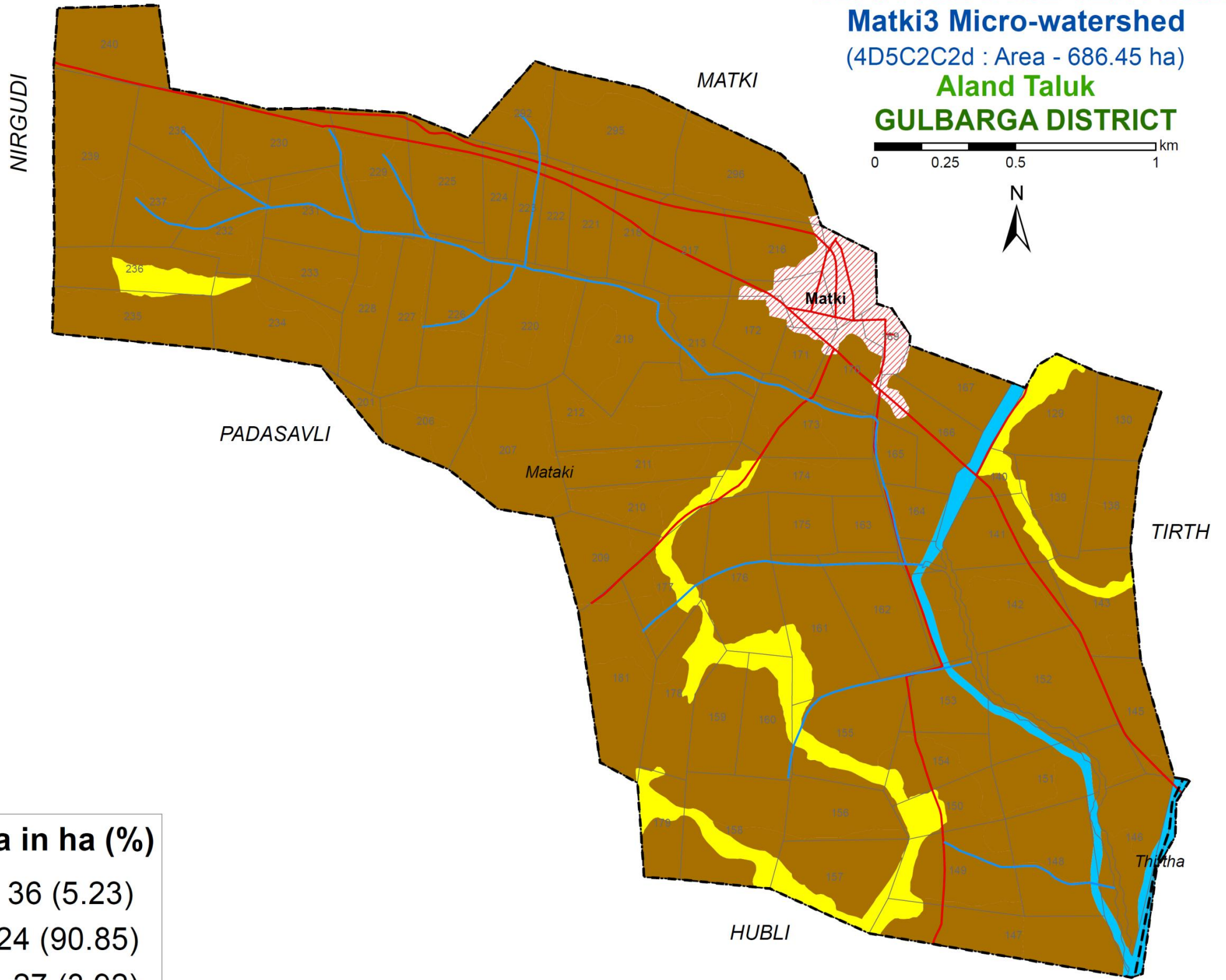
SURFACE SOIL TEXTURE

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

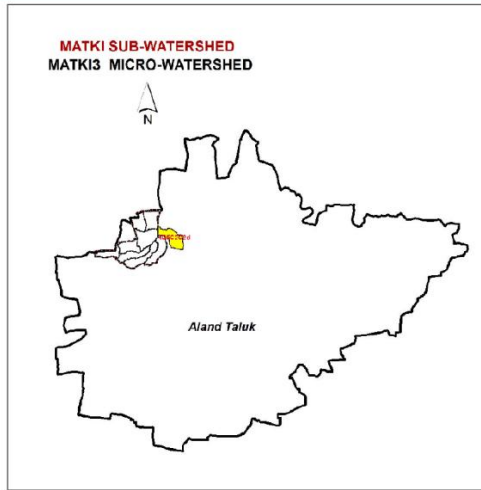
- Stream/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Land parcel with No's
- Village boundary
- Micro-watershed boundary

Texture Class Area in ha (%)

	Sandy clay	36 (5.23)
	Clay	624 (90.85)
	Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru



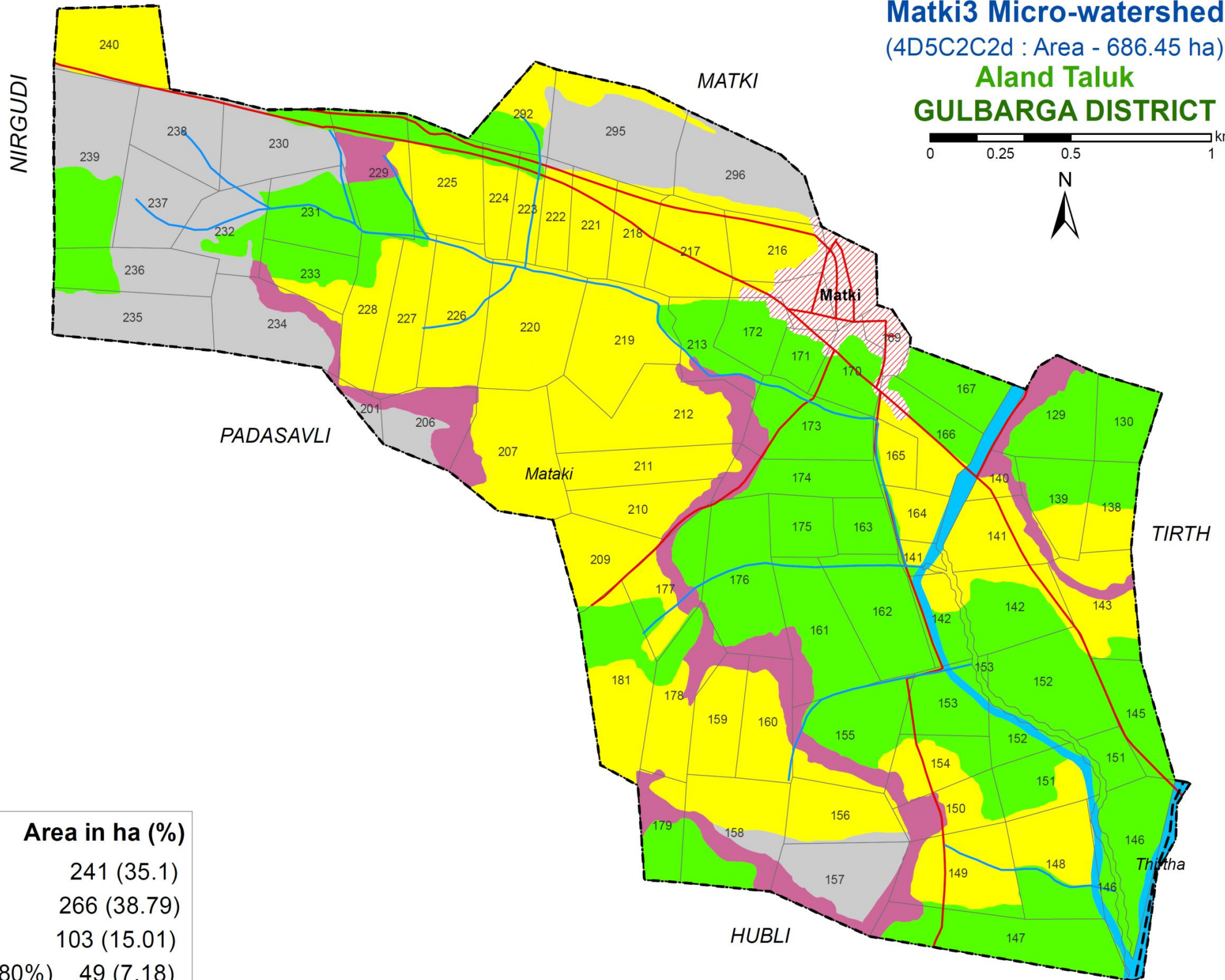
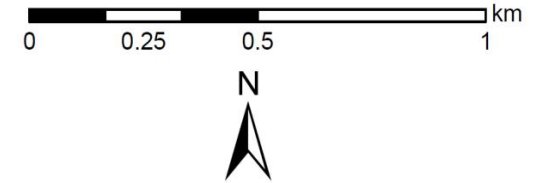
SOIL GRAVELLINESS

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



- References**
- Stream/Drainage
 - Road/Cart track
 - Habitation
 - Waterbody
 - Land parcel with No's
 - Village boundary
 - Micro-watershed boundary

Gravelliness Class	Area in ha (%)
Non gravelly (<15%)	241 (35.1)
Gravelly (15-35%)	266 (38.79)
Very gravelly (35-60%)	103 (15.01)
Extremely gravelly (60-80%)	49 (7.18)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

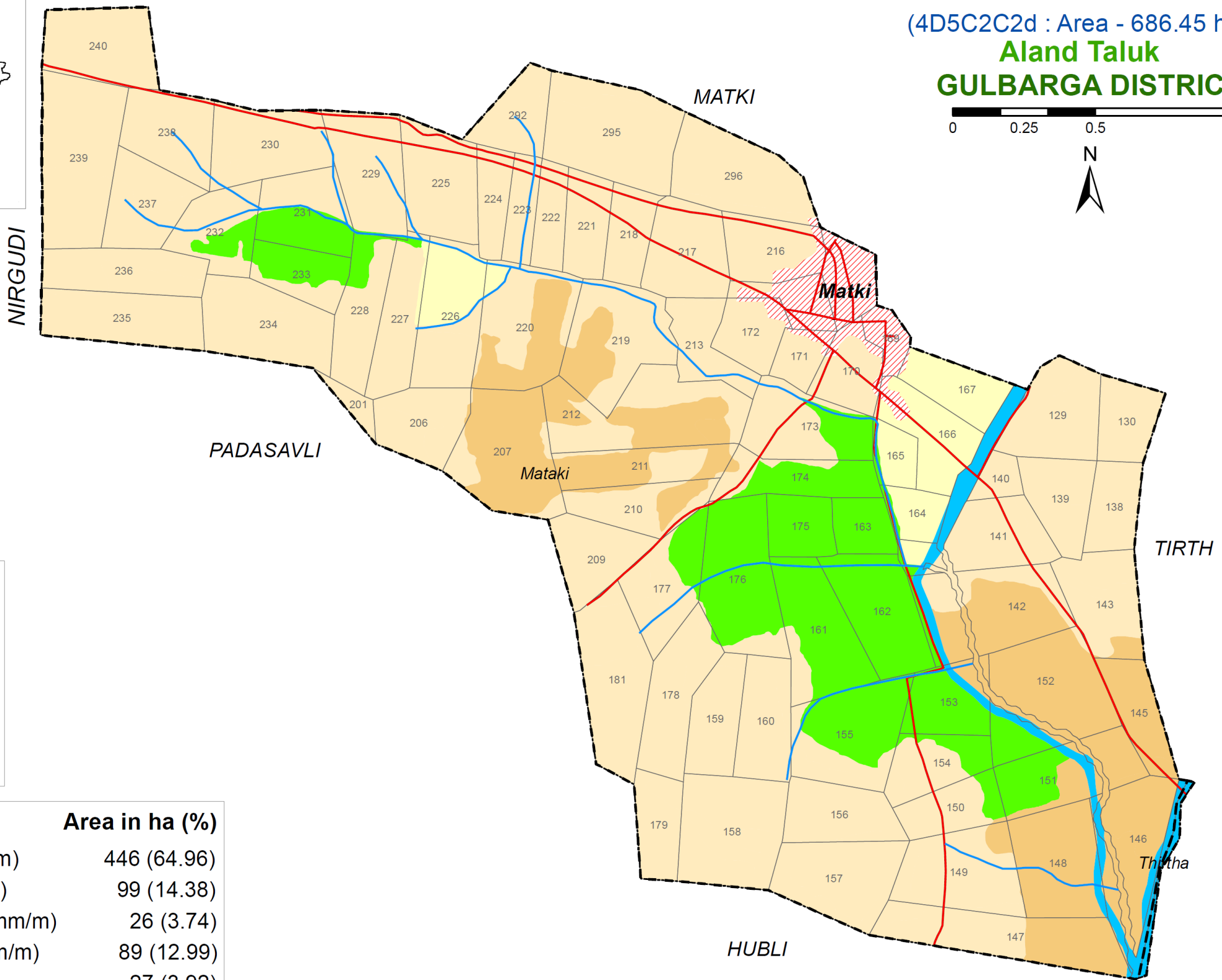
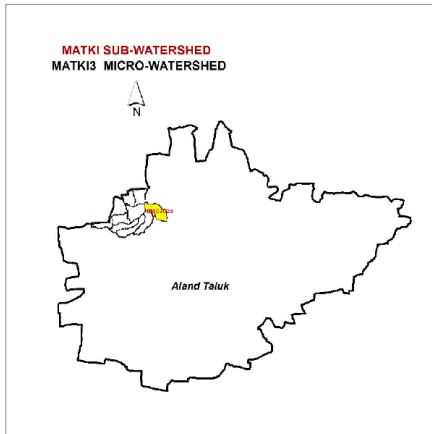
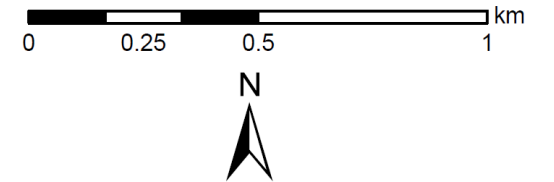
AVAILABLE WATER CAPACITY

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

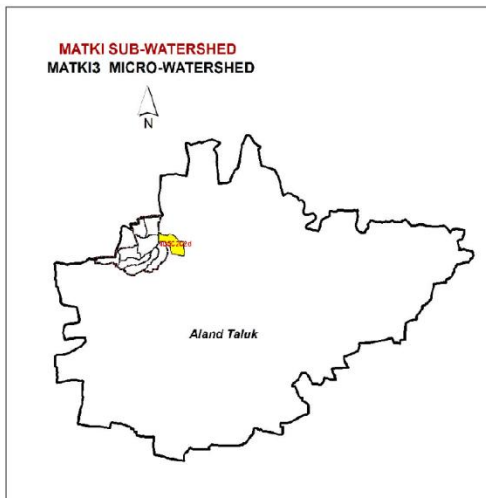
Soil Phases

Area in ha (%)

	Very low (<50 mm/m)	446 (64.96)
	Low (51-100 mm/m)	99 (14.38)
	Medium (101-150 mm/m)	26 (3.74)
	Very high (>200 mm/m)	89 (12.99)
	Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

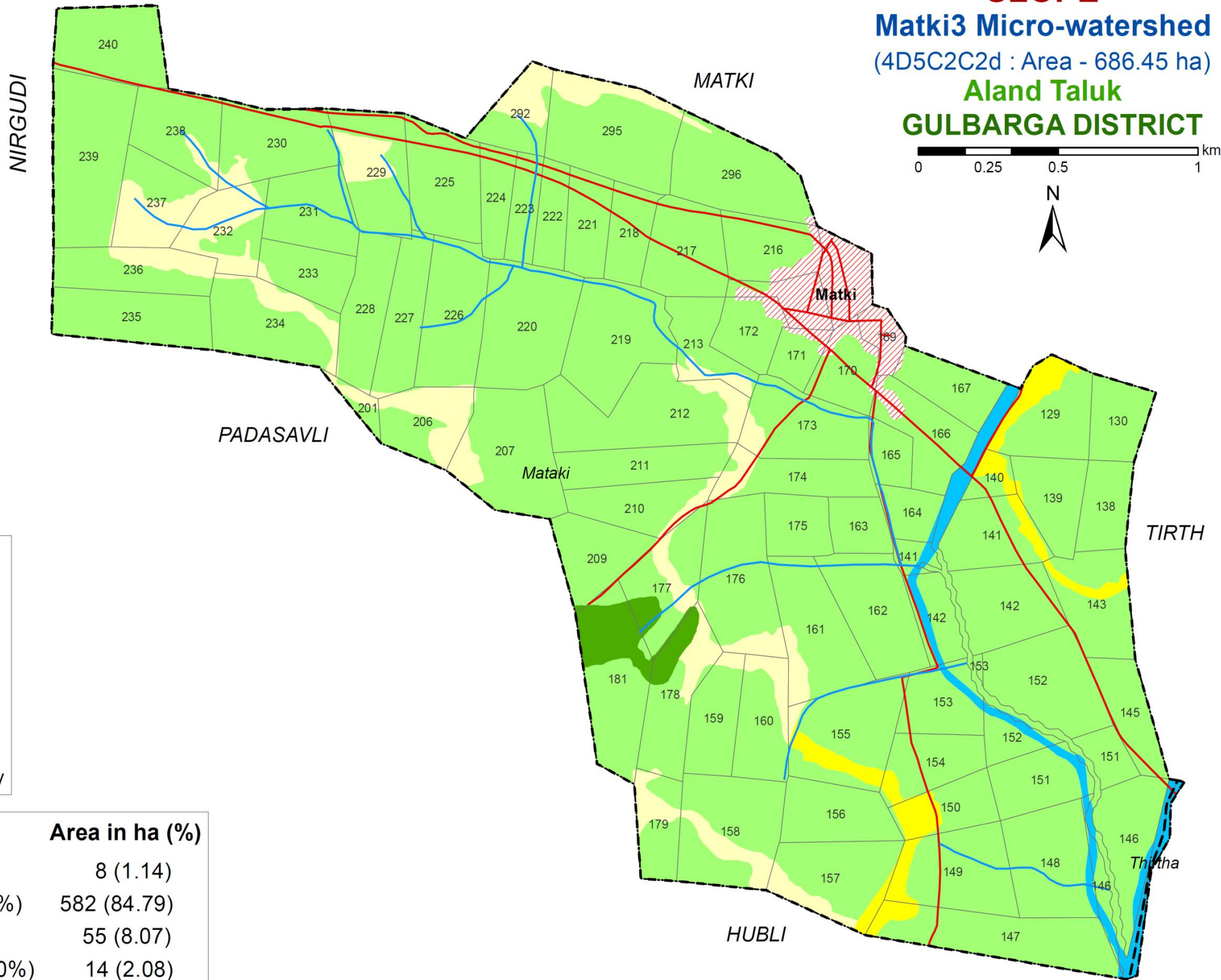
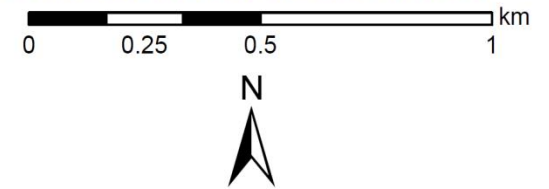


SLOPE

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk GULBARGA DISTRICT



References

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

Slope Class

Slope Class	Area in ha (%)
 Nearly level (0-1%)	8 (1.14)
 Very gently sloping (1-3%)	582 (84.79)
 Gently sloping (3-5%)	55 (8.07)
 Moderately sloping (5-10%)	14 (2.08)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

MATKI SUB-WATERSHED
MATKI3 MICRO-WATERSHED



SOIL EROSION

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT

0 0.25 0.5 1 km



NIRGUDI

MATKI

Matki

PADASAVLI

Mataki

TIRTH

Thatha




HUBLI

References

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

Erosion Class

Area in ha (%)

	Slight	472 (68.78)
	Moderate	118 (17.15)
	Severe	70 (10.15)
	Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

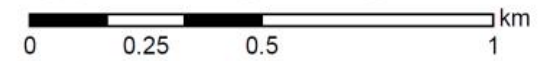
SOIL REACTION (pH) 2014

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



NIRGUDI

MATKI

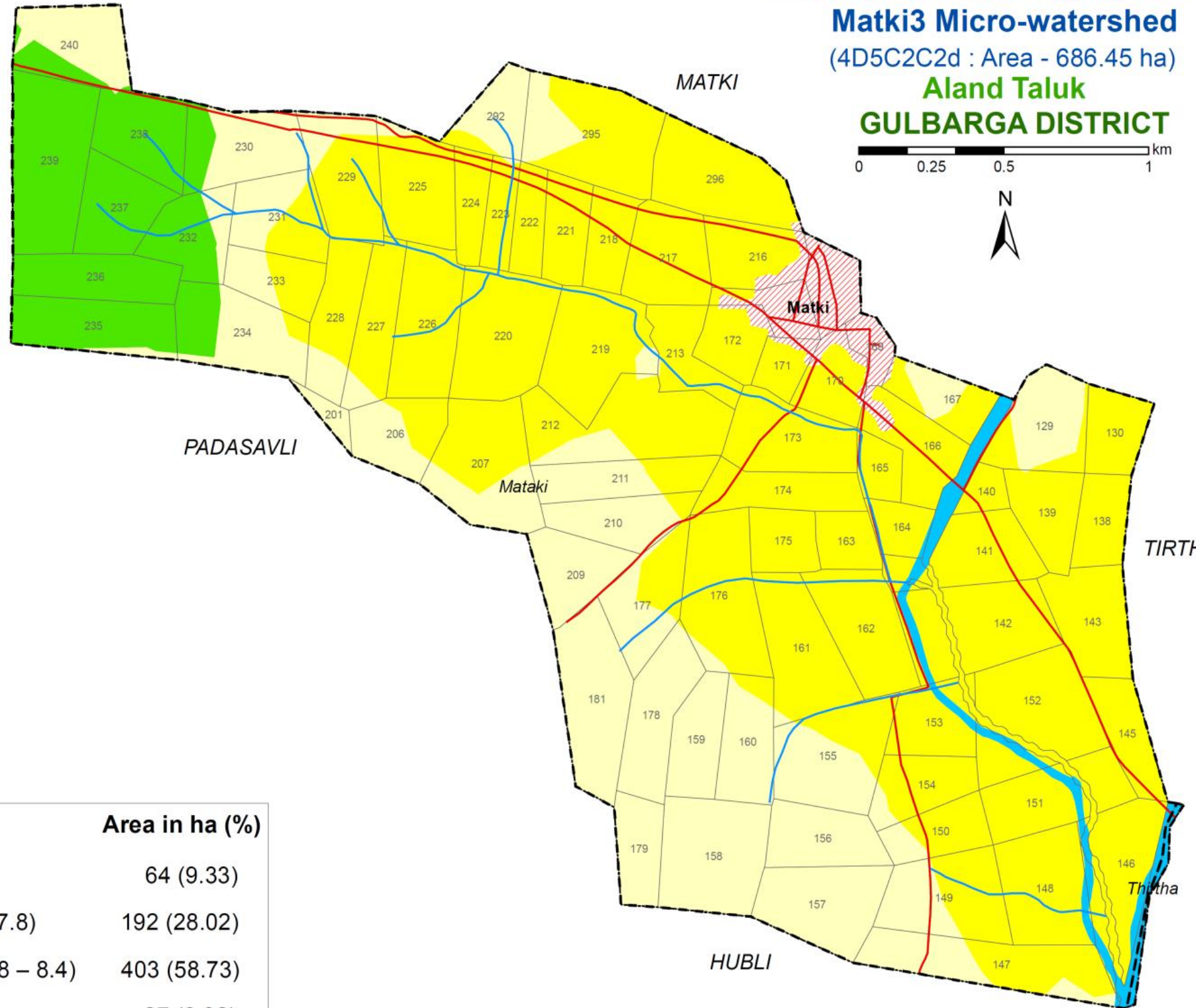
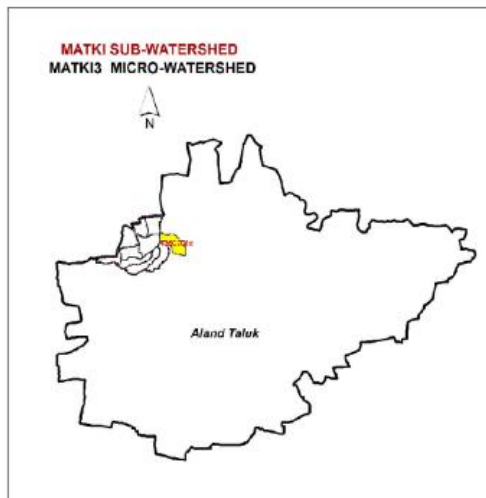
PADASAVLI

Mataki

TIRTH

HUBLI

Thatha



References

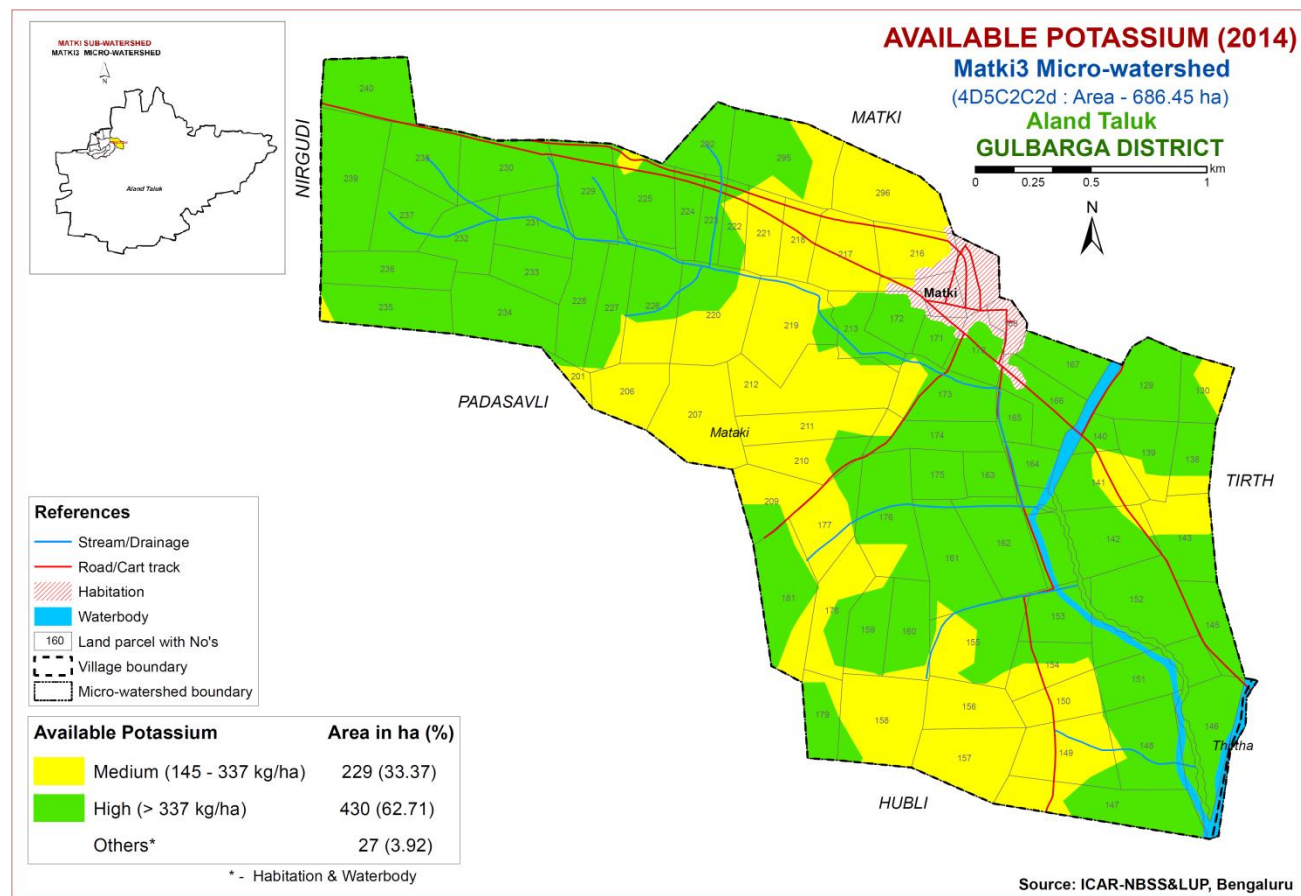
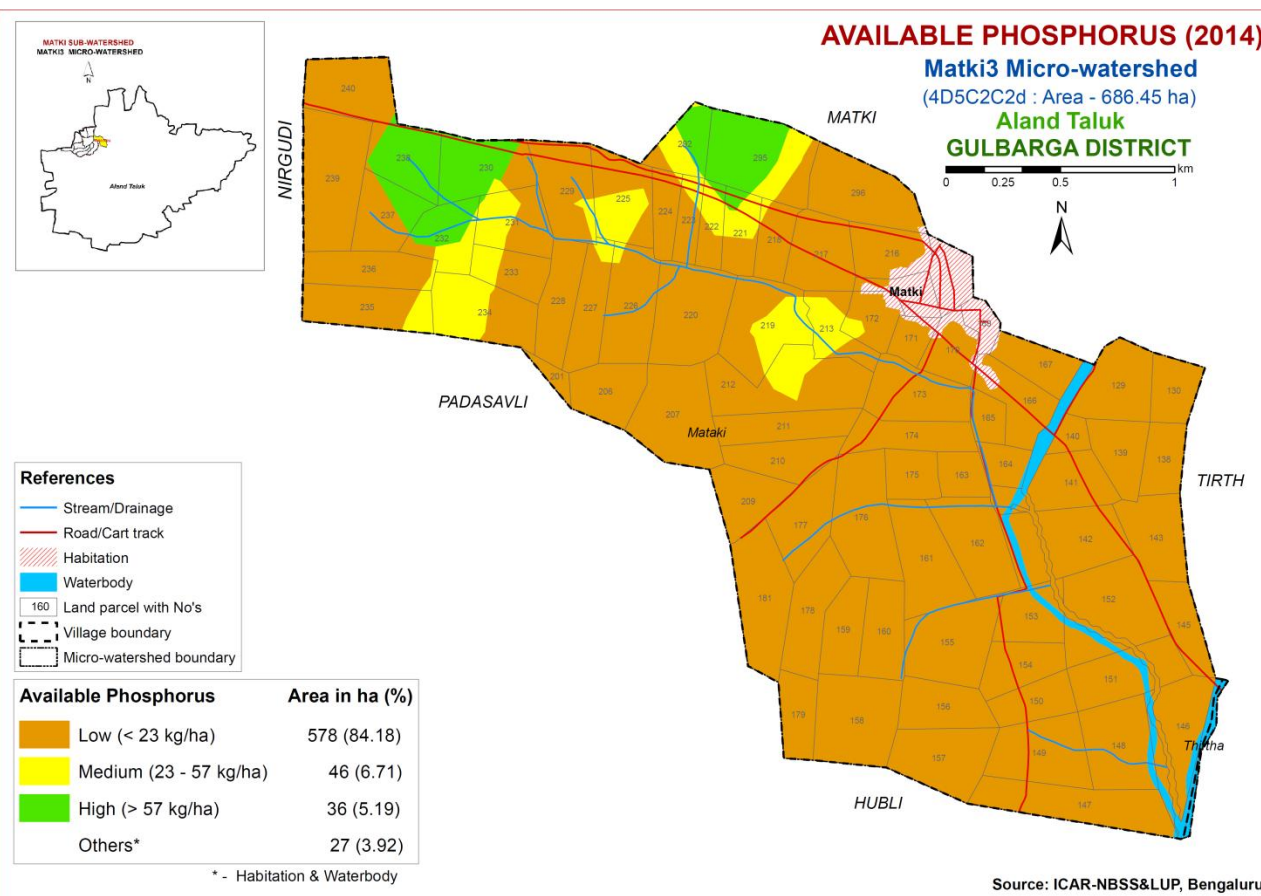
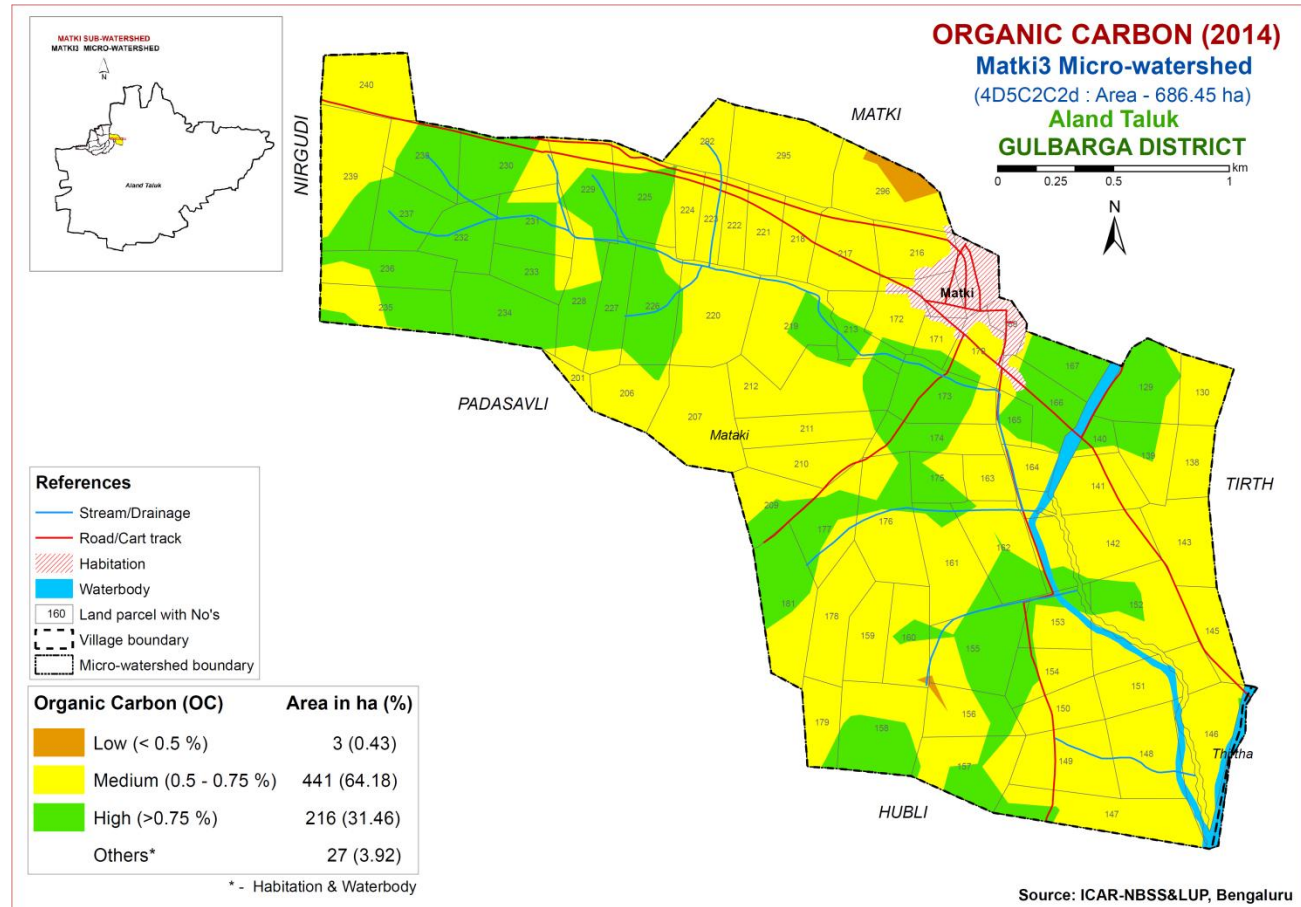
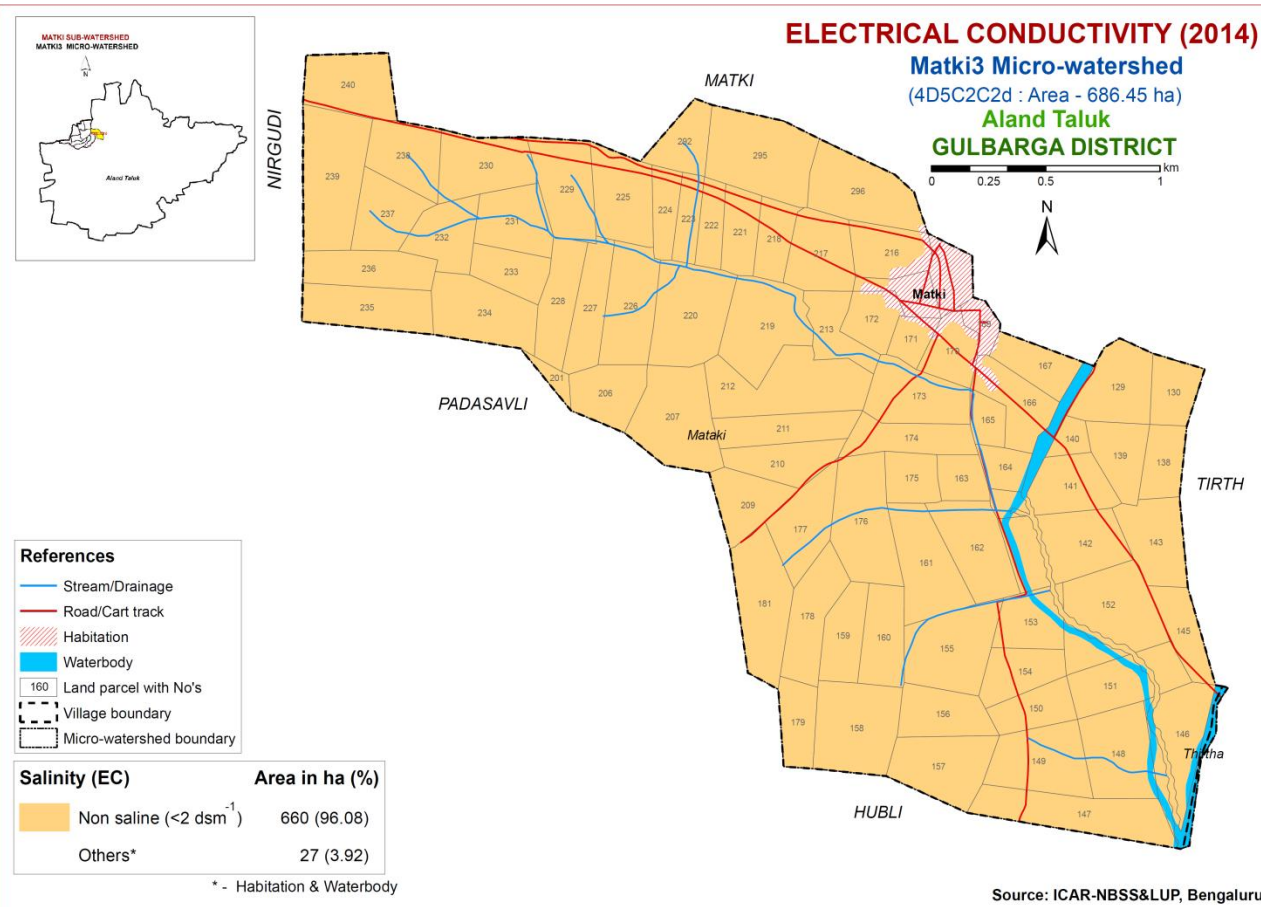
- Stream/Drainage
- Road/Cart track
- Habitation
- Waterbody
- Land parcel with No's
- Village boundary
- Micro-watershed boundary

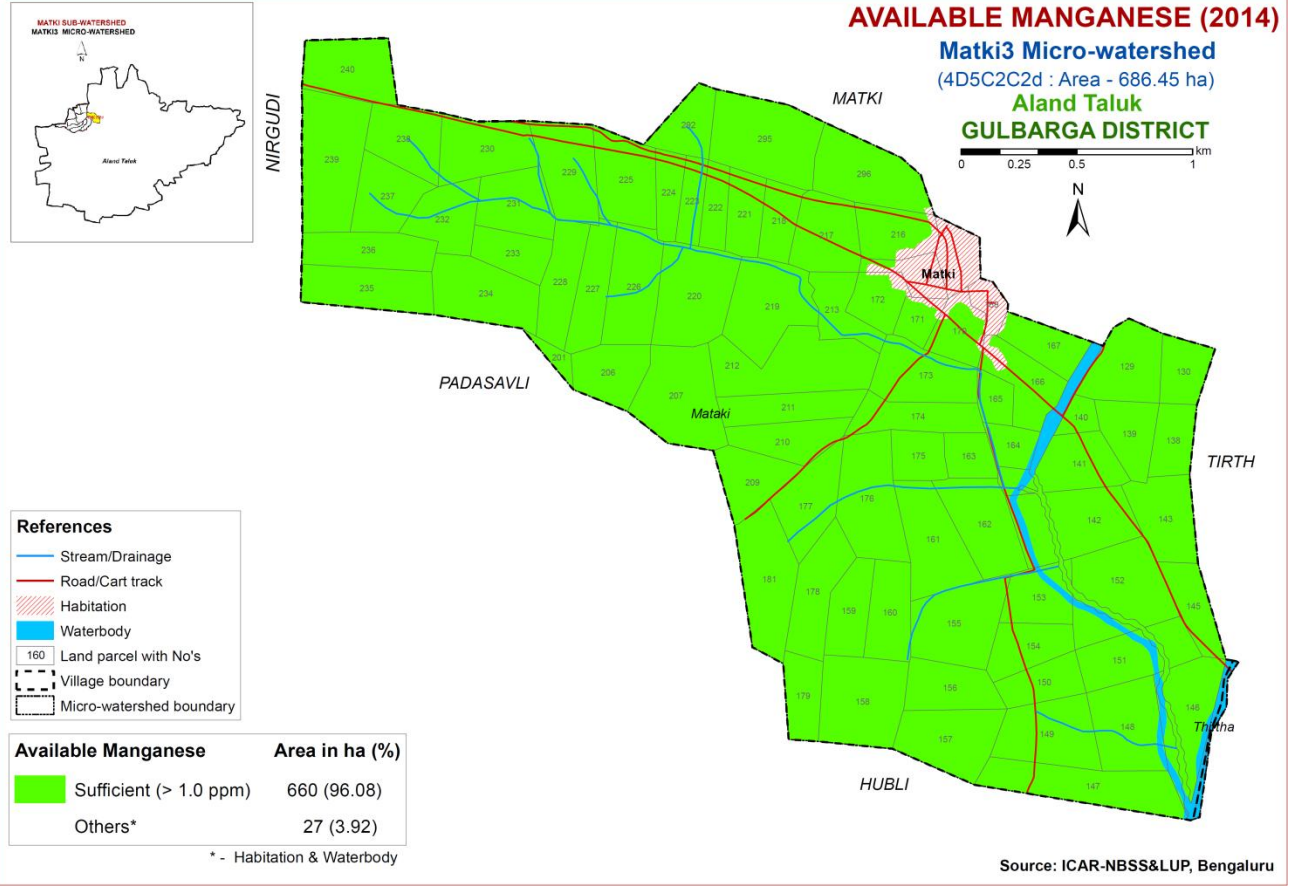
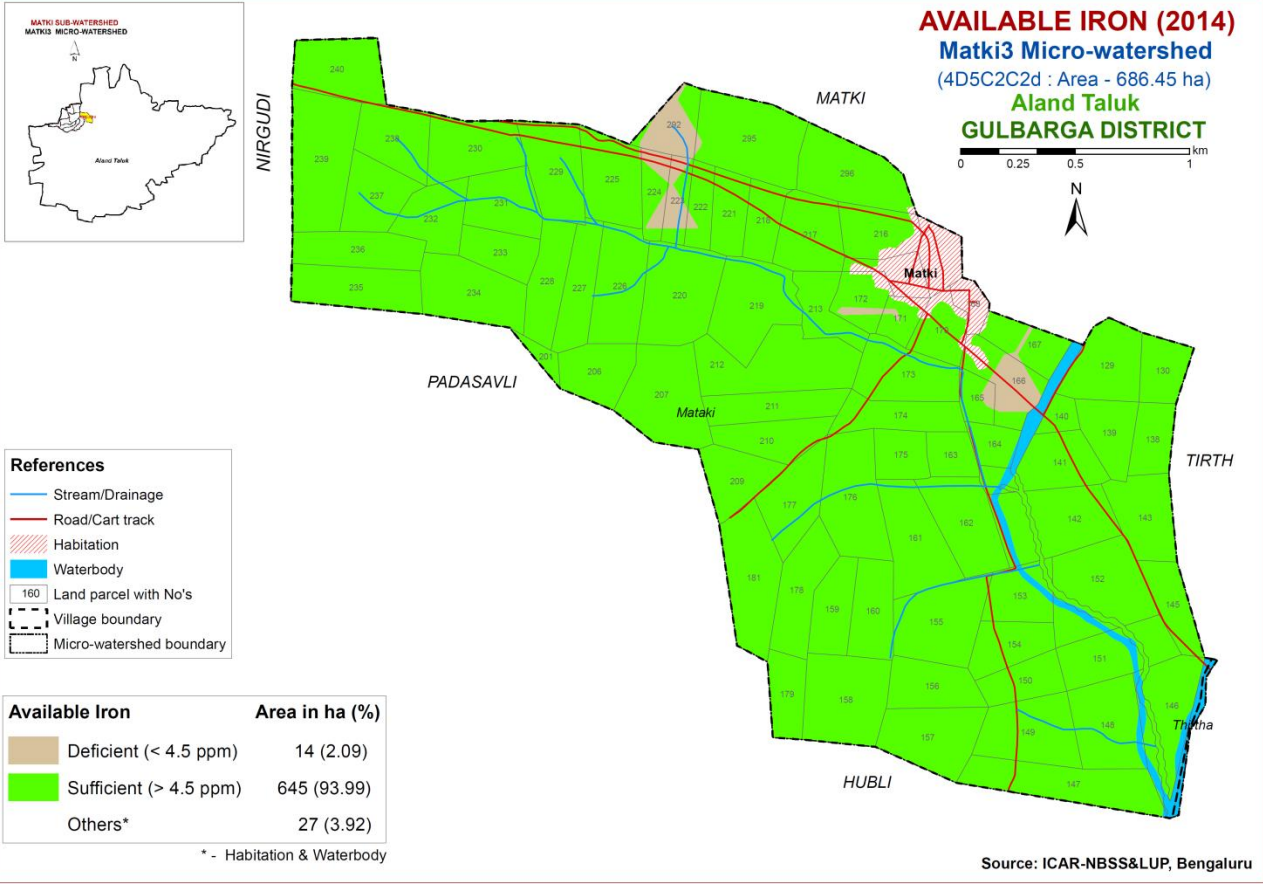
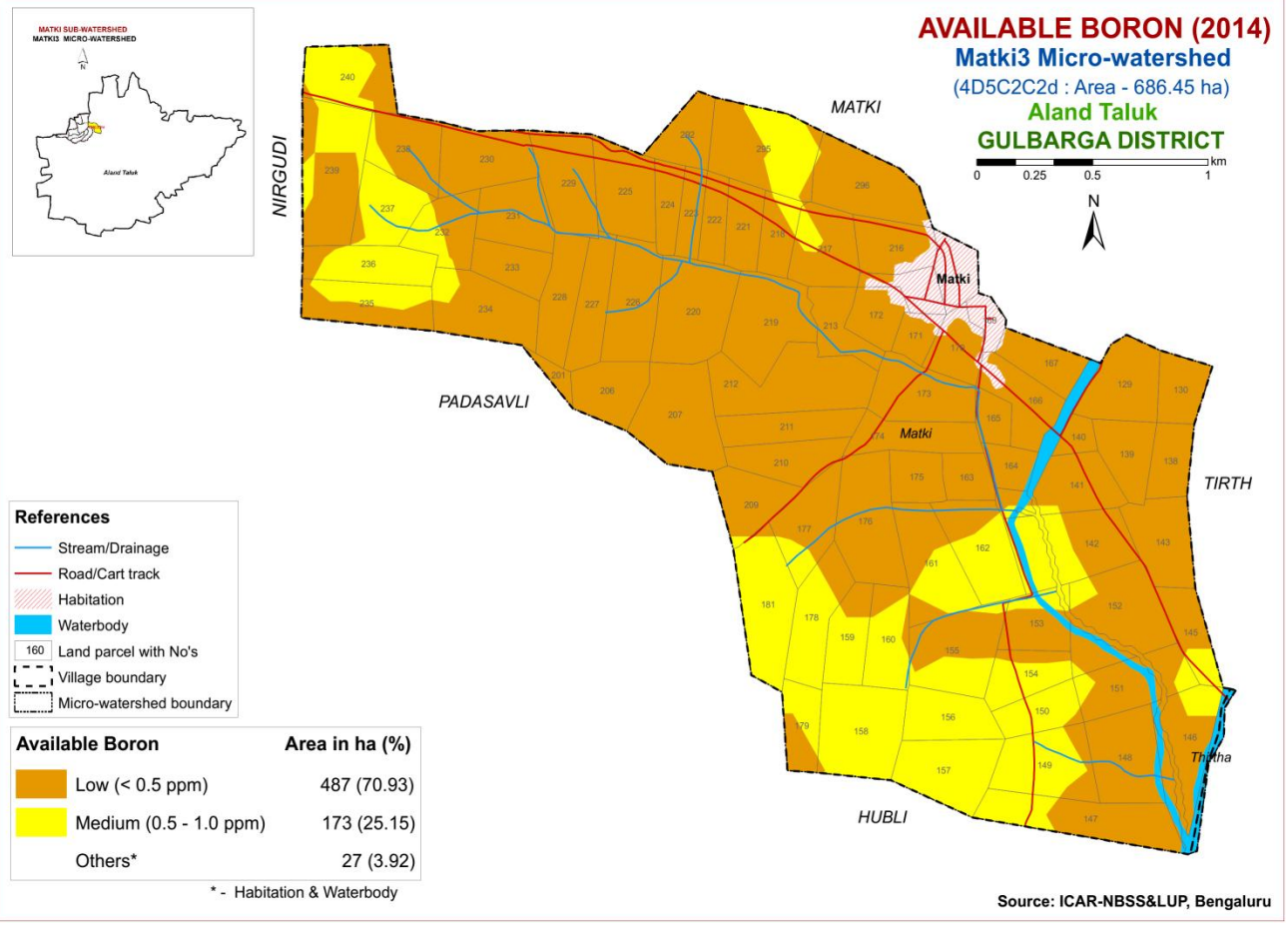
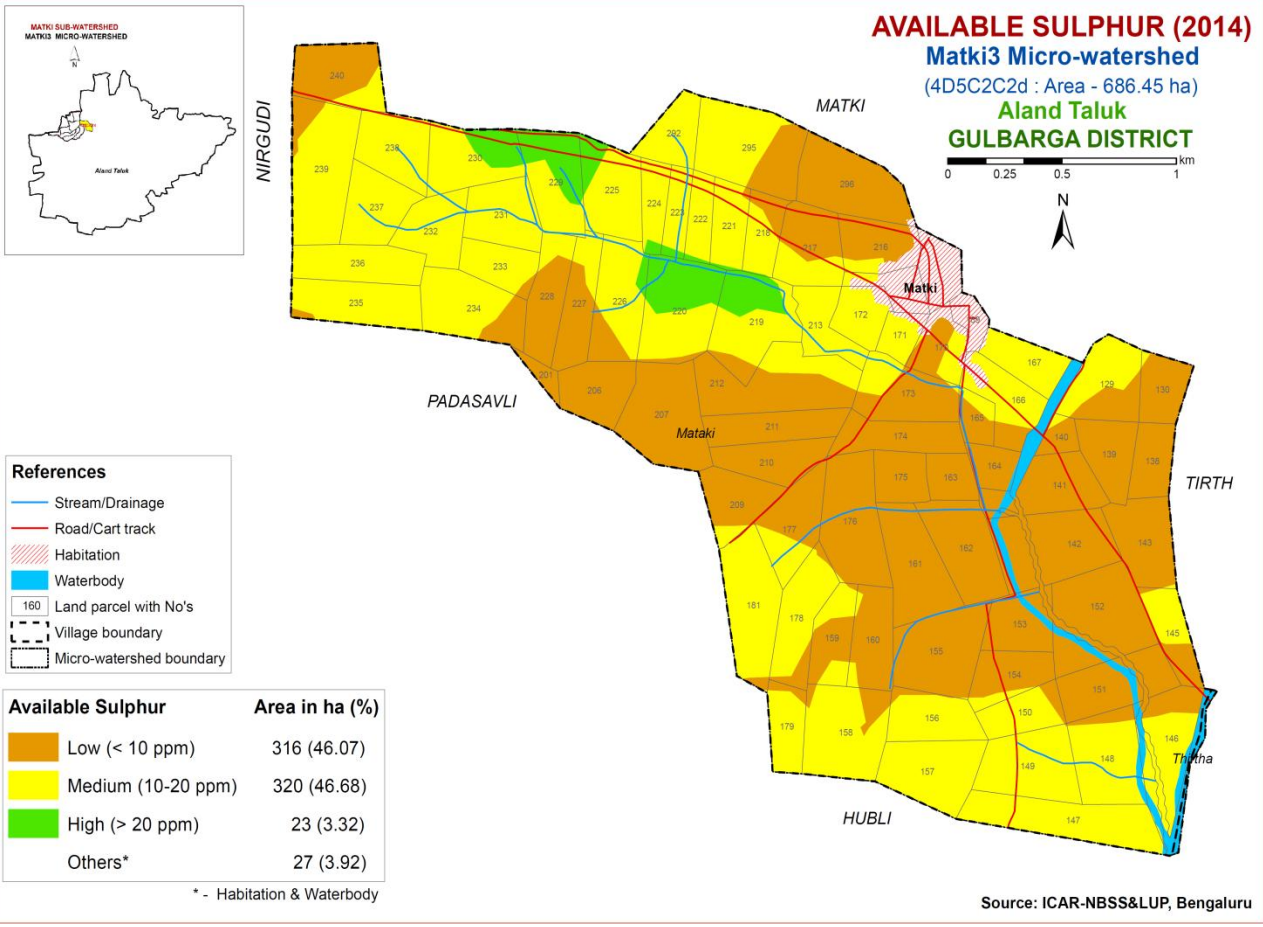
Reaction classes

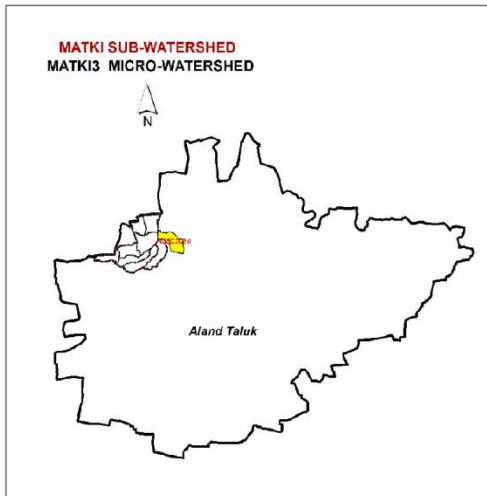
Reaction class	Area in ha (%)
Neutral (pH 6.5 – 7.3)	64 (9.33)
Slightly alkaline (pH 7.3 – 7.8)	192 (28.02)
Moderately alkaline (pH 7.8 – 8.4)	403 (58.73)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru







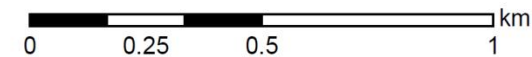
AVAILABLE COPPER (2014)

Matki3 Micro-watershed

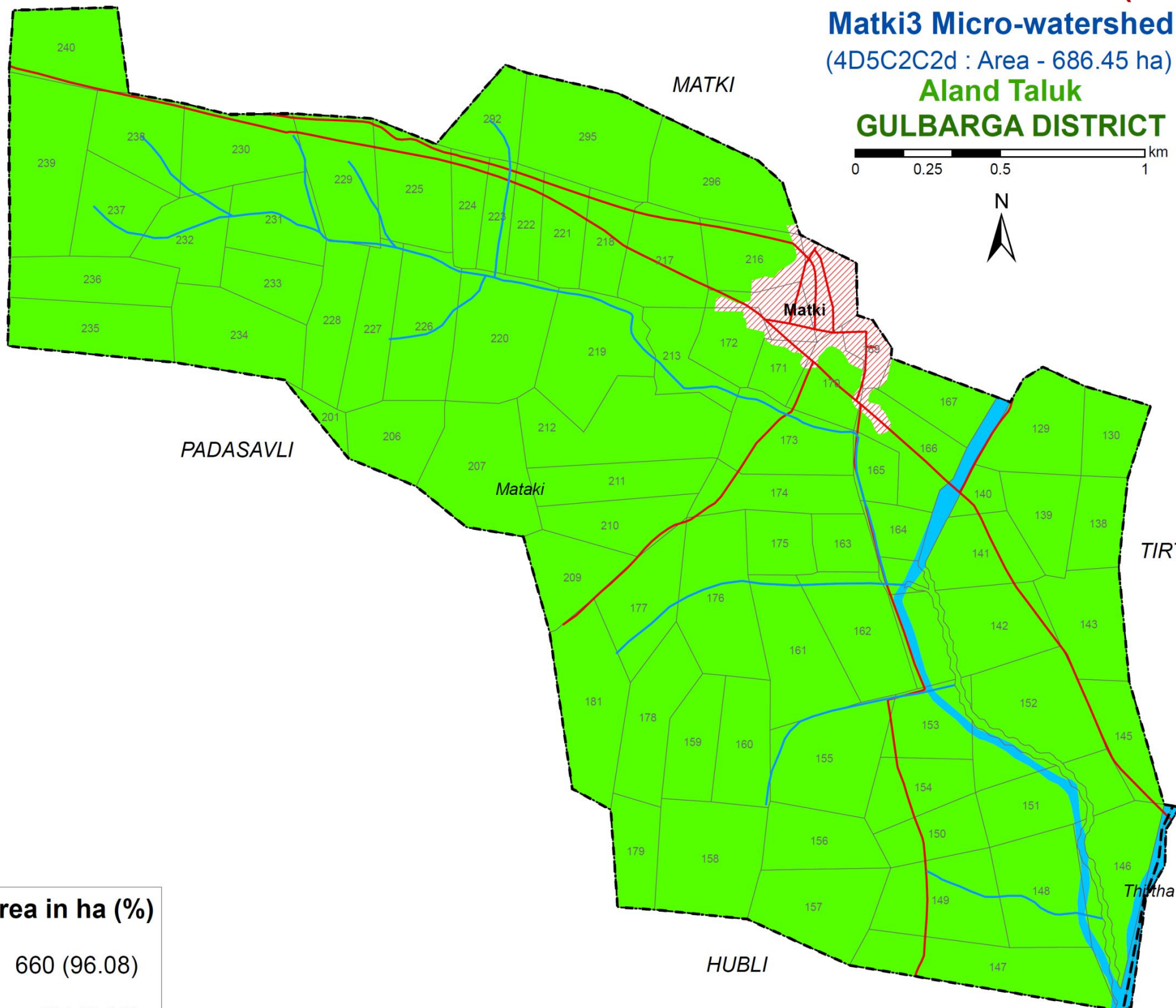
(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



NIRGUDI



PADASAVLI

Mataki

MATKI

Matki

TIRTH

HUBLI

Tirtha

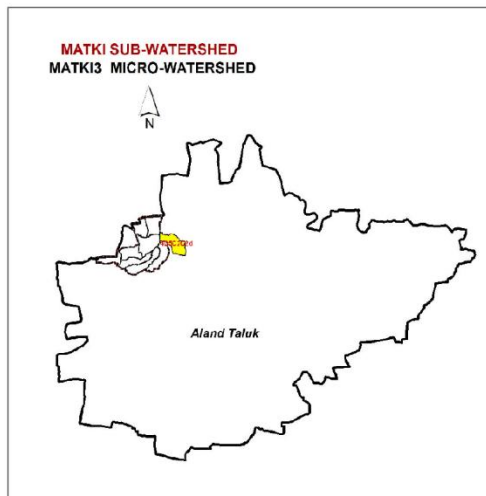
References

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

Available Copper	Area in ha (%)
Sufficient (> 0.2 ppm)	660 (96.08)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

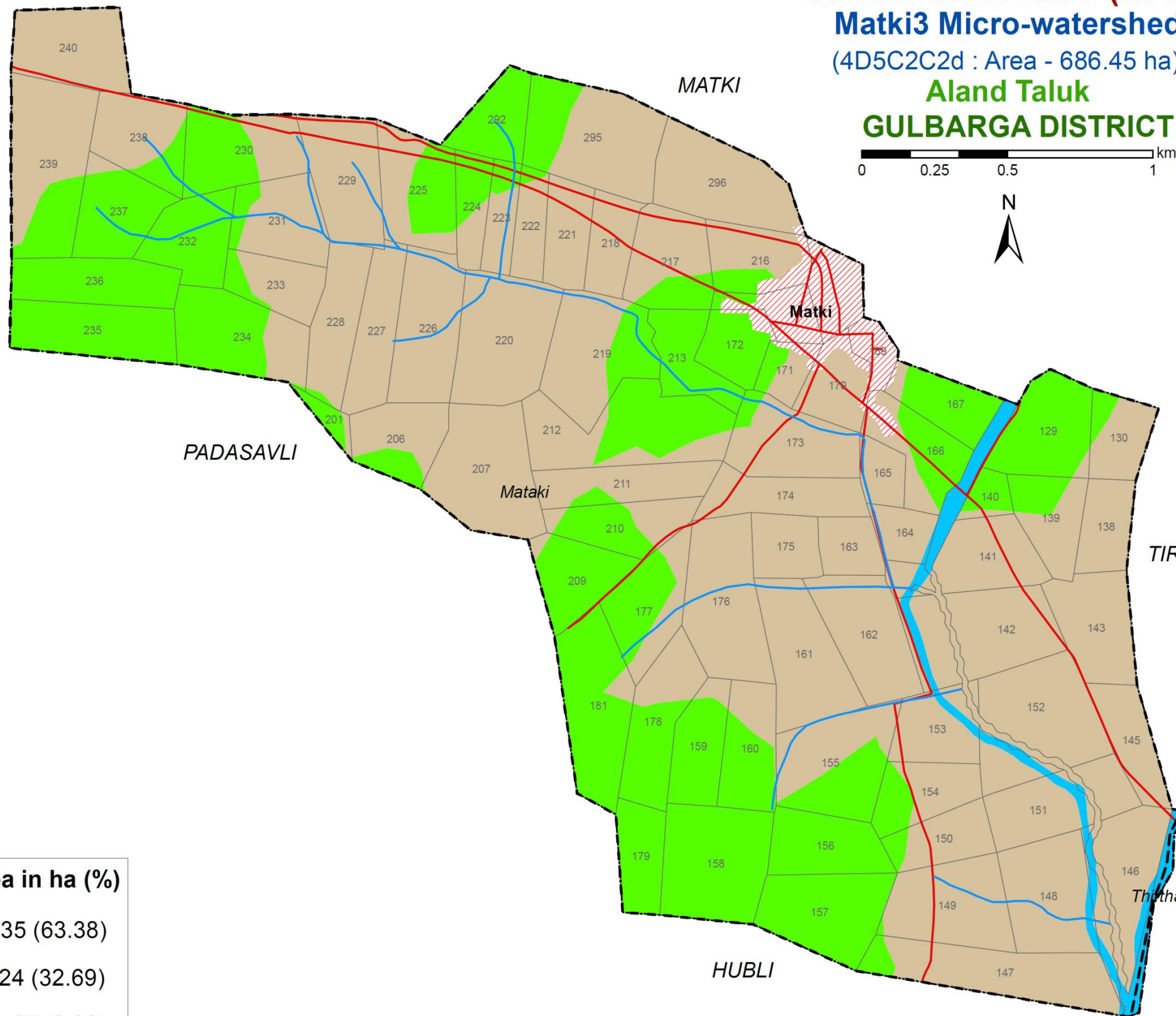


AVAILABLE ZINC (2014)
Matki3 Micro-watershed
 (4D5C2C2d : Area - 686.45 ha)
Aland Taluk
GULBARGA DISTRICT

0 0.25 0.5 1 km



NIRGUDI



References

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

Available Zinc

Area in ha (%)

	Deficient (< 0.6 ppm)	435 (63.38)
	Sufficient (> 0.6 ppm)	224 (32.69)
	Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

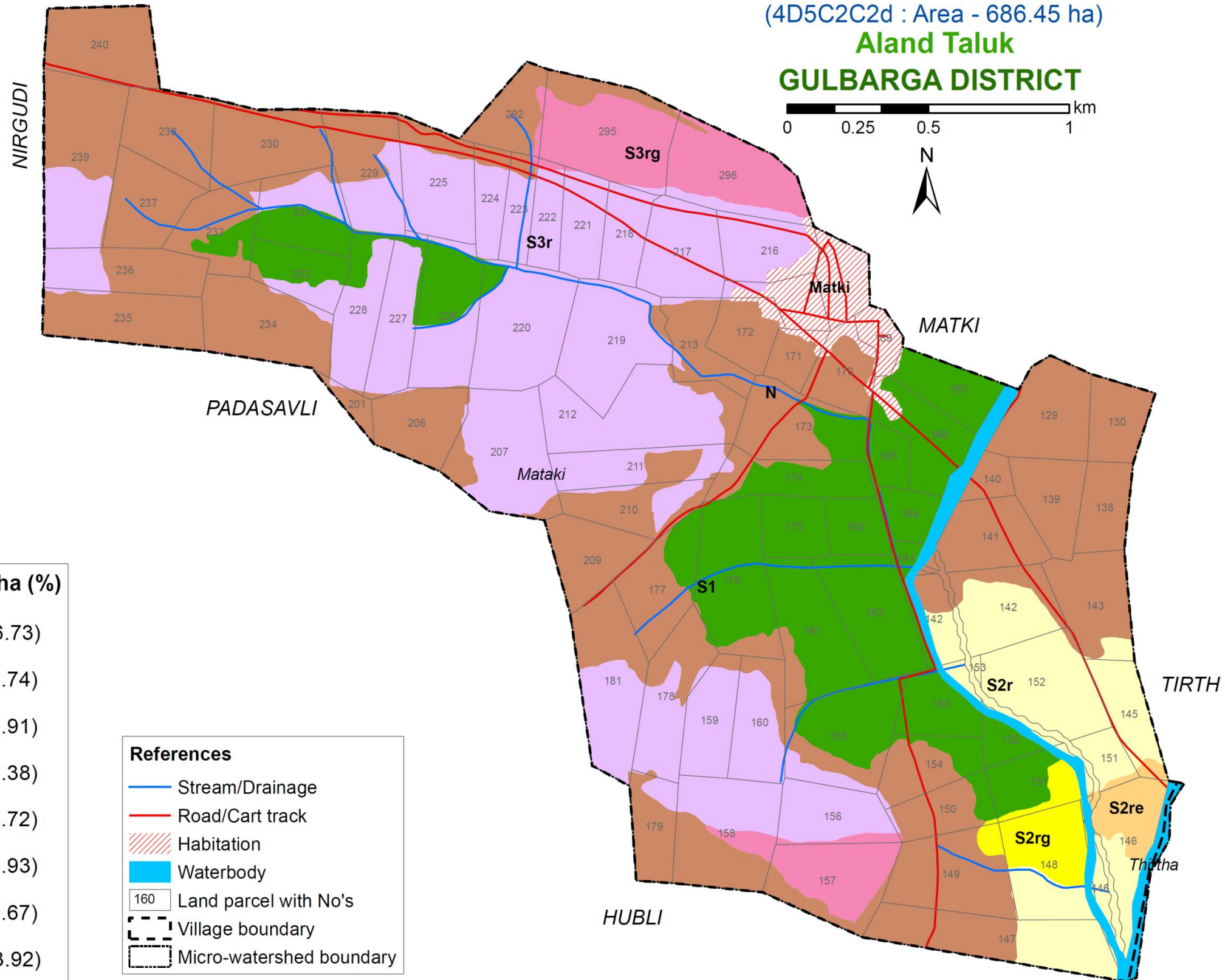
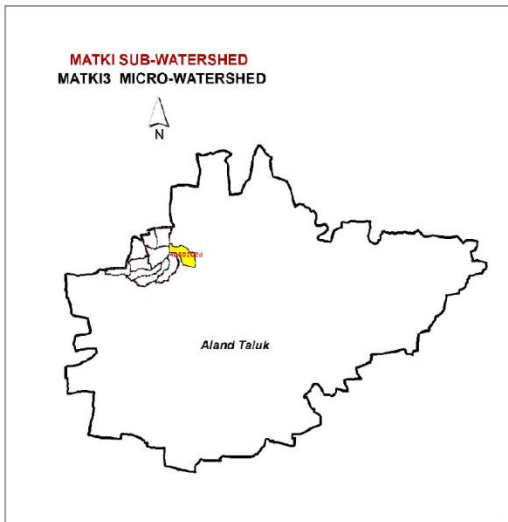
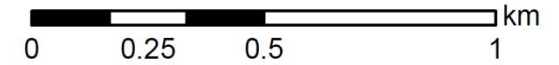
LAND SUITABILITY FOR SORGHUM

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



Key
 S1-Highly Suitable
 S2-Moderately Suitable
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 e- erosion
 g- gravelliness
 r- rooting condition

Suitability subclass	Area in ha (%)
S1	115 (16.73)
S2r	46 (6.74)
S2re	6 (0.91)
S2rg	9 (1.38)
S3r	183 (26.72)
S3rg	34 (4.93)
N	265 (38.67)
Others*	27 (3.92)

References

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

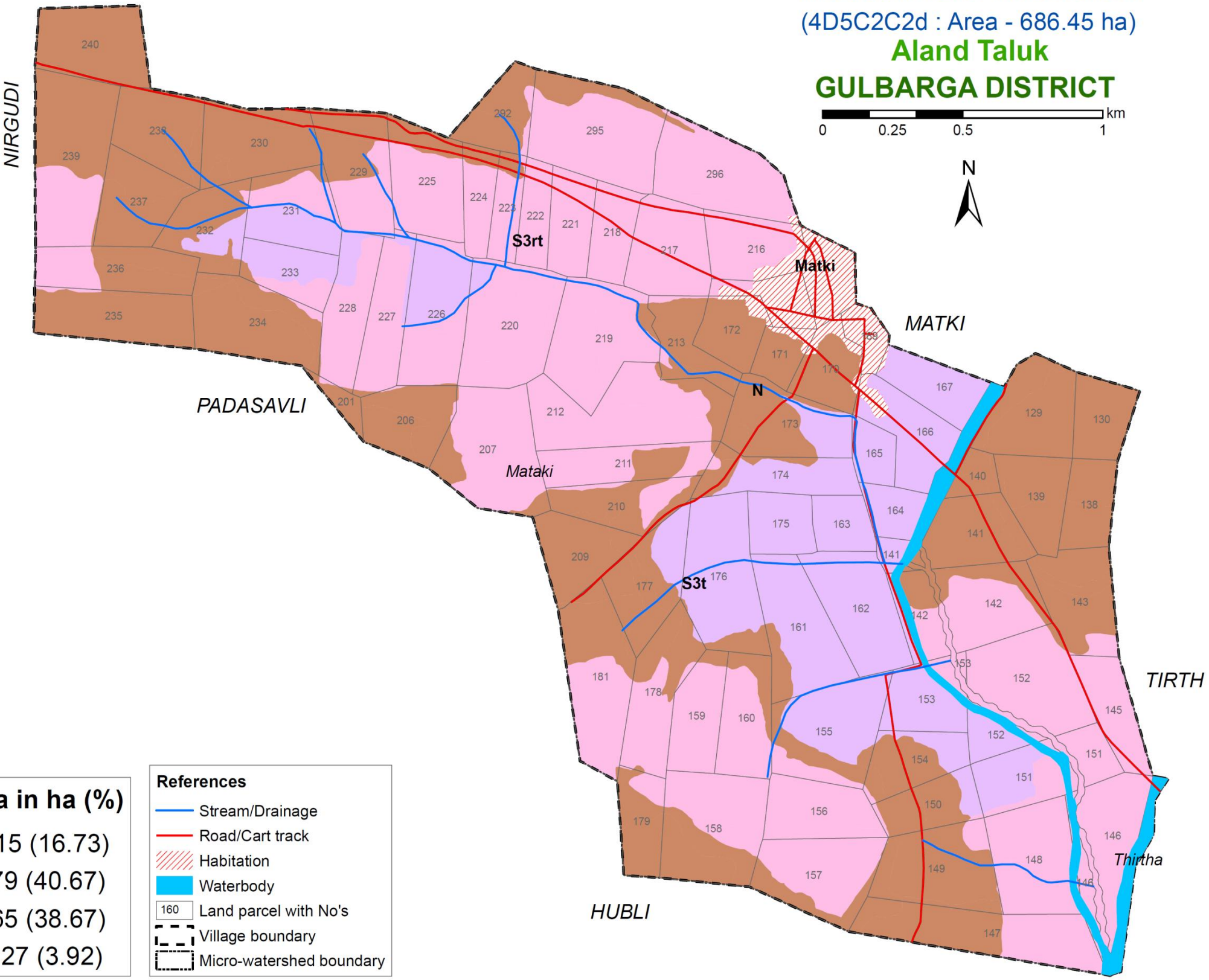
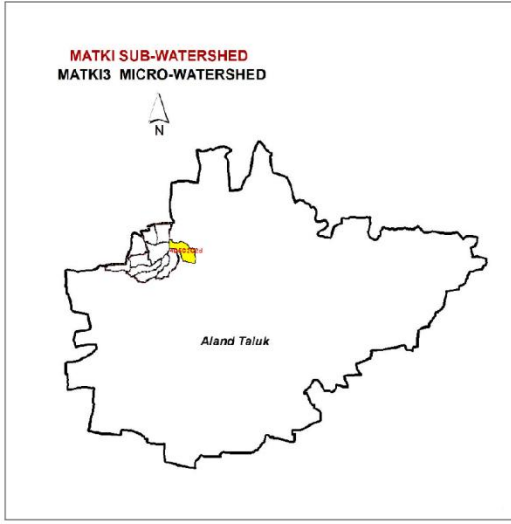
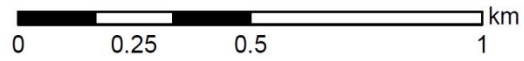
LAND SUITABILITY FOR MAIZE

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



Key
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 t- texture
 r- rooting condition

Suitability subclass	Area in ha (%)
S3t	115 (16.73)
S3rt	279 (40.67)
N	265 (38.67)
Others*	27 (3.92)

References

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

LAND SUITABILITY FOR REDGRAM

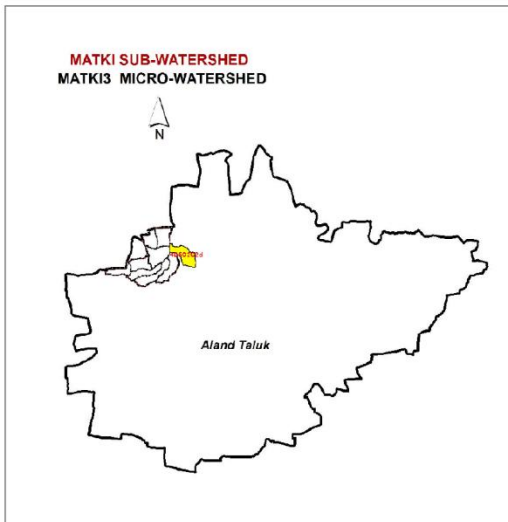
Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT

0 0.25 0.5 1 km



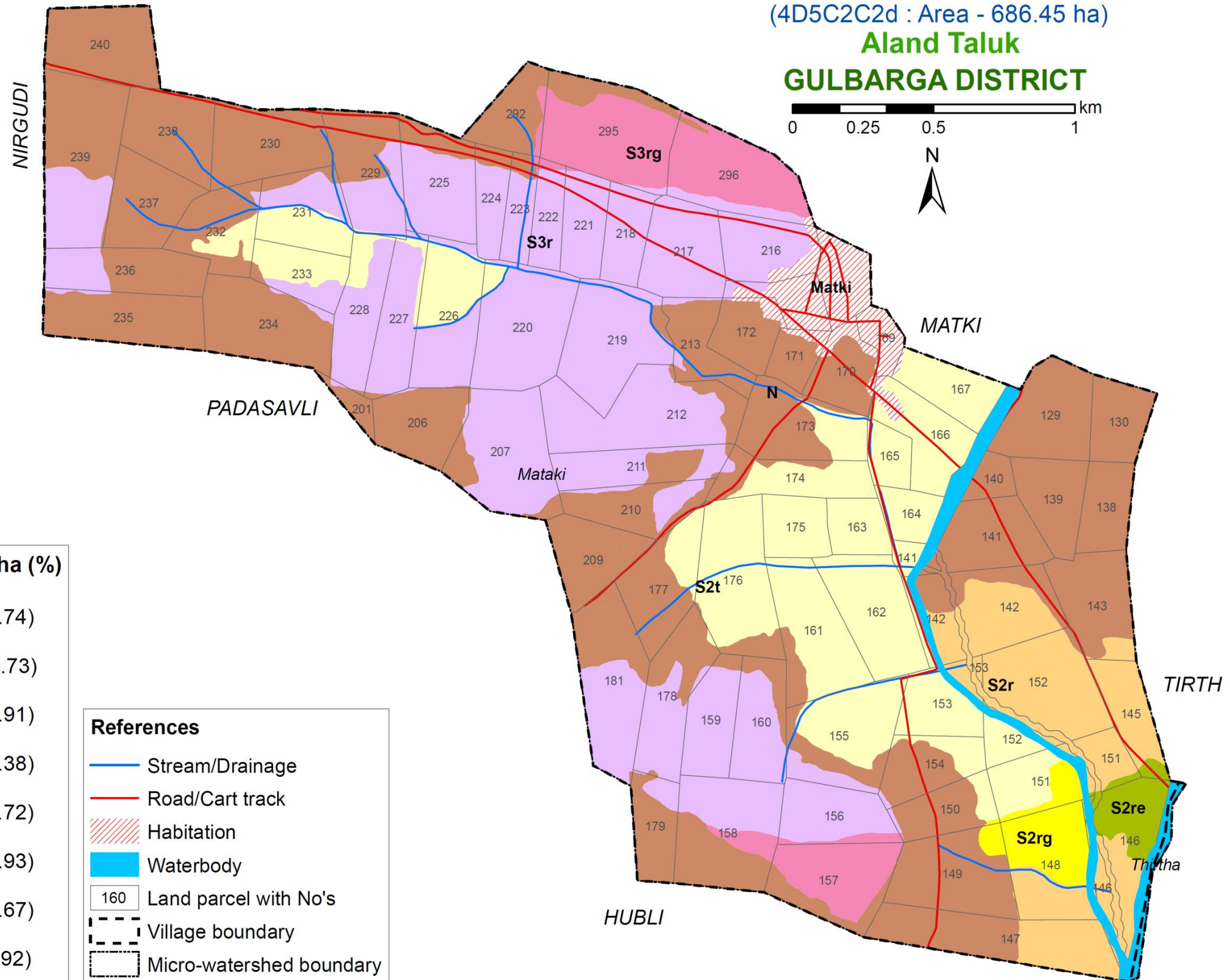
Key	
S2-Moderately Suitable	
S3-Marginally Suitable	
N-Not Suitable	
Limitations	
e- erosion	
g- gravelliness	
r- rooting condition	
t- texture	

Suitability subclass Area in ha (%)

	S2r	46 (6.74)
	S2t	115 (16.73)
	S2re	6 (0.91)
	S2rg	9 (1.38)
	S3r	183 (26.72)
	S3rg	34 (4.93)
	N	265 (38.67)
	Others*	27 (3.92)

References

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



* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

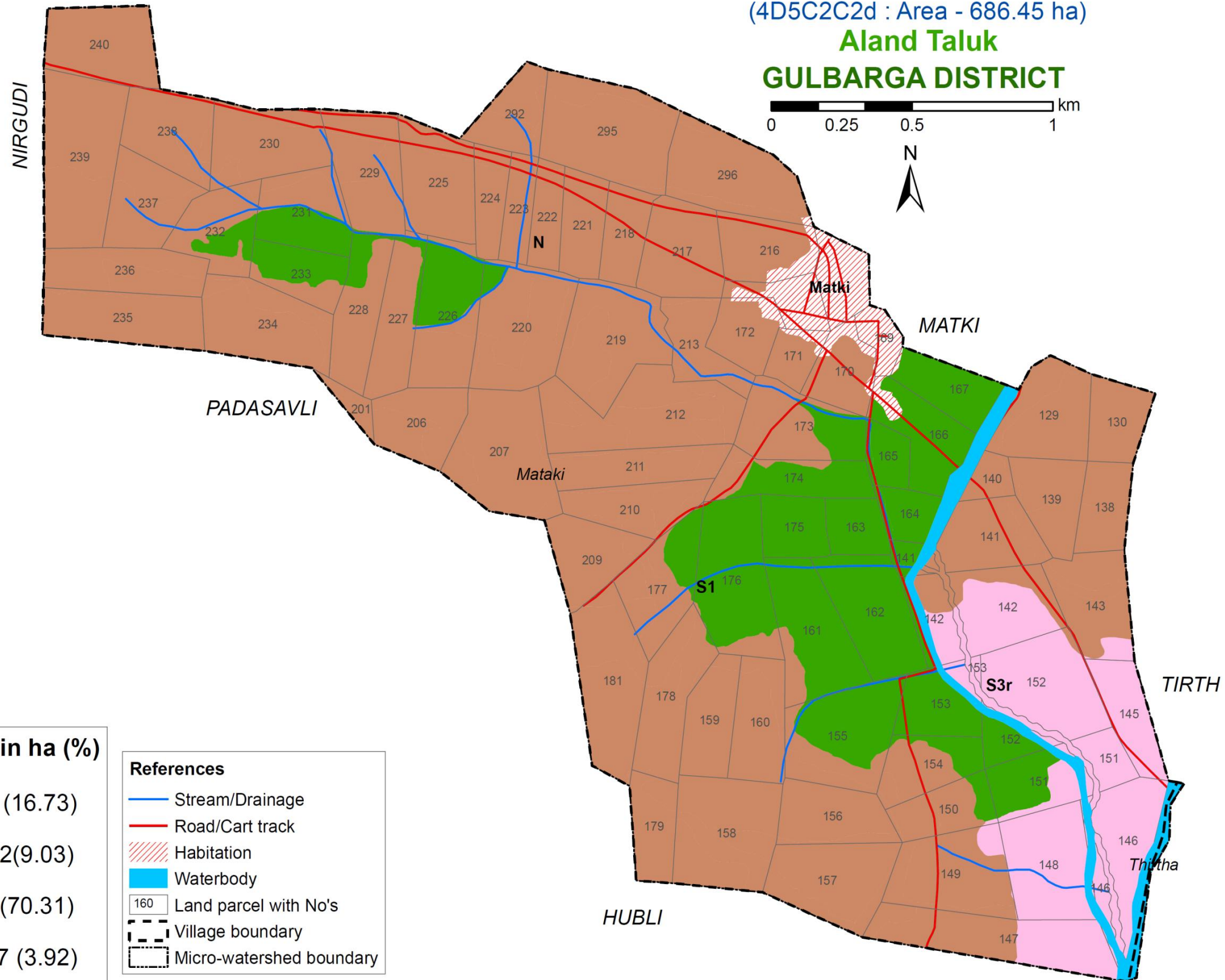
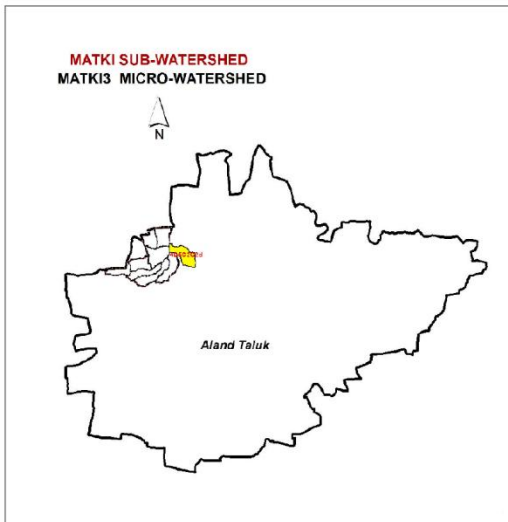
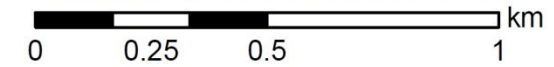
LAND SUITABILITY FOR SUNFLOWER

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



Key
 S1-Highly Suitable
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 r- rooting condition

Suitability subclass	Area in ha (%)
S1	115 (16.73)
S3r	62(9.03)
N	483 (70.31)
Others*	27 (3.92)

References

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

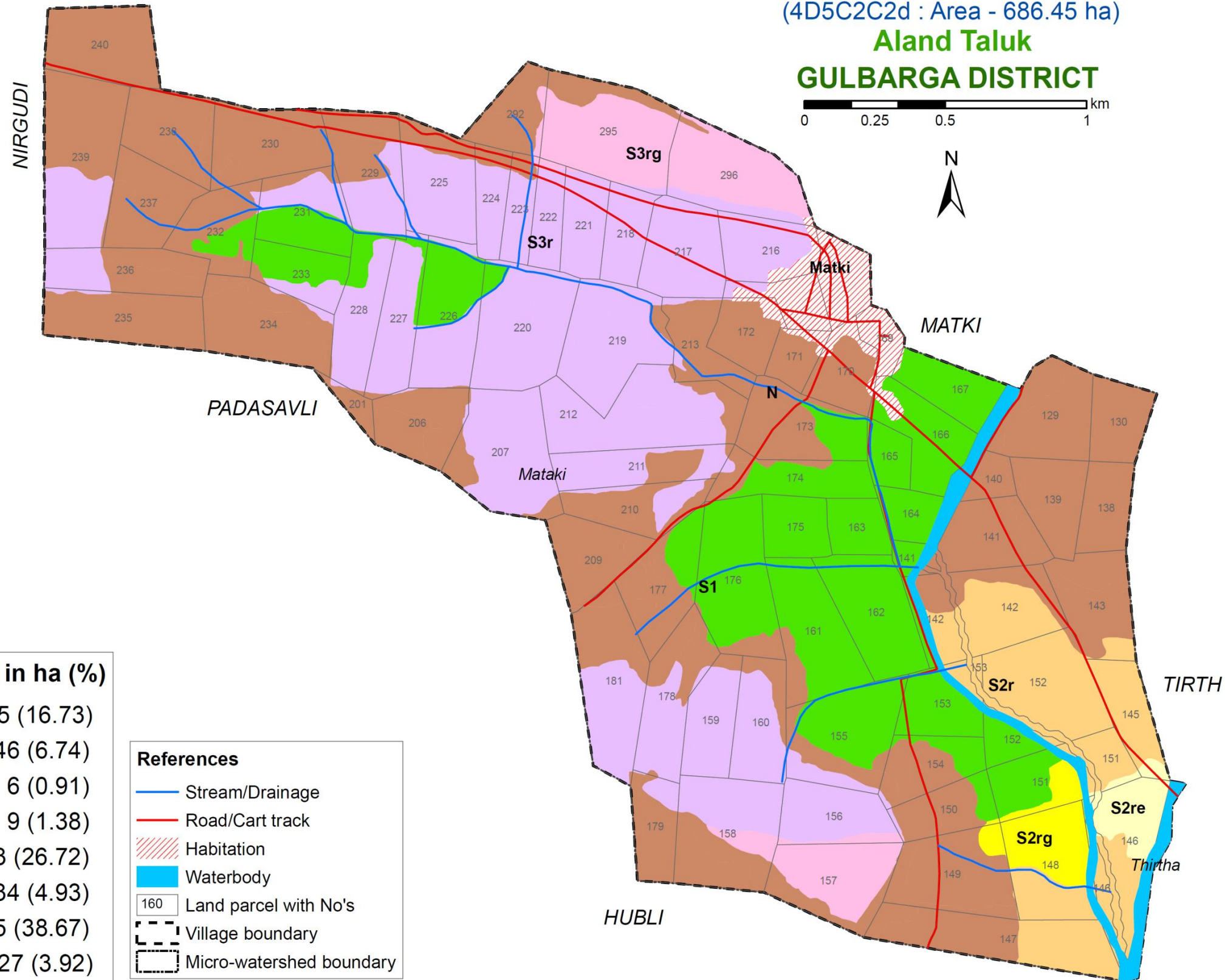
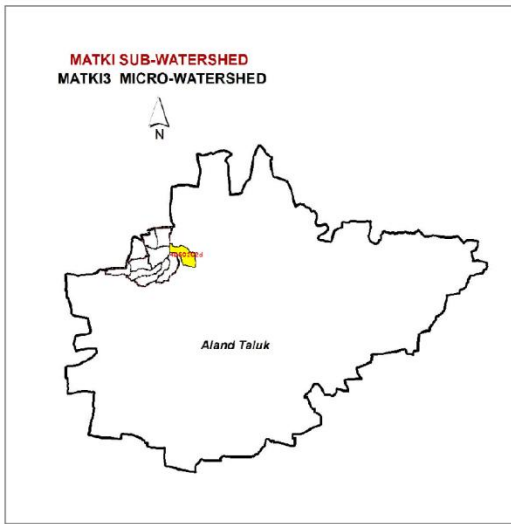
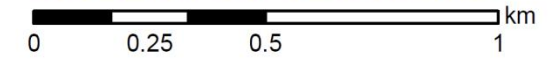
LAND SUITABILITY FOR COTTON

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



Key
 S1-Highly Suitable
 S2-Moderately Suitable
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 e- erosion
 r- rooting condition
 g- gravelliness/stoniness

Suitability subclass	Area in ha (%)
S1	115 (16.73)
S2r	46 (6.74)
S2re	6 (0.91)
S2rg	9 (1.38)
S3r	183 (26.72)
S3rg	34 (4.93)
N	265 (38.67)
Others*	27 (3.92)

References

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

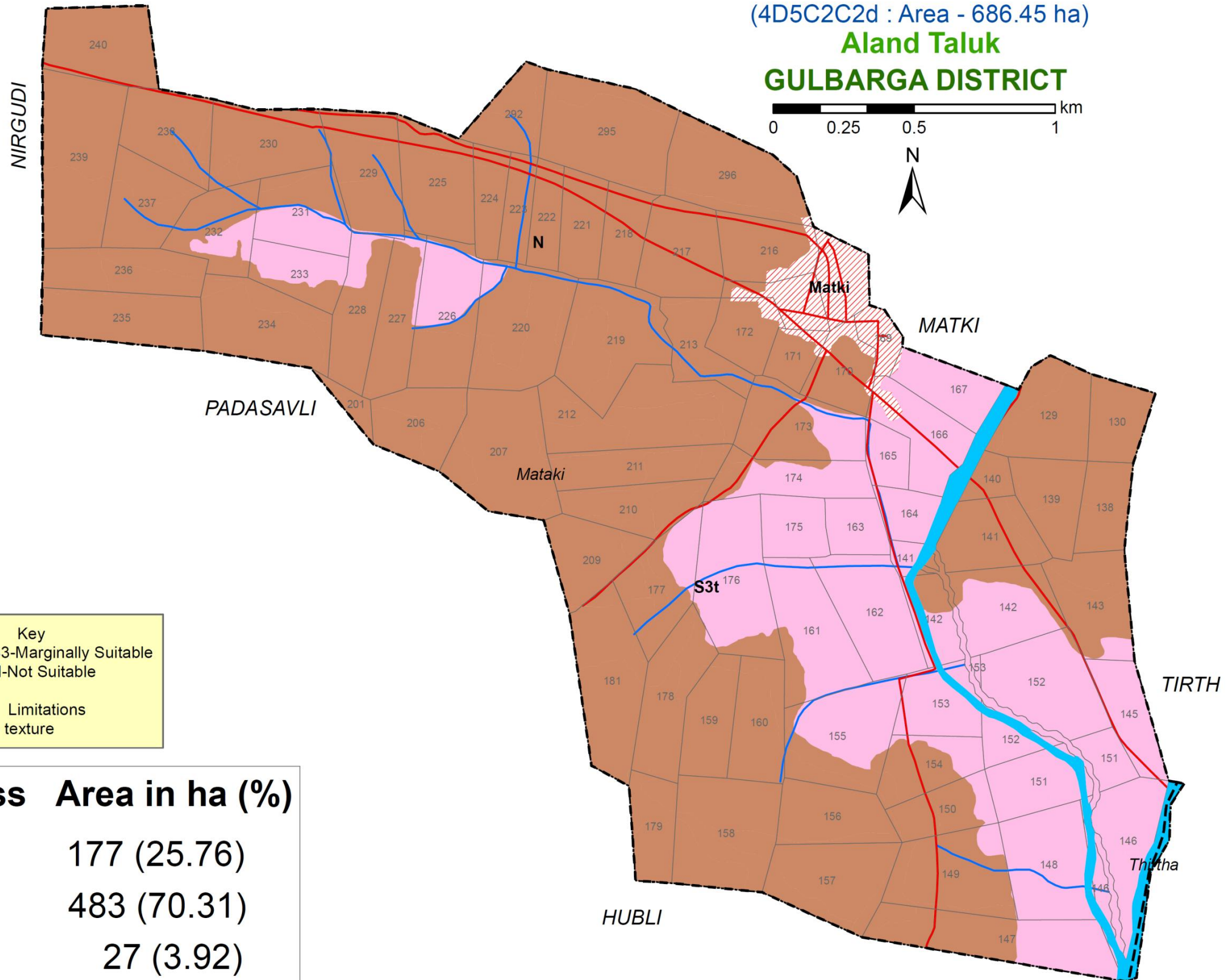
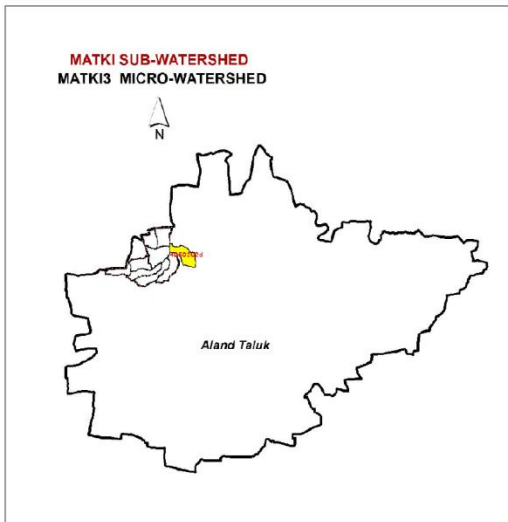
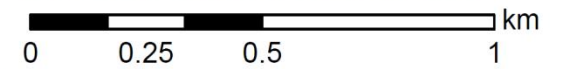
LAND SUITABILITY FOR SUGARCANE

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



- References**
- Stream/Drainage
 - Road/Cart track
 - Habitation
 - Waterbody
 - Land parcel with No's
 - Village boundary
 - Micro-watershed boundary

Key
 S3-Marginally Suitable
 N-Not Suitable
 Limitations
 t- texture

Suitability subclass	Area in ha (%)
S3t	177 (25.76)
N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

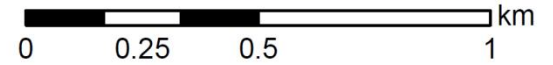
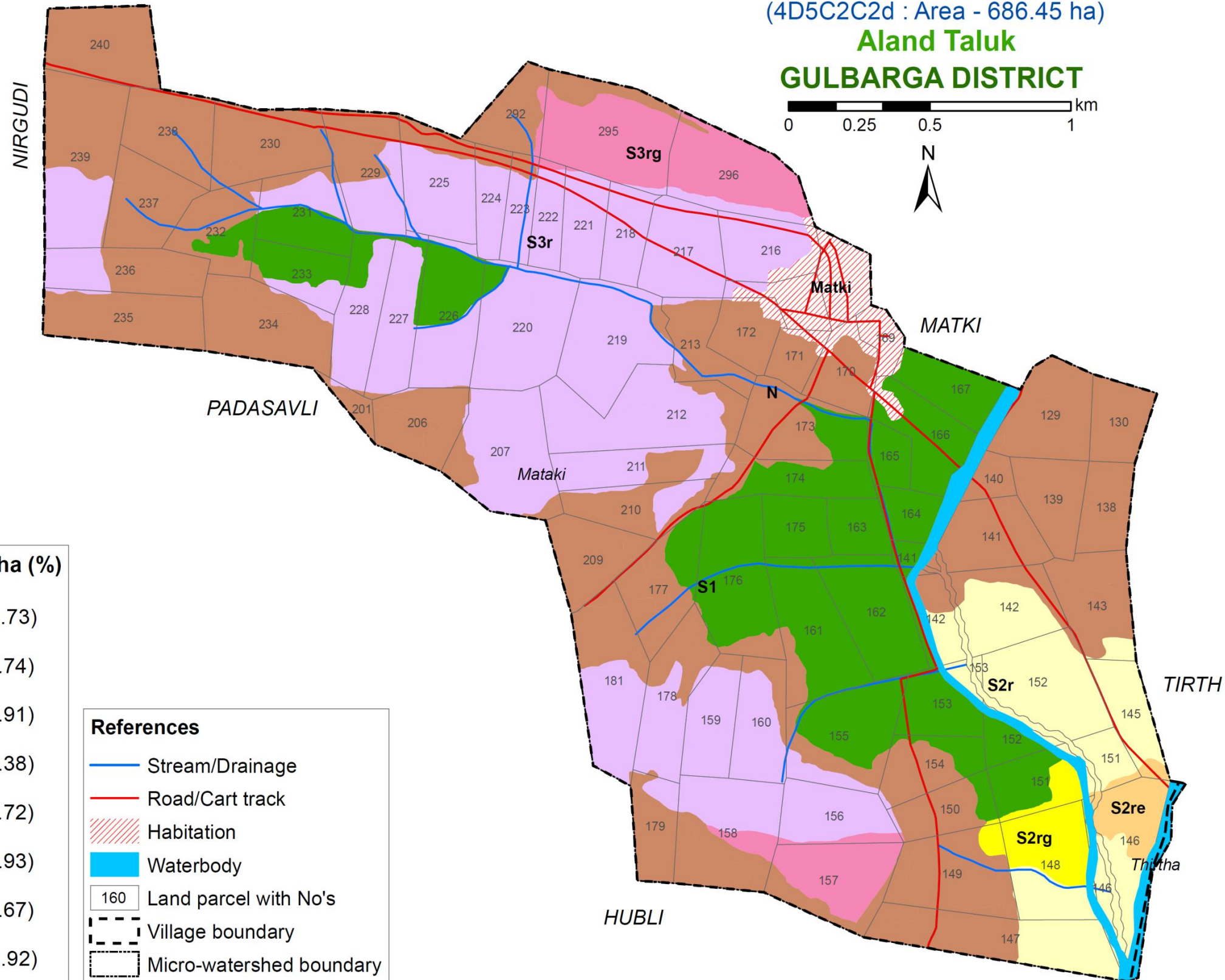
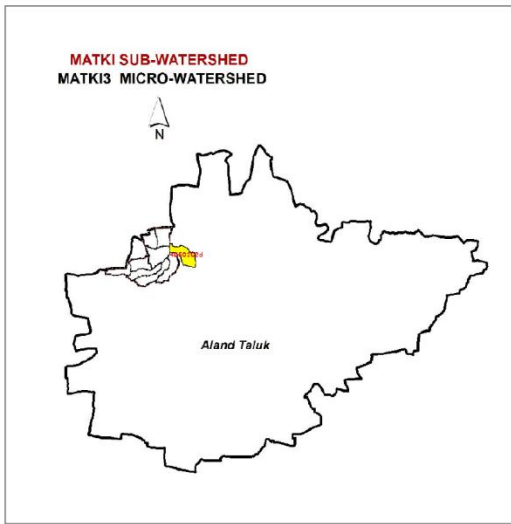
LAND SUITABILITY FOR SOYABEAN

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



Key

S1-Highly Suitable
S2-Moderately Suitable
S3-Marginally Suitable
N-Not Suitable

Limitations

e- erosion
g- gravelliness
r- rooting condition

Suitability subclass Area in ha (%)

	S1	115 (16.73)
	S2r	46 (6.74)
	S2re	6 (0.91)
	S2rg	9 (1.38)
	S3r	183 (26.72)
	S3rg	34 (4.93)
	N	265 (38.67)
	Others*	27 (3.92)

References

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

* - Habitation & Waterbody

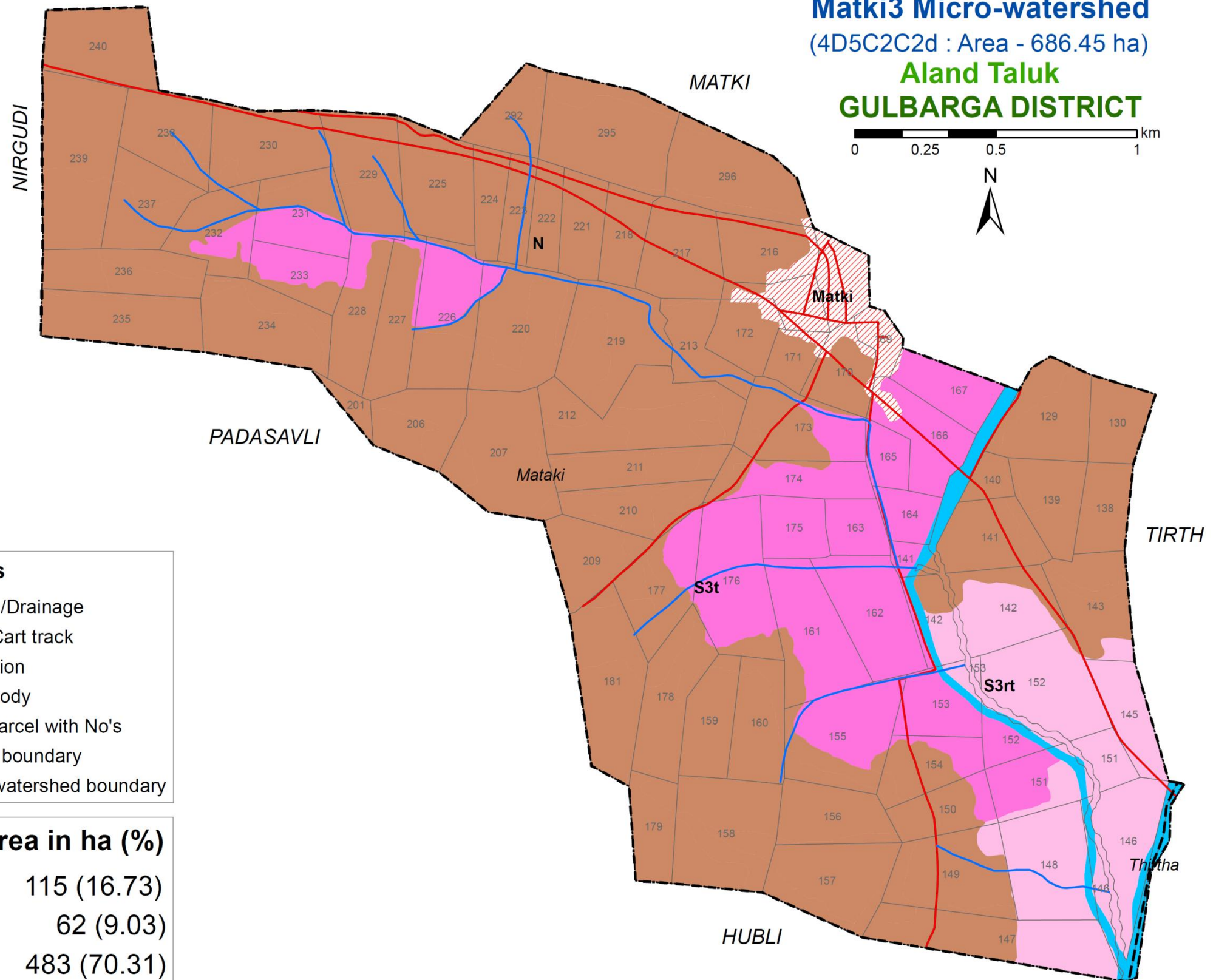
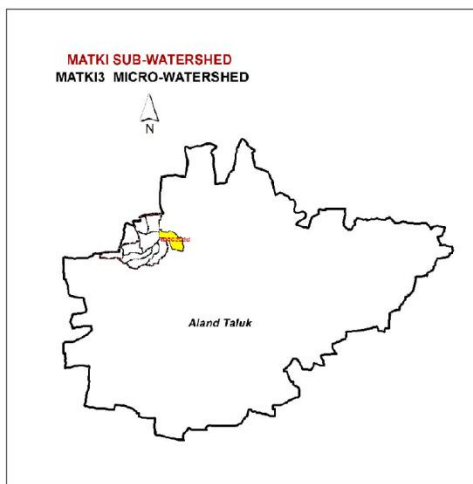
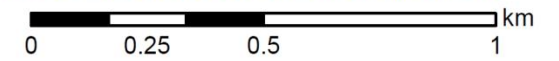
Source: ICAR-NBSS&LUP, Bengaluru

LAND SUITABILITY FOR GUAVA

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk GULBARGA DISTRICT



References

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

Key
S3-Marginally Suitable
N-Not Suitable

Limitations
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
S3t	115 (16.73)
S3rt	62 (9.03)
N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

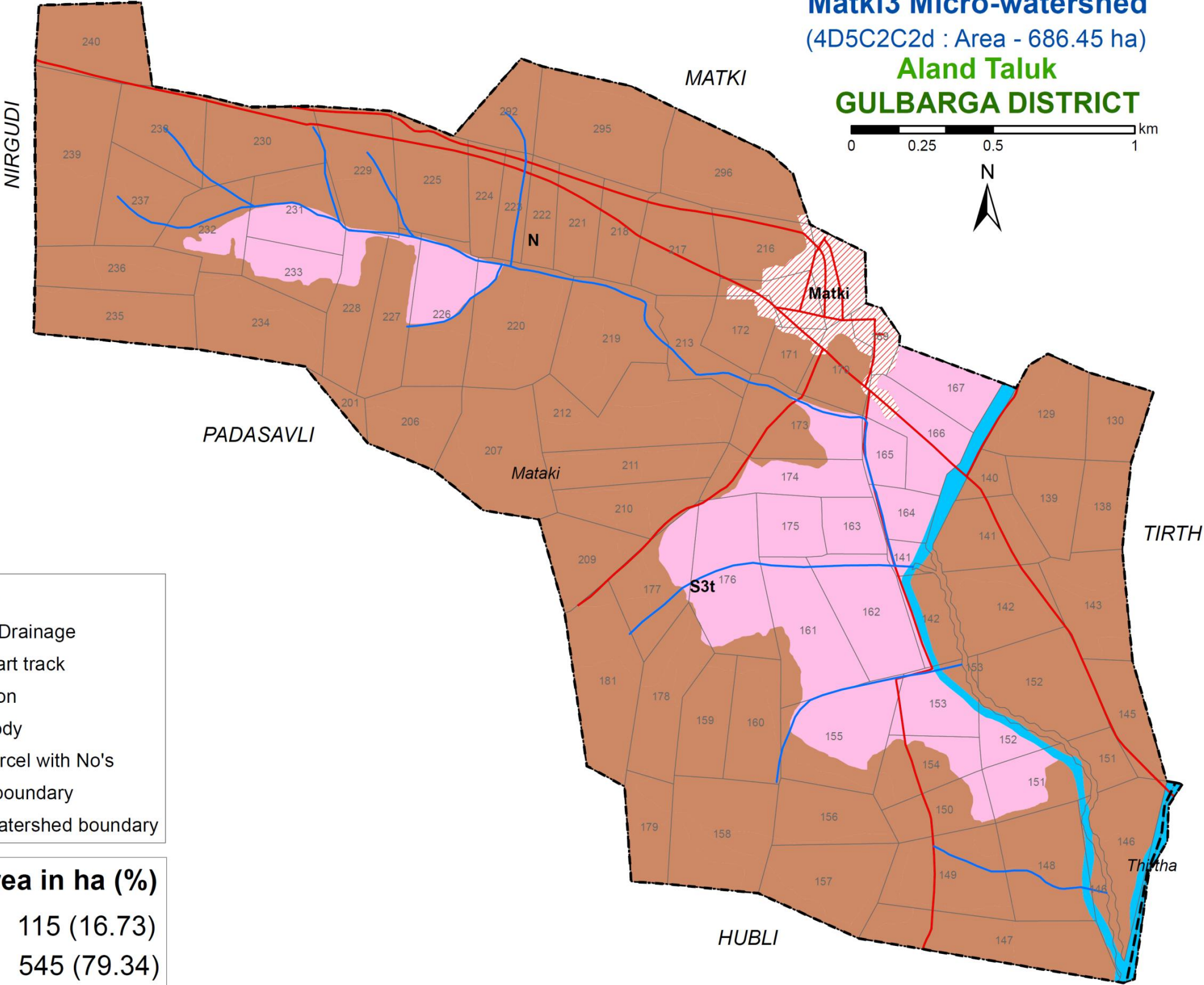
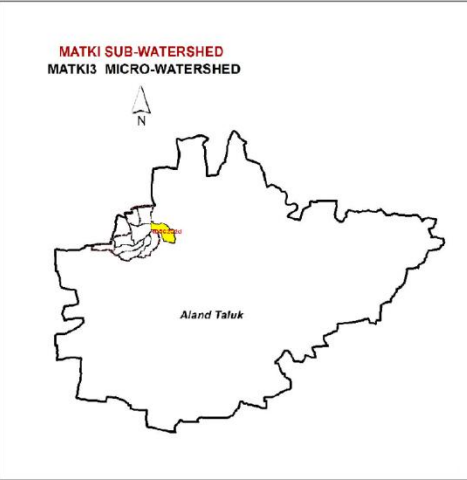
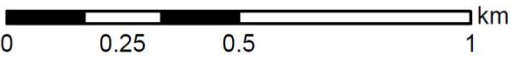
LAND SUITABILITY FOR MANGO

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Key
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 t- texture

Suitability subclass	Area in ha (%)
S3t	115 (16.73)
N	545 (79.34)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

LAND SUITABILITY FOR SAPOTA

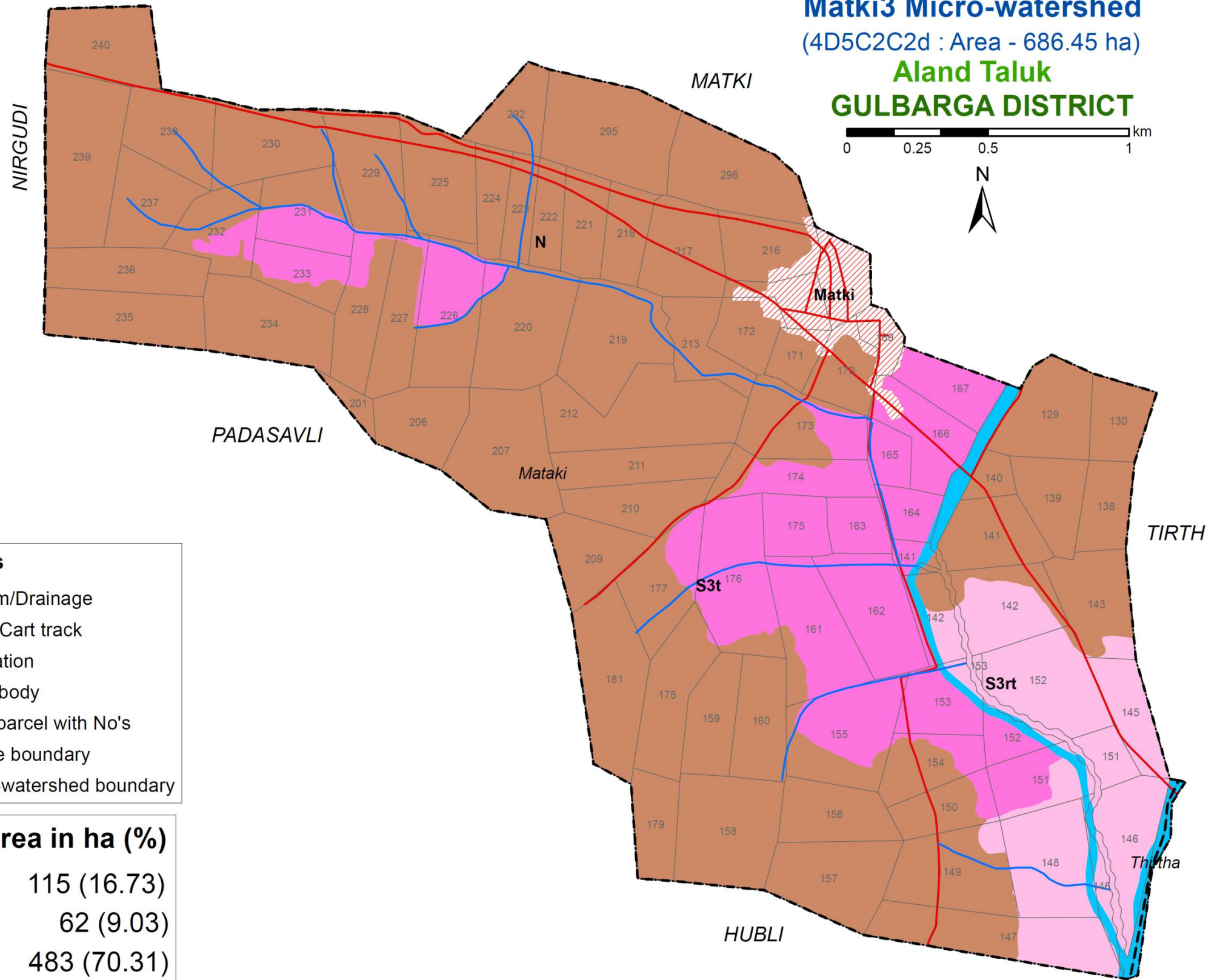
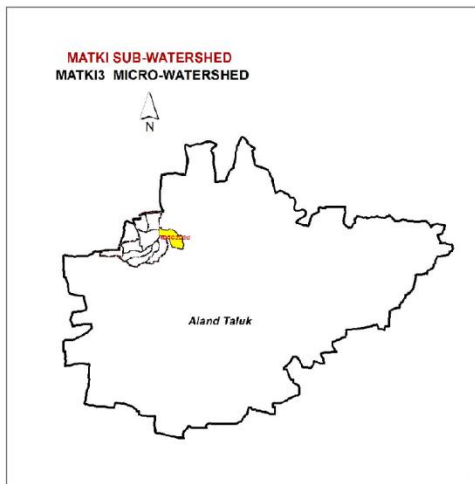
Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)







Aland Taluk

GULBARGA DISTRICT

0 0.25 0.5 1 km



References

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

Key

S3-Marginally Suitable
N-Not Suitable

Limitations

t- texture
r- rooting condition

Suitability subclass Area in ha (%)

 S3t	115 (16.73)
 S3rt	62 (9.03)
 N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

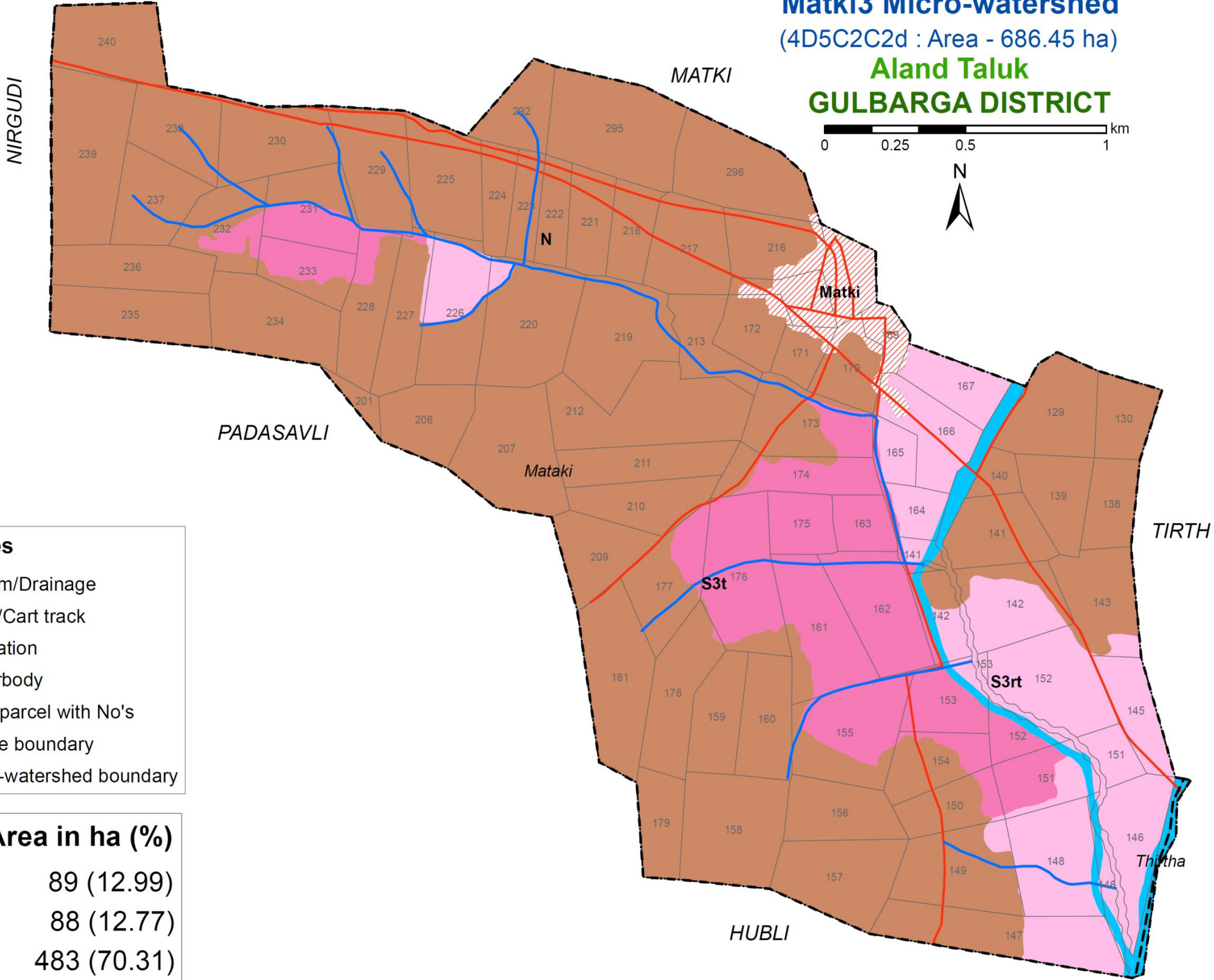
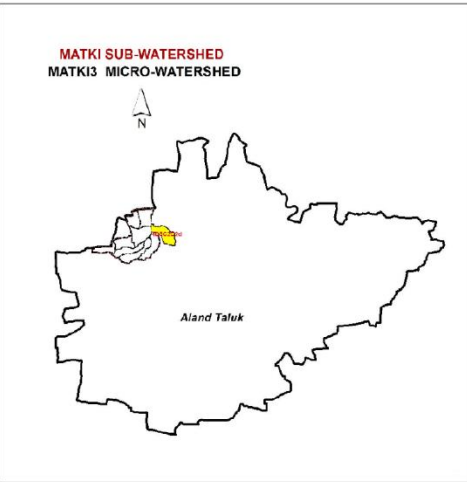
LAND SUITABILITY FOR JACKFRUIT

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Key
S3-Marginally Suitable
N-Not Suitable

Limitations
r- rooting condition
t- texture

Suitability subclass	Area in ha (%)
 S3t	89 (12.99)
 S3rt	88 (12.77)
 N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

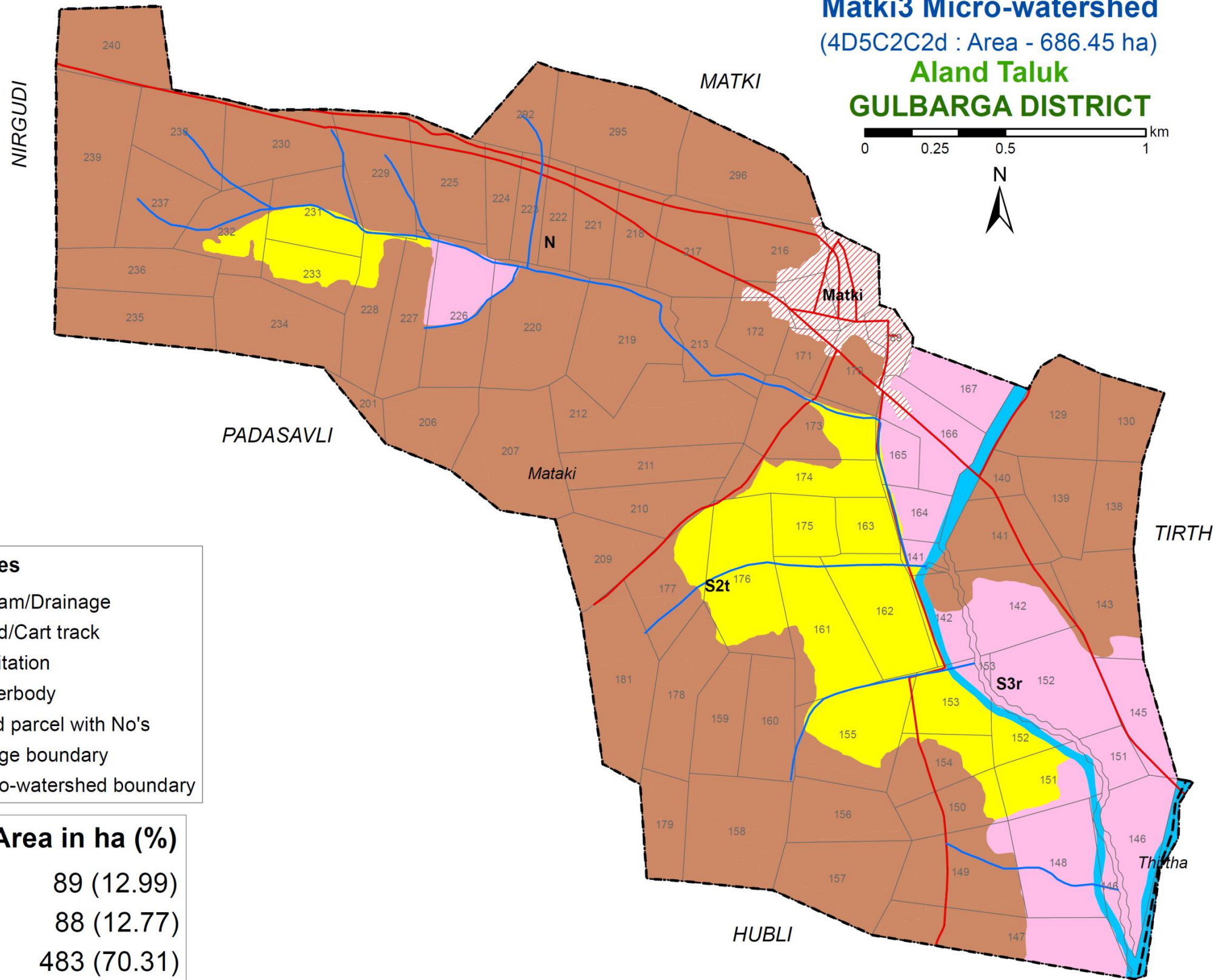
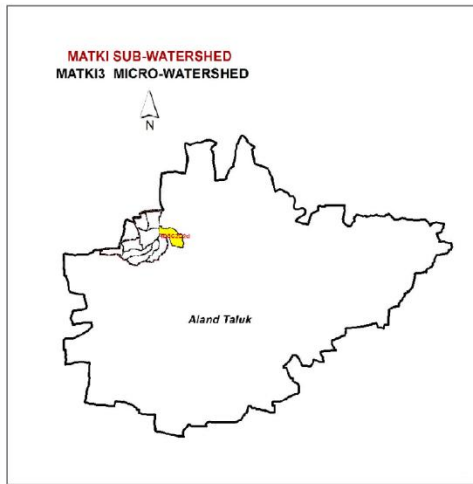
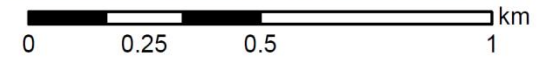
LAND SUITABILITY FOR JAMUN

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Key
 S2-Moderately Suitable
 S3-Marginally Suitable
 N-Not Suitable

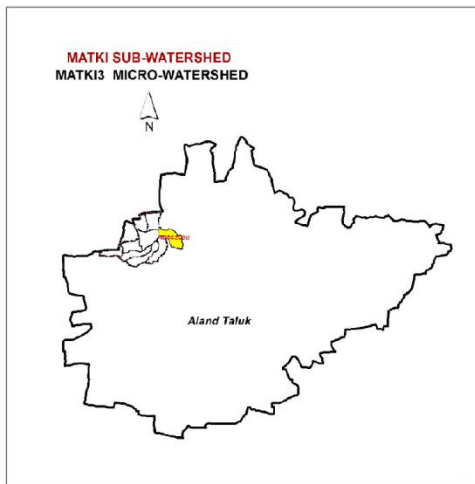
Limitations
 r- rooting condition
 t- texture

Suitability subclass Area in ha (%)

S2t	89 (12.99)
S3r	88 (12.77)
N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru



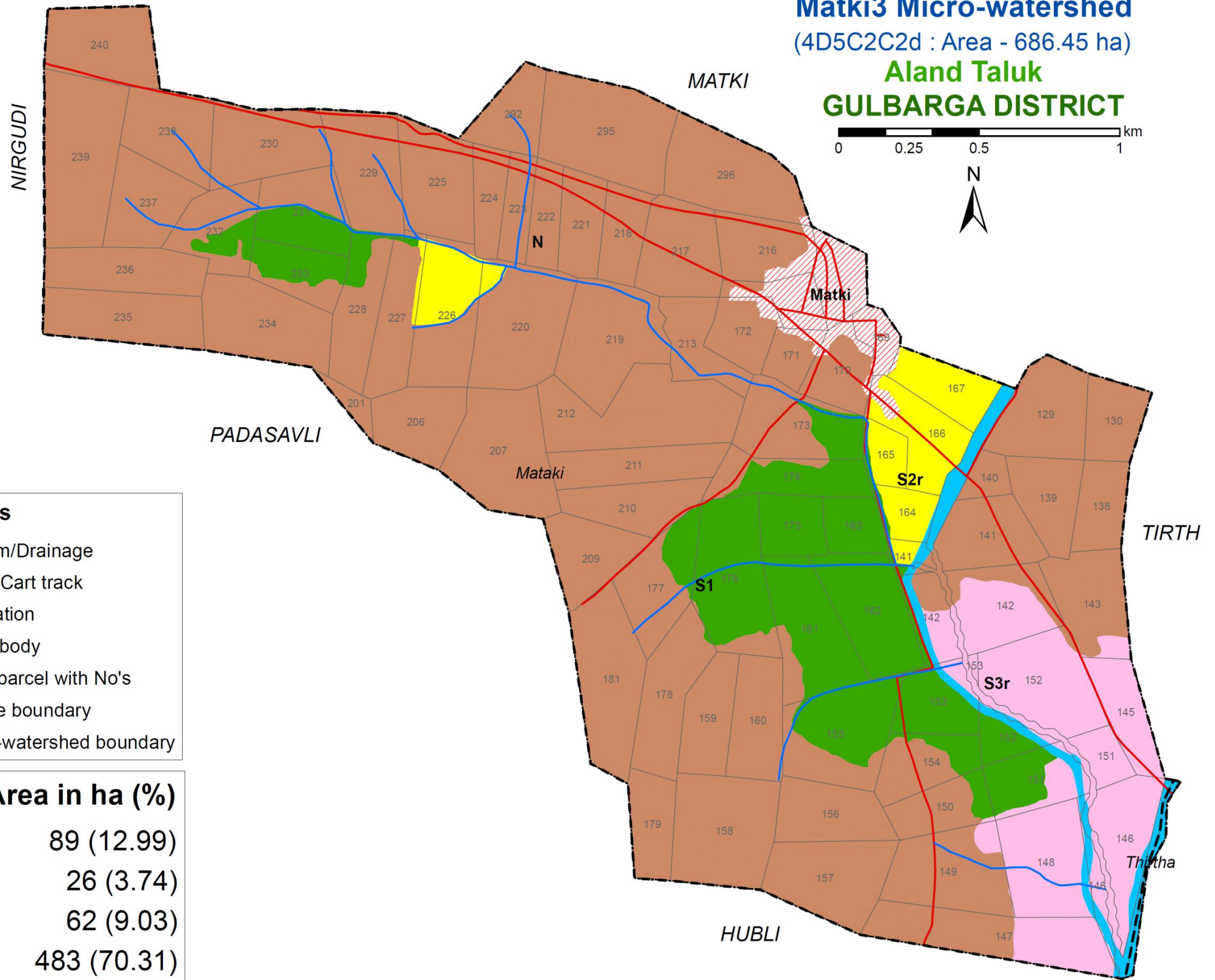
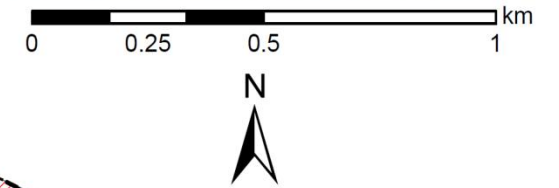
LAND SUITABILITY FOR MUSAMBI

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Key

- S1-Highly Suitable
- S2-Moderately Suitable
- S3-Marginally Suitable
- N-Not Suitable

Limitations

- r- rooting condition

Suitability subclass	Area in ha (%)
S1	89 (12.99)
S2r	26 (3.74)
S3r	62 (9.03)
N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

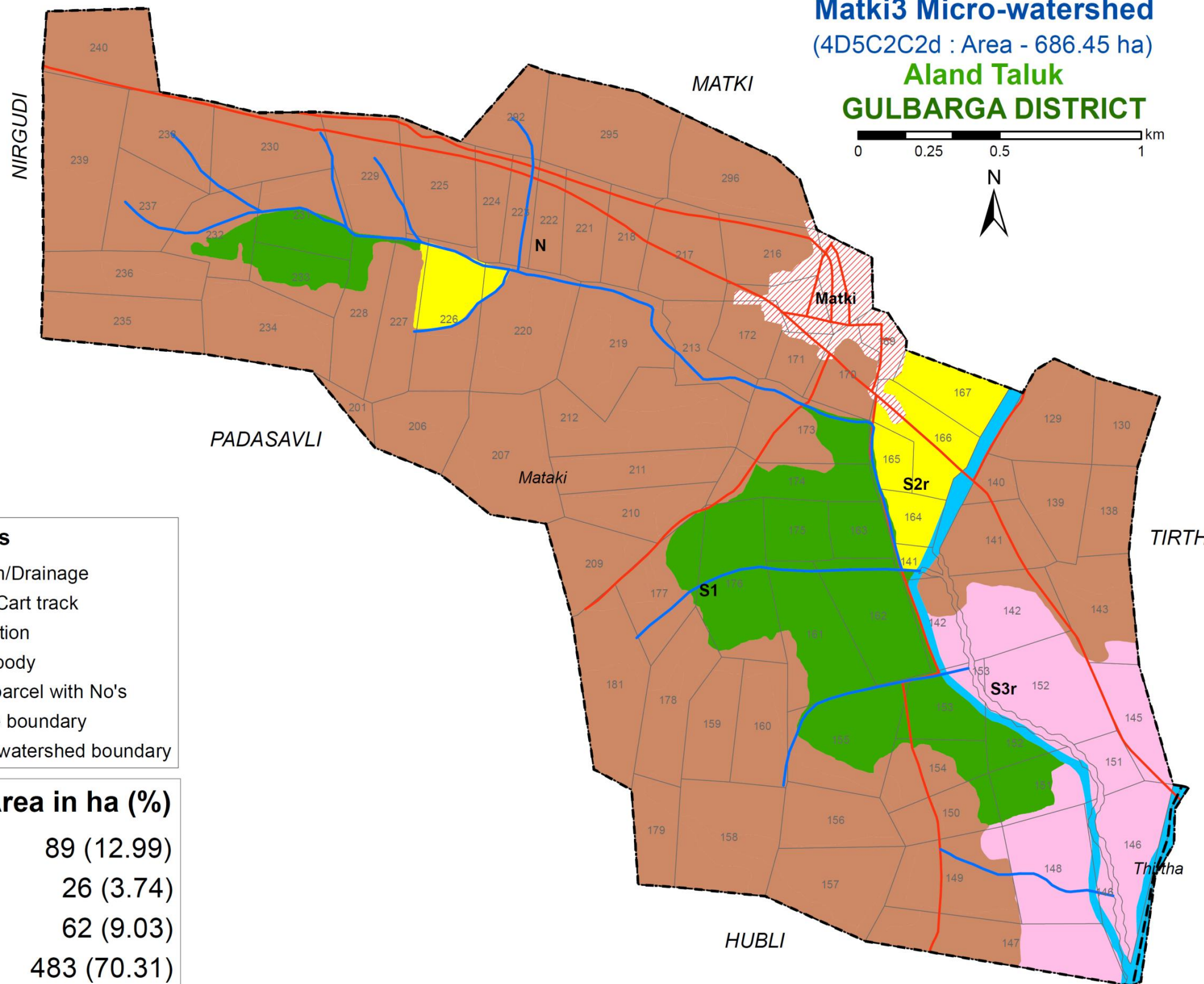
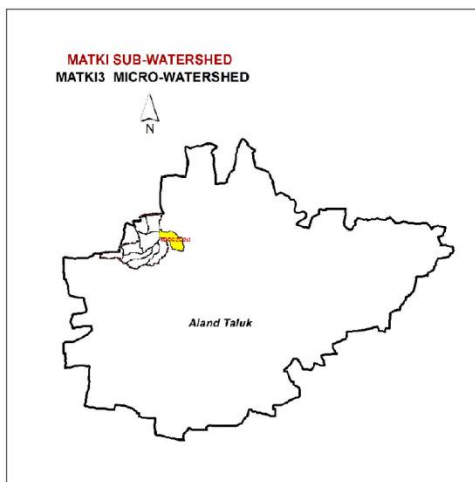
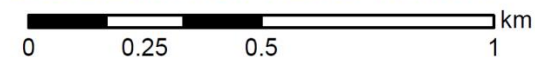
LAND SUITABILITY FOR LIME

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Key
 S1-Highly Suitable
 S2-Moderately Suitable
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 r- rooting condition

Suitability subclass	Area in ha (%)
S1	89 (12.99)
S2r	26 (3.74)
S3r	62 (9.03)
N	483 (70.31)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

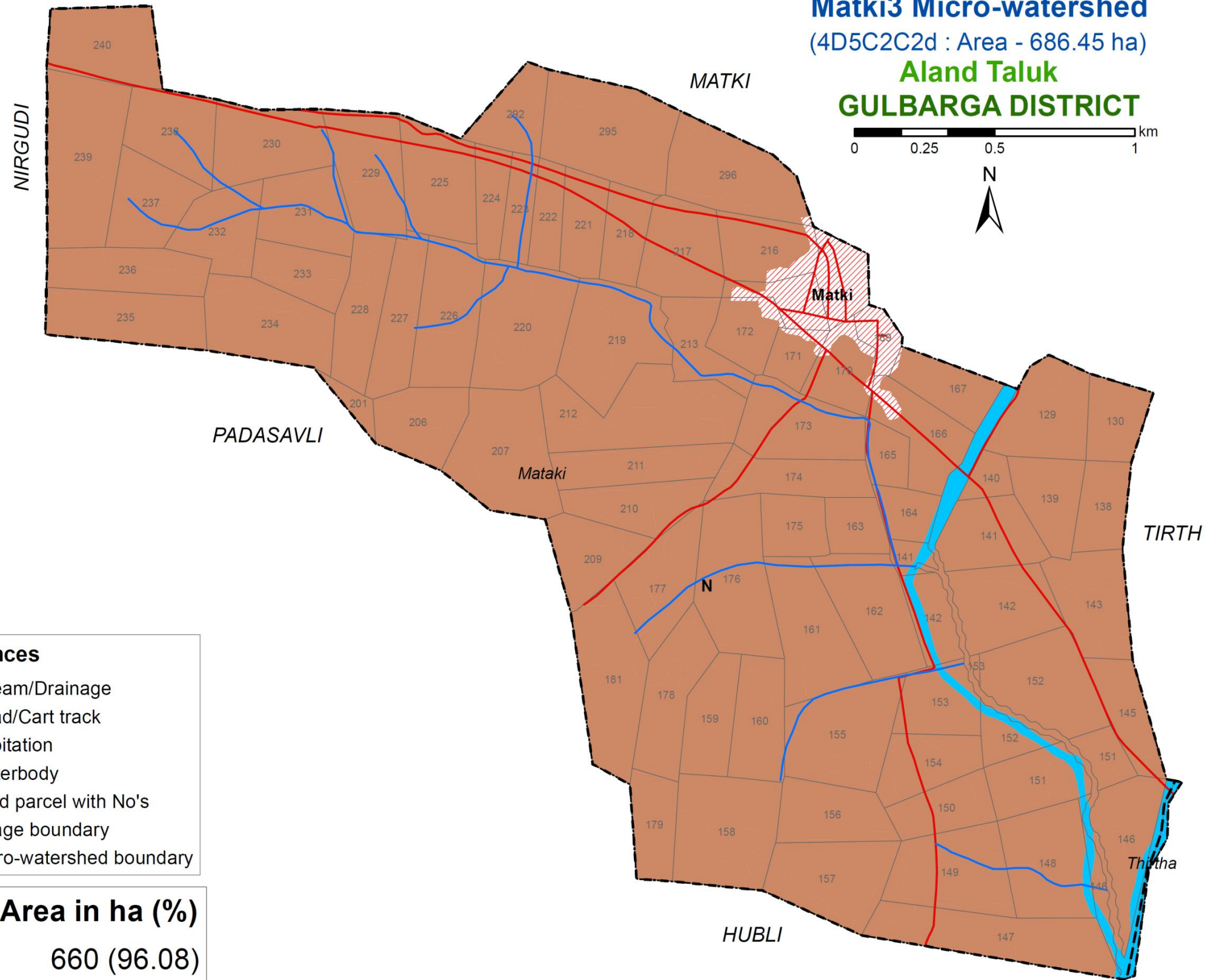
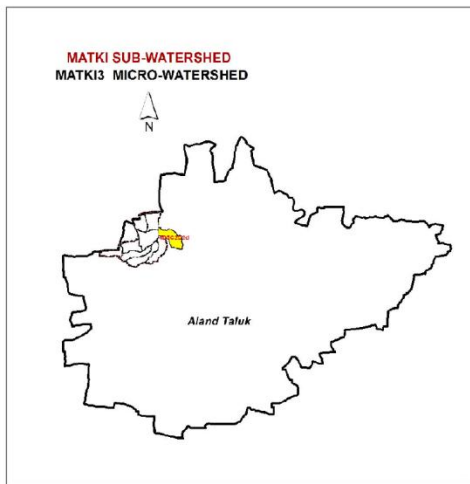
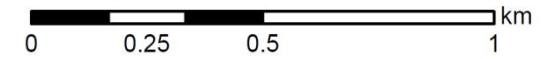
LAND SUITABILITY FOR CASHEW

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



References

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

Key
N-Not Suitable

Suitability subclass	Area in ha (%)
N	660 (96.08)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

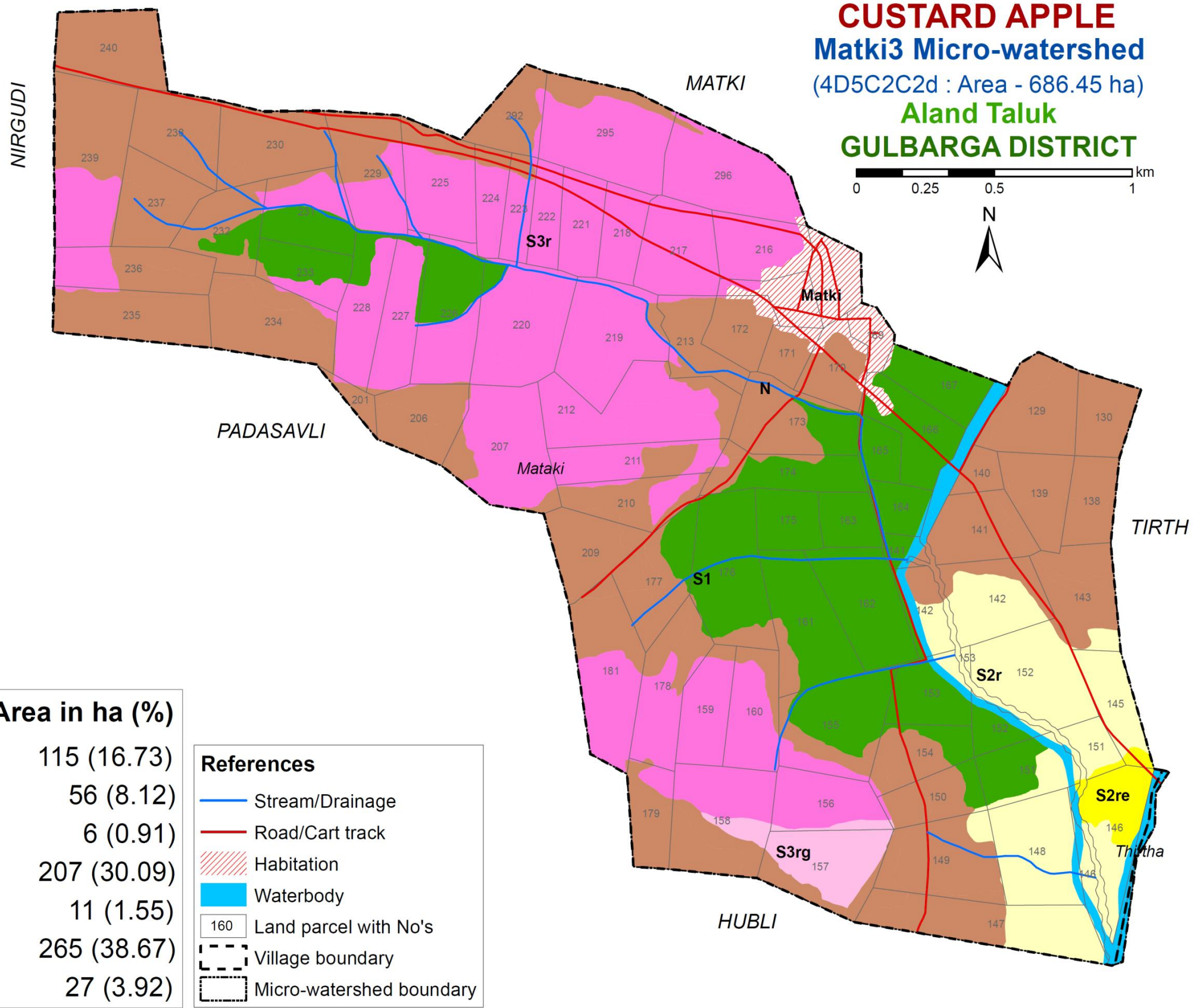
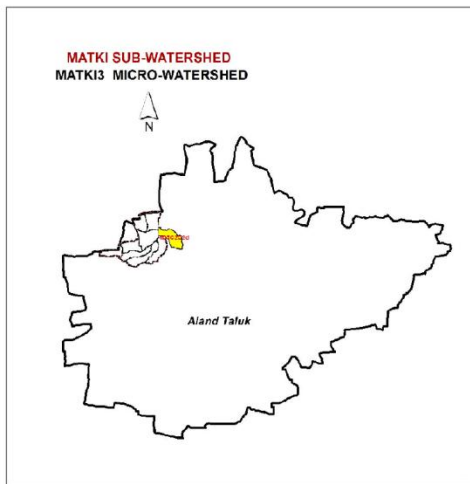
LAND SUITABILITY FOR CUSTARD APPLE

Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



Key

S1-Highly Suitable
S2-Moderately Suitable
S3-Marginally Suitable
N-Not Suitable

Limitations

e- erosion
r- rooting condition
g- gravelliness/stoniness

Suitability subclass	Area in ha (%)
S1	115 (16.73)
S2r	56 (8.12)
S2re	6 (0.91)
S3r	207 (30.09)
S3rg	11 (1.55)
N	265 (38.67)
Others*	27 (3.92)

References

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

LAND SUITABILITY FOR TAMARIND

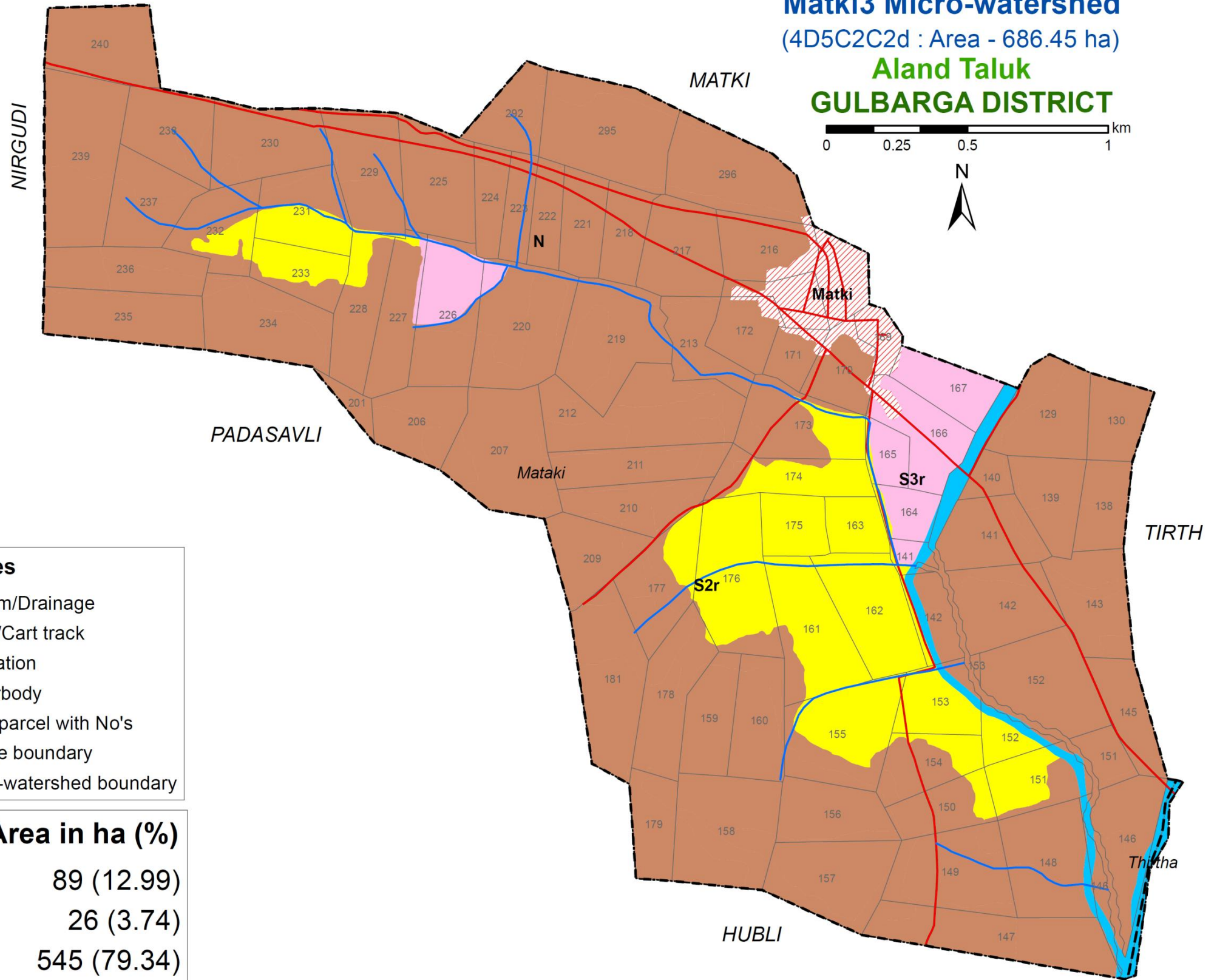
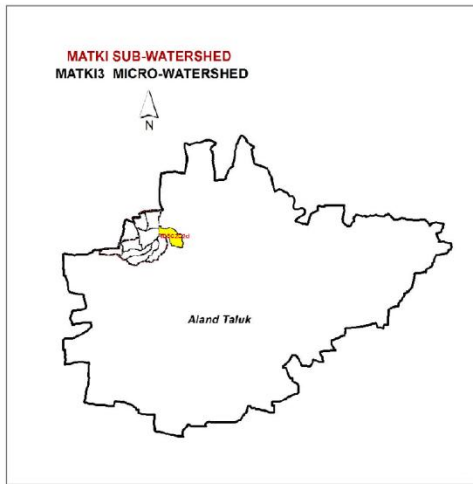
Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT

0 0.25 0.5 1 km



References

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

Key
 S2-Moderately Suitable
 S3-Marginally Suitable
 N-Not Suitable

Limitations
 r- rooting condition

Suitability subclass	Area in ha (%)
S2r	89 (12.99)
S3r	26 (3.74)
N	545 (79.34)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

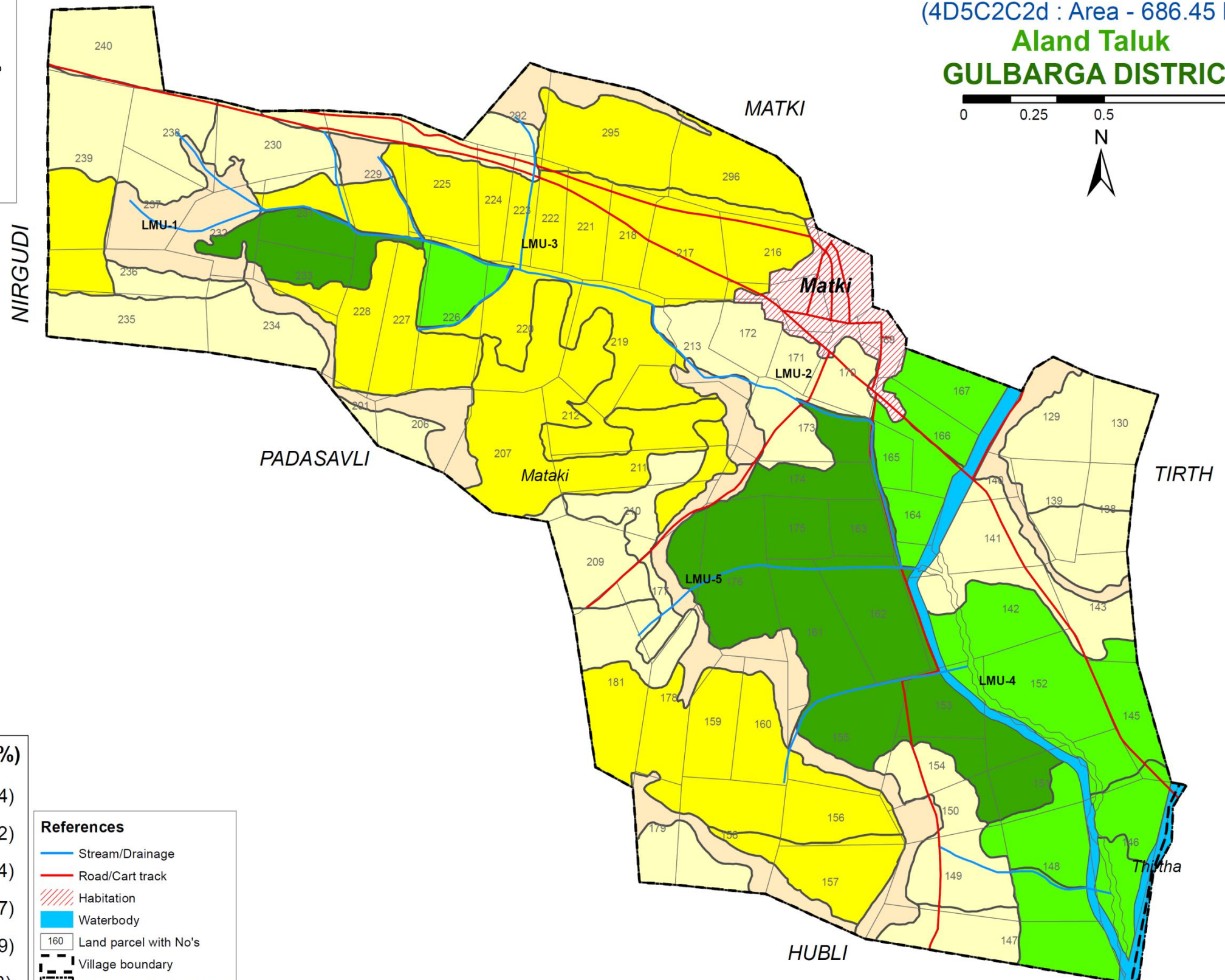
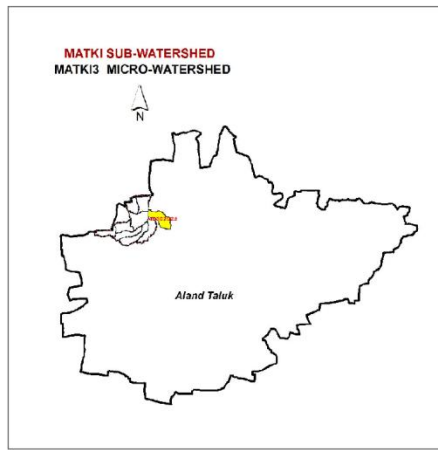
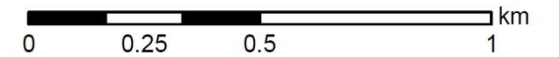
LAND MANAGEMENT UNITS






Matki3 Micro-watershed








(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT



LMU	Area in ha (%)
 LMU-1	70 (10.14)
 LMU-2	196 (28.52)
 LMU-3	217 (31.64)
 LMU-4	88 (12.77)
 LMU-5	89 (12.99)
Others*	27 (3.92)

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

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

NOTE: Proposed Crop Plan for LMU's are given in Table

**Table. Proposed Crop Plan for Matki-3 Micro-watershed, Matki Sub-watershed
Aland Taluk, Gulbarga District based on soil-site–crop suitability Assessment**

LMU	Mapping unit	Survey No	Characters	Crops proposed				Suitable Intervention
				Field crops	Forestry Crop/Grasses	Horticulture crops (Rainfed Condition)	Horticulture crops With suitable intervention	
LMU-1	2 MGTiC3g3 3 MGTiD3g3 10MGTmC3g1 11 MGTmC3g2 12 MGTmC3g3	Matki: 140,206,232,237, 292	Very shallow Black soil Depth (<25 cm) slightly gravelly to moderately gravelly, severely eroded	-	Neem, Glyricydia , Silviculture, Agave, Simaroba	-	-	Crescent bunds
LMU-2	4 MGTmA1 5 MGTmB1 6 MGTmB1g1 7 MGTmB1g2 8 MGTmB2g1 1 MGTiB2g2 9 MGTmB2g2	Matki: 129,130,138,139, 141,143,147,149, 150,154,170,171, 172,173,177,179, 201,209,210,213, 230,234,235,238, 239,240	Very shallow Black soil Depth (<25 cm) slight to moderately gravelly, slight to moderate erosion	Horse gram, Green gram, chick pea	Neem, Glyricydia , Silviculture, Agave, Simaroba	-	-	Crescent bunds

LMU	Mapping unit	Survey No	Characters	Crops proposed				Suitable Intervention
				Field crops	Forestry Crop/Grasses	Horticulture crops (Rainfed Condition)	Horticulture crops With suitable intervention	
LMU-3	17 NHAmB1g1 18 NHAmB2g1 13BHImB1 14BHImB1g1 15BHImB1g2 16BHImB2g2	Matki: 156,157,158,159, 160,178,181,207, 211,212,216,217, 218,219,220,221, 222,223,224,225, 226,227,228,229, 236,295,296	Shallow black soil (25-50 cm) 1-3 % slope, slight to moderately eroded, slight to mod. Gravelly.	Bajra, Linseed, Green gram, Black gram, Chick pea	Subabhul, Neem, Teak	Custard apple, Charoli, Ber, Amla Vegetable: Ladies finger, Brinjal, Cowpea, Flower: Marigold, Chrysanthemum	Custard apple, Charoli, Ber, Amla Vegetable: Onion, Tomato, Brinjal, Chillies, Bhendi Flower: Marigold, Chrysanthemum	Drip irrigation, suitable soil and water conservations like cultivation on raised beds with mulches and drip
LMU-4	19 GTTmB1 20 GTTmB1g1 21 GTTmB2 22KMPmB1 23KMPmB1g1	Matki: 142,145,146,148, 152,164,165,166 ,167	Moderately shallow black soil (50-75 cm & 75-100 1-3 % slope, slight to moderately eroded.	Sorghum, Cotton, Red Gram, Black gram, Green gram, Soybean, Sesame, Sunflower, Safflower Rabi: Sorghum, Chickpea	Subabhul, Neem, Teak	Custard apple, Charoli, Ber, Amla Vegetable: Ladies finger, Brinjal, Cowpea, Flower: Marigold, Chrysanthemum	Custard apple, Charoli, Ber, Amla, Papaya, Banana, Lime, Citrus Vegetable: Onion, Tomato, Brinjal, Chillies, Bhendi Flower: Marigold, Chrysanthemum	-do- Graded bunds, Strengthening of field bunds

LMU	Mapping unit	Survey No	Characters	Crops proposed				Suitable Intervention
				Field crops	Forestry Crop/Grasses	Horticulture crops (Rainfed Condition)	Horticulture crops With suitable intervention	
LMU-5	24RNLmB1	Matki: 151,153,155, 161,162,163, 174,175,176, 231,233	Deep Black soil (100-150 cm), 1-3 % slope, slight erosion	Sorghum, Cotton, Red Gram Black gram, Green gram, Soybean, Sesame, Sunflower, Safflower, Rabi: Sorghum, Chickpea	-	Vegetable: Ladies finger, Brinjal, Cowpea, coriander Field crops: Sorghum, Cotton, Red Gram, Sunflower, Safflower, Perennial component: Guava, Tamarind, Sapota, Lime, Mosambi Flower: Marigold, Chrysanthemum	Banana, Papaya, Lime. Mosambi, Guava, Tamrind Vegetable: Onion, Tomato, Brinjal, Chillies, Bhendi Flower: Marigold, Chrysanthemum	-do- Graded bunds, Strengthening of field bunds

SOIL & WATER CONSERVATION PLAN

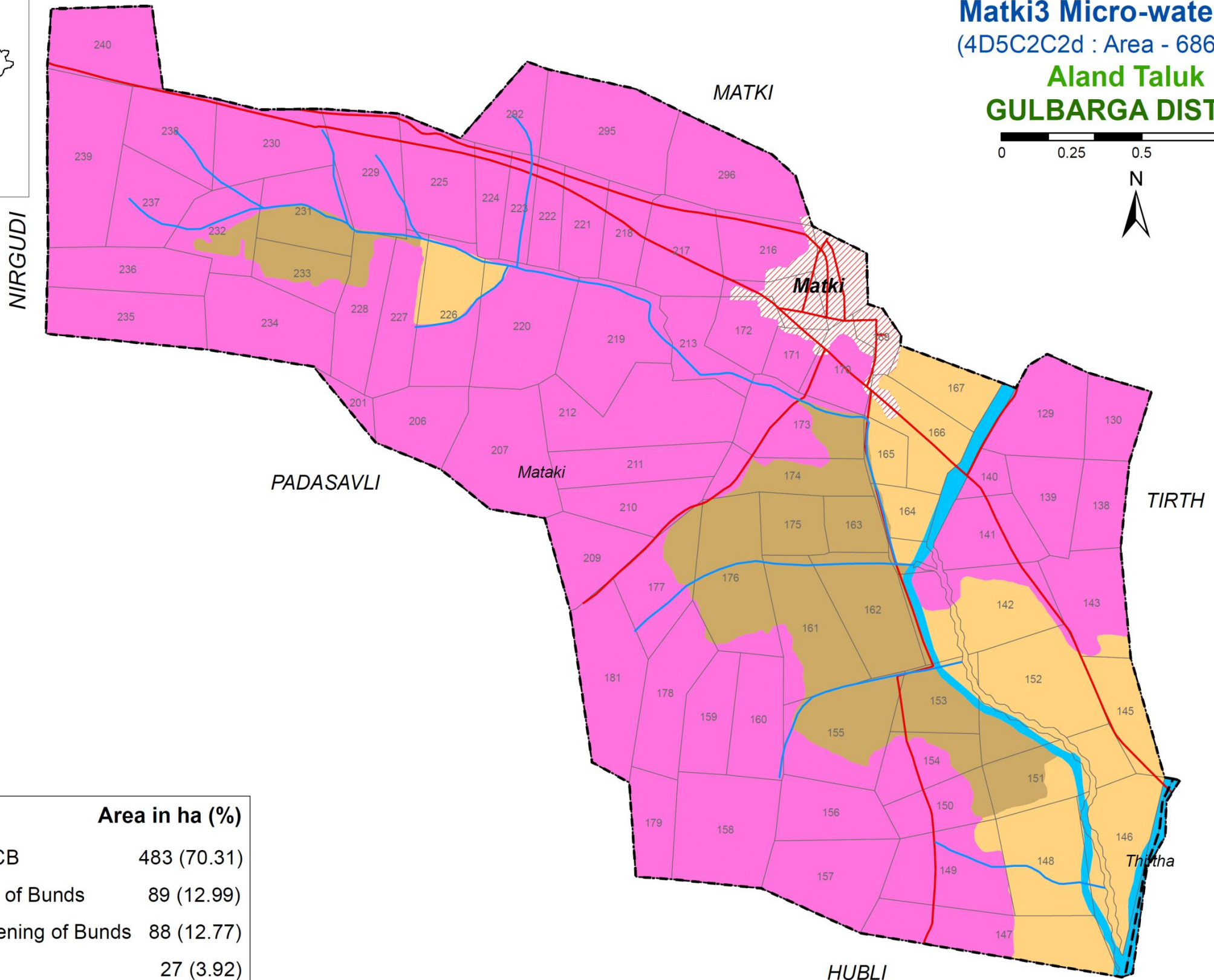
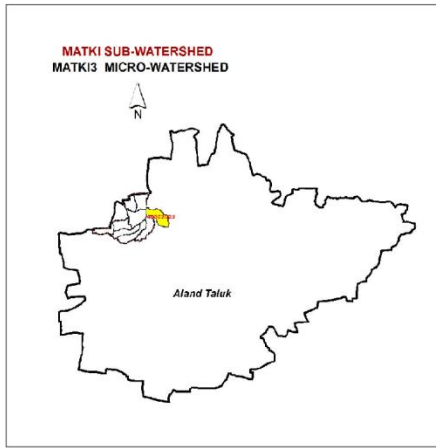
Matki3 Micro-watershed

(4D5C2C2d : Area - 686.45 ha)

Aland Taluk

GULBARGA DISTRICT

0 0.25 0.5 1 km



References

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

Legend

	Area in ha (%)
Crescent bund/TCB	483 (70.31)
GB/strengthening of Bunds	89 (12.99)
TCB/GB/strengthening of Bunds	88 (12.77)
Others*	27 (3.92)

* - Habitation & Waterbody

Source: ICAR-NBSS&LUP, Bengaluru

PART - B

Hydrological Inventory of Matki Sub-watershed, Aland Taluk, Kalaburagi District, Karnataka for Watershed Planning and Development



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



Hydrological Inventory of Matki Sub-watershed, Aland Taluk, Kalaburagi District, Karnataka for Watershed Planning and Development



ICAR - NBSS & LUP

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

Phone:080-23412242

E-mail: hd_rcb.nbsslup@icar.gov.in
nbssrcb@gmail.com



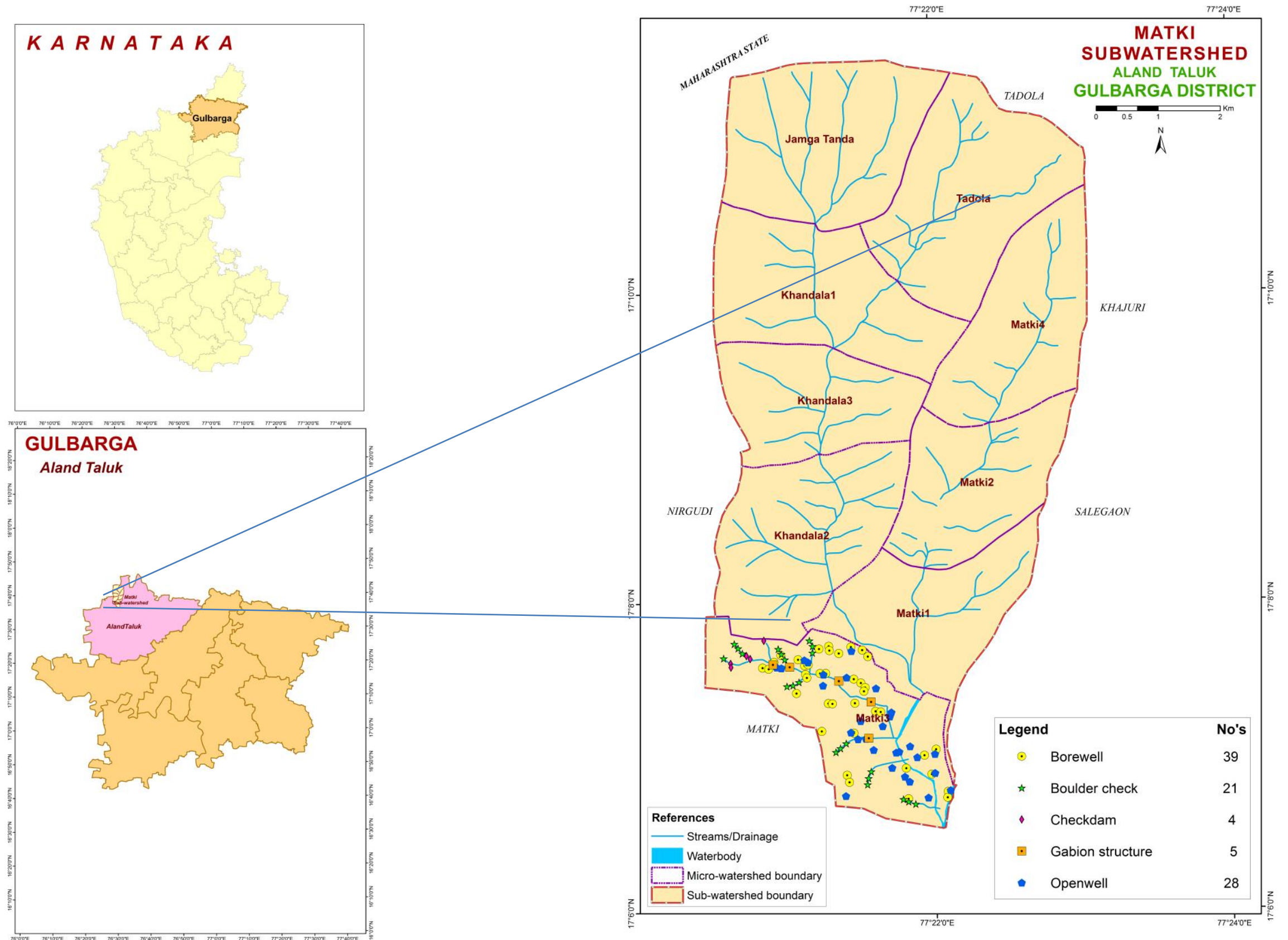
Details of Hydrology Team of LRI Partner Responsible for Preparation of Atlas

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
Dr. Sekhar Muddu (Reviewed and approved)	Professor & Lead Scientist, Dept. of Civil Engineering & ICWaR, IISc, Bangalore
<p style="text-align: right;">Email: hd_rcb.nbsslup@icar.gov.in nbssrcb@gmail.com Phone: Office: 080-23412242,23410993 Fax: 080-23510350</p>	

INTRODUCTION

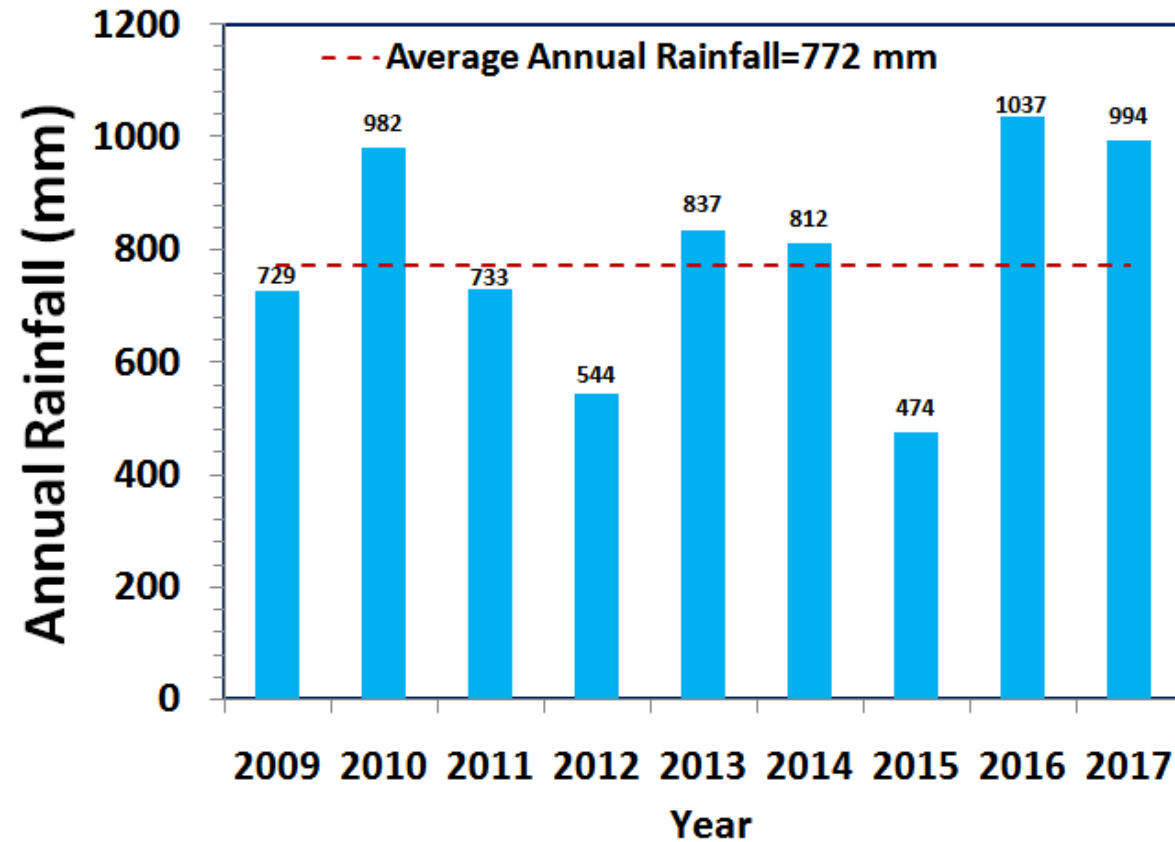
- The inventory and documentation of spatial and temporal changes in hydrological components of Matki sub-watershed (4D5C2C) in Aland taluk, Kalaburagi district, has been undertaken for integrated planning, development and management at the level of soil mapping units.
- Matki sub-watershed (Aland taluk, Kalaburagi district) is located between $17^{\circ}36'24''$ – $17^{\circ}42'33''$ North latitudes and $76^{\circ}27'49''$ - $76^{\circ}33'32''$ East longitudes, covering an area of about 5730.52 ha.
- This sub-watershed encompasses of 9 MWs namely, Jamga Tanda (4D5C2C1a), Tadola (4D5C2C1b), Matki-4 (4D5C2C2a), Khandala-1 (4D5C2C1c), Khandala-3 (4D5C2C1d), Matki-2 (4D5C2C2b), Khandala-2 (4D5C2C1e), Matki-1 (4D5C2C2c) and Matki-3 (4D5C2C2d) micro watersheds. Land Resource Inventory (LRI) was generated for one among the nine micro-watersheds.
- Average annual rainfall (1960-2014) of the Hobli (Block) pertaining to the sub-watershed is 772 mm.
- In this sub-watershed major *kharif* crops grown are Maize, Soyabean, Redgram, Sugarcane, Sunflower, Cotton and major *rabi* crops are Sorghum and Bengal gram.
- 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 MATKI SUB-WATERSHED



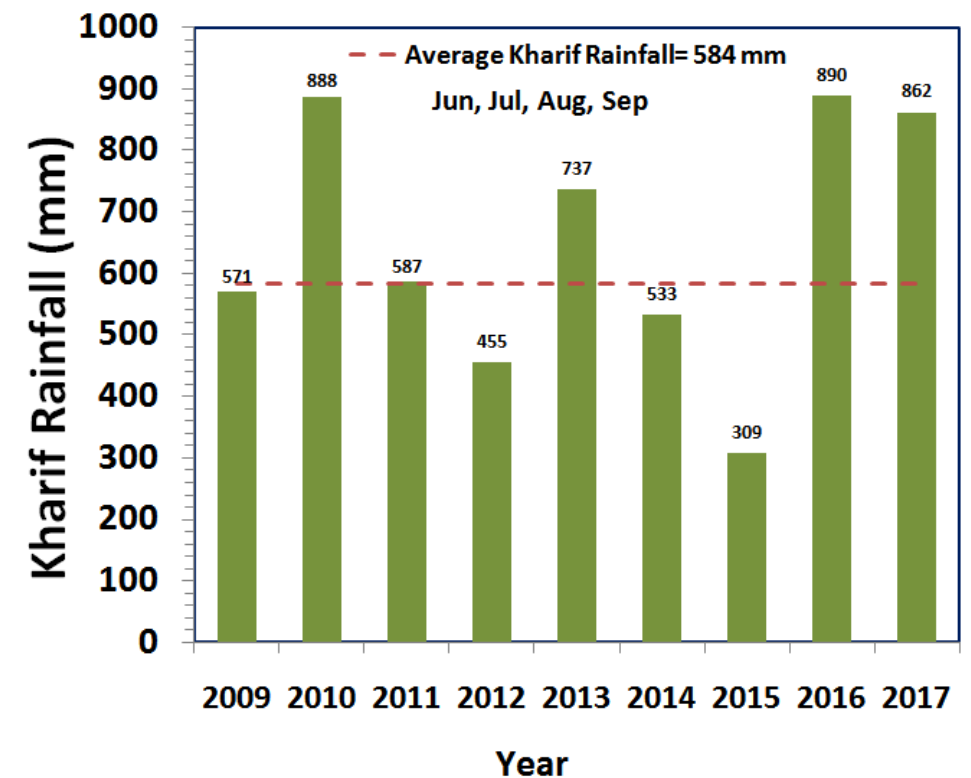
Soil & Water Conservation Structures in Matki Sub-watershed, Aland taluk, Kalaburagi district

RAINFALL INDEX

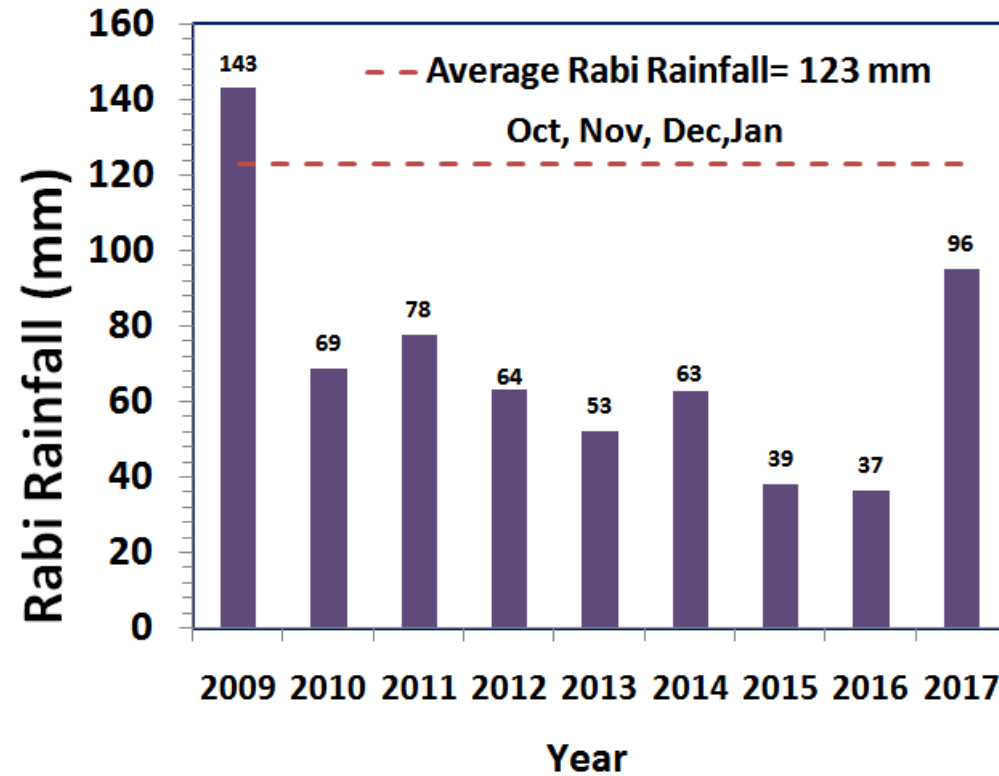


The average annual rainfall (1960-2014) recorded at the Aland station in Aland taluk of Kalaburagi district is 772 mm. The annual rainfall at Khajuri station (Hobli H.Q.) is presented. During the years 2009, 2011, 2012 and 2015 the annual rainfall was deficient by 7%, 6%, 36% and 47% respectively.

The *kharif* rainfall (Jun–Sep) is an average about 80% of the annual rainfall and it typically follows the annual rainfall patterns. During the years 2009, 2012, 2014 and 2015 the *kharif* rainfall was deficient by 2%, 22%, 9% and 47% respectively.

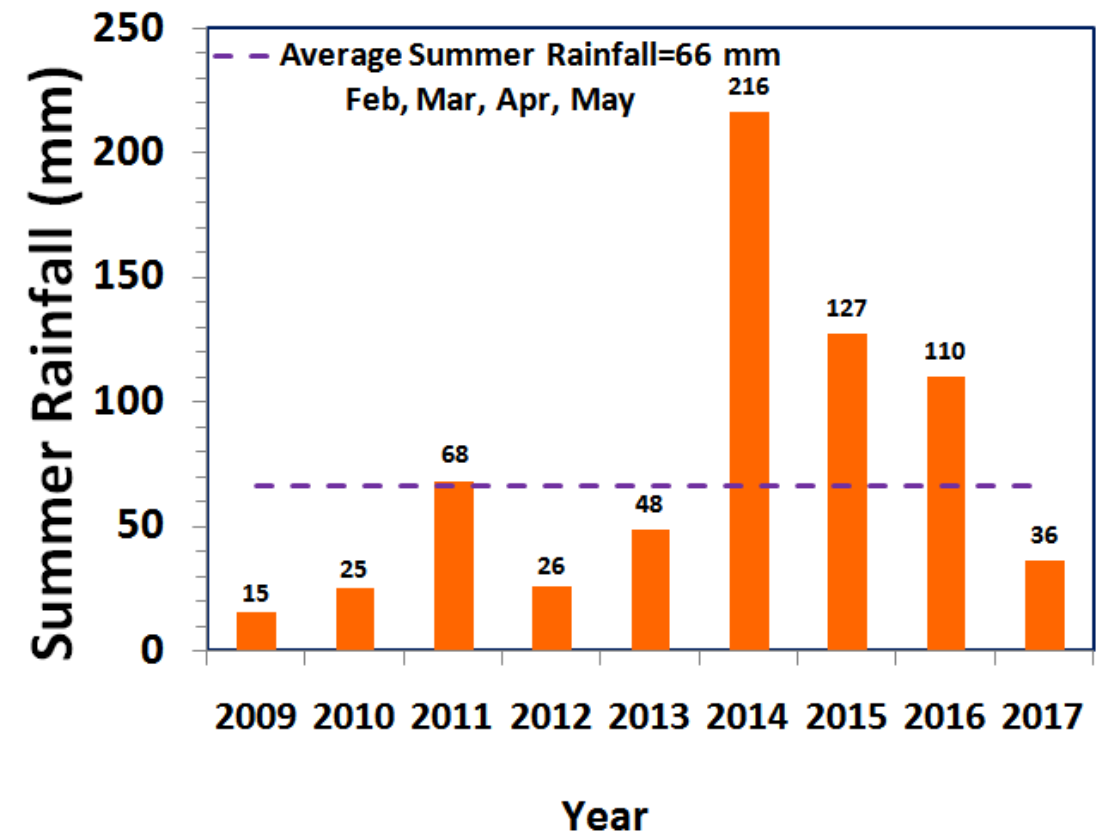


RAINFALL INDEX

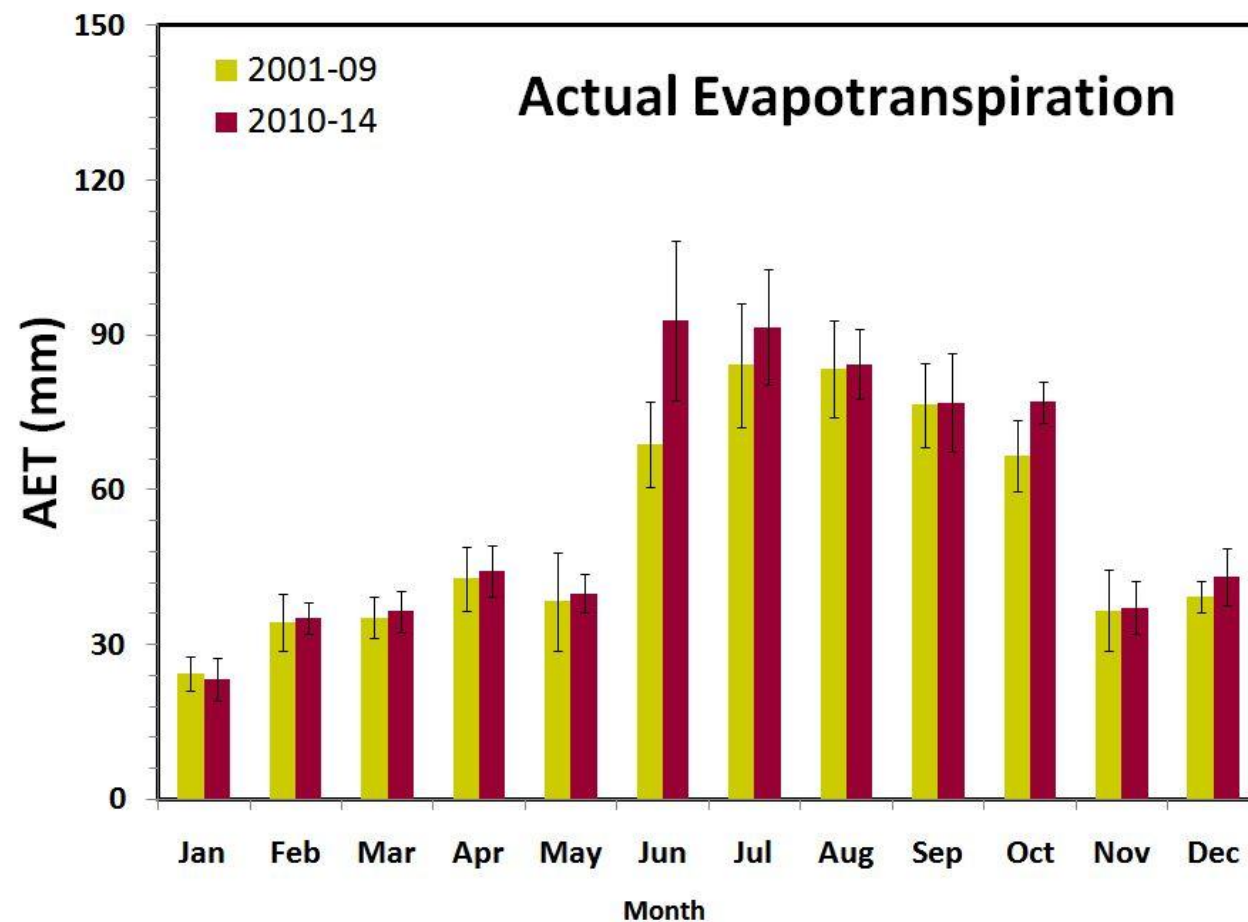
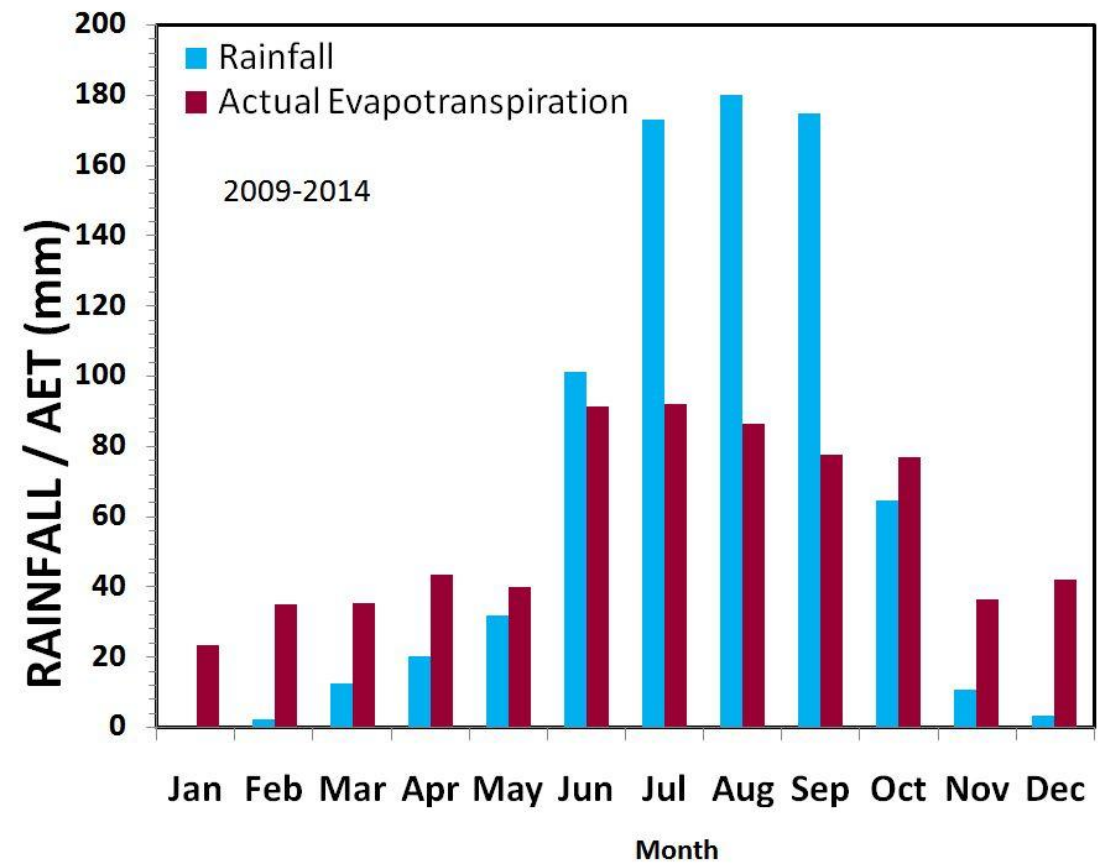
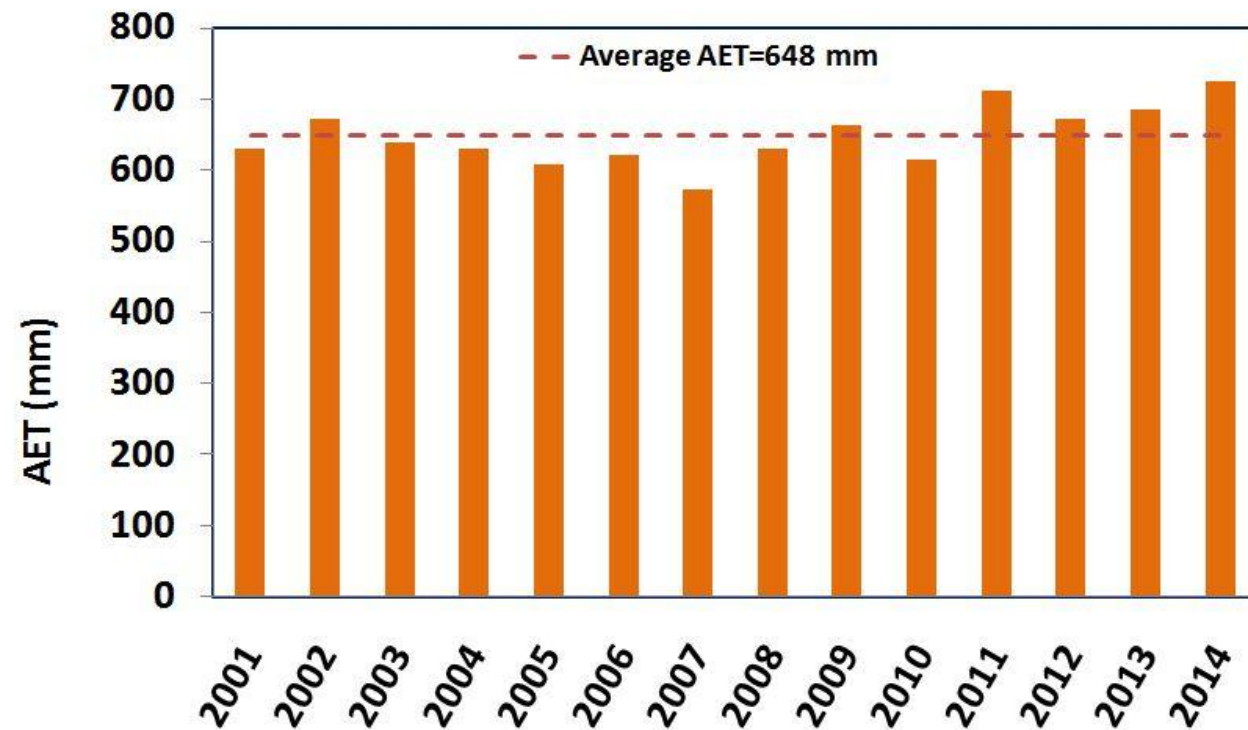


The average *rabi* rainfall (Oct-Jan) is about 9% of the average annual rainfall. During the year 2009 high *rabi* rainfall was received, where as other years showed deficient rainfall.

The average summer rainfall (Feb-May) is about 10% of the average annual rainfall.

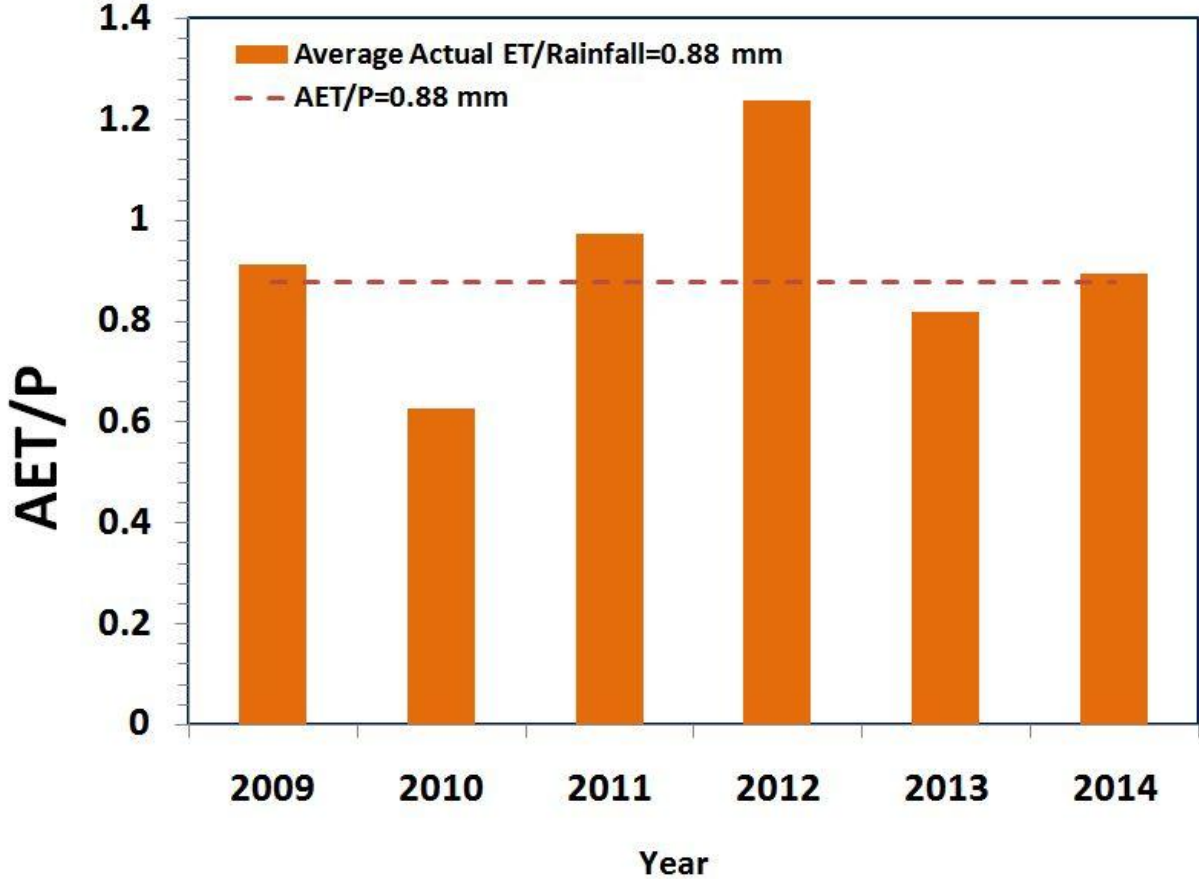


EVAPOTRANSPIRATION

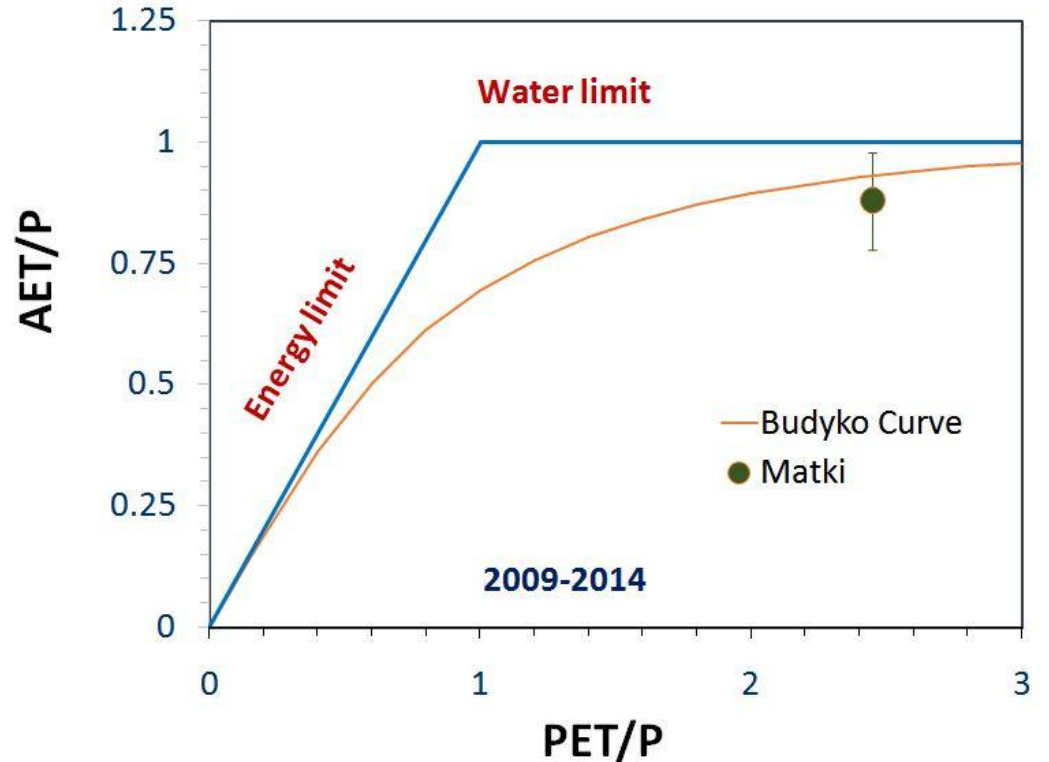
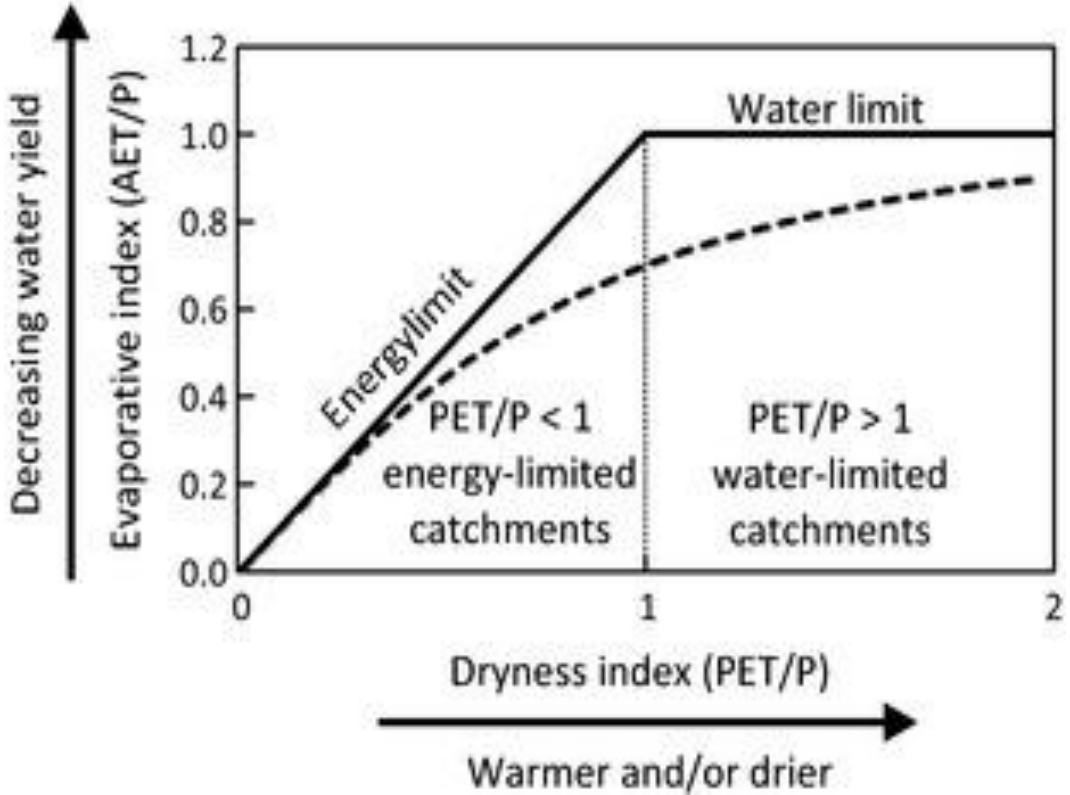


The average annual actual ET is lower than the average rainfall. During *kharif*, average rainfall and ET was found to be 648 mm and 347 mm respectively, whereas in *rabi* it was about 71 mm and 178 mm. In comparison to the 2001-2009, the annual ET increased by 8% during 2010-2014.

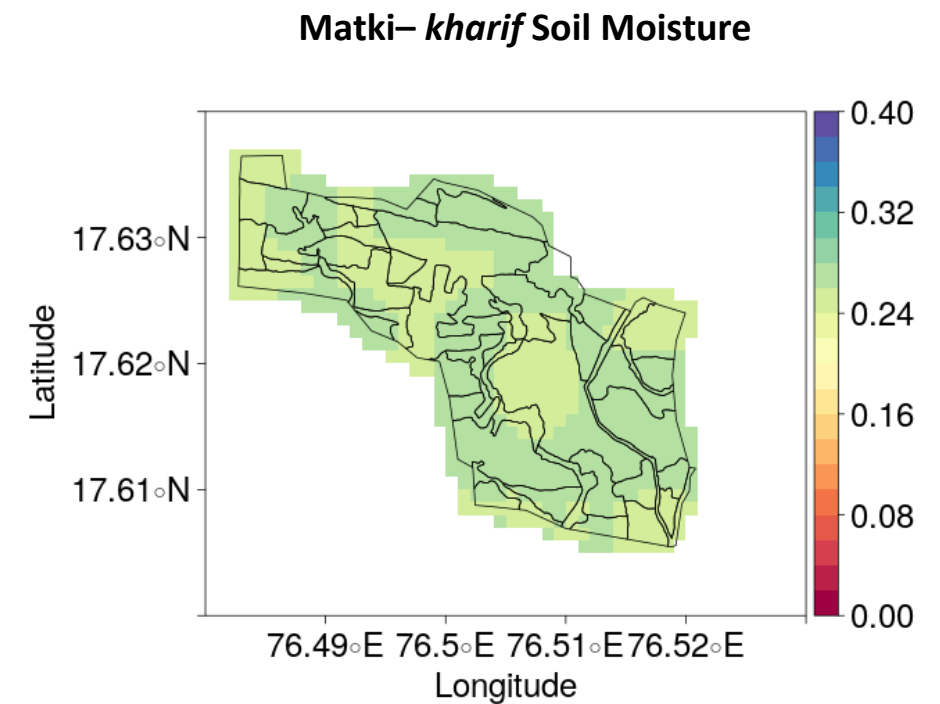
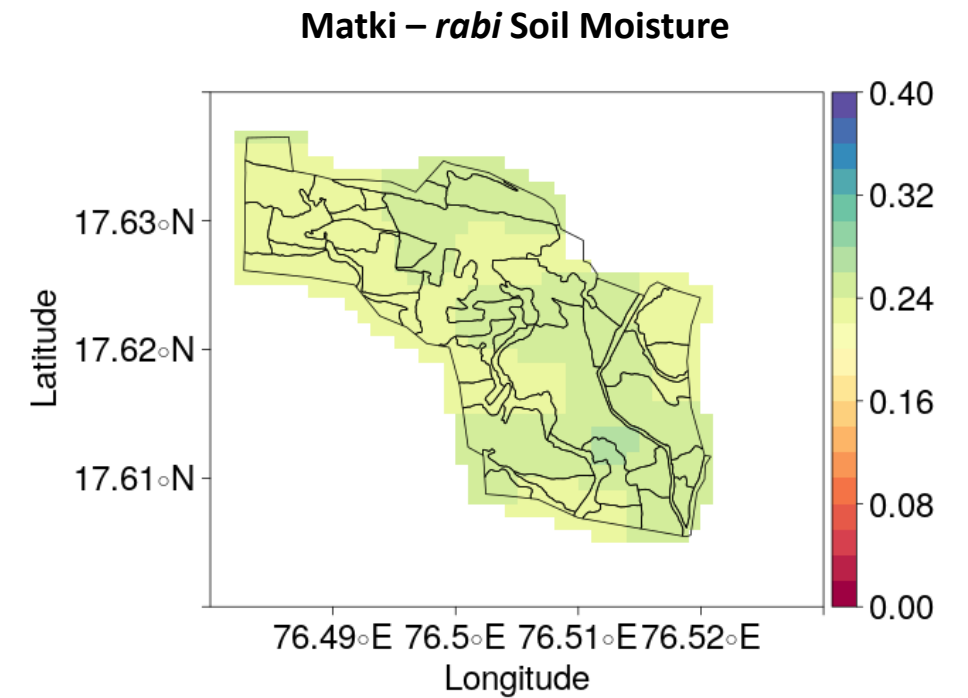
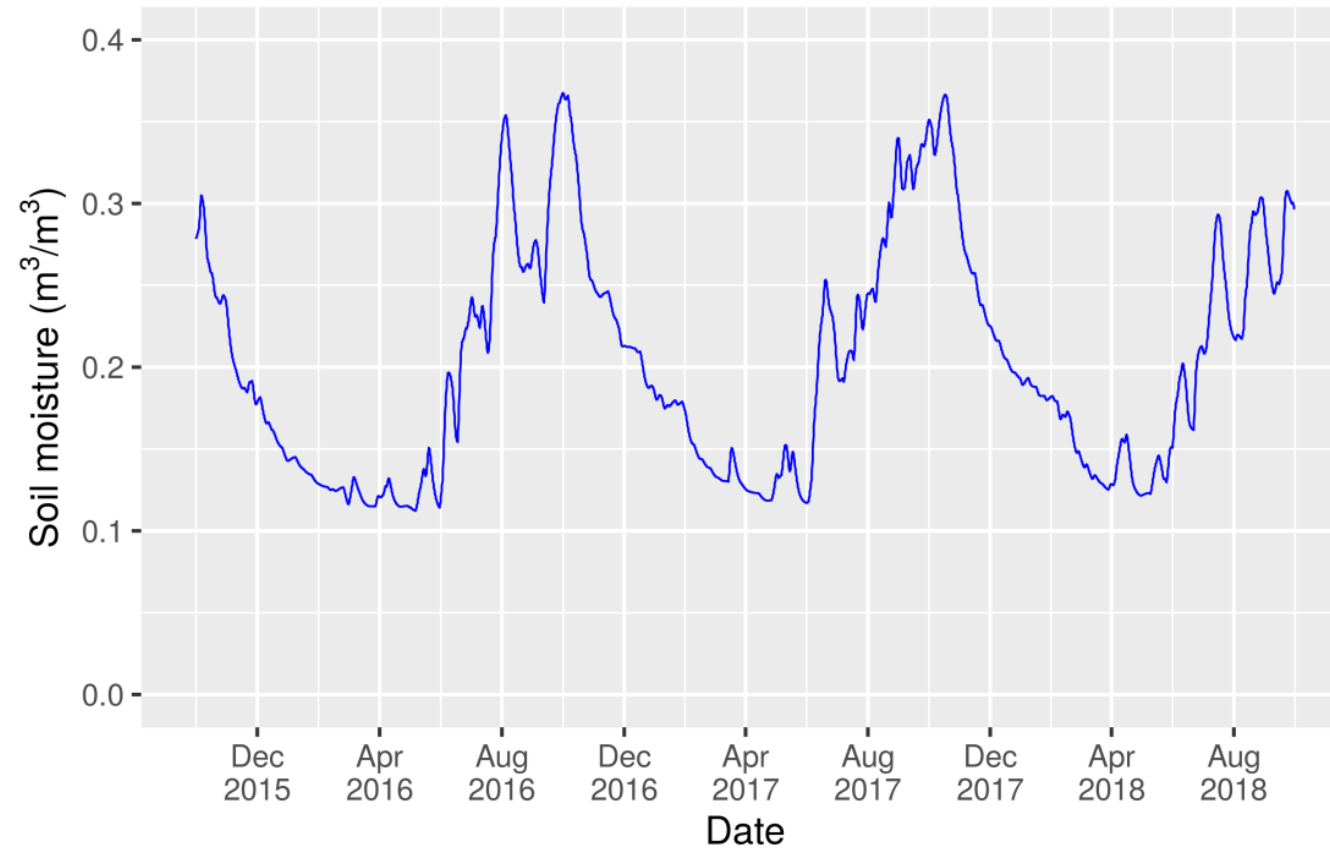
EVAPOTRANSPIRATION INDEX



The average AET/P ratio was about 88%, which is slightly higher than the sustainable limit of about 80%. This suggests the sub-watershed is in sustainable limit due to good rainfall during *kharif season*.



SATELLITE RETRIEVED SOIL MOISTURE

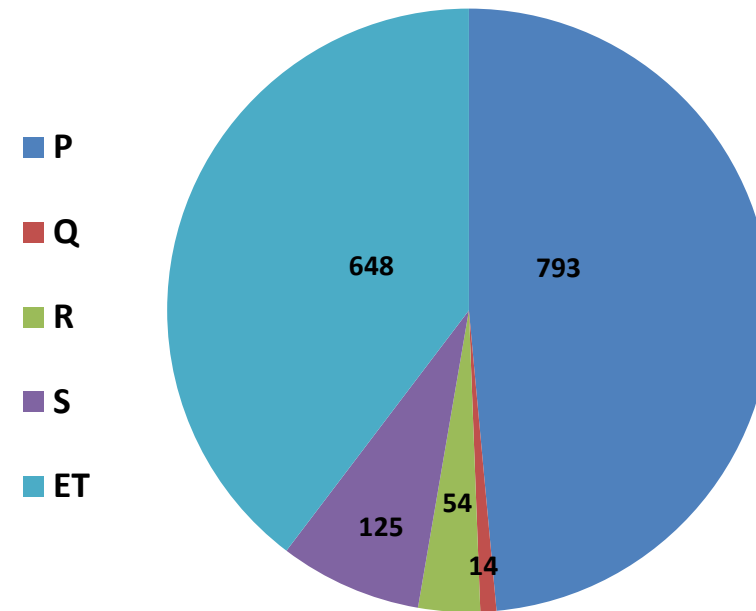


The method developed for retrieving soil moisture from multi-satellite observations allowed to map surface soil moisture behavior in the micro-watershed. The available surface moisture was varied in the range of 12-27 % in *kharif* and 19-33 % in *rabi* seasons of 2016 and 12-33 % in *kharif* and 19-35% in *rabi* seasons of 2017.

WATER BALANCE

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

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

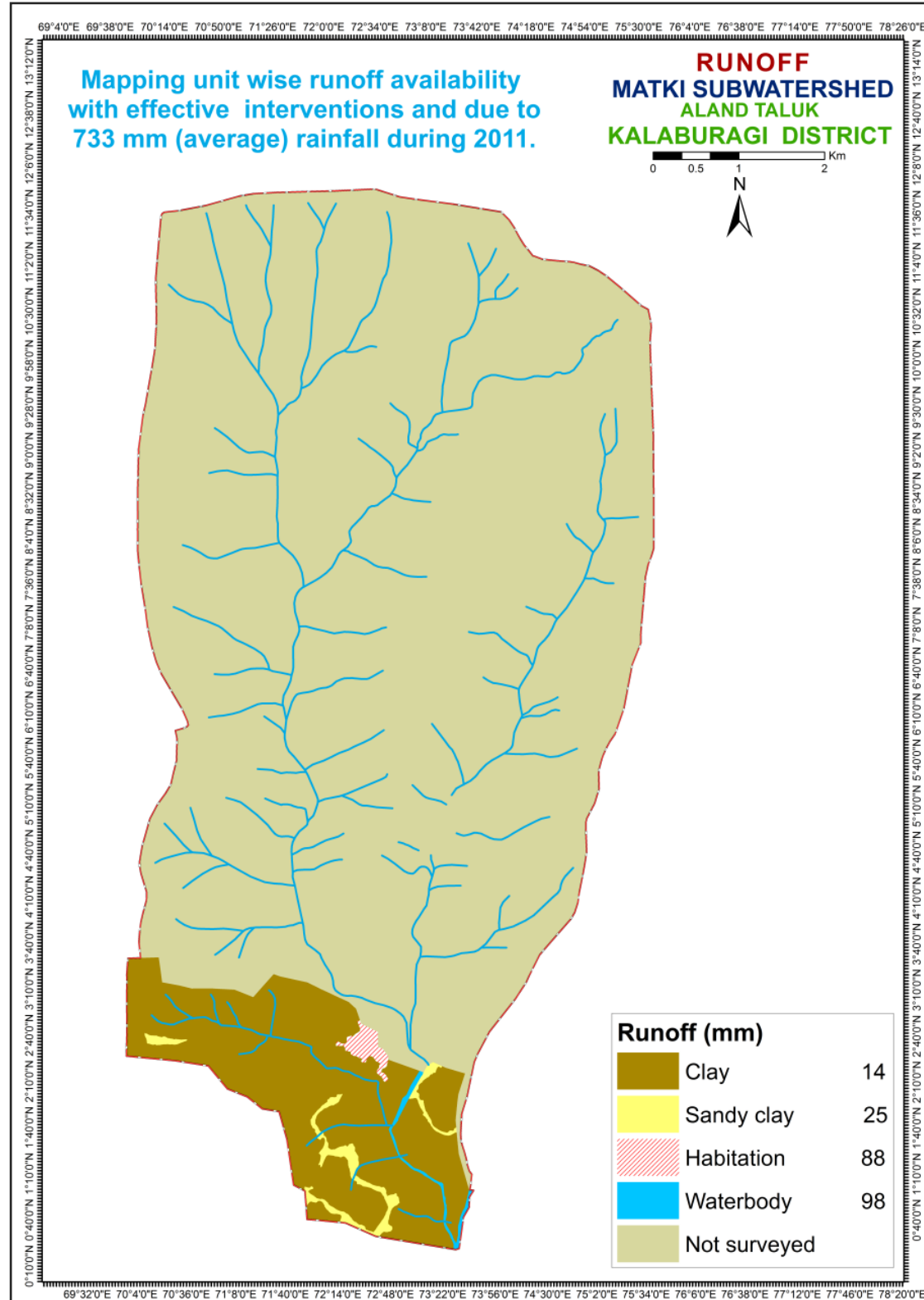


During June-September months, Precipitation is slightly higher than Evapotranspiration, hence Slight Runoff can occur in the watershed.

P = 648 mm (average of 2009-2017) ET = 793 mm R = 54 mm S = 125 mm Q = 14 mm

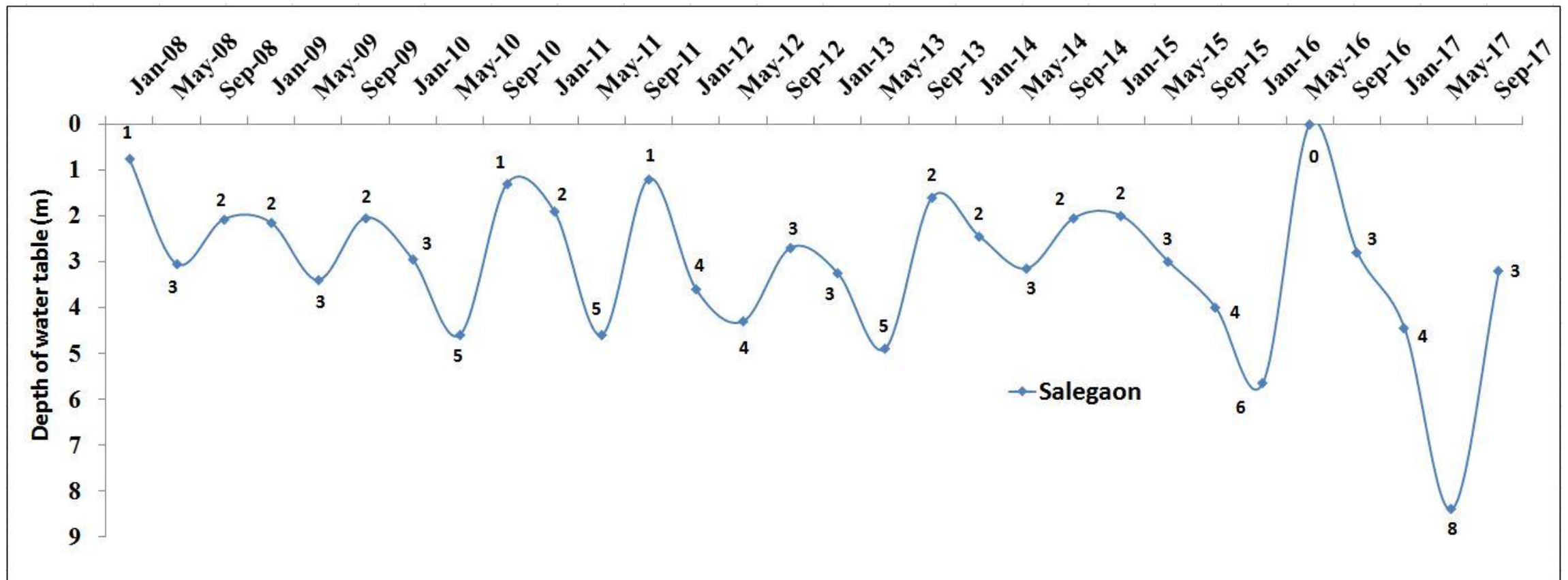
Sl. No.	Parameters	Average_ 2011 (mm)
1.	Rainfall	733
2.	Runoff availability with existing conditions	69
3.	Runoff availability with effective interventions	18
4.	Runoff allowed as environmental flow at the outlet	4
5.	Runoff excess for harvesting by construction of structures	14

RUNOFF



GROUND WATER STATUS

SALEGAON STATION



The total number of wells present in Matki Sub-watershed as per LRI data is 97 (39-Borewells and 28-Open wells). The groundwater level was found from the data obtained from KSNDMC for the nearest station Salegaon. The above graph depicts the groundwater levels during the years 2008-2016 were slightly varying. Deepest levels were found in 2017.

SUMMARY

- The average annual rainfall of 772 mm in the Matki sub-watershed as recorded from the Khajuri station data by KSNDMC.
- 80%, 9% and 10% of the annual rainfall occurs during *kharif*, *rabi* and summer seasons respectively and exhibited a higher temporal variability.
- The evapotranspiration estimation tool developed indicates that the watershed water balance is in sustainable limit.
- The estimated runoff available to use is 14 mm for an average annual rainfall of 648 mm (2009-2017). The utilizable groundwater is 38 mm (70% of 54 mm recharge estimated). This means the total available water resource combining the soil moisture store for kharif & rabi (125 mm) and utilizable runoff plus recharge is 177 (=125+38+14)
- The average actual evapotranspiration estimated in the watershed based on the current land use and irrigation practices for the kharif and rabi seasons is 525 mm. Hence the amount of water use for kharif and rabi seasons may be estimated as 656 mm (i.e 125% of AET). This demand for the two seasons is higher by 479 mm, i.e. (656-177). The AET in June-Sept months is 55% of rainfall. Hence, there is a good opportunity to harvest the excess water through watershed management practices for utilizing during rabi season.
- The total number of wells present in Matki Sub-watershed as per LRI data is 97 (39-Borewells and 28-Open wells). The groundwater level was found from the data obtained from KSNDMC for the nearest station Salegaon. Deepest levels were found in 2017.