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LAND RESOURCE INVENTORY AND SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS FOR WATERSHED PLANNING AND DEVELOPMENT

KATARKI WEST-1 (4D4A2R1f) MICRO WATERSHED

Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

THE WORLD BANK

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

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

Please write to:
Director, ICAR - NBSS & LUP,

Amaravati Road, NAGPUR - 440 033, India

Phone : (0712) 2500386, 2500664, 2500545 (O)

Telefax : 0712-2522534

E-Mail : director@nbsslup.ernet.in

Website URL : nbsslup.in

Or

Head, Regional Centre, ICAR - NBSS&LUP, Hebbal, Bangalore - 560 024

Phone : (080) 23412242, 23510350 (O)

Telefax : 080-23510350

E-Mail : nbssrcb@gmail.com

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PREFACE

In Karnataka, as in other Indian States, the livelihoods of rural people are intertwined with farming pursuits. The challenges in agriculture are seriously threatening the livelihood of a large number of farmers as they have been practicing farming in contextual factors beyond their control. Climatic factors are the most important ones and have become much more significant in recent times due to rapid climate changes induced by intensive anthropogenic activities affecting our ecosystem in multiple ways. Climate change has become the reality, it is happening and efforts to evolve and demonstrate climate resilient technologies have become essential. Due to the already over stressed scenario of agrarian sector, the climate change is resulting in manifold increase in the complexities, pushing the rural mass to face more and more unpredictable situations. The rising temperatures and unpredictable rainfall patterns are going to test seriously the informed decisions farmers have to make in order to survive in farming and sustain their livelihood.

It is generally recognized that impacts of climate change shall not be uniform across the globe. It is said that impact of climate change is more severe in South Asia. Based on the analysis of meteorological data, it is predicted that in India, there will be upward trend in mean temperature, downward trend in relative humidity, annual rainfall and number of wet days in a year. Also, in general, phenomena like erratic monsoon, spread of tropical diseases, rise in sea levels, changes in availability of fresh water, frequent floods, droughts, heat waves, storms and hurricanes are predicted. Each one of these adverse situations are already being experienced in various parts of India and also at the global level. Decline in agricultural productivity of small and marginal farmers becoming more vulnerable is already witnessed.

In Karnataka, more than 60 per cent of the population live in rural areas and depend on agriculture and allied activities for their livelihood. Though the state has achieved significant progress in increasing the yield of many crops, there is tremendous pressure on the land resources due to the growing and competing demands of various land uses. This is reflected in the alarming rate of land degradation observed. Already more than 50 per cent of the area is affected by various forms of degradation. If this trend continues, the sustainability of the fragile ecosystem will be badly affected. The adverse effects of change in the climatic factors are putting additional stress on the land resources and the farmers dependent on this.

The natural resources (land, water and vegetation) of the state need adequate and constant care and management, backed by site-specific technological interventions and investments particularly by the government. Detailed database pertaining to the nature of the land resources, their constraints, inherent potentials and suitability for various land based rural enterprises, crops and other uses is a prerequisite for preparing location-specific action plans, which are in tune with the inherent capability of the resources. Any effort to evolve climate resilient technologies has to be based on the baseline scientific database. Then only one can expect effective implementation of climate resilient technologies, monitor the progress, make essential review of the strategy, and finally evaluate the effectiveness of the implemented programs. The information available at present on the land resources of the state are of general nature and useful only for general purpose planning. Since the need of the hour is to have site-specific information suitable for farm level planning and detailed characterization and delineation of the existing land resources of an area into similar management units is the only option.

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component -1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on “Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of for Katarki West-1 microwatershed in Koppal Taluk, Koppal District, Karnataka” for integrated development was taken up in collaboration with the State Agricutural Universities, IISC, KSRSAC, KSNDMC as Consortia partners. The project provides detailed land resource information at cadastral level (1:7920 scale) for all the plots and socio-economic status of farm households covering thirty per cent farmers randomely selected representing landed and landless class of farmers in the micro-watershed. The project report with the accompanying maps for the microwatershed will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner

It is hoped that this database will be useful to the planners, administrators and developmental agencies working in the area in not only for formulating location specific developmental schemes but also for their effective monitoring at the village/watershed level.

Nagpur **S.K. SINGH**
Date: 26-10-2019 Director, ICAR - NBSS&LUP Nagpur

Contributors

Dr. Rajendra Hegde Principal Scientist, Head & Project Leader, Sujala-III Project ICAR-NBSS&LUP, Regional Centre, Bangalore	**Dr. S.K.Singh** Director, ICAR-NBSS&LUP Coordinator, Sujala-III Project Nagpur
Soil Survey, Mapping & Report Preparation	
Dr. K.V. Niranjana	Sh. R.S. Reddy
Dr. B.A. Dhanorkar	Smt. Chaitra, S.P.
	Dr. Gopali Bardhan
	Dr. Mahendra Kumar M.B
	Mr. Somashekar T.N
	Ms. Arpitha G.M
Field Work	
Sh. C. Bache Gowda	Sh. Mayur Patil
Sh. Somashekar	Sh. Arun Kumar, S.
Sh. M. Jayaramaiah	Sh. Sunil Raj
	Sh. Yogesh Kumar, B.
	Sh. Vikas, N.K.
	Sh. Arun Kumar, S.G.
	Sh. Umesh Jadiyappa Madolli
	Sh. Praveen Kumar P. Achalkar
	Sh. Veerabhadraswamy
	Sh. Vinay
	Sh. Shankarappa, K.
	Sh. Lankesh, R.S.
	Sh. Appanna B. Hattigoudar
	Sh. Maharudra
GIS Work	
Dr. S.Srinivas	Sh. A.G.Devendra Prasad
Sh. D.H.Venkatesh	Sh. Abhijith Sastry, N.S.
Smt. K.Sujatha	Smt. Shyla, B.
Smt. K.V.Archana	Smt. Swetha ,K.
Sh. N.Maddileti	Ms. Vidya, P.C.
	Sh. Deepak, M.J.
	Smt. K.Karunya Lakshmi
	Ms. Seema, K.V.

Laboratory Analysis	
Dr. M. Lalitha	Sh. Vindhya, N.G.
Smt. Arti Koyal	Ms. P. Pavanakumari, P.
Smt. Parvathy, S.	Ms. Rashmi, N.
	Ms. Leelavathy, K.U.
	Smt. Usha Kiran, G.
Socio-Economic Analysis	
Dr. S.C. Ramesh Kumar	Sh. M.K. Prakashanaik
	Ms. Karuna V. Kulkarni
	Mrs. Sowmya A.N
	Sh. Vinod R
	Sh. Basavaraja
	Sh. Vijay Kumar Lamani
	Ms. Sowmya K.B
	Mrs. Prathibha, D.G
	Sh. Rajendra,D
Soil & Water Conservation	
Sh. Sunil P. Maske	
Watershed Development Department, GoK, Bangalore	
Sh. Prabhash Chandra Ray, IFS Project Director & Commissioner, WDD	Dr. A. Natarajan NRM Consultant, Sujala-III Project
Sh. A. Padmaya Naik, Director (In-Charge) Executive Director, KWDP-II, Sujala-III, WDD	

PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Katarki West-1microwatershed was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and these physiographic delineations were used as base for mapping soils. The soils were studied in several transects and a soil map was prepared with phases of soil series as mapping units. Random checks were made all over the area outside the transects to confirm and validate the soil map unit boundaries. The soil map shows the geographic distribution and extent, characteristics, classification, behavior and use potentials of the soils in the Microwatershed.

The present study covers an area of 485 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 99 per cent is covered by soil and 1 per cent by habitation and water body. The salient findings from the land resource inventory are summarized briefly below

- *The soils belong to 7 soil series and 11 soil phases (management units) and 2 land management units.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 320 m grid interval.*
- *Land suitability for growing 31 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 20 per cent of the soils are moderately shallow (50-75 cm), 13 per cent of the soils are moderately deep (75- 100 cm) and 66 per cent is deep to very deep (100 to >150 cm) soils.*
- *Entire area in the microwatershed is clayey soils at the surface.*
- *About 87 per cent of the area has non-gravelly (<15%) soils and 11 per cent has gravelly (15-35 %) soils.*
- *With respect to available water capacity 20 per cent of the area has low (51-100 mm/m), 13 per cent medium (101-150 mm/m) and 66 per cent very high (>200 mm/m) in available water capacity.*
- *An area of about 13 per cent is nearly level (0-1%) and 86 per cent is very gently sloping (1-3%) lands.*

- *An area of about 16 per cent is slightly eroded (e1) and 83 per cent is moderately eroded (e2) lands.*
- *An area of about 5 per cent is strongly alkaline (pH 8.4-9.0) and 93 per cent is very strongly alkaline (pH >9.0) in reaction.*
- *The Electrical Conductivity (EC) of the soils are dominantly <2* dSm^{-1} *indicating that the soils are non saline.*
- *Organic carbon is low (<0.5%) in 60 per cent and medium (0.5-0.75%) in 39 per cent area of the soils.*
- *Available phosphorus is low (<23 kg/ha) in the entire area of the microwatershed.*
- *Available potassium is medium (145-337 kg/ha) in 59 per cent and high (>337 kg/ha) in 40 per cent area of the soils.*
- *Available sulphur is low (<10 ppm) in 58 per cent and medium (10-20 ppm) in 40 per cent area of the soils.*
- *Available boron is low (<0.5 ppm) in 43 per cent and medium (0.5-1.0 ppm) in 55 per cent area of the microwatershed.*
- *Available iron is deficient (<4.5 ppm) in 74 per cent and sufficient (>4.5 ppm) in 25 per cent area of the soils.*
- *Available zinc is deficient (<0.6 ppm) in the entire area of the microwatershed.*
- *Available manganese and copper are sufficient in the entire area of the microwatershed.*
- *The land suitability for 31 major agricultural and horticultural crops grown in the microwatershed was assessed and the areas that are highly suitable (class S1) and moderately suitable (class S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price, and finally the demand and supply position.*

Land suitability for various crops in the microwatershed

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*342(71)*	*136(29)*		*Sapota*	-	-
Maize	-	*466(96)*		*Pomegranate*	-	*383(79)*
Bajra	-	*478(99)*		*Musambi*	*308(63)*	*75(16)*
Groundnut	-	-		*Lime*	*308(63)*	*75(16)*
Sunflower	*308(63)*	*75(16)*		*Amla*	-	*478(99)*
Redgram	-	*355(74)*		*Cashew*	-	-
Bengal gram	*342(71)*	*136(28)*		*Jackfruit*	-	-
Cotton	*342(71)*	*136(28)*		*Jamun*	-	*321(66)*
Chilli	-	-		*Custard apple*	*342(71)*	*136(28)*
Tomato	-	*12(3)*		*Tamarind*	-	*321(66)*
Brinjal	-	*478(99)*		*Mulberry*	-	-
Onion	-	-		*Marigold*	-	*478(99)*
Bhendi	-	*466(96)*		*Chrysanthemum*	-	*478(99)*
Drumstick	-	*383(79)*		*Jasmine*	-	*107(23)*
Mango	-	-		*Crossandra*	-	*107(23)*
Guava	-	-				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the 2 identified LMUs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops.*
- *Maintaining soil-health is vital for crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested to these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation and drainage line treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. That would help in supplementing the farm income, provide fodder and fuel, and generate lot of biomass which in turn would help in maintaining the ecological balance and contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use the land in a rational and judicious manner. But what is happening in many areas of the state is a cause for concern to everyone involved in the management of land resources at the grassroots level. 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 dependant 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 significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest in farmers for farming, large tracts of cultivable lands are turning into fallows in many areas and this trend is continuing at an alarming rate.

Further, land degradation has emerged as a serious problem which has already affected about 38 lakh ha of cultivated area in the state. Soil erosion alone has degraded about 35 lakh ha. Almost all the uncultivated areas are facing various degrees of degradation, particularly soil erosion. Salinity and alkalinity has emerged as a major problem in more than 3.5 lakh ha in the irrigated areas of the state. Nutrient depletion and declining factor productivity is common in both rainfed and irrigated areas. The degradation is continuing at an alarming rate and there appears to be no systematic effort among the stakeholders to contain this process. In recent times, an aberration of weather due to climate change phenomenon has added another dimension leading to unpredictable situations to be tackled by the farmers.

In this critical juncture, the challenge before us is not only to increase the productivity per unit area which is steadily declining and showing a fatigue syndrome, but also to prevent or at least reduce the severity of degradation. If the situation is not reversed at the earliest, then the sustainability of the already fragile crop production system and the overall ecosystem will be badly affected in the state. The continued neglect and unscientific use of the resources for a long time has led to the situation observed at present in the state. It is a known fact and established beyond doubt by many studies in the past that the cause for all kinds of degradation is the neglect and irrational use of the land resources. Hence, there is urgent need to generate a detailed site-specific farm level database on various land resources for all the villages/watersheds in a time bound manner that would help to protect the valuable soil and land resources and also to stabilize the farm production.

Therefore, the land resource inventory required for farm level planning is the one which investigates not only the surface but also consider the other parameters which are critical for productivity *viz.*, soils, climate, water, minerals and rocks, topography, geology, hydrology, vegetation, crops, land use pattern, animal population, socio-economic conditions, infrastructure, marketing facilities and various schemes and developmental works of the government etc. 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.

The Land Resource Inventory is basically done for identifying potential and problem areas, developing sustainable land use plans, estimation of surface run off and water harvesting potential, preparation of soil and water conservation plans, land degradation/desertification etc. The Bureau is presently engaged in developing an LRI methodology using high resolution satellite remote sensing data and Digital Elevation Model (DEM) data to prepare Landscape Ecological Units (LEU) map representing agro-ecosystem as a whole. The LEU is preferred over landform as the base map for LRI. LEU is the assemblage of landform, slope and land use. An attempt was made to upscale the soil resource information from 1:250000 and 1:50000 scale to the LEU map in Goa and other states.

The land resource inventory aims to provide site-specific database for Katarki West-1 microwatershed in Koppal Taluk, Koppal District, Karnataka State for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

The study was organized and executed by the ICAR- National Bureau of Soil Survey and Land Use Planning, Regional Centre, Bangalore under Generation of Land Resource Inventory Data Base Component-1 of the Sujala-III Project funded by the World Bank.

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Katarki West-1 micro-watershed is located in the central part of Karnataka in Koppal taluk and district (Fig 2.1). It lies between $15^0$15' and $15^0$14' North latitudes and $76^0$02' and $76^0$04' East longitudes and covers an area of about 485 ha. It is about 23 km from Koppal town. It comprises and bounded by Bisarahalli on the north, Gudlanura on the western and eastern and Betageri village on the southern side of the microwatershed.

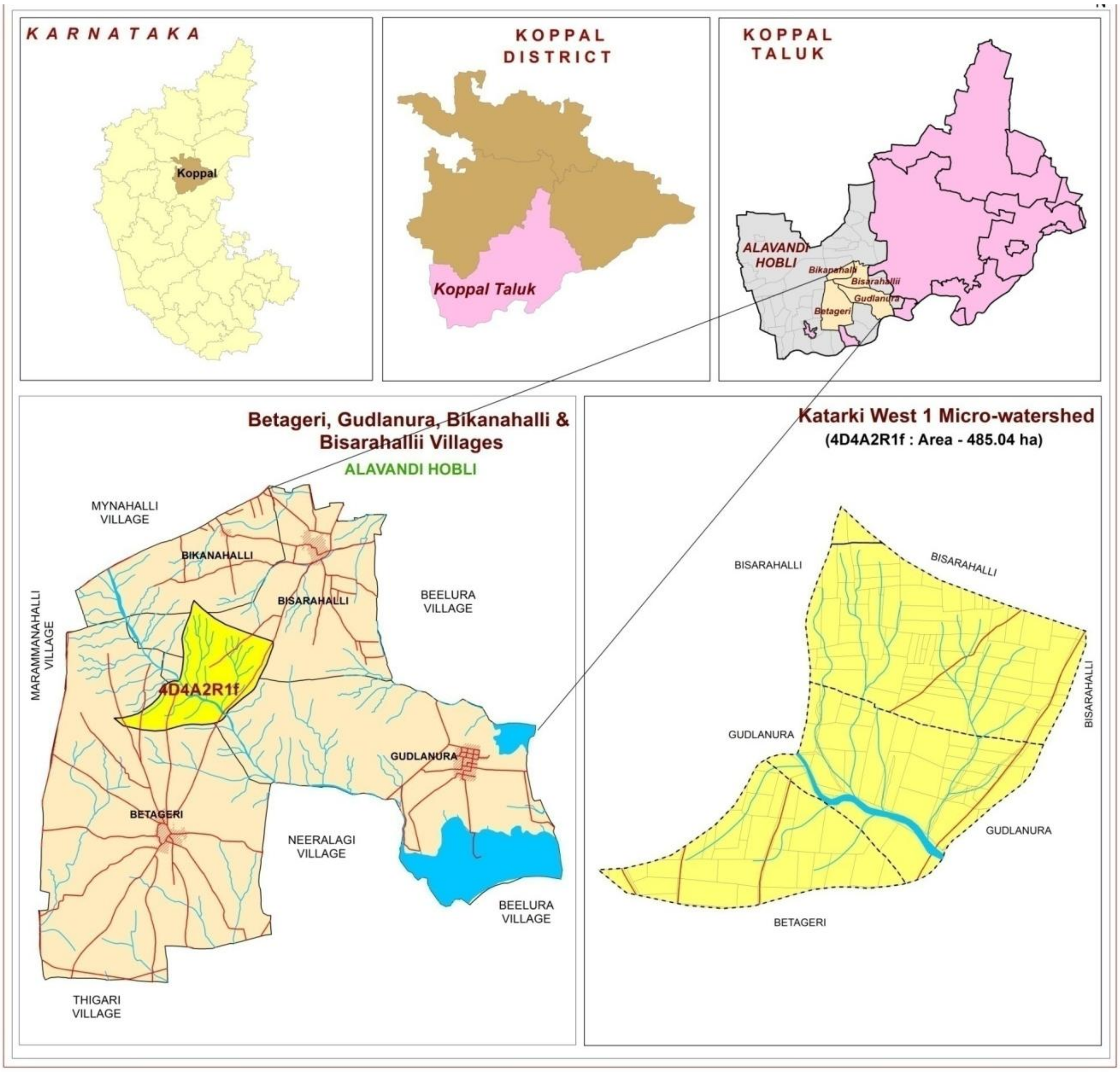


Fig.2.1 Location map of Katarki West-1 Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are alluvium (Fig.2.2). The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent paleo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2b Alluvium

2.3 Physiography

Physiographically, the area has been identified as alluvial landscape based on geology. The microwatershed area has been further divided into mounds/ridges, summits, side slopes and very gently sloping uplands and nearly level plains based on slope and its relief features. The elevation ranges from 510 to 537 m in the gently sloping uplands. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

The area is drained by several small seasonal streams that join Hire *halla* and Chenna *halla* along its course. Though, the streams are not perennial, during rainy season they carry large quantities of rain water. The microwatershed has only few small tanks which are not able to store the water flowing during the rainy season. Due to this, the ground water recharge is very much affected in the villages. This is reflected in the failure of many bore wells in the villages. If the available rain water is properly harnessed by constructing tanks and recharge structures at appropriate places in the villages, then the drinking and irrigation needs of the area can be easily met. The drainage network is dendritic to sub parallel.

2.5 Climate

The district falls under semiarid tract of the state and is categorized as drought - prone with total annual rainfall of 662 mm (Table 2.1). Of this, a maximum of 424 mm precipitation is received during south–west monsoon period from June to September, north-east monsoon contributes about 161 mm and prevails from October to early December and the remaining 77 mm is received during the rest of the year. The winter season is from December to February. During April and May, the temperatures reach up to 45°C and in December and January, the temperatures will go down to 16°C. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo Transpiration (PET) is 145 mm and varies from a low of 101 mm in December to 193 mm in the month of May. The PET is always higher than precipitation in all the months except in the month of September. Generally, the Length of crop Growing Period (LGP) is <90 days and starts from 2nd week of August to 2nd week of November.

Table 2.1 Mean Monthly Rainfall, PET, 1/2 PET at Koppal Taluk and District

Sl. no.	Months	Rainfall	PET	1/2 PET
1	January	1.60	116.70	58.35
2	February	1.50	129.20	64.60
3	March	14.10	169.80	84.90
4	April	18.10	180.60	90.30
5	May	41.60	193.50	96.75
6	June	85.80	167.90	83.95
7	July	72.10	156.20	78.10
8	August	110.50	152.50	76.25
9	September	155.60	138.50	69.25
10	October	116.30	122.30	61.15
11	November	36.00	106.40	53.20
12	December	9.10	101.00	50.50
TOTAL		**662.30**	**144.55**	

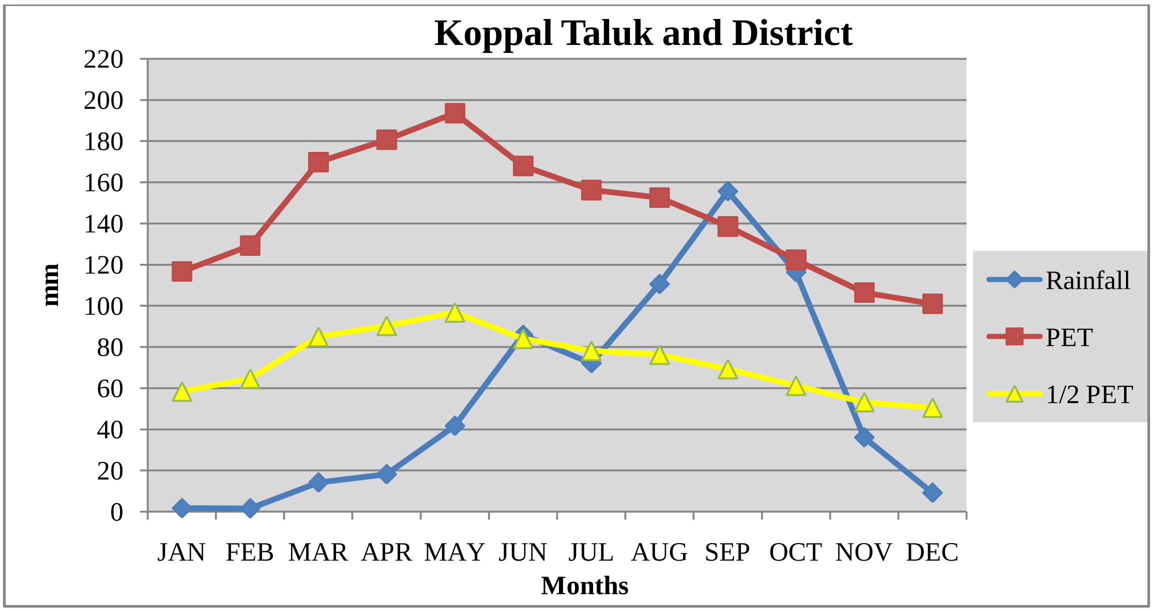


Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

The natural vegetation is sparse comprising few tree species, shrubs and herbs. The mounds, ridges and boulders occupy sizeable areas which are under thin to moderately thick forest vegetation. Still, there are some remnants of the past forest cover which can be seen in patches in some ridges and hillocks in the microwatershed (Fig 2.4).

Apart from the continuing deforestation, the presence of large population of goats, sheep and other cattle in the microwatershed is causing vegetative degradation of whatever little vegetation left in the area. The uncontrolled grazing has left no time for the regeneration of the vegetative cover. This leads to the accelerated rate of erosion on the hill slopes, resulting in the formation of deep gullies in the foot slopes and eventually resulting in the heavy siltation of few tanks and reservoirs in the microwatershed.

Fig 2.4 Natural vegetation of Katarki West-1 microwatershed

2.7 Land Utilization

About 91 per cent area (Table 2.2) in Koppal district is cultivated at present and about 17 per cent of the area is sown more than once. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and boulder areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatershed is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Katarki West-1 microwatershed is presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells) and conservation structures is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of conservation structures in Katarki West-1 microwatershed is given in Fig 2.7.

Table 2.2 Land Utilization in Koppal District

Sl. No.	Agricultural land use	Area (ha)	Per cent
1	Total geographical area	552495	-
2	Total cultivated area	500542	90.6
3	Area sown more than once	92696	16.8
4	Trees and groves	210	0.04
5	Cropping intensity	-	118
6	Forest	29451	5.33
7	Cultivable wasteland	2568	0.46
8	Permanent Pasture land	14675	2.66
9	Barren land	16627	3.01
10	Non agricultural land	40591	7.35
11	Current fallow	19660	3.56

Fig.2.5 (a) Different crops and cropping systems in Katarki West-1 Microwatershed

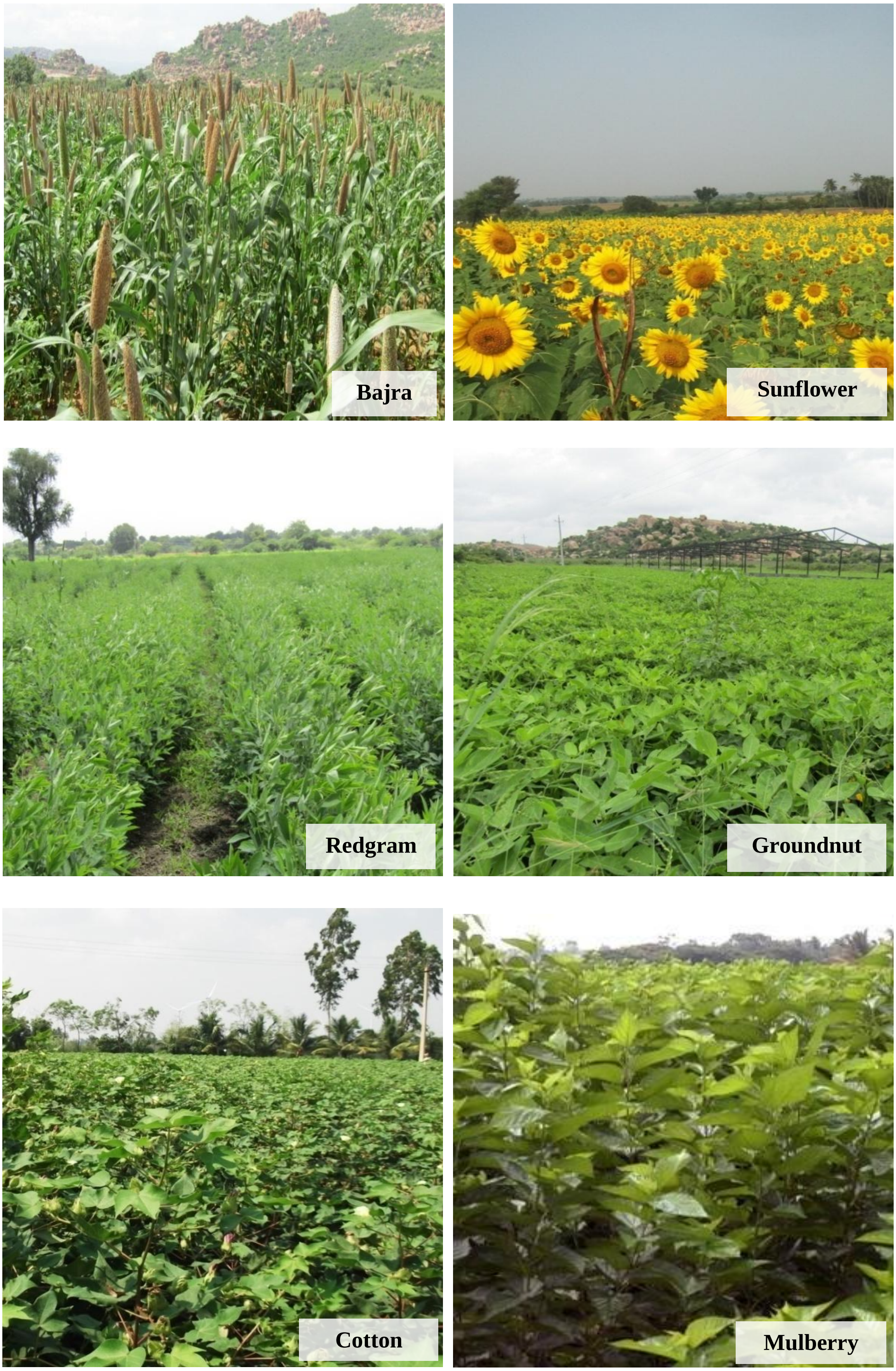


Fig.2.5 (b) Different crops and cropping systems in Katarki West-1 Microwatershed

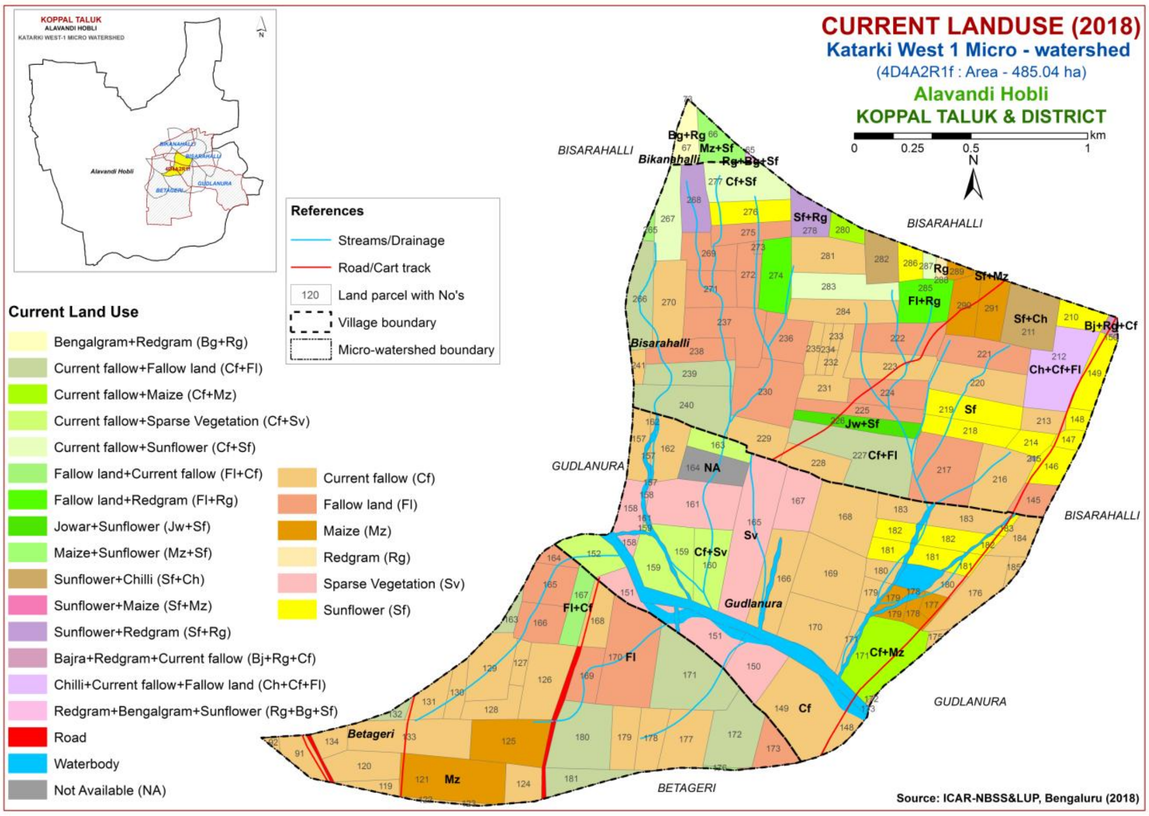


Fig.2.6 Current Land Use map of Katarki West-1 Microwatershed

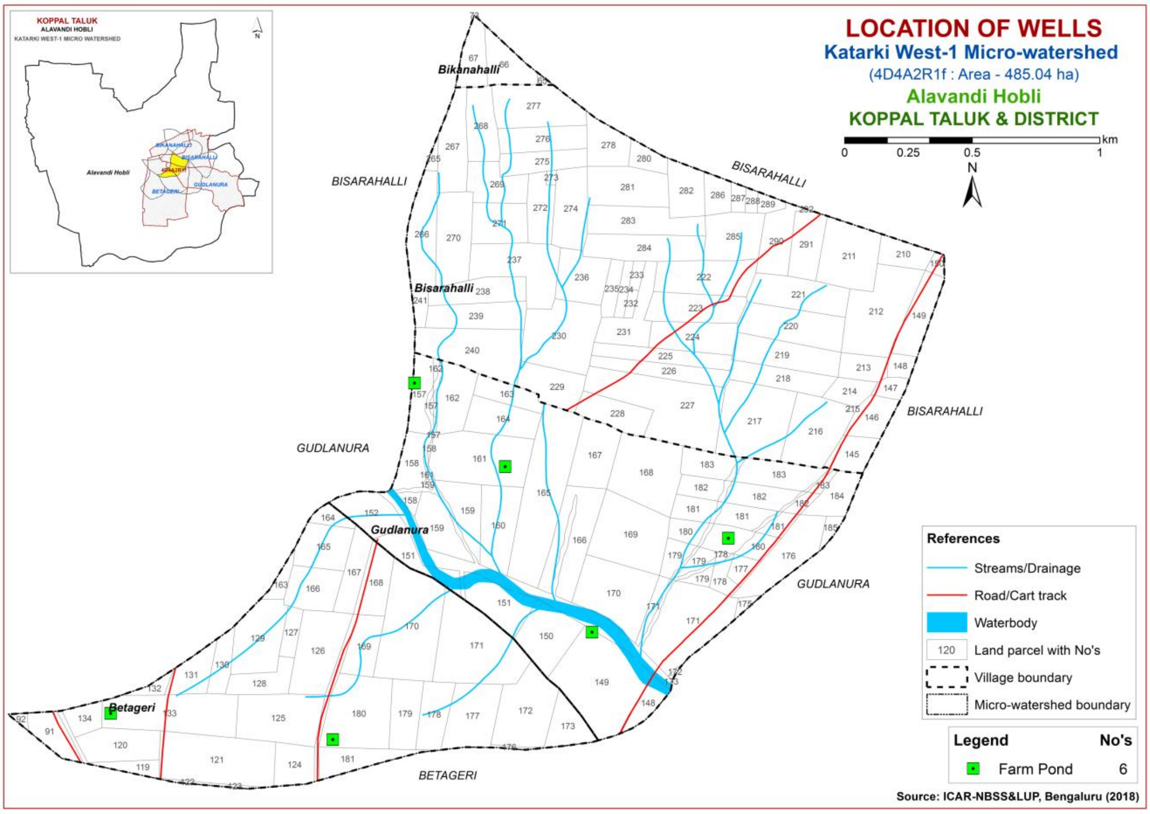


Fig.2.7 Location of conservation structures map of Katarki West-1 Microwatershed

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly for a given level of management. This was achieved in Katarki West-1 microwatershed by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site characteristics (slope, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatershed cadastral map. The detailed soil survey at 1:7920 scale was carried out in 485 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.*, 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatershed was carried out by using digitized cadastral map and satellite imagery as base supplied by the KSRSAC. The cadastral map shows field boundaries with their survey numbers, location of tanks, streams and other permanent features of the area (Fig. 3.1). Apart from the cadastral map, remote sensing data products from Cartosat-1 and LISS IV merged at the scale of 1:7920 were used in conjunction with the cadastral map to identify the geology, landscapes, landforms and other surface features. The imagery helped in the identification and delineation of boundaries between hills, uplands and lowlands, water bodies, forest and vegetated areas, roads, habitations and other cultural features of the area (Fig.3.2).The cadastral map was overlaid on the satellite imagery (Fig.3.3) that helps to identify the parcel boundaries and other permanent features. Apart from cadastral maps and images, toposheets of the area (1:50,000 scale) were used for initial traversing, identification of geology, landscapes and landforms, drainage features, present land use and also for selection of transects in the microwatershed.

3.2 Image Interpretation for Physiography

False Colour Composites (FCC) of Cartosat-I and LISS-IV merged satellite data covering the microwatershed area was visually interpreted using image interpretation elements and all the available collateral data with local knowledge. The delineated physiographic boundaries were transferred on to a cadastral map overlaid on satellite imagery. Physiographically, the area has been identified as alluvial landscape and is divided into landforms such as ridges, mounds and uplands based on slope. They were further subdivided into physiographic/image interpretation units based on image characteristics. The image interpretation legend for physiography is given below.

Image Interpretation Legend for Physiography

DSe -Alluvial landscape

DSe 1 Summit

DSe 11 Nearly level Summit with dark grey tone
DSe 12 Nearly level Summit with medium grey tone
DSe 13 Nearly level Summit with whitish grey tone
DSe 14 Nearly level Summit with whitish tone (Calcareousness)
DSe 15 Nearly level Summit with pinkish grey tone
DSe 16 Nearly level Summit with medium pink tone
DSe 17 Nearly level Summit with bluish white tone
DSe 18 Nearly level Summit with greenish grey tone

DSe 2 Very genetly sloping

DSe 21 Very gently sloping, whitish tone
DSe 22 Very gently sloping, greyish pink tone
DSe 23 Very gently sloping, whitish grey tone
DSe 24 Very gently sloping, medium grey tone
DSe 25 Very gently sloping, medium pink tone
DSe 26 Very gently sloping, dark grey tone
DSe 27 Very gently sloping, bluish grey tone
DSe 28 Very gently sloping, greenish grey tone
DSe 29 Very gently sloping, Pinkish grey

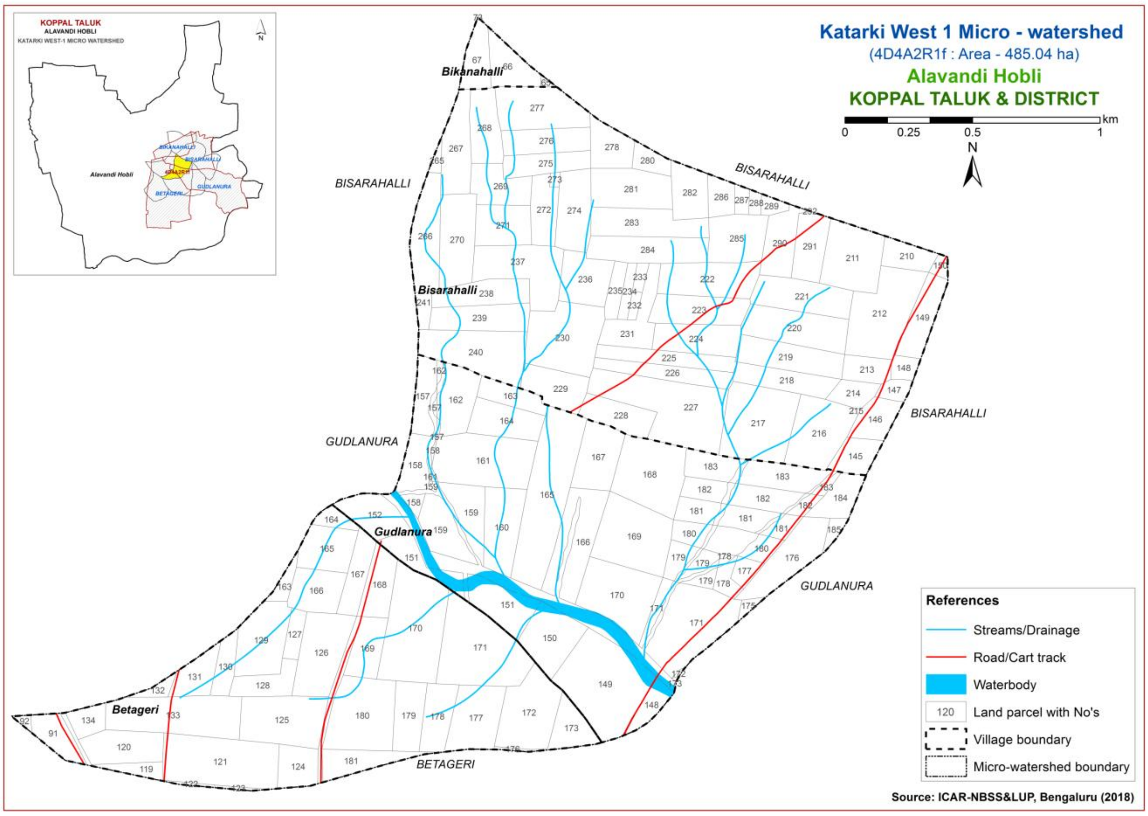


Fig 3.1 Scanned and Digitized Cadastral map of Katarki West-1 Microwatershed

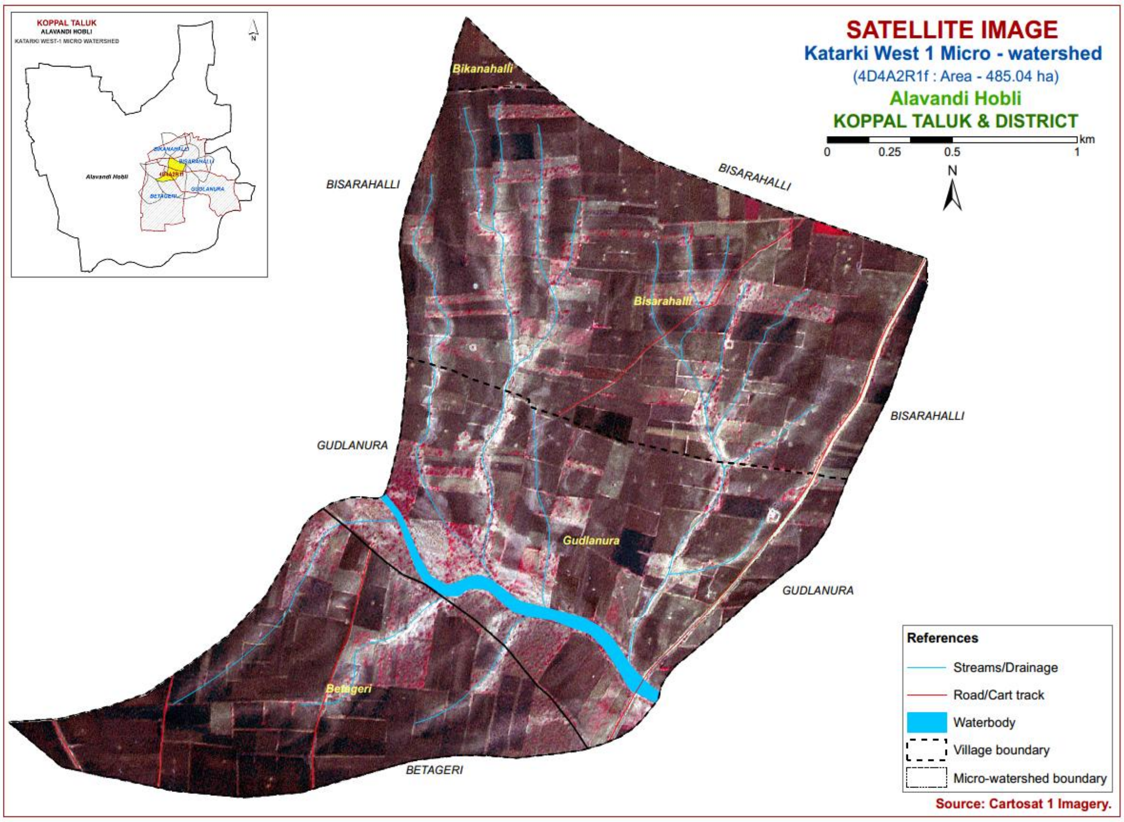


Fig.3.2 Satellite Image of Katarki West-1 Microwatershed

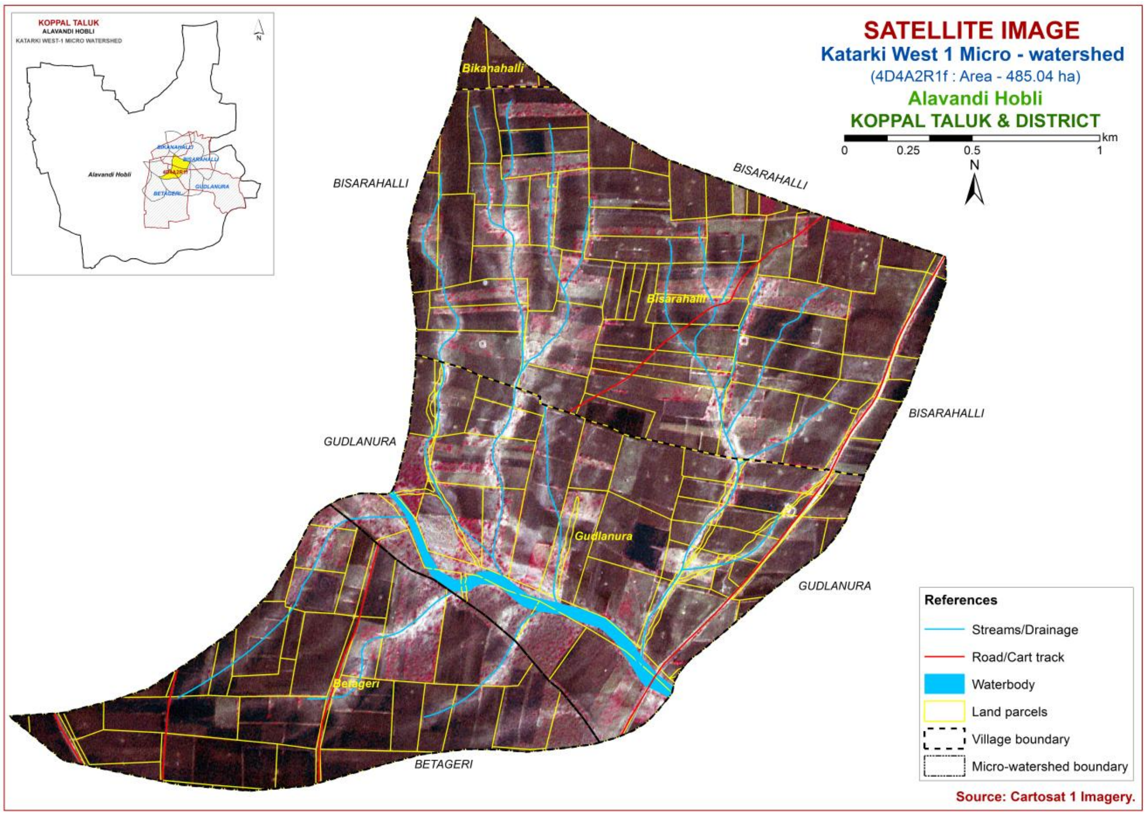


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Katarki West-1 Microwatershed

3.3 Field Investigation

The field boundaries and survey numbers given on the cadastral sheet were located on the ground by following permanent features like roads, cart tracks, *nallas*, streams, tanks etc., and wherever changes were noticed, they were incorporated on the microwatershed cadastral map. Preliminary traverse of the microwatershed was carried out with the help of cadastral map, imagery and toposheets. While traversing, landforms and physiographic units identified were checked and preliminary soil legend was prepared by studying soils at few selected places. Then, intensive traversing of each physiographic unit like hills, ridges, uplands and plains was carried out. Based on the variability observed on the surface, transects (Fig 3.4) were selected across the slope covering all the landform units in the microwatershed (Natarajan and Dipak Sarkar, 2010).

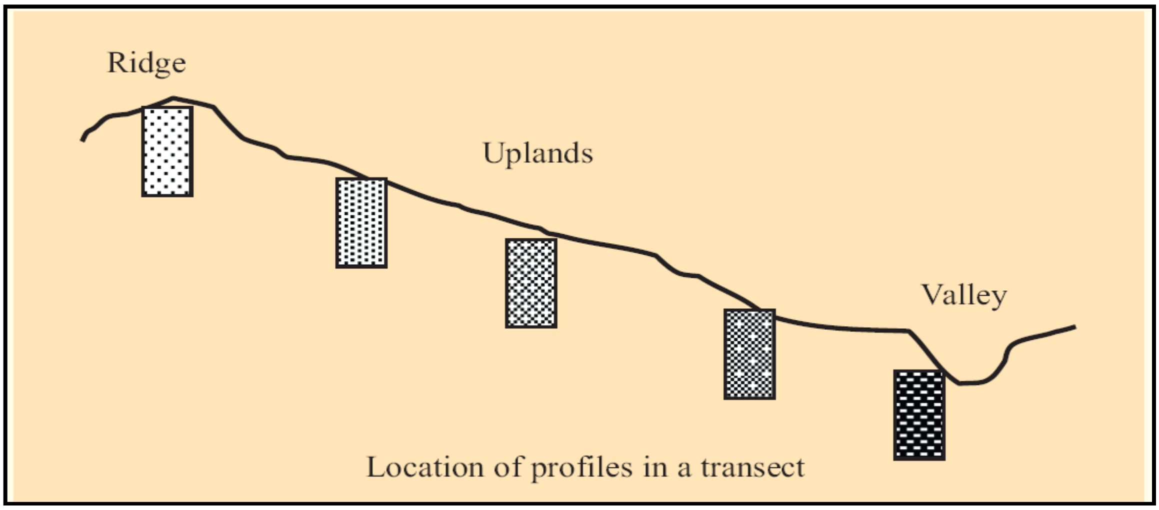


Fig: 3.4. Location of profiles in a transect

In the selected transect, soil profiles (Fig.3.4) were located at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, profiles (vertical cut showing the soil layers from surface to the rock) were opened upto 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, profiles were also studied at random, almost like in a grid pattern, outside the transect areas to validate the soil map unit boundaries.

Based on the soil characteristics, the soils were grouped into different soil series. Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 7 soil series were identified in Katarki West-1 microwatershed.

Table 3.1 Differentiating Characteristics used for identifying Soil Series (Characteristics are of Series Control Section)

Soils of Alluvial landscape							
Sl. No	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareo-usness**
1	Ravanaki (RNK)	50-75	7.5YR3/2,3/3,5/2,5/3 10YR3/1,3/2,4/1, 4/2, 5/1,6/1	c	<15	Ap-Bw-Cr	e-ev
2	Dambarahalli (DRL)	75-100	10YR 2/1, 3/1, 4/3	c	<15	Ap-Bss-Ck	e-es
3	Narasapura (NSP)	75-100	10YR 3/1, 3/2, 4/2	c	<15	Ap-Bw-Cr	e-es
4	Gatareddihal (GRH)	100-150	10YR 2/1, 3/1 2.5Y 4/3, 5/4	c	<15	Ap-Bss-BC-C	es
5	Handrala (HDL)	100-150	10YR 2/1, 3/1,4/1	c	-	Ap-Bss-Ck	es
6	Alawandi (AWD)	>150	10YR 2/1, 3/2	c	<15	Ap-Bss	e-es
7	Allipura (APR)	>150	10YR 4/1 2.5Y 4/1	c-s-c	<15	Ap-Bw-C-2Bw	es-ev

3.4 Soil Mapping

The area under each soil series was further separated into soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management. The soil mapping units are shown on the map (Fig.3.5) in the form of symbols. During the survey many soil profile pits, few mini pits and a few auger bores representing different landforms occurring in the microwatershed were studied. In addition to the profile study, spot observations in the form of mini pits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map.

The soil map shows the geographic distribution of 11 mapping units representing 7 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 11 phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units

The 11 soil phases identified and mapped in the microwatershed were regrouped into 2 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LMU's. For Katarki West-1 microwatershed, five soil and site characteristics, namely the soil depth, soil texture, slope, erosion and gravel content have been considered for defining LMUs. The land use classes are expected to behave similarly for a given level of management.

3.5 Laboratory Characterization

Soil samples for each series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2018 from farmer's fields in Katarki West-1 microwatershed (50 samples) for fertility status (major and micronutrients) at 320 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Katarki West-1 Microwatershed

Soil map unit No*	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
Soils of Alluvial Landscape				
	RNK	Ravanaki soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to very dark grayish brown and dark gray, calcareous clay black soils occurring on nearly level to very gently sloping plains under cultivation.		**95(19.55)**
336		RNKmB2	Clay surface, slope 1-3%, moderate erosion	59(12.21)
337		RNKmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	36(7.34)
	DRL	Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have dark brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation.		**28(5.75)**
348		DRLmB1	Clay surface, slope 1-3%, slight erosion	10(1.98)
351		DRLmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	18(3.77)
	NSP	Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, black		**34(7.06)**

Soil map unit No*	Soil Series	Soil Phase	Mapping Unit Description	Area in ha (%)
		calcareous cracking clay soils occurring on nearly level to very gently sloping plains under cultivation.		
360		NSPmB1	Clay surface, slope 1-3%, slight erosion	3(0.63)
362		NSPmB2	Clay surface, slope 1-3%, moderate erosion	31(6.43)
	GRH	Gatareddihal soils are deep (100-150 cm), moderately well drained, have light olive brown to very dark gray, calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation.		**241(49.69)**
370		GRHmA1	Clay surface, slope 0-1%, slight erosion	51(10.54)
373		GRHmB2	Clay surface, slope 1-3%, moderate erosion	190(39.15)
	HDL	Handrala soils are deep (100-150 cm), moderately well drained, have dark gray to very dark gray, black calcareous cracking clay soils occurring on very gently sloping plains under cultivation.		**67(13.83)**
382		HDLmB2	Clay surface, slope 1-3%, moderate erosion	67(13.83)
	AWD	Alawandi soils are very deep (>150 cm), moderately well drained, have very dark grayish brown to black , calcareous black cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**1(0.19)**
423		AWDmB1g1	Clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	1(0.19)
	APR	Allipura soils are very deep (>150 cm), moderately well drained, have dark gray black, cracking calcareous clay soils occurring on nearly level sloping lowlands under cultivation.		**12(2.56)**
463		APRmA1	Clay surface, slope 0-1%, slight erosion	12(2.56)
1000	Others	Habitation and water body		**7(1.37)**

*Soil map unit numbers are continuous for the taluk, not the microwatersheds

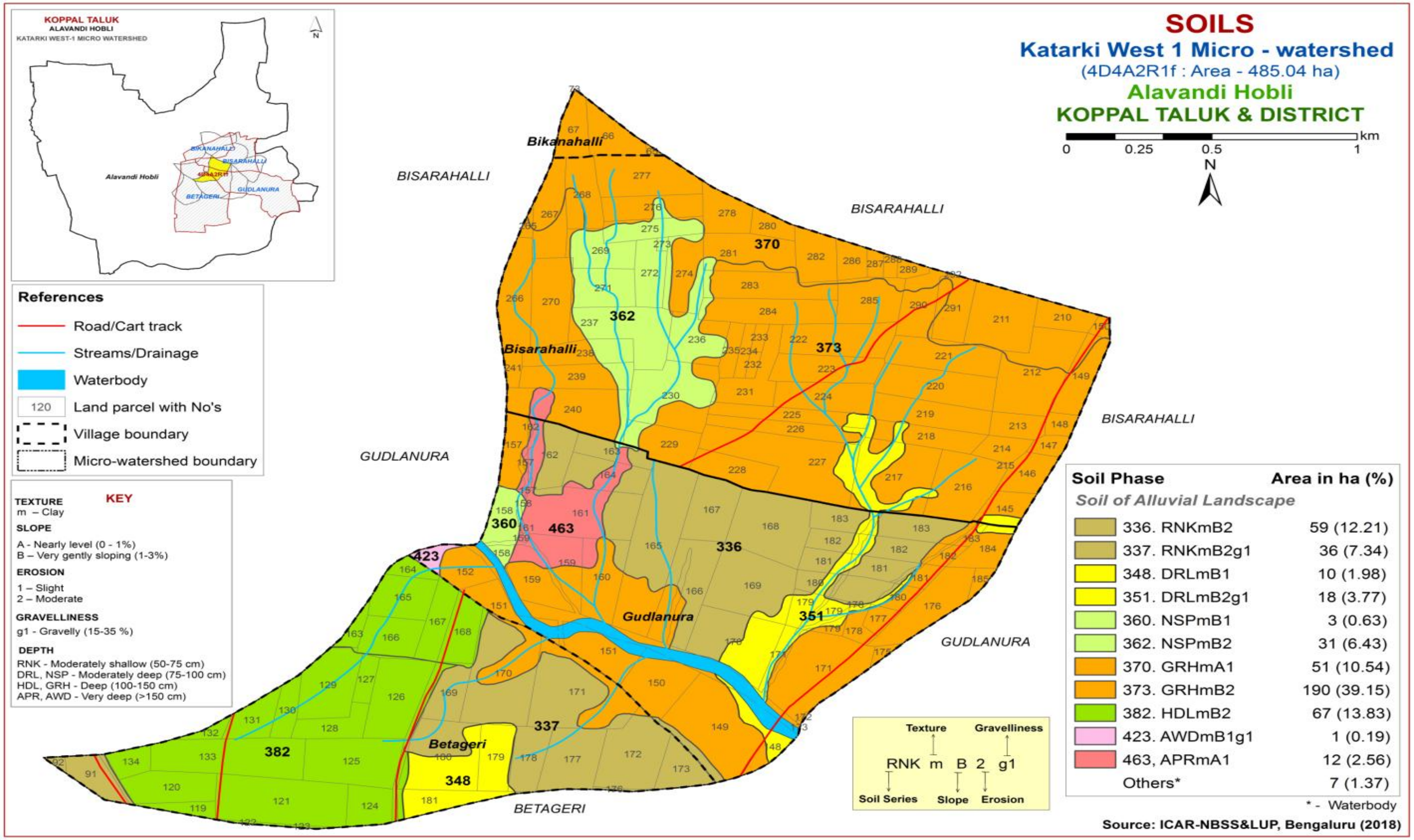


Fig 3.5 Soil Phase or Management Units of Katarki West-1 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Katarki West-1 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscape based on geology. In all, 7 soil series were identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 7 soil series identified followed by 11 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Katarki West-1 microwatershed are given in Table 4.1 along with soil classification. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatershed in Appendix-I.

4.1 Soils of Alluvial Landscape

In this landscape, 7 soil series were identified and mapped. Of these series, GRH series occupies maximum area of 241 ha (50%) followed by RNK 95 ha (19%), HDL 67 ha (14%), NSP 34 ha (7%), DRL 28 ha (6%), APR 12 ha (3%) and AWD 1 ha (<1%).The brief description of the soil series along with the soil phases identified and mapped is given below.

4.1.1 Ravanaki (RNK) Series: Ravanaki soils are moderately shallow (50-75 cm), well drained, have dark brown to very dark grayish brown, calcareous clay soils. They have developed from alluvium and occur on nearly level to very gently sloping plains. The Ravanaki soil series has been classified as a member of the very fine, smectitic, (calc), isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 50 to 75 cm. The thickness of A horizon ranges from 15 to 20 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2.5 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 35 to 60 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 6 and chroma 2 to 4. Its texture is sandy clay to clay with gravel content of 10 to 20 per cent. The available water capacity is medium (51-100 mm/m). Two soil phases were identified and mapped.

Landscape and Soil Profile Characteristics of Ravanaki (RNK) Series

4.1.2 Dambarahalli (DRL) Series: Dambarahalli soils are moderately deep (75-100 cm), moderately well drained, have black and very dark gray to dark brown calcareous cracking clay soils. They have developed from alluvium and occur on very gently to gently sloping plains under cultivation. The Dambarahalli series has been classified as a member of the very fine, smectitic, (calc), isohyperthermic family of Typic Haplusterts.

The thickness of the solum ranges from 75 to 99 cm. The thickness of A horizon ranges from 13 to 24 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. The texture is clay. The thickness of B horizon ranges from 54 to 85 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 3. Its texture is clay and is calcareous. The available water capacity is high (151-200 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Dambarahalli (DRL) Series

4.1.3 Narsapura (NSP) Series: Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, sodic, calcareous, black cracking clay soils. They have developed from alluvium and occur on very gently sloping plains. The Narsapura series has been classified as a member of the very-fine, smectitic, (calc), isohyperthermic family of Vertic Haplustepts.

The thickness of the solum is 76 to 98 cm. The thickness of A-horizon ranges from 15 to 19 cm. Its colour is in 10 YR hue with value 3 and chroma 1 to 2.The texture is clay with no gravel. The thickness of B horizon ranges from 57 to 83 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Its texture is clay and is calacreous. The available water capacity is medium (101-150 mm/m).Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Narsapura (NSP) Series

4.1.4 Gatareddihal (GRH) Series: Gatareddihal soils are deep (100-150 cm), moderately well drained, have black or dark grey to light olive brown, calcareous sodic clay soils. They are developed from alluvium and occur on nearly level to very gently sloping plains under cultivation. The Gatareddihal series has been classified as member of the very fine, smectitic, (calc), isohyperthermic family of Sodic Haplusterts.

The thickness of the solum ranges from 102 to 149 cm. The thickness of A-horizon ranges from 12 to 19 cm. Its colour is in 7.5 YR, 10 YR hue with value 3 to 4 and chroma 1 to 6. The texture is sandy clay loam to clay. The thickness of B-horizon ranges from 86 to 117 cm. Its colour is in 10 YR and 7.5 YR hue with value 3 and chroma 2 to 6. Texture is clay with less than 15 per cent gravel. The available water capacity is very high (>200 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Gatareddihal (GRH) Series

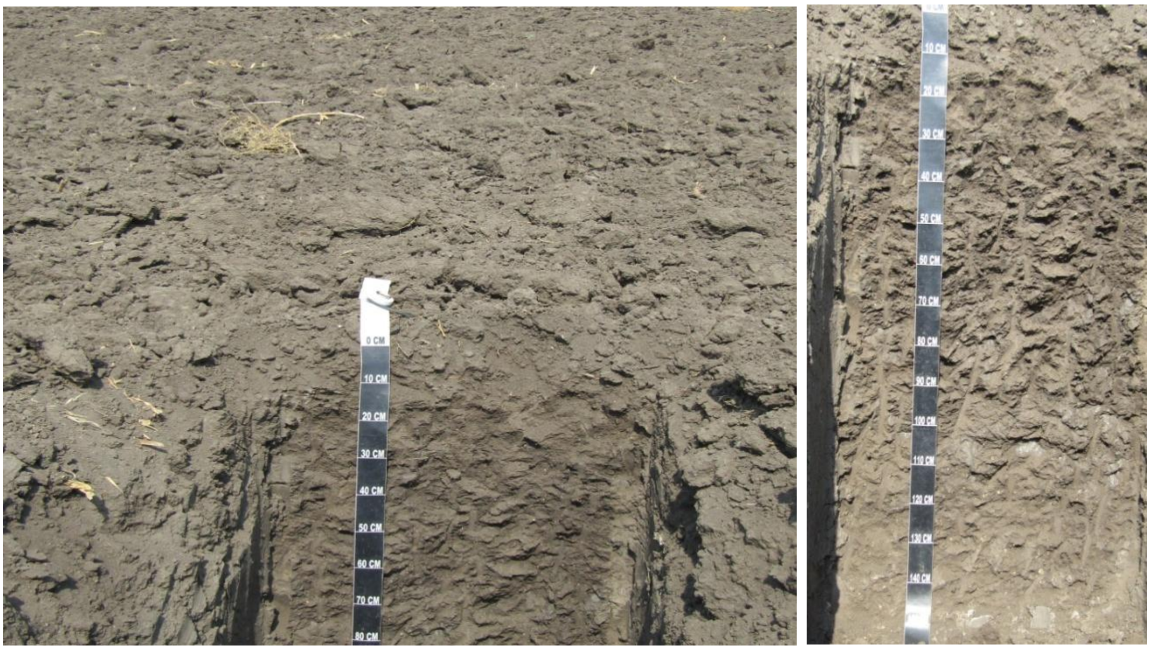
4.1.5 Handrala (HDL) Series: Handrala soils are deep (100-150 cm), moderately well drained, have black, very dark brown to dark gray, calcareous cracking clay soils. They are developed from alluvium and occur on very gently to gently sloping plains. The Handrala series has been classified as a member of the very fine, smectitic, (calc), isohyperthermic family of Typic Haplusterts.

The thickness of the solum ranges from 102 to 149 cm. The thickness of A horizon ranges from 14 to 26 cm. Its colour is in 10 YR hue with value 3 and chroma 1. The texture is clay. The thickness of B horizon ranges from 103 to 127 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1 to 2. Texture is dominantly clay. The available water capacity is very high (>200 mm/m). Only one soil phase was identified and mapped.

Landscape and soil Profile Characteristics of Handrala (HDL) Series

4.1.6 Alawandi (AWD) Series: Alawandi soils are very deep (>150 cm), moderately well drained, have black to very dark grayish brown, calcareous cracking clay soils. They have developed from alluvium and occur on nearly level to very gently sloping plains under cultivation. The Alawandi series has been classified as a member of the fine, smectitic, (calc), isohyperthermic family of Typic Haplusterts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 16 to 26 cm. Its colour is in 10 YR hue with value 2 to 3 and chroma 1 to 2. The texture varies from sandy clay to clay. The thickness of B horizon is more than 150 cm. Its colour is in 10 YR hue with value 2 to 3 and chroma 1 to 3. Its texture is clay and is calcareous. The available water capacity is very high (>200 mm/m). Only one soil phase was identified and mapped.



Landscape and soil Profile Characteristics of Alawandi (AWD) Series

4.1.7 Allipur (APR) series: Allipura soils are very deep (>150 cm), moderately well drained, have gray to dark gray, black calcareous clayey stratified sandy soils in some sub horizons. They are developed from alluvium and occur on nearly level sloping plains under cultivation. The Allipura series has been classified as a member of the fine, mixed, (calc), isohyperthermic family of Vertic Haplustepts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 15 to 18 cm. Its colour is in 10 YR hue with value 4 to 5 and chroma 2 with loamy sand to clay in texture with no gravel. The thickness of B horizon ranges from 144 to 167 cm. Its colour is in 10 YR hue with value 2 to 5 and chroma 1 to 2. Its texture is black clayey stratified sandy soils in some sub horizons with less than 15 per cent gravel. The available water capacity is very high (>200 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Allipur (APR) series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Katarki West-1 microwatershed

Series Name: Ravanaki (RNK), **Pedon:** RM-20
Location: 15°14'22.7"N, 75°57'45.8"E, Gatareddihalla village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (Calc) Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-28	Ap	24.43	17.76	57.81	5.30	3.89	3.78	7.14	4.32	20	c	41.40	29.60
28-55	Bw	18.77	15.59	65.64	2.74	3.73	2.85	4.83	4.61	10	c	46.71	35.18

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-28	8.86	-	-	0.483	0.63	15.48	-	-	0.86	6.27	-	37.00	0.64	-	6.78
28-55	8.61	-	-	1.4	0.23	13.68	-	-	0.68	12.27	-	53.20	0.81	-	9.22

Contd…

Series Name: Dombarahalli (DRL), **Pedon:** R-8
Location: 15^{0}13'96.2"N, 75^{0}57'48.6" E Ragunathanahalli village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-15	Ap	28.25	19.48	52.27	4.76	4.44	4.87	8.23	5.95	-	c	39.86	27.20
15-27	BA1	21.55	20.00	58.45	3.76	2.76	3.43	6.30	5.30	-	c	46.35	34.84
27-45	Bss1	14.86	20.89	64.25	2.46	2.23	2.23	3.91	4.02	-	c	57.99	41.06
45-80	Bss2	10.42	19.04	70.54	1.74	1.97	1.27	2.78	2.66	-	c	66.36	36.24

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-15	8.78	-	-	0.42	0.32	12.35	-	-	0.59	4.25	-	49.70	0.95	100.00	5.62
15-27	9.03	-	-	0.61	0.30	12.48	-	-	0.30	8.96	-	57.23	0.98	100.00	10.07
27-45	9.10	-	-	0.67	0.34	11.70	-	-	0.25	11.85	-	60.71	0.95	100.00	14.05
45-80	9.18	-	-	0.86	0.32	13.39	-	-	0.27	15.40	-	63.33	0.90	100.00	18.45

Contd…

Series Name: Narsapura (NSP), **Pedon:** A2/RM-2
Location: $15^0$19’86.9”N, $75^0$57’86.1”E, Kavalura village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), isohyperthermic Vertic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-29	Ap	31.32	16.52	52.16	5.51	5.40	5.51	9.83	5.08	10	c	38.86	27.64
29-52	Bw1	13.30	22.08	64.62	2.52	2.41	2.41	3.67	2.29	05	c	49.88	40.05
52-77	BW2	13.22	17.39	69.40	3.56	2.41	1.95	2.76	2.53	05	c	51.33	41.55

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-29	9.16	-	-	0.615	0.23	9.36	-	-	0.72	10.98	-	51.09	0.98	-	8.60
29-52	8.69	-	-	2.01	0.5	8.64	-	-	0.55	24.42	-	60.63	0.94	-	16.11
52-77	8.52	-	-	2.68	0.46	7.68	-	-	0.50	25.65	-	60.74	0.88	-	16.90

Contd…

Series Name: Gatareddihal (GRH), **Pedon:** R-7
Location: 15^{0}14'20.8"N, 76^{0}04'28.4" E Gudlanur village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), isohyperthermic Sodic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-18	Ap	20.07	19.71	60.23	1.76	3.75	3.64	3.42	7.50	-	c	41.70	29.56
18-51	Bss1	15.11	17.47	67.42	3.16	3.04	2.25	3.38	3.27	-	c	59.43	38.52
51-80	Bss2	13.19	18.74	68.07	1.80	2.93	2.37	3.04	3.04	-	c	60.69	40.91
80-107	Bss3	17.54	19.50	62.96	2.46	4.13	3.24	4.25	3.46	-	c	57.25	37.31
107-131	BC	9.42	17.48	73.10	1.48	1.82	1.36	1.93	2.84	-	c	64.62	43.98

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	9.08	-	-	0.23	0.33	6.89	-	-	0.70	6.36	-	63.21	1.05	100.00	7.11
18-51	9.19	-	-	0.61	0.49	9.10	-	-	0.54	14.20	-	66.05	0.98	100.00	15.98
51-80	9.27	-	-	0.56	0.29	9.36	-	-	0.49	14.75	-	65.63	0.96	100.00	17.07
80-107	9.28	-	-	0.57	0.39	9.62	-	-	0.44	14.64	-	63.95	1.02	100.00	17.49
107-131	9.04	-	-	1.08	0.31	8.32	-	-	0.52	16.40	-	68.36	0.94	100.00	17.30

Contd…

Series Name: Handrala (HDL), **Pedon:** A2/RM-1
Location: $15^0$19'69.8"N, $75^0$58'00"E, Kavalura village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, (calc), isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-25	Ap	21.68	16.62	61.70	4.42	3.98	3.43	5.64	4.20	10	c	41.36	31.27
25-50	Bss1	14.93	15.76	69.32	2.64	2.53	2.99	3.33	3.44	05	c	48.92	39.19
50-82	Bss2	23.11	16.60	60.29	4.51	3.61	6.31	4.74	3.95	05	c	42.46	33.85
82-117	Bss3	10.50	18.38	71.12	1.98	1.98	1.63	2.57	2.33	05	c	52.95	42.82

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-25	9.06	-	-	0.371	0.16	4.80	-	-	0.80	7.93	-	62.33	1.01	-	5.09
25-50	9.09	-	-	0.719	0.2	7.20	-	-	0.42	14.94	-	67.10	0.97	-	8.90
50-82	9.28	-	-	0.47	0.19	9.36	-	-	0.47	11.59	-	60.21	1.00	-	7.70
82-117	8.76	-	-	1.55	0.36	8.64	-	-	0.11	2.28	-	25.33	0.36	-	3.61

Contd…

Series Name: Alawandi (AWD), **Pedon:** R-16
Location: : $15^0$13'08.2"N, $76^0$15'27.3" E Neeralagi village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, smectitic, (calc), isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-17	Ap	20.88	25.75	53.37	3.31	4.31	4.31	5.19	3.76	-	c	33.11	25.58
17-39	Bss1	25.99	19.79	54.22	5.04	5.48	5.04	5.92	4.50	-	c	33.11	26.23
39-70	Bss2	26.76	17.80	55.44	2.93	5.31	5.53	7.37	5.63	-	c	36.15	28.67
70-111	Bss3	23.83	20.25	55.93	4.15	4.81	4.92	6.01	3.93	-	c	43.60	33.71
111-139	Bss4	21.21	20.40	58.40	2.79	4.80	4.91	5.25	3.46	-	c	46.92	36.28
139-162	Bss5	13.15	20.96	65.90	1.69	2.47	2.36	3.37	3.26	-	c	54.96	41.81

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	8.10	-	-	0.37	0.52	9.48	-	-	0.40	1.56	-	51.30	0.96	100.00	1.22
17-39	8.60	-	-	0.24	0.52	9.60	-	-	0.14	4.60	-	52.60	0.97	100.00	3.50
39-70	8.89	-	-	0.27	0.52	9.48	-	-	0.16	2.41	-	53.90	0.97	100.00	1.78
70-111	9.10	-	-	0.35	0.54	11.28	-	-	0.15	8.95	-	54.10	0.97	100.00	6.61
111-139	9.15	-	-	0.41	0.58	10.80	-	-	0.15	7.36	-	56.10	0.96	100.00	5.24
139-162	9.16	-	-	0.50	0.50	15.48	-	-	0.19	10.19	-	61.66	0.94	100.00	6.61

Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

The most important soil and site characteristics that affect the land use and conservation needs of an area are land capability, land irrigability, soil depth, soil texture, coarse fragments, available water capacity, soil slope, soil erosion, soil reaction etc. These are interpreted from the data base generated through land resource inventory and several thematic maps are generated. These would help in identifying the areas suitable for growing crops and, soil and water conservation measures and structures needed thus helping to maintain good soil health for sustained crop production. The various thematic maps generated are described below.

5.1 Land Capability Classification

Land capability classification is an interpretative grouping of soil map units (soil phases) mainly based on inherent soil characteristics, external land features and environmental factors that limit the use of land for agriculture, pasture, forestry, or other uses on a sustained basis (IARI, 1971). The land and soil characteristics used to group the land resources in an area into various land capability classes, subclasses and units are

Soil characteristics: Soil depth, soil texture, coarse fragments, soil reaction, available water capacity, calcareousness, salinity/alkali *etc*.

Land characteristics: Slope, erosion, drainage, rock outcrops.

Climate: Total rainfall and its distribution, and length of crop growing period.

The Land Capability Classification system is divided into land capability classes, subclasses and units based on the level of information available. Eight land capability classes are recognized. They are

Class I: They are very good lands that have no limitations or very few limitations that restrict their use.

Class II: They are good lands that have minor limitations and require moderate conservation practices.

Class III: They are moderately good lands that have severe limitations that reduce the choice of crops or that require special conservation practices.

Class IV: They are fairly good lands that have very severe limitations that reduce the choice of crops or that require very careful management.

Class V: Soils in these lands are not likely to erode, but have other limitations like wetness that are impractical to remove and as such not suitable for agriculture, but suitable for pasture or forestry with minor limitations.

Class VI: The lands have severe limitations that make them generally unsuitable for cultivation, but suitable for pasture or forestry with moderate limitations.

Class VII: The lands have very severe limitations that make them unsuitable for cultivation, but suitable for pasture or forestry with major limitations.

Class VIII: Soil and other miscellaneous areas (rock lands) that have very severe limitations that nearly preclude their use for any crop production, but suitable for wildlife, recreation and installation of wind mills.

The land capability subclasses are recognized based on the dominant limitations observed within a given land capability class. The subclasses are designated by adding a lower case letter like 'e', 'w', 's', or 'c' to the class numeral. The subclass "e" indicates that the main hazard is risk of erosion, "w" indicates drainage or wetness as a limitation for plant growth, "s" indicates shallow soil depth, coarse or heavy textures, calcareousness, salinity/alkalinity or gravelliness and "c" indicates limitation due to climate.

The land capability subclasses have been further subdivided into land capability units based on the kinds of limitations present in each subclass. Ten land capability units are used in grouping the soil map units. They are stony or rocky (0), erosion hazard (slope, erosion) (1), coarse texture (sand, loamy sand, sandy loam) (2), fine texture (cracking clay, silty clay) (3), slowly permeable subsoil (4), coarse underlying material (5), salinity/alkali (6), stagnation, overflow, high ground water table (7), soil depth (8) and fertility problems (9). The capability units thus identified have similar soil and land characteristics that respond similarly to a given level of management. The soils of the microwatershed have been classified upto land capability subclass level.

The 11 soil map units identified in the Katarki West-1 microwatershed are grouped under 1 land capability classes and 2 land capability subclasses (Fig. 5.1).

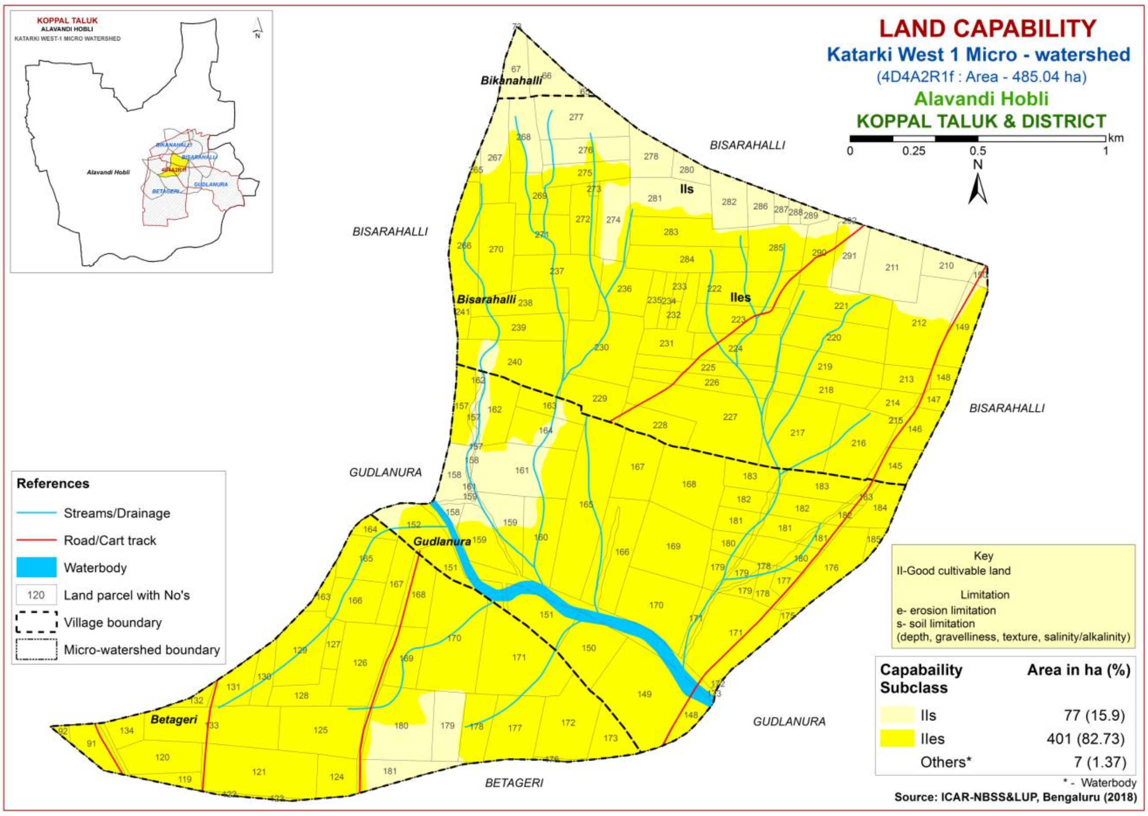


Fig. 5.1 Land Capability classification map of Katarki West-1 Microwatershed

Entire cultivated area in the microwatershed is suitable for agriculture. Good lands (Class II) cover entire area of the microwatershed with minor problems of soil and erosion. An area of about 7 ha (1%) is covered by others (habitation and water body).

5.2 Soil Depth

Soil depth refers to the depth of the soil occurring above the parent material or hard rock. The depth of the soil determines the effective rooting depth for plants and in accordance with soil texture, mineralogy and gravel content, the capacity of the soil column to hold water and nutrient availability. Soil depth is one of the most important soil characteristic that is used in differentiating soils into different soil series. The soil depth classes used in identifying soils in the field are very shallow (<25 cm), shallow (25-50 cm), moderately shallow (50-75 cm), moderately deep (75-100 cm), deep (100-150 cm) and very deep (>150 cm). They were used to classify the soils into different depth classes and a soil depth map was generated (Fig. 5.2). The area extent and their geographical distribution in the microwatershed is given in Fig. 5.2.

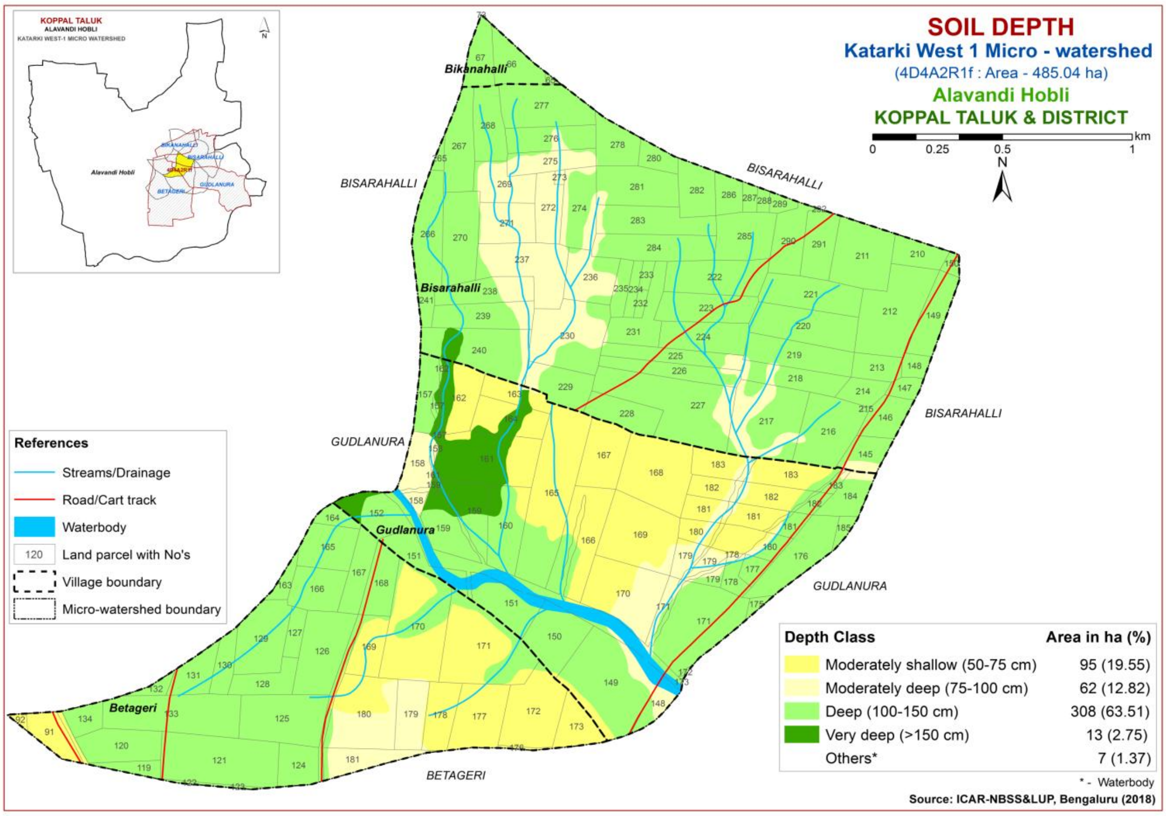


Fig. 5.2 Soil Depth map of Katarki West-1 Microwatershed

An area of 95 ha (20%) is moderately shallow (50-75 cm) soils and distributed in the central, eastern, western and southern part of the microwatershed. An area of about 62 ha (13%) is moderately deep soils (75-100 cm) and are distributed in the northern, eastern and southern part of the microwatershed. Deep to very deep (100 to >150 cm) soils occupy a maximum area of about 321 ha (66%) and are distributed in all parts of the microwatershed.

The most productive lands cover about 321 ha (66%) where all climatically adopted long duration crops can be grown. Problem soils cover about 95 ha (20%) where only short duration crops can be grown.

5.3 Surface Soil Texture

Texture is an expression to indicate the coarseness or fineness of the soil as determined by the relative proportion of primary particles of sand, silt and clay. It has a direct bearing on the structure, porosity, adhesion and consistence. The surface layer of a soil to a depth of about 25 cm is the layer that is most used by crops and plants. The surface soil textural class provides a guide to understanding soil-water retention and availability, nutrient holding capacity, infiltration, workability, drainage, physical and chemical behavior, microbial activity and crop suitability. The textural classes used for LRI were used to classify and a surface soil texture map was generated. The area extent and their geographical distribution in the microwatershed is shown in Fig 5.3.

An entire area in the microwatershed is clayey at the surface and are distributed in all parts of the microwatershed.

The most productive lands with respect to surface soil texture are clayey soils that (99%) have high potential for soil-water retention and availability and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems.

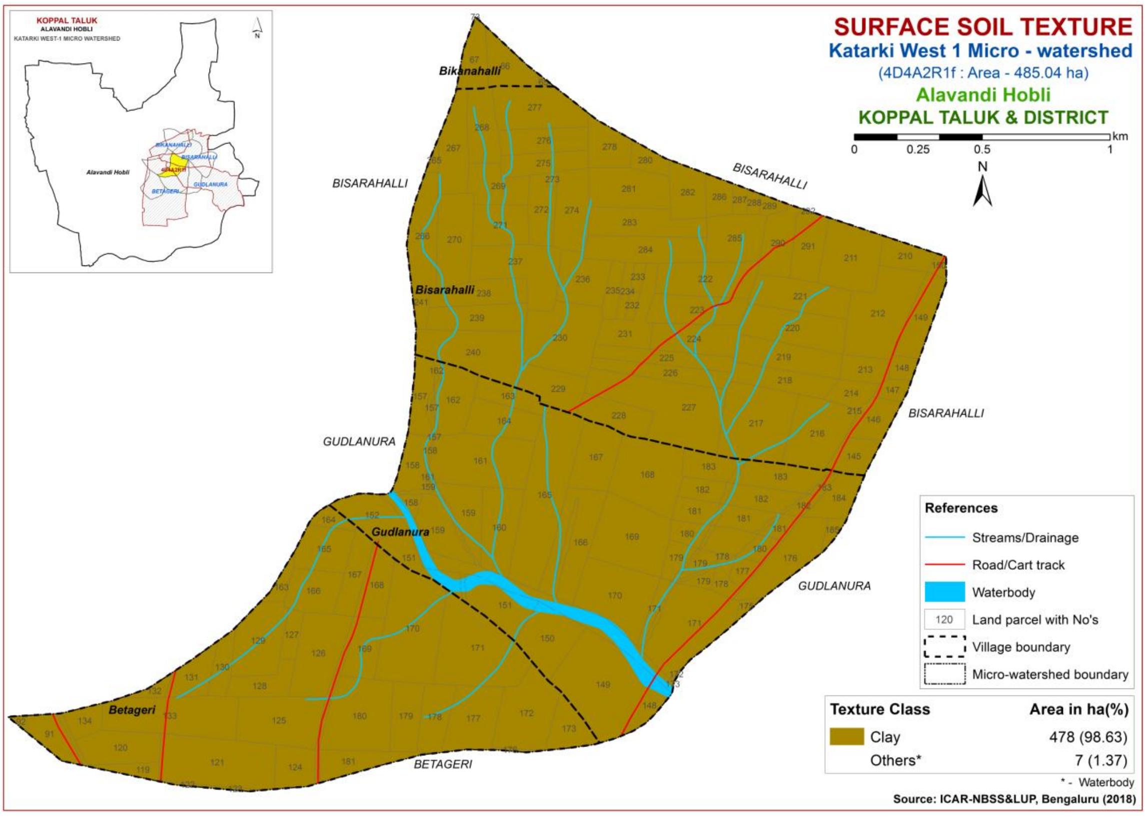


Fig. 5.3 Surface Soil Texture map of Katarki West-1 Microwatershed

5.4 Soil Gravelliness

Gravel is the term used for describing coarse fragments between 2 mm and 7.5 cm diameter and stones for those between 7.5 cm and 25 cm. The presence of gravel and stones in soil reduces the volume of soil responsible for moisture and nutrient storage, drainage, infiltration and runoff, and hinders plant growth by impeding root growth and seedling emergence, intercultural operations and farm mechanization. The gravelliness classes used in LRI were used to classify the soils and using these classes a gravelliness map was generated. The area extent and their geographic distribution in the microwatershed is shown in Fig. 5.4.

The soils that are non-gravelly (<15% gravel) cover a maximum area of about 424 ha (87%) and distributed in all parts of the microwatershed. An area of about 55 ha (11%) is covered by gravelly (15-35% gravel) soils and are distributed in the eastern and southern part of the microwatershed (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 87 per cent that are non gravelly (<15%) soils. These are most productive soils and have potential for growing both annual and perennial crops. The problem soils that are gravelly (15-35%) cover an area of about 11 per cent where only short duration crops can be grown.

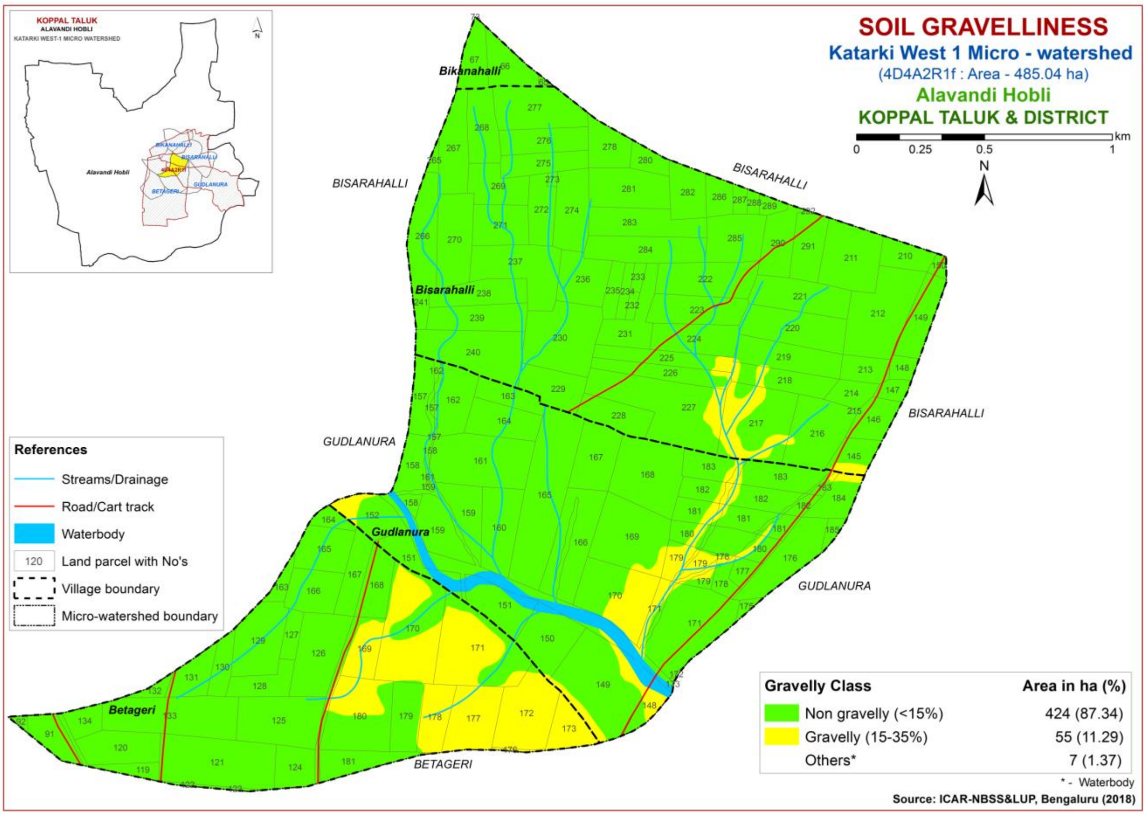


Fig. 5.4 Soil Gravelliness map of Katarki West-1 Microwatershed

5.5 Available Water Capacity

The soil available water capacity (AWC) is estimated based on the ability of the soil column to retain water between the tensions of 0.33 and 15 bar in a depth of 100 cm or the entire solum if the soil is shallower. The AWC of the soils (soil series) as estimated by considering the soil texture, mineralogy, soil depth and gravel content (Sehgal *et al.*, 1990) and accordingly the soil map units were grouped into five AWC classes *viz*, very low (<50 mm/m), low (50-100 mm/m), medium (100-150 mm/m), high (150-200 mm/m) and very high (>200 mm/m) and using these values, an AWC map was generated. The area extent and their geographic distribution of different AWC classes in the microwatershed is shown in Fig. 5.5.

An area of about 95 ha (20%) has soils that are low (51 to 100 mm/m) in available water capacity and are distributed in the western, eastern, central and southern part of the microwatershed. An area of about 62 ha (13%) has soils that are medium (101-150 mm/m) in available water capacity and are distributed in northern, western, eastern and southwestern part of the microwatershed. Maximum area of about 321 ha (66%) is very high (>200 mm/m) in available water capacity and are distributed in all parts of the microwatershed.

An area of about 95 ha (20%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses. An area of about 321 ha (66%) has soils that have high potential (>200 mm/m) with regard to available water capacity where all climatically adapted long duration crops can be grown successfully.

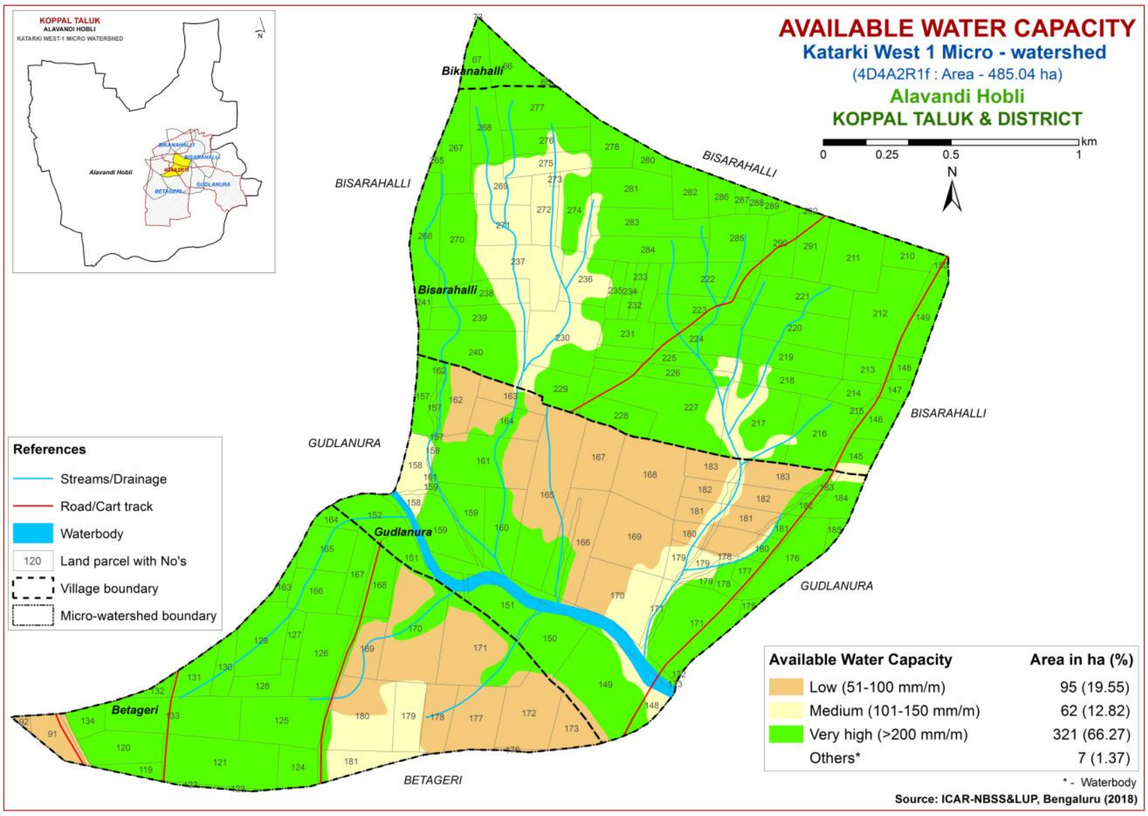


Fig. 5.5 Soil Available Water Capacity map of Katarki West-1 Microwatershed

5.6 Soil Slope

Soil slope refers to the inclination of the surface of the land. It is defined by gradient, shape and length, and is an integral feature of any soil as a natural body. Slope is considered important in soil genesis, land use and land development. The length and gradient of slope influences the rate of runoff, infiltration, erosion and deposition. The soil map units were grouped into three slope classes and a slope map was generated showing the area extent and their geographic distribution of different slope classes in the microwatershed (Fig. 5.6).

An area of about 64 ha (13%) is nearly level (0-1%) lands and are distributed in the northern and western part of the microwatershed. Maximum area of 415 ha (86%) in the microwatershed has very gently sloping (1-3%) lands and are distributed in all parts of the microwatershed. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

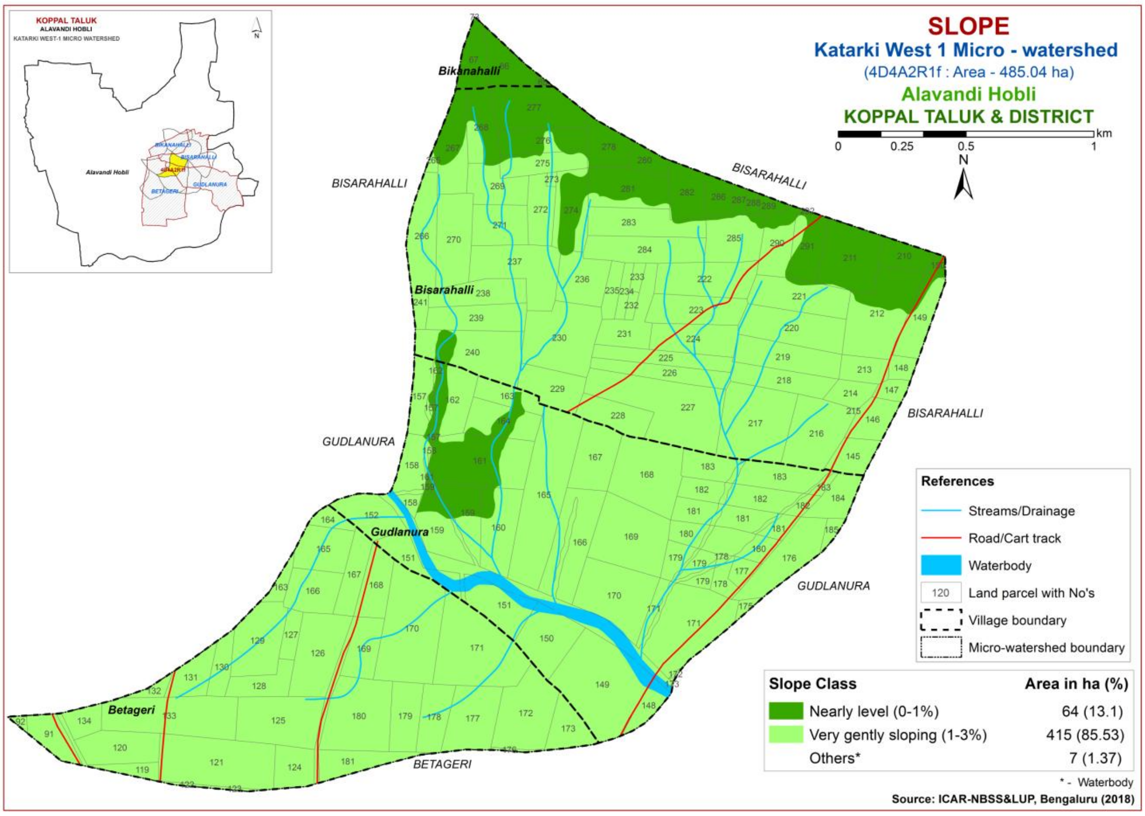


Fig. 5.6 Soil Slope map of Katarki West-1 Microwatershed

5.7 Soil Erosion

Soil erosion refers to the wearing away of the earth's surface by the forces of water, wind and ice involving detachment and transport of soil by raindrop impact. It is used for accelerated soil erosion resulting from disturbance of the natural landscape by burning, excessive grazing and indiscriminate felling of forest trees and tillage, all usually by man. The erosion classes showing an estimate of the current erosion status as judged from field observations in the form of rills, gullies or a carpet of gravel on the surface are recorded. Four erosion classes, viz, slight erosion (e1), moderate erosion (e2), severe erosion (e3) and very severe erosion (e4) are recognized. The soil map units were grouped into different erosion classes and a soil erosion map generated. The area extent and their spatial distribution in the microwatershed is given in Figure 5.7.

Slightly eroded (e1 class) lands cover an area of about 77 ha (16%) and are distributed in the northern, western and southern part of the microwatershed. Maximum area of about 401 ha (83%) is moderately eroded (e2 class) and distributed in all parts of the microwatershed. Moderately eroded lands are problematic and need appropriate soil and water conservation and other land development measures.

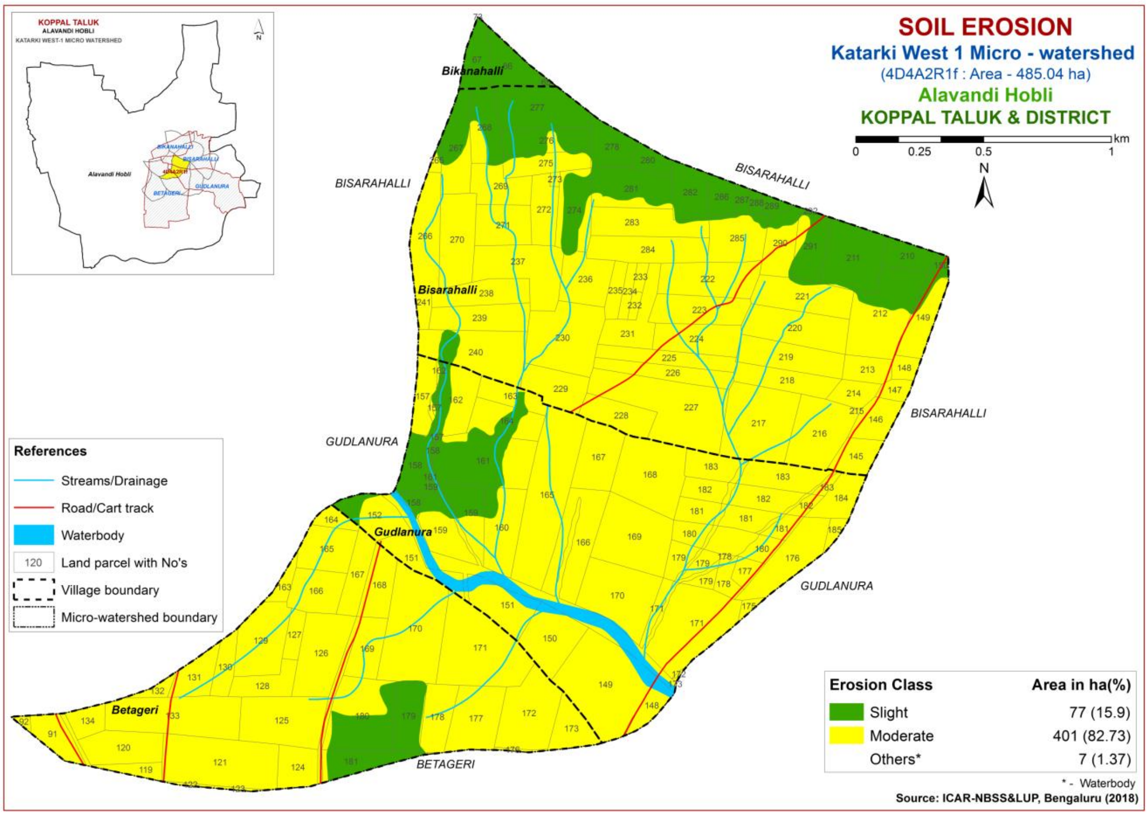


Fig. 5.7 Soil Erosion map of Katarki West-1 Microwatershed

Chapter 6

FERTILITY STATUS

Soil fertility plays an important role in increasing crop yield. The adoption of high yielding varieties that require high amounts of nutrients has resulted in deficiency symptoms in crops and plants due to imbalanced fertilization and poor inherent fertility status, as these areas are characterized by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 320 m grid interval) all over the microwatershed through land resource inventory in the year 2017 were analyzed for pH, EC, organic carbon, available phosphorus and potassium, and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

Soil fertility data generated has been assessed and individual maps for all the nutrients for the microwatershed have been generated by using the Kriging method under GIS. The village/survey number wise fertility data for the microwatershed is given in Appendix-II.

6.1 Soil Reaction (pH)

The soil analysis of the Katarki West-1 microwatershed for soil reaction (pH) showed that an area of about 25 ha (5%) is strongly alkaline (pH 8.4-9.0) and are distributed in the northern part of the microwatershed. Maximum area of 453 ha (93%) is very strongly alkaline (pH >9.0) and distributed in all parts of the microwatershed. Thus, major soils in the microwatershed are alkaline in reaction (Fig.6.1).

6.2 Electrical Conductivity (EC)

The Electrical Conductivity in the entire area of the microwatershed is <2 dS/m and as such soils are non-saline (Fig 6.2).

6.3 Organic Carbon

Maximum area of about 289 ha (60%) is low (<0.5%) and distributed in all parts of the microwatershed. An area of about 190 ha (39%) is medium (0.5-0.75%) in organic carbon content and distributed in the northern and southern part of the microwatershed (Fig.6.3).

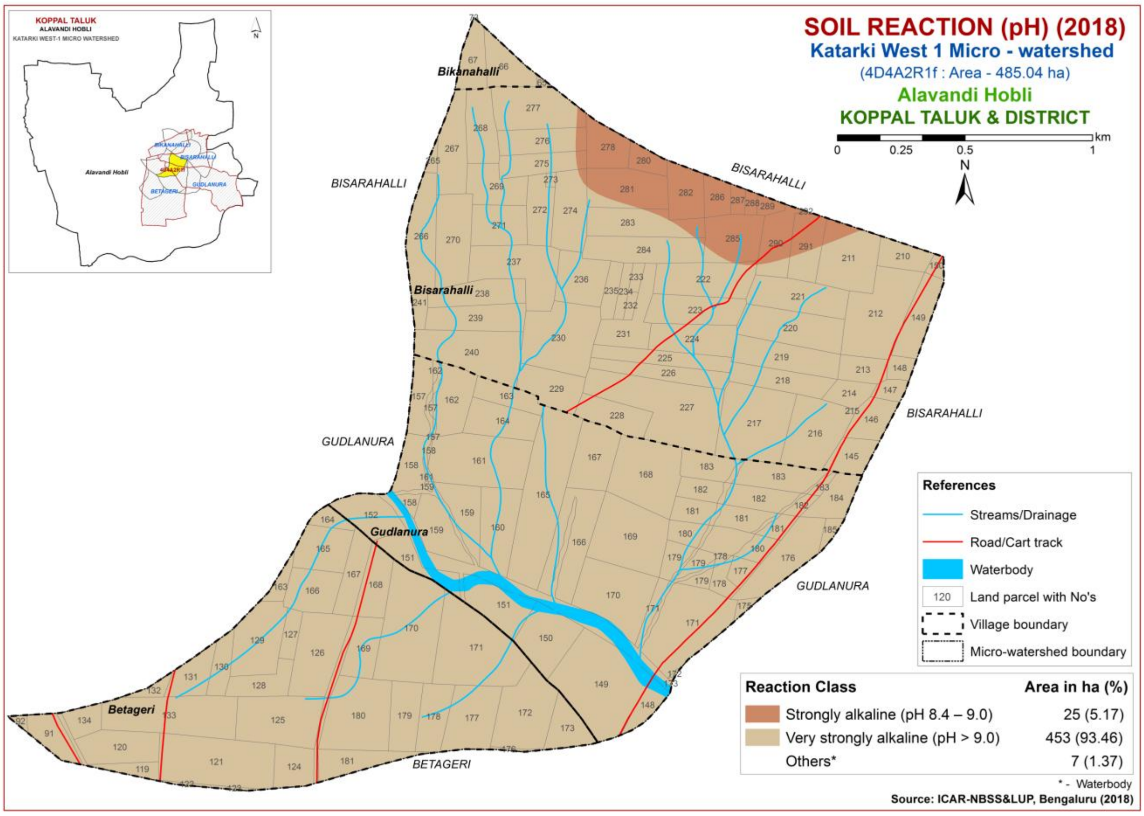


Fig.6.1 Soil Reaction (pH) map of Katarki West-1 Microwatershed

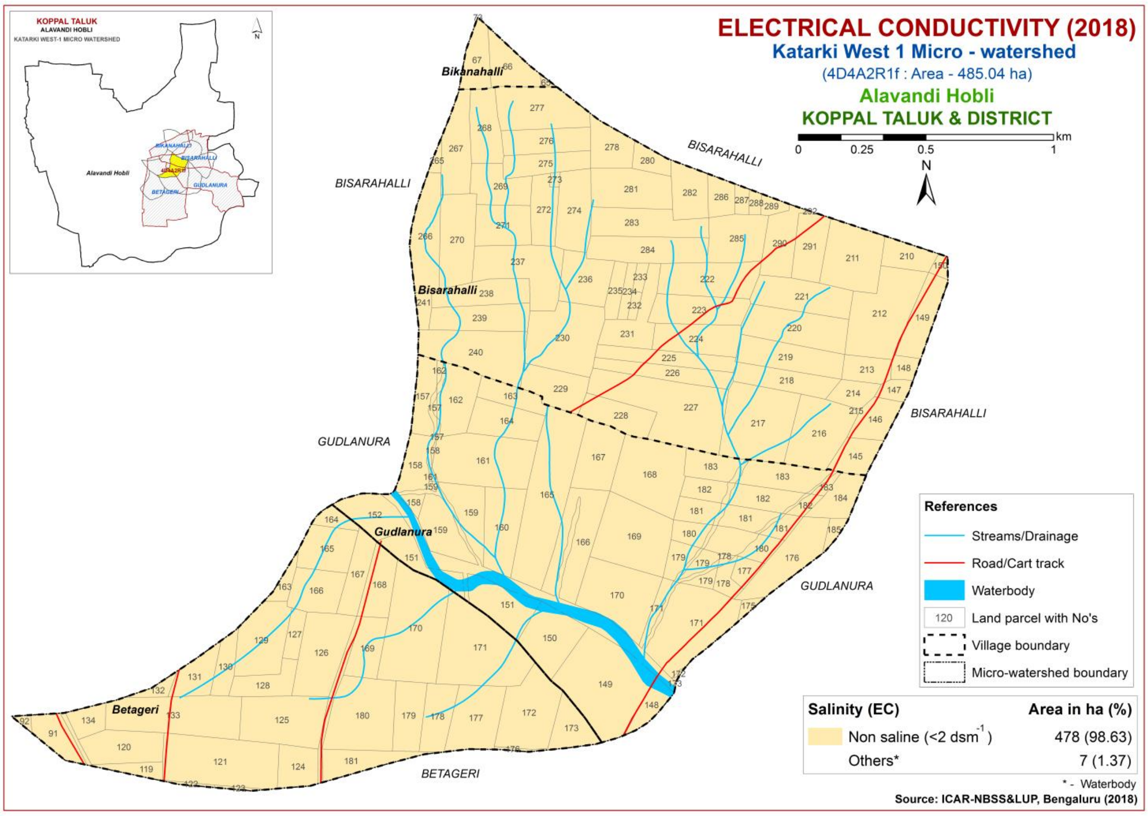


Fig.6.2 Electrical Conductivity (EC) map of Katarki West-1 Microwatershed

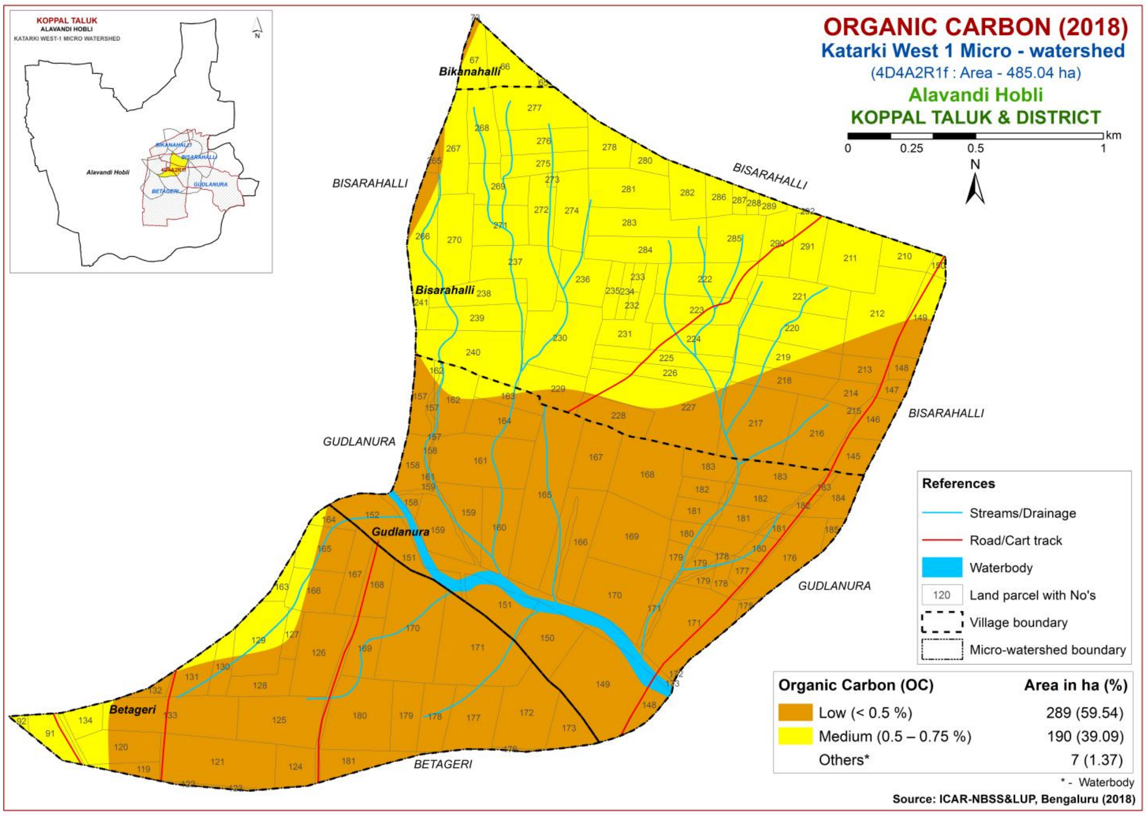


Fig.6.3 Soil Organic Carbon map of Katarki West-1 Microwatershed

6.4 Available Phosphorus

Available phosphorus content is low (<23 kg/ha) in the entire microwatershed area. Apply additional 25% phosphorous in areas where it is low and medium in available phosphorous (Fig 6.4).

6.5 Available Potassium

Medium (145-337 kg/ha) in a maximum area of about 284 ha (59%) and are distributed in all parts of the microwatershed. An area of about 194 ha (40%) is high (>337 kg/ha) in available potassium and are distributed in the northern, central, eastern, western and southern part of the microwatershed (Fig. 6.5). Apply additional 25% potassium in areas where it is low and medium in available potassium.

6.6 Available Sulphur

Available sulphur content is low (<10 ppm) in a maximum area of about 283 ha (58%) and are distributed in all parts of the microwatershed. An area of about 195 ha (40%) is medium (10-20 ppm) in available sulphur and are distributed in the northern part of the microwatershed. The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content in Katarki West-1 microwatershed is low (< 0.5ppm) in an area of about 210 ha (43%) and distributed in the western, central, southern and eastern part of the microwatershed. Maximum area of about 269 ha (55%) is medium (0.5-1.0 ppm) and distributed in all parts of the microwatershed (Fig.6.7).

6.8 Available Iron

Available iron content is deficient (<4.5 ppm) in a maximum area of about 357 ha (74%) and distributed in all parts of the microwatershed. An area of about 122 ha (25%) is sufficient (>4.5 ppm) and distributed in the northern part of the microwatershed (Fig 6.8).

6.9 Available Manganese

Available manganese content is sufficient (>1.0 ppm) in the entire microwatershed area (Fig 6.9).

6.10 Available Copper

Available copper content is sufficient (>0.2 ppm) in the entire microwatershed area (Fig 6.10).

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in the entire microwatershed area (Fig 6.11).

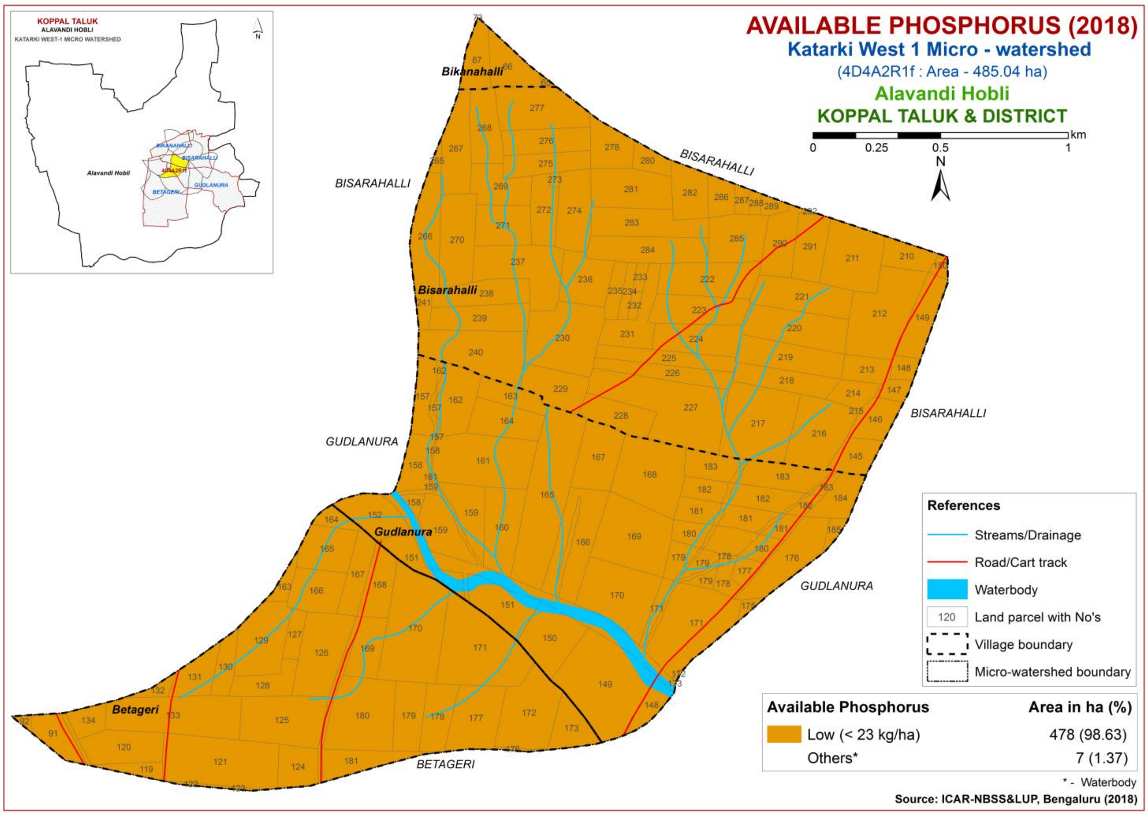


Fig.6.4 Soil Available Phosphorus map of Katarki West-1 Microwatershed

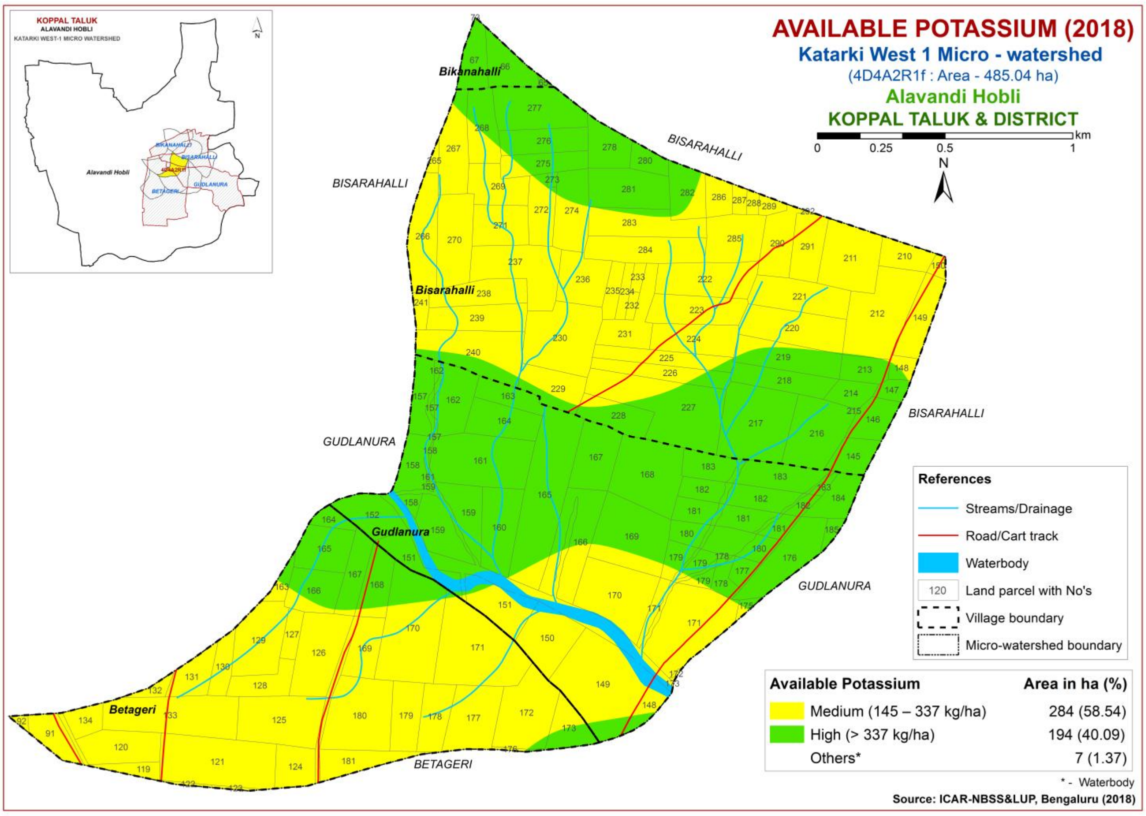


Fig.6.5 Soil Available Potassium map of Katarki West-1 Microwatershed

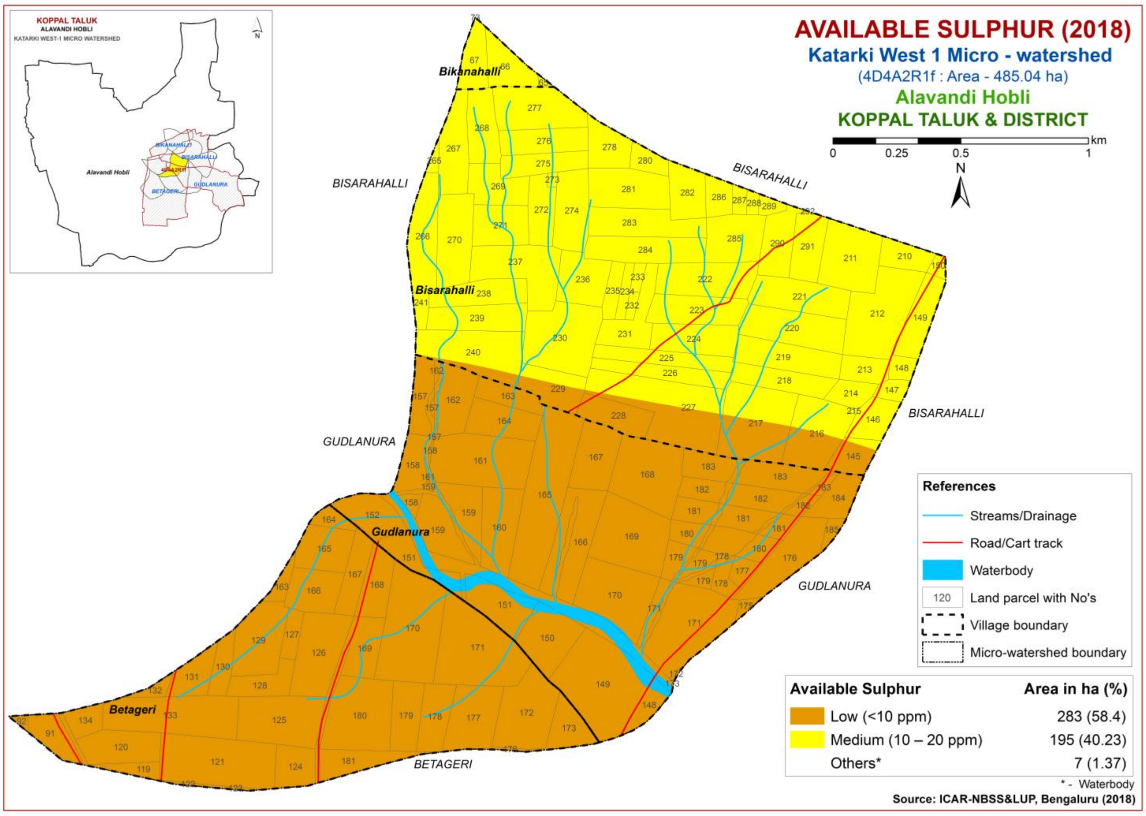


Fig.6.6 Soil Available Sulphur map of Katarki West-1 Microwatershed

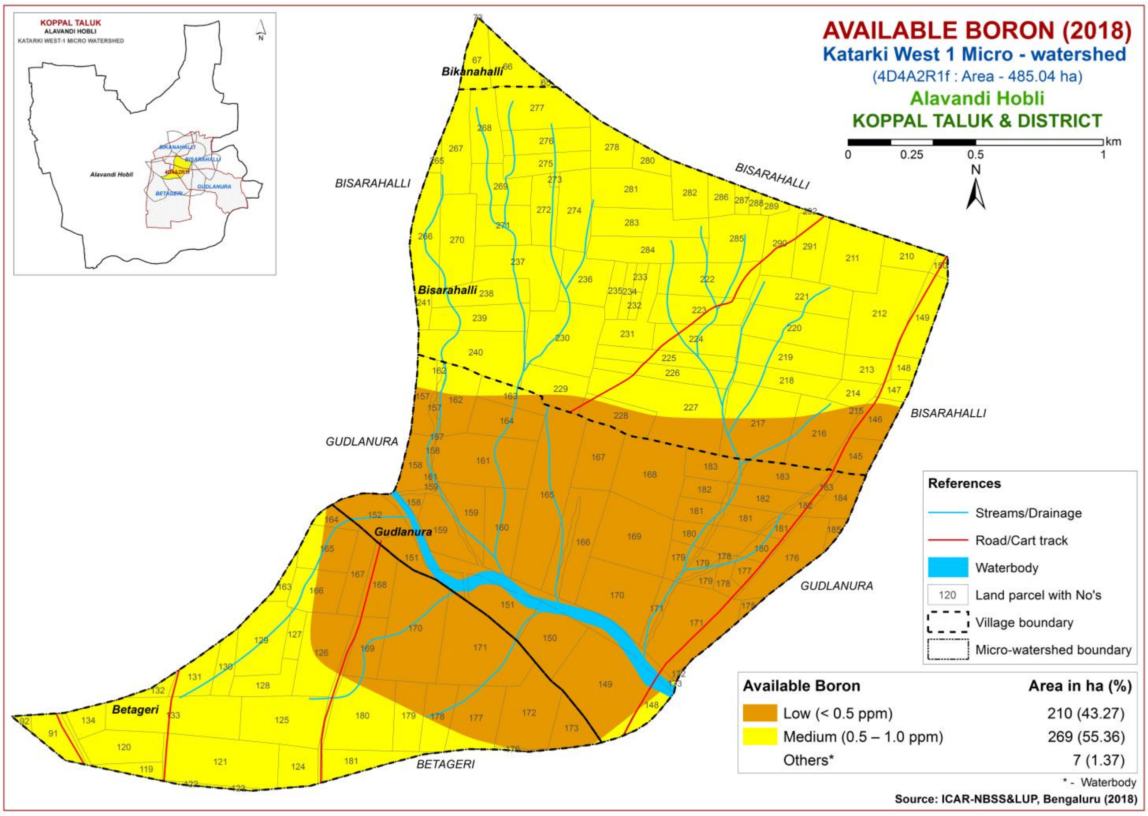


Fig.6.7 Soil Available Boron map of Katarki West-1 Microwatershed

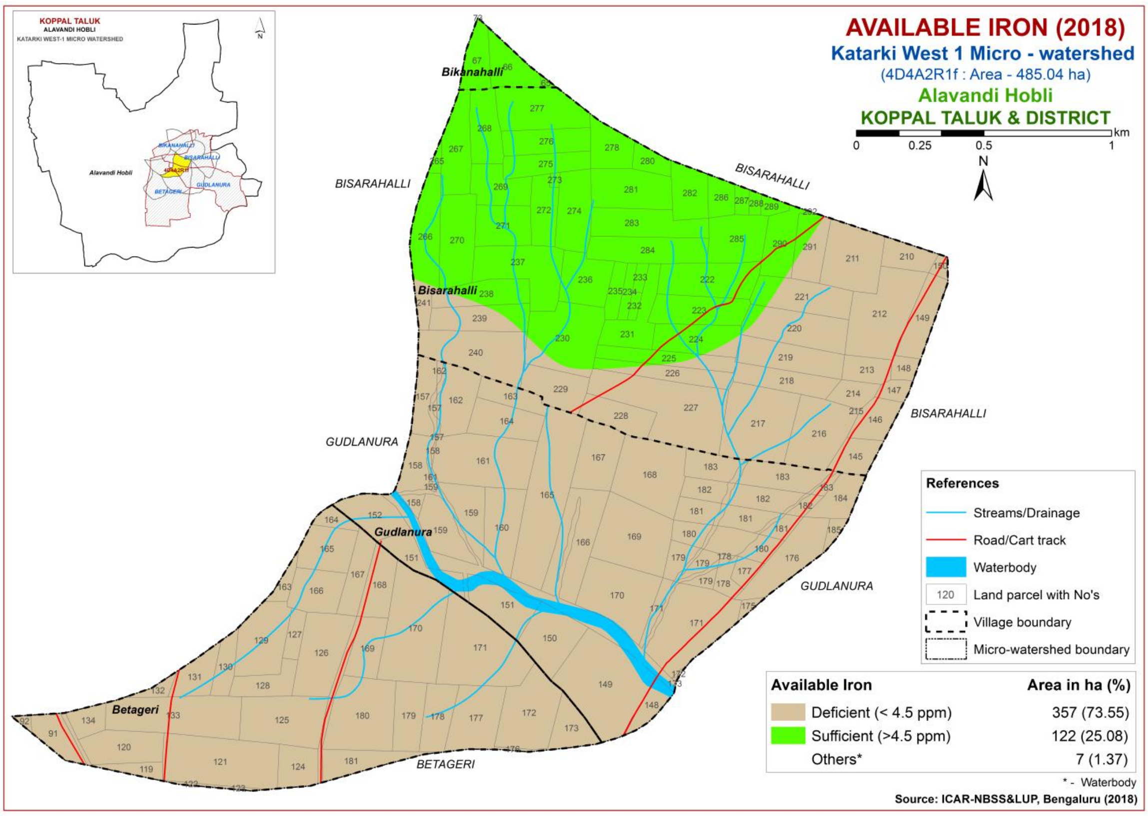


Fig.6.8 Soil Available Iron map of Katarki West-1 Microwatershed

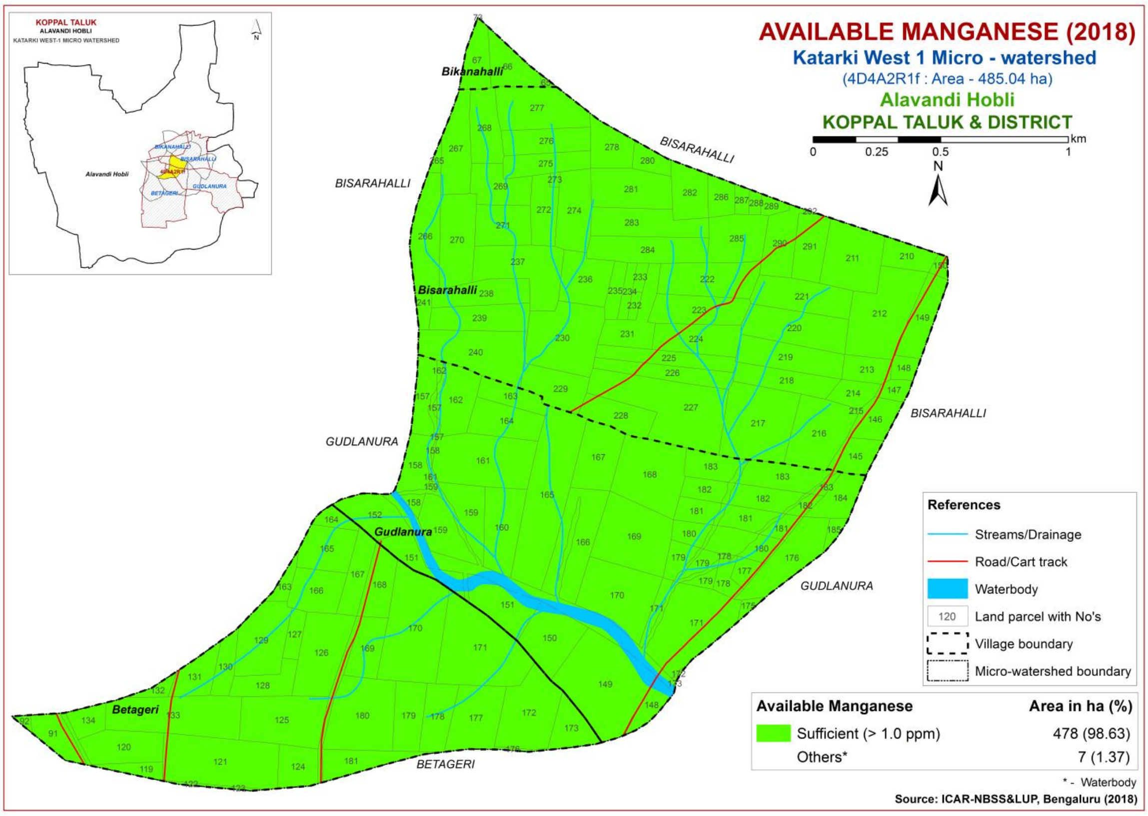


Fig.6.9 Soil Available Manganese map of Katarki West-1 Microwatershed

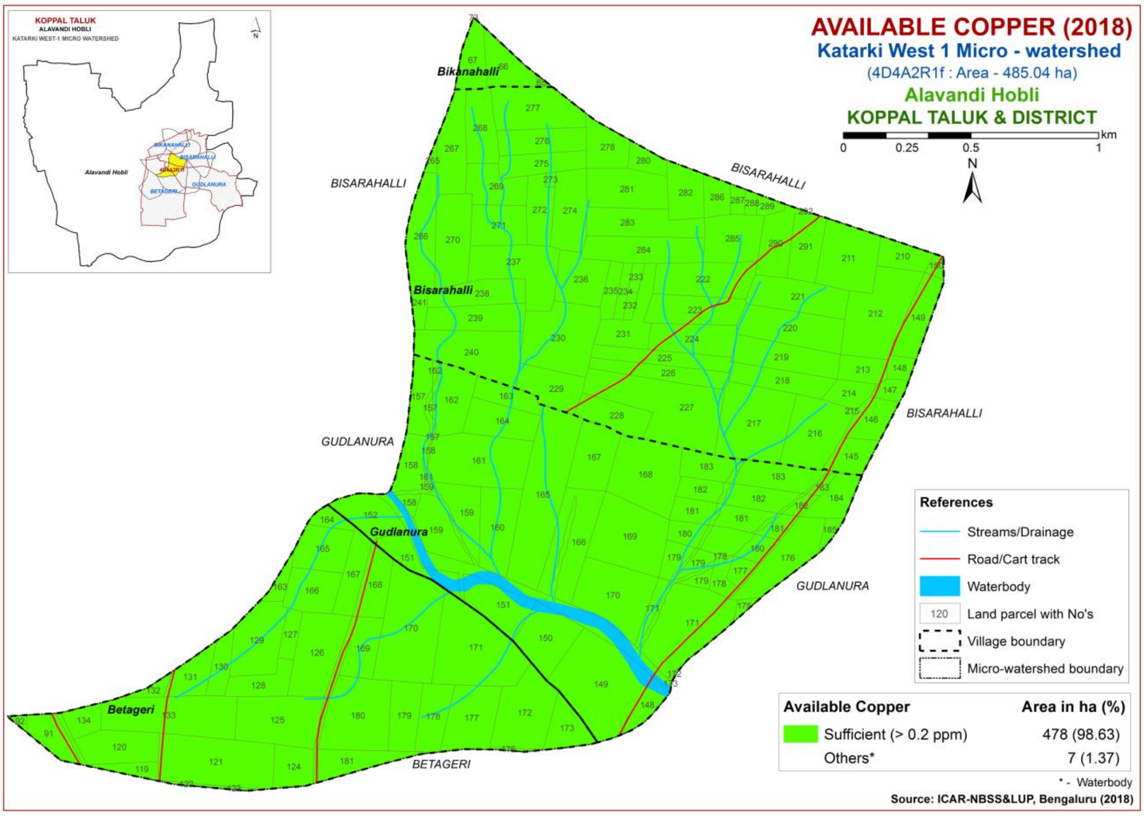


Fig.6.10 Soil Available Copper map of Katarki West-1 Microwatershed

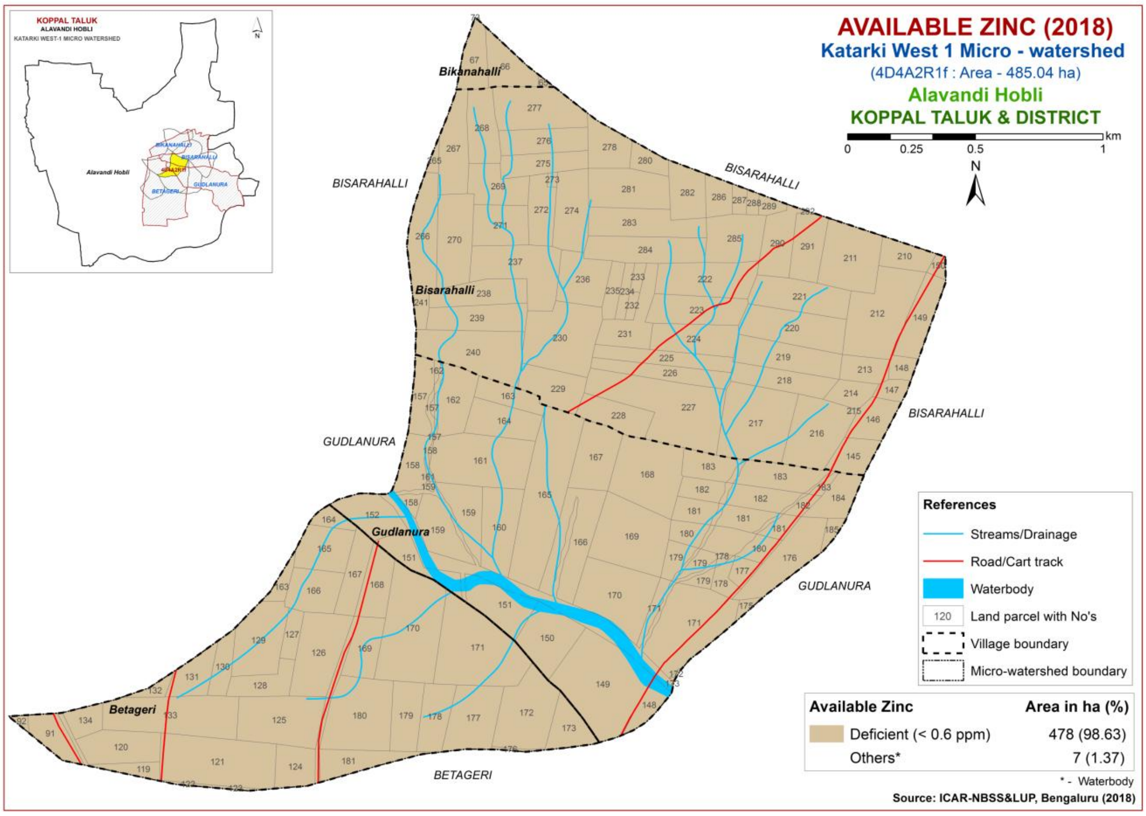


Fig.6.11 Soil Available Zinc map of Katarki West-1 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Katarki West-1 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirements to arrive at the crop suitability. The soil and land characteristics table (Table 7.1) were matched with the crop requirements (Tables 7.2-7.32) to arrive at the crop suitability and the criteria tables are given at the end of the chapter. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N- Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1- Highly Suitable, Class S2- Moderately Suitable and Class S3- Marginally Suitable. Order N has two Classes, N1- Currently not Suitable and N2-Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3 and N1 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 's' for sodium 'z' for calcareousness and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatershed, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatershed were evaluated and land suitability maps for 31 major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatershed in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

Sorghum is one of the major food crop grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and Chamarajnagar districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing sorghum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.1.

Highly suitable (Class S1) lands occupy a maximum area of about 342 ha (71%) for growing sorghum and occur in all parts of the microwatershed. An area of about 136 ha (29%) is moderately suitable (Class S2) for growing sorghum and distributed in the central, eastern, western and southern part of the microwatershed with minor limitations of nutrient availability, calcareousness and rooting depth.

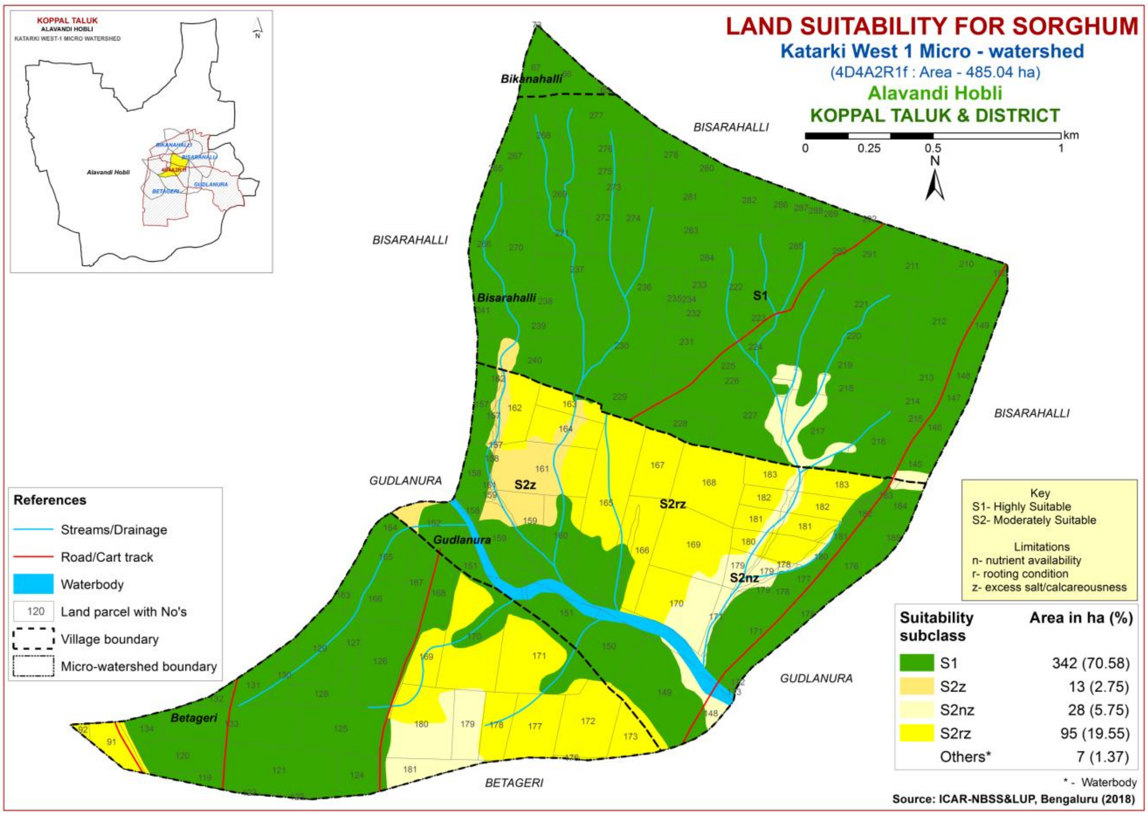


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is one of the most important food crop grown in an area of 13.37 lakh ha in almost all the districts of the State. The crop requirements for growing maize (Table 7.3) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing maize was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.2.

No highly suitable (Class S1) lands for growing Maize in the microwatershed. Maximum area of about 466 ha (96%) is moderately suitable (Class S2) lands for growing Maize and distributed in all parts of the microwatershed with minor limitations of calcareousness and texture. An area of about 12 ha (3%) is marginally suitable (Class S3) and distributed in the western part of the microwatershed with major limitations of texture and calcareousness.

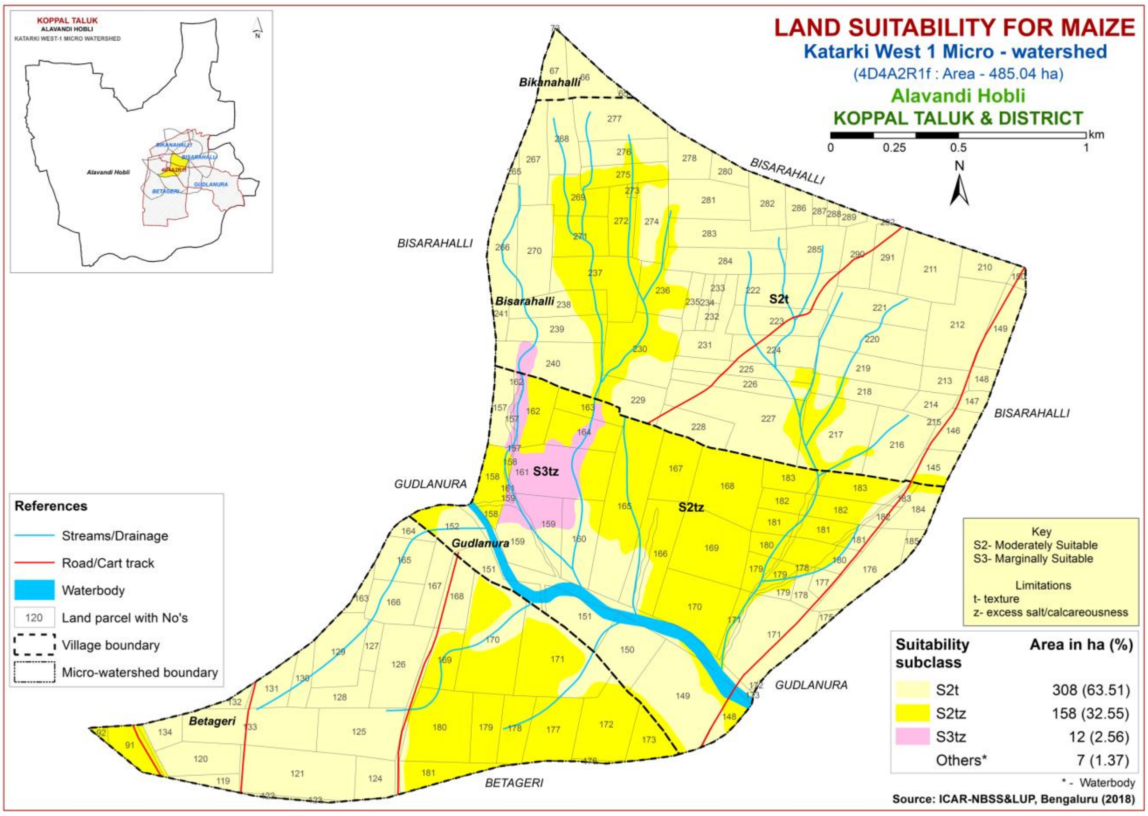


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

Bajra is one of the major food crop grown in an area of 2.34 lakh ha in Karnataka in the northern districts. The crop requirements (Table 7.4) for growing bajra were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing Bajra was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.3.

No highly suitable (Class S1) lands for growing Bajra in the microwatershed. Entire area in the microwatershed is moderately suitable (Class S2) lands for growing Bajra with minor limitations of calcareousness and texture.

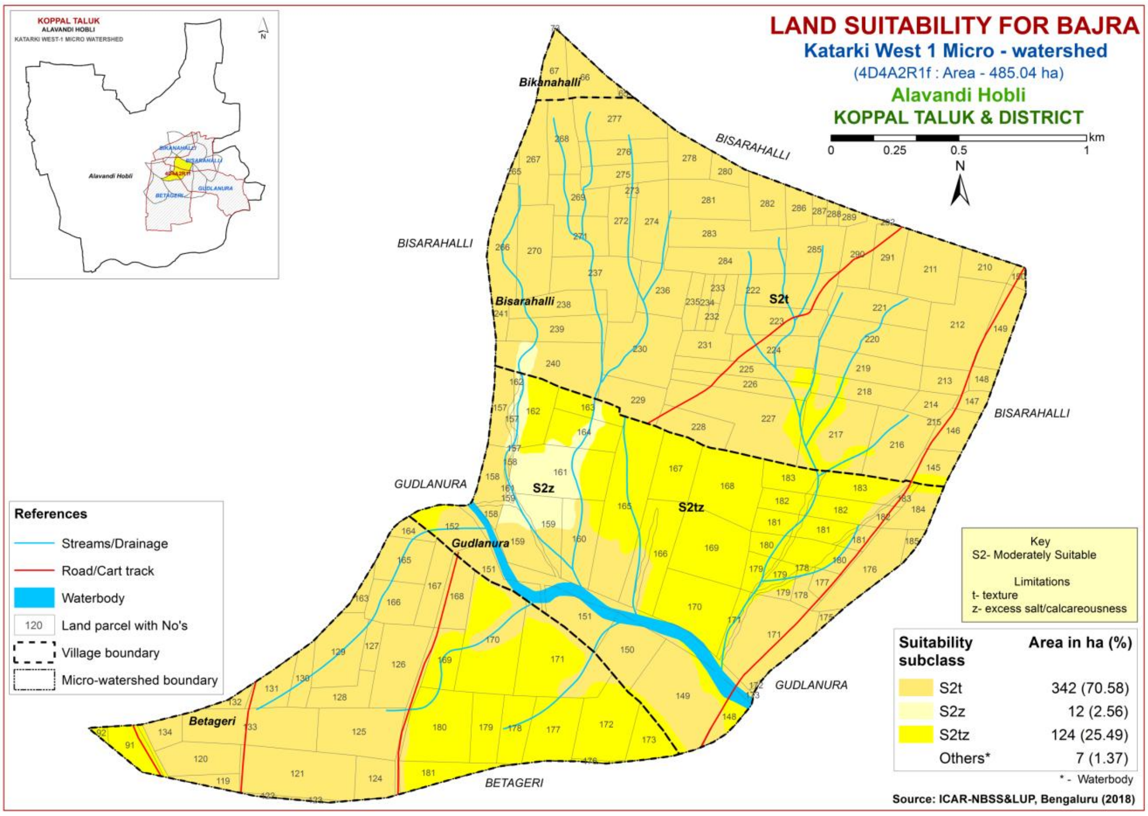


Fig. 7.3 Land Suitability map of Bajra

7.4 Land Suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in Karnataka in most of the districts either as rainfed or irrigated crop. The crop requirements for growing groundnut (Table 7.5) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing groundnut was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.4.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Groundnut in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture and calcareousness.

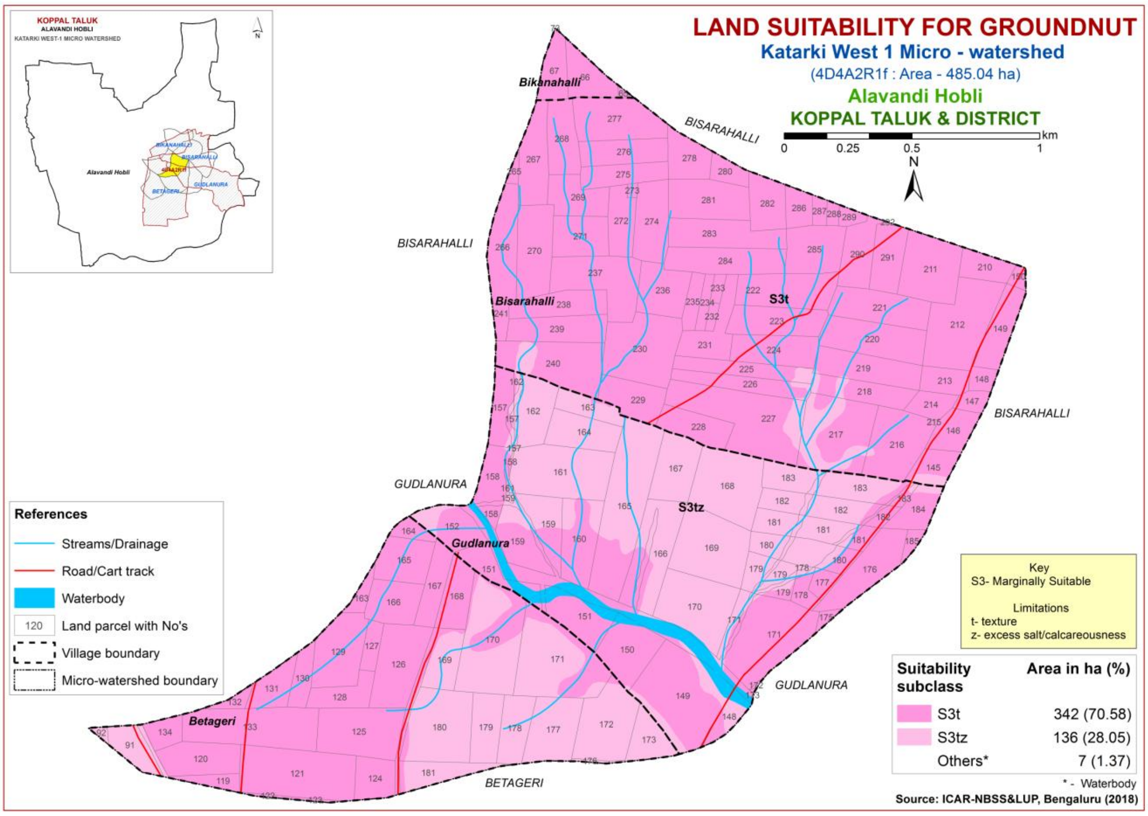


Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 3.56 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.6) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.5.

Maximum area of about 308 ha (63%) is highly suitable (Class S1) lands for growing Sunflower and distributed in all parts of the microwatershed. An area of about 75 ha (16%) is moderately suitable (Class S2) and distributed in the northern, eastern, western and southern part of the microwatershed with minor limitations of rooting depth and calcareousness. Marginally suitable (Class S3) lands cover an area of about 95 ha (20%) and distributed in the central, eastern, western and southern part of the microwatershed. They have moderate limitations of calcareousness and rooting depth.

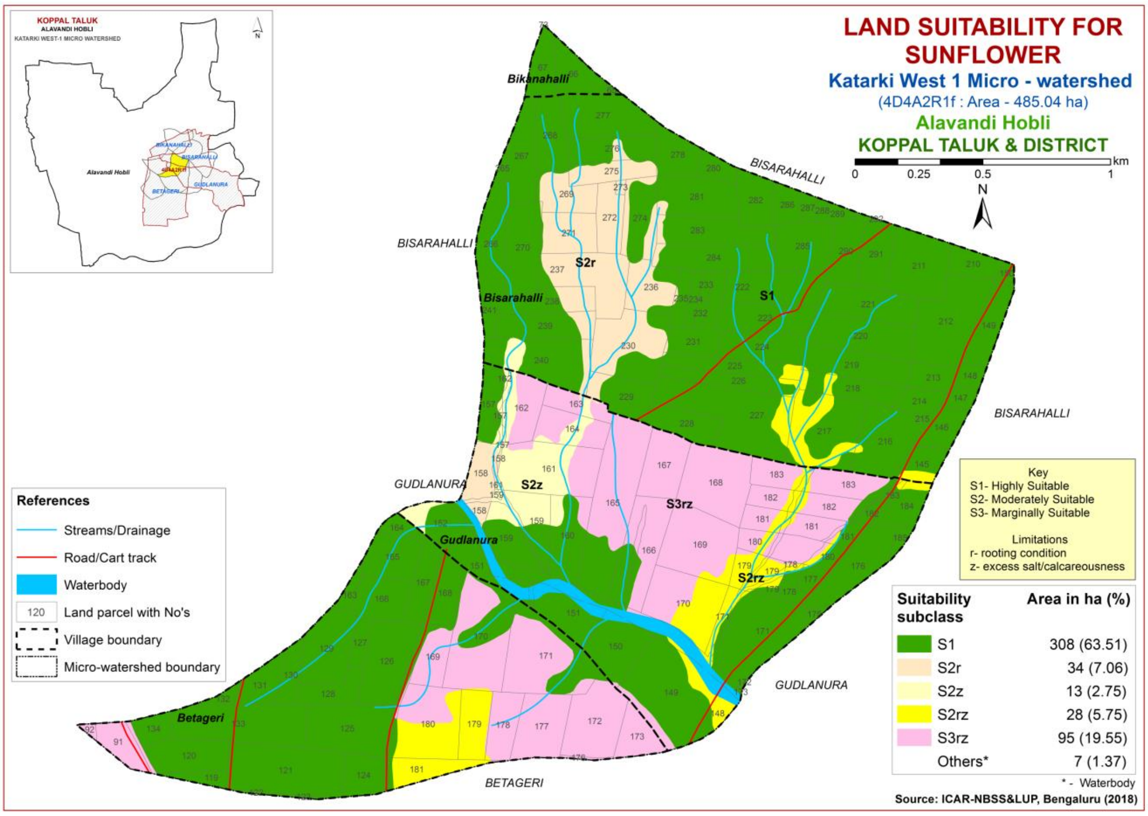


Fig. 7.5 Land Suitability map of Sunflower

7.6 Land Suitability for Redgram (*Cajanus cajan*)

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.7) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing redgram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.6.

No highly suitable (Class S1) lands for growing Redgram in the microwatershed. Maximum area of about 355 ha (74%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of texture, calcareousness and gravelliness. Marginally suitable (Class S3) lands cover an area of about 123 ha (25%) and distributed in the southern, eastern, central and western part of the microwatershed. They have moderate limitations of calcareousness and rooting depth.

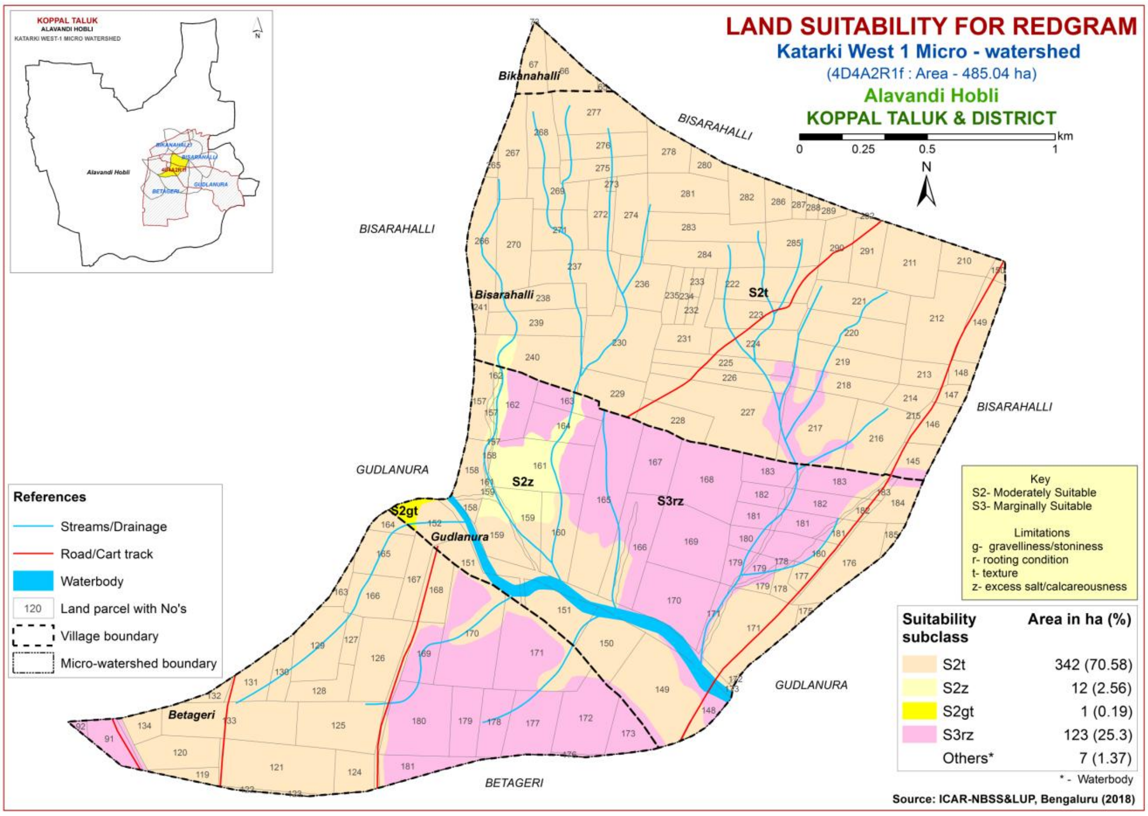


Fig. 7.6 Land Suitability map of Redgram

7.7 Land Suitability for Bengal gram (*Cicer arietinum*)

Bengal gram is one of the major pulse crop grown in an area of 9.39 lakh ha in northern Karnataka in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad and Bell ary districts. The crop requirements for growing Bengal gram (Table 7.8) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing Bengal gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.7.

Highly suitable (Class S1) lands occupy a maximum area of about 342 ha (71%) for growing Bengal gram and occur in all parts of the microwatershed. An area of about 136 ha (28%) is moderately suitable (Class S2) for growing Bengal gram and distributed in the eastern, central, western and southern part of the microwatershed with minor limitations of rooting depth, calcareousness and gravelliness.

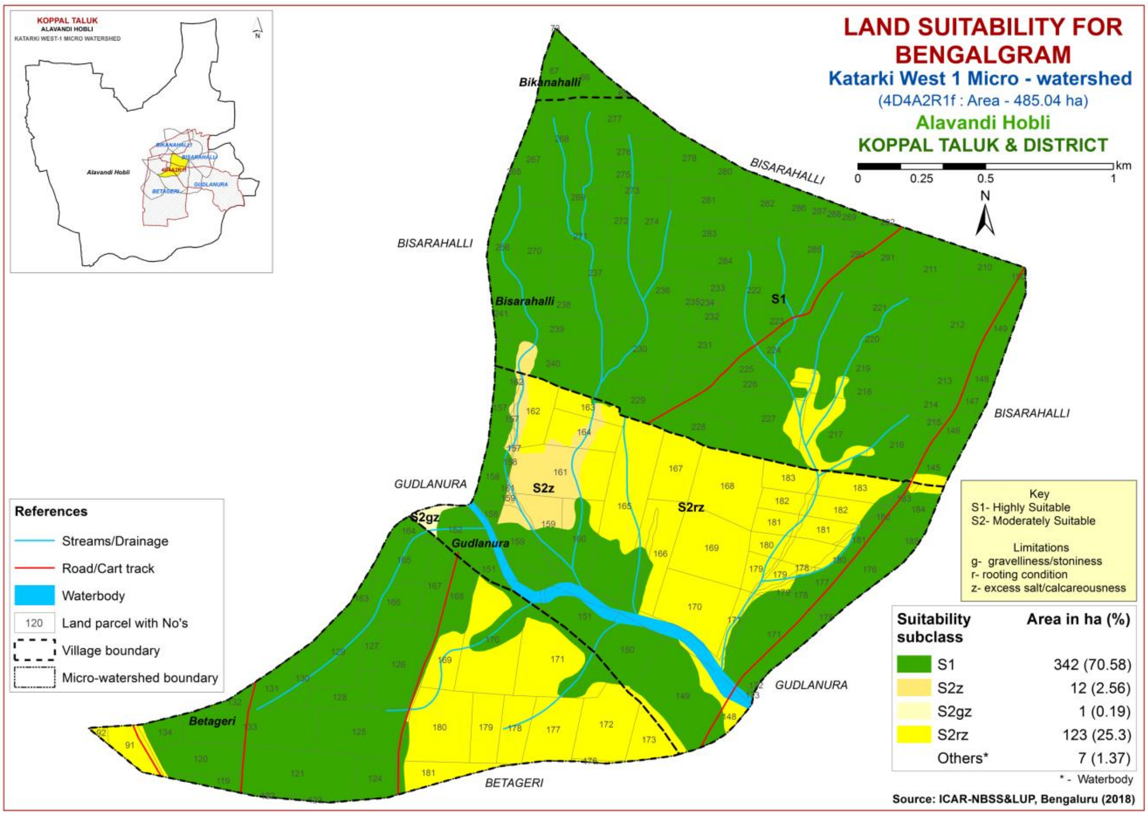


Fig. 7.7 Land Suitability map of Bengal gram

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

Cotton is one of the most important fibre crop grown in the State in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.8.

Highly suitable (Class S1) lands occupy a maximum area of about 342 ha (71%) for growing Cotton and occur in all parts of the microwatershed. An area of about 136 ha (28%) is moderately suitable (Class S2) for growing Cotton and distributed in the eastern, central, western and southern part of the microwatershed with minor limitations of rooting depth, calcareousness and gravelliness.

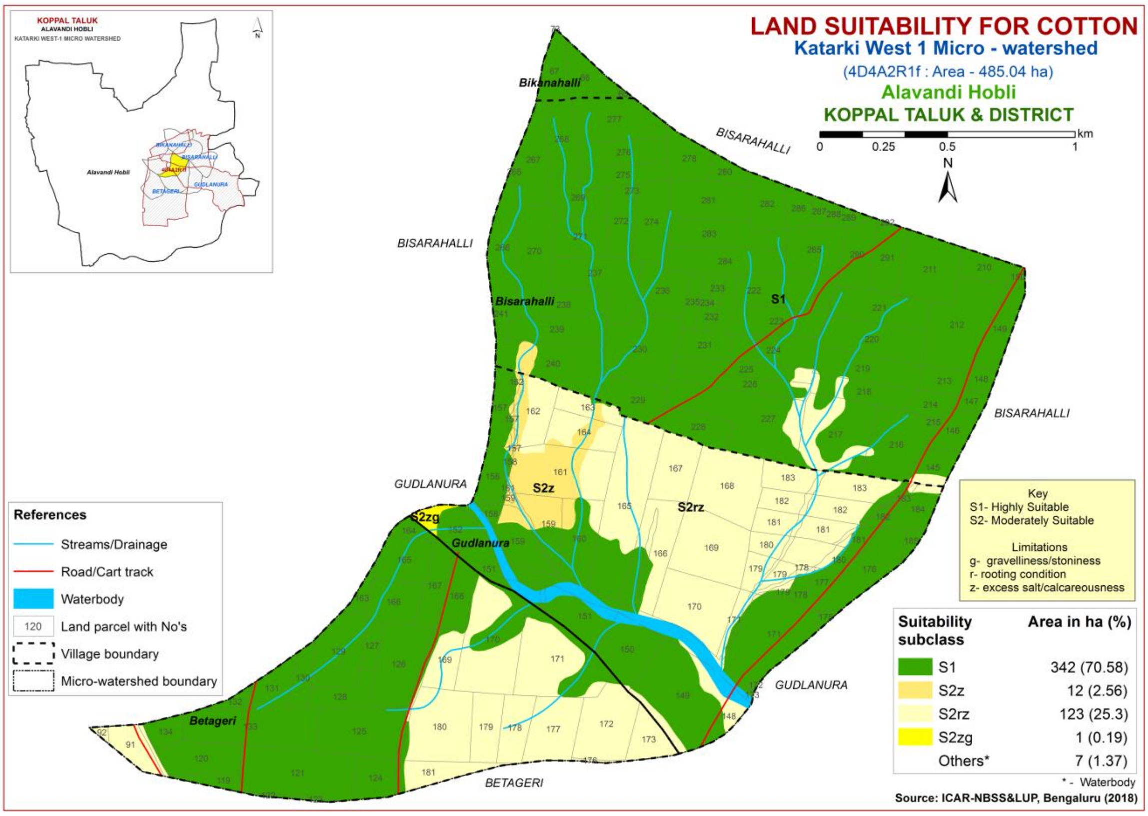


Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum L*)

Chilli is one of the most important spice crop grown in an area of 0.42 lakh ha in Karnataka State. The crop requirements for growing chilli (Table 7.10) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing chilli was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.9.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Chilli in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture and calcareousness.

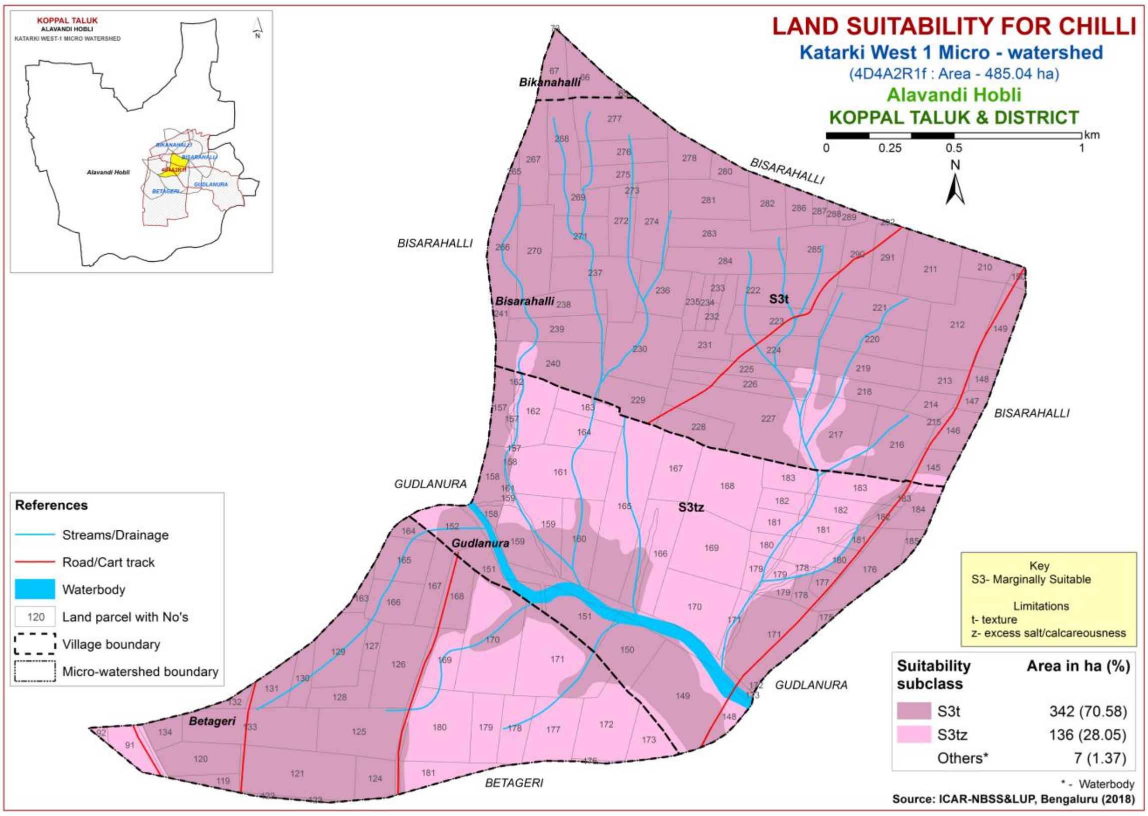


Fig. 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato (*Solanum lycopersicum*)

Tomato is one of the most important vegetable crop grown in an area of 0.65 lakh ha in almost all the districts of the State. The crop requirements (Table 7.11) for growing tomato were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tomato was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.10.

No highly suitable (Class S1) lands for growing Tomato in the microwatershed. An area of about 12 ha (3%) is moderately suitable (Class S2) for growing Tomato and distributed in the western part of the microwatershed with minor limitation of calcareousness. Marginally suitable (Class S3) lands cover a maximum area of about 466 ha (96%) and occur in all parts of the microwatershed with major limitations of texture, drainage and calcareousness.

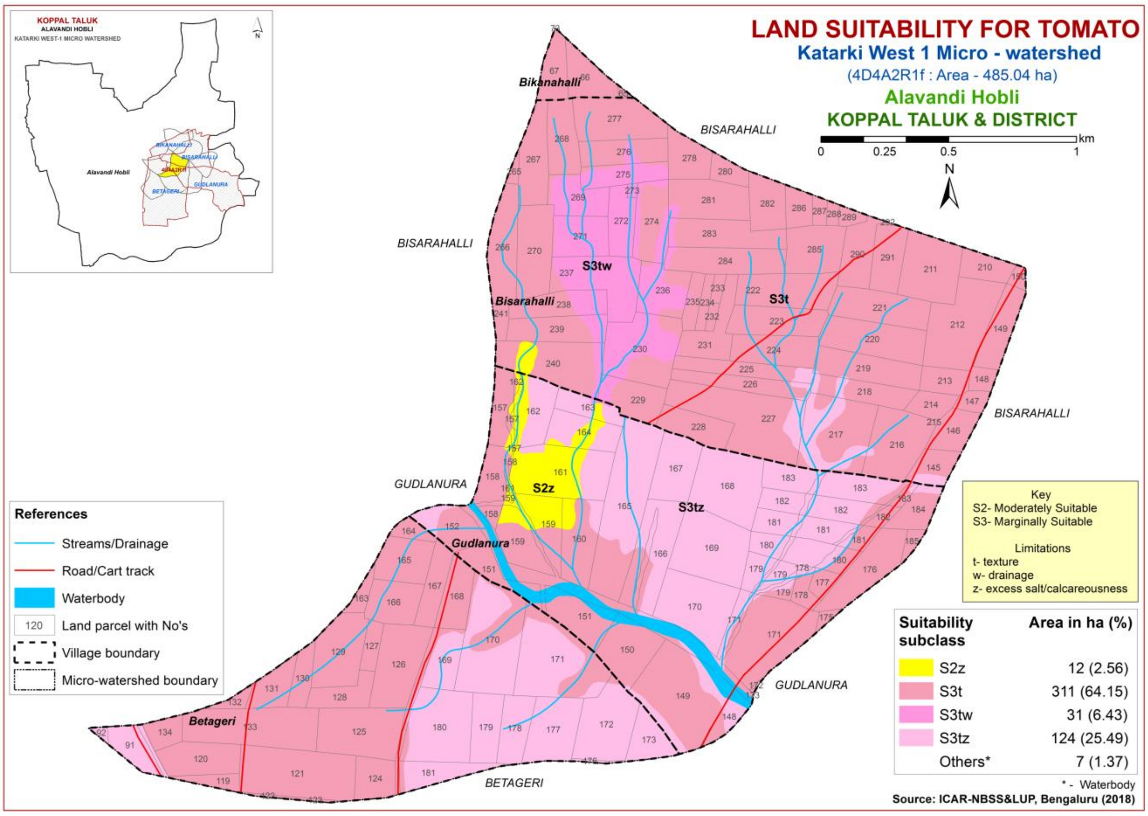


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Brinjal (*Solanum melongena*)

Brinjal is one of the most important vegetable crop grown in the state. The crop requirements for growing brinjal (Table 7.12) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing brinjal was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.11.

No highly suitable (Class S1) lands for growing Brinjal in the microwatershed. Entire area is covered by moderately suitable (Class S2) lands for growing Brinjal with minor limitations of texture, rooting depth and calcareousness.

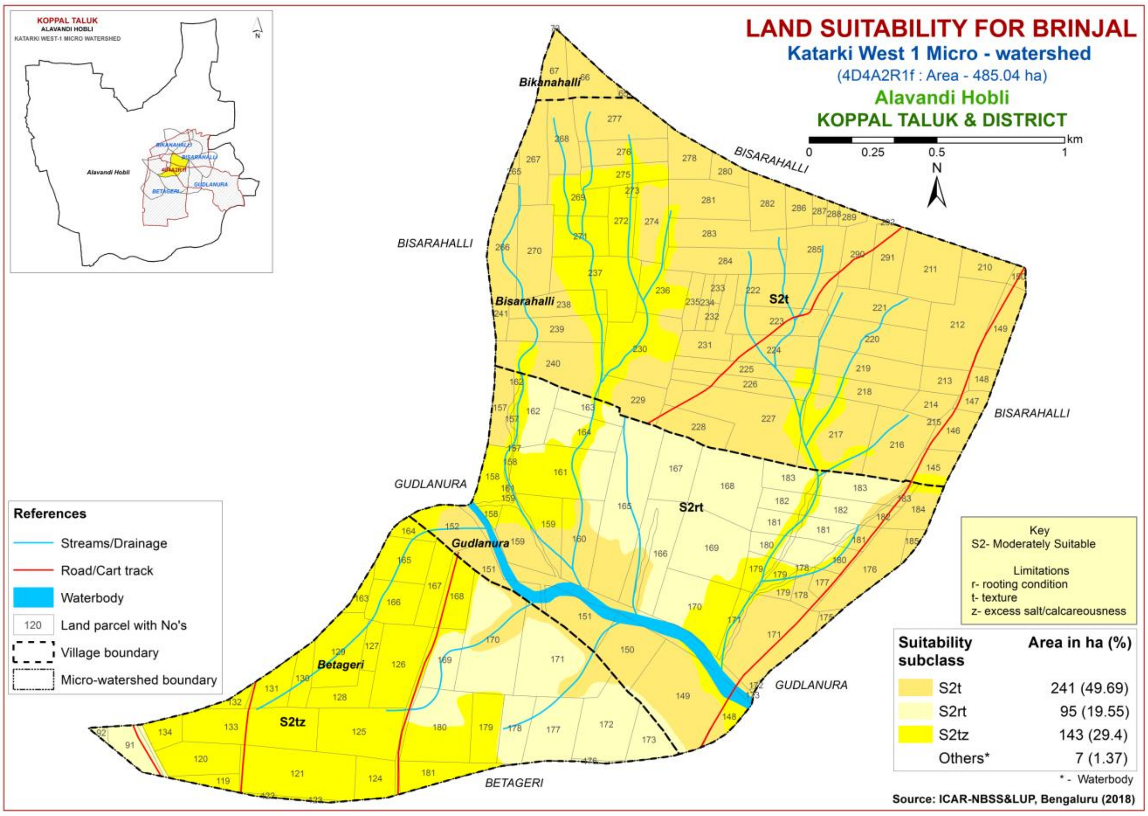


Fig 7.11 Land Suitability map of Brinjal

7.12 Land Suitability for Onion (*Allium cepa L.,*)

Onion is one of the most important vegetable crop grown in the state. The crop requirements for growing onion (Table 7.13) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing onion was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.12.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Onion in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture and calcareousness.

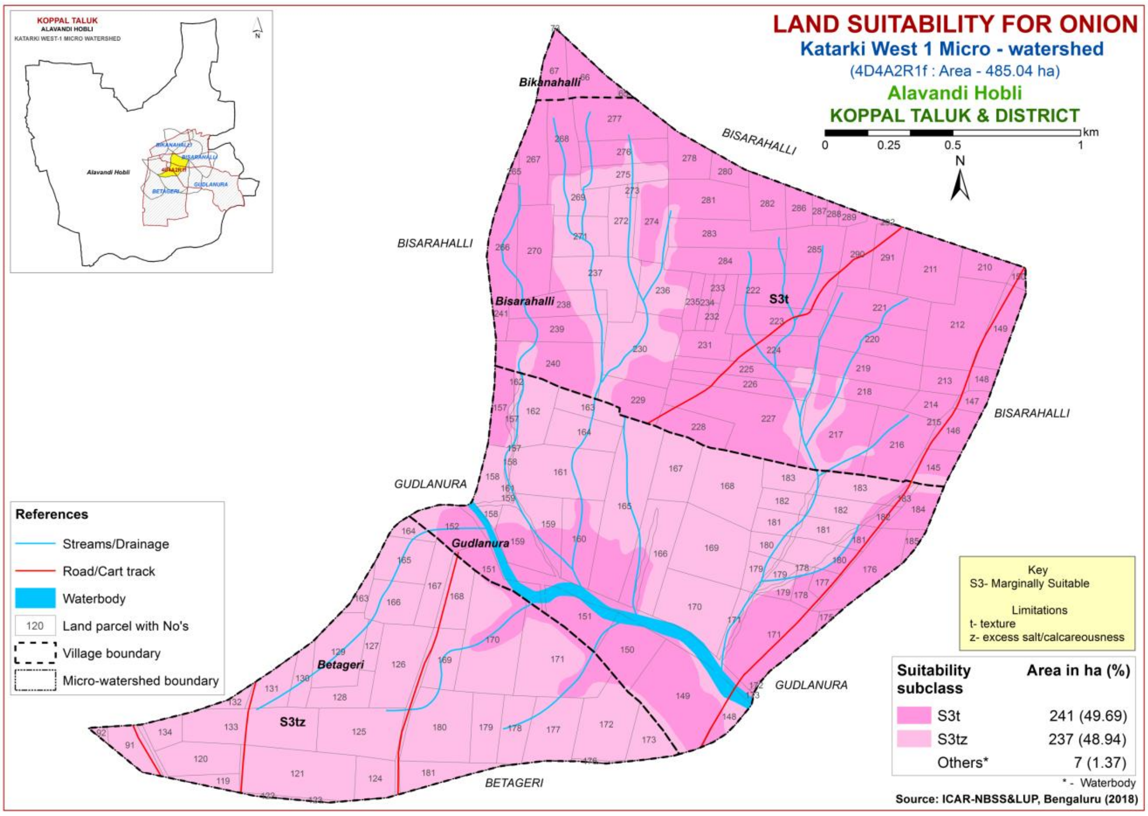


Fig 7.12 Land Suitability map of Onion

7.13 Land Suitability for Bhendi (*Abelmoschus esculentus*)

Bhendi is one of the most important vegetable crop grown in the state. The crop requirements for growing bhendi (Table 7.14) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing bhendi was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.13.

No highly suitable (Class S1) lands for growing Bhendi in the microwatershed. Maximum area of about 466 ha (96%) is moderately suitable (Class S2) for growing Bhendi and distributed in all parts of the microwatershed with minor limitations of texture, rooting depth and calcareousness. Marginally suitable (Class S3) lands cover an area of about 12 ha (3%) and occur in the eastern part of the microwatershed with major limitations of texture and calcareousness.

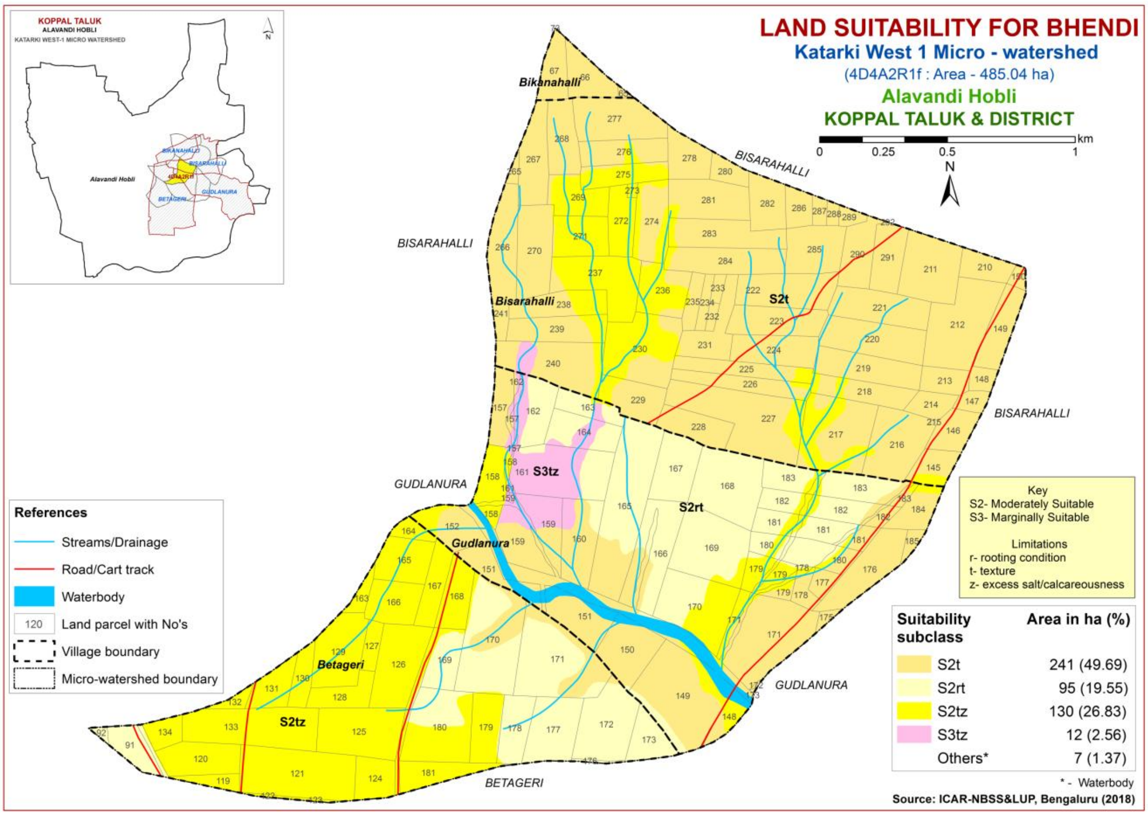


Fig 7.13 Land Suitability map of Bhendi

7.14 Land Suitability for Drumstick (*Moringa oleifera)*

Drumstick is one of the most important vegetable crop grown in 2403 ha area in the state. The crop requirements for growing drumstick (Table 7.15) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing drumstick was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.14.

No highly suitable (Class S1) lands for growing Drumstick in the microwatershed. Maximum area of about 383 ha (79%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover an area of about 95 ha (20%) and distributed in the central, eastern and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness.

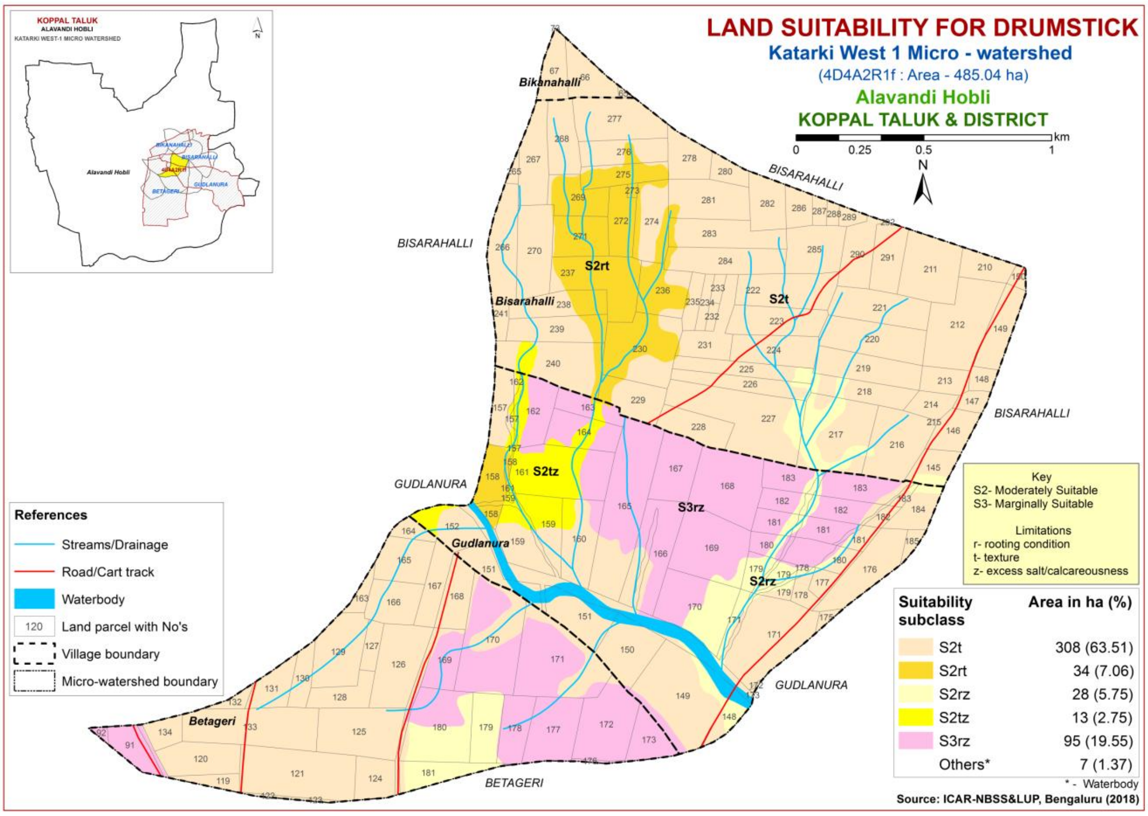


Fig. 7.14 Land Suitability map of Drumstick

7.15 Land Suitability for Mango (*Mangifera indica*)

Mango is one of the most important fruit crop grown in about 1.73 lakh ha in almost all the districts of the State. The crop requirements (Table 7.16) for growing mango were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mango was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.15.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Mango in the microwatershed. Marginally suitable (Class S3) lands cover a maximum area of about 383 ha (79%) and distributed in all parts of the microwatershed. They have moderate limitations of texture, rooting depth and calcareousness. An area of about 95 ha (20%) is currently not suitable (Class N1) for growing Mango and are distributed in the eastern, central, western and southern part of the microwatershed with severe limitations of rooting depth and calcareousness.

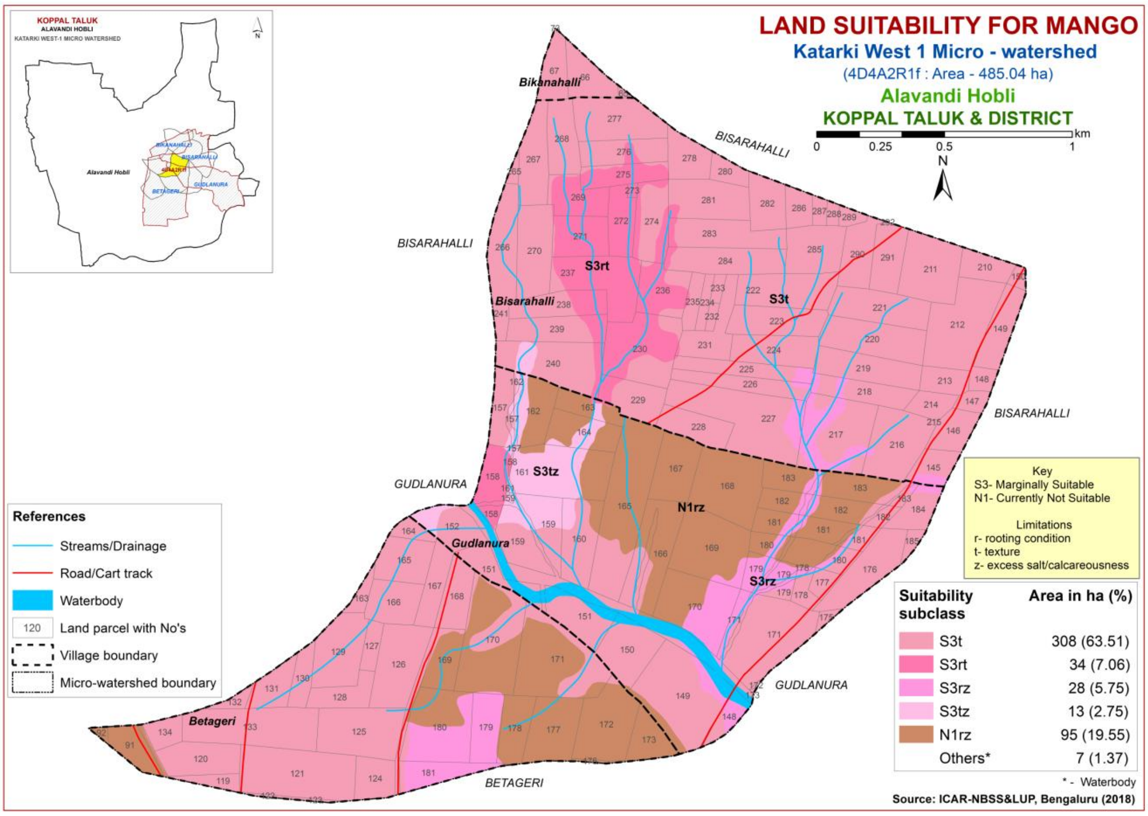


Fig. 7.15 Land Suitability map of Mango

7.16 Land Suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of about 6558 ha in almost all the districts of the state. The crop requirements (Table 7.17) for growing guava were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing guava was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.16.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Guava in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture and calcareousness.

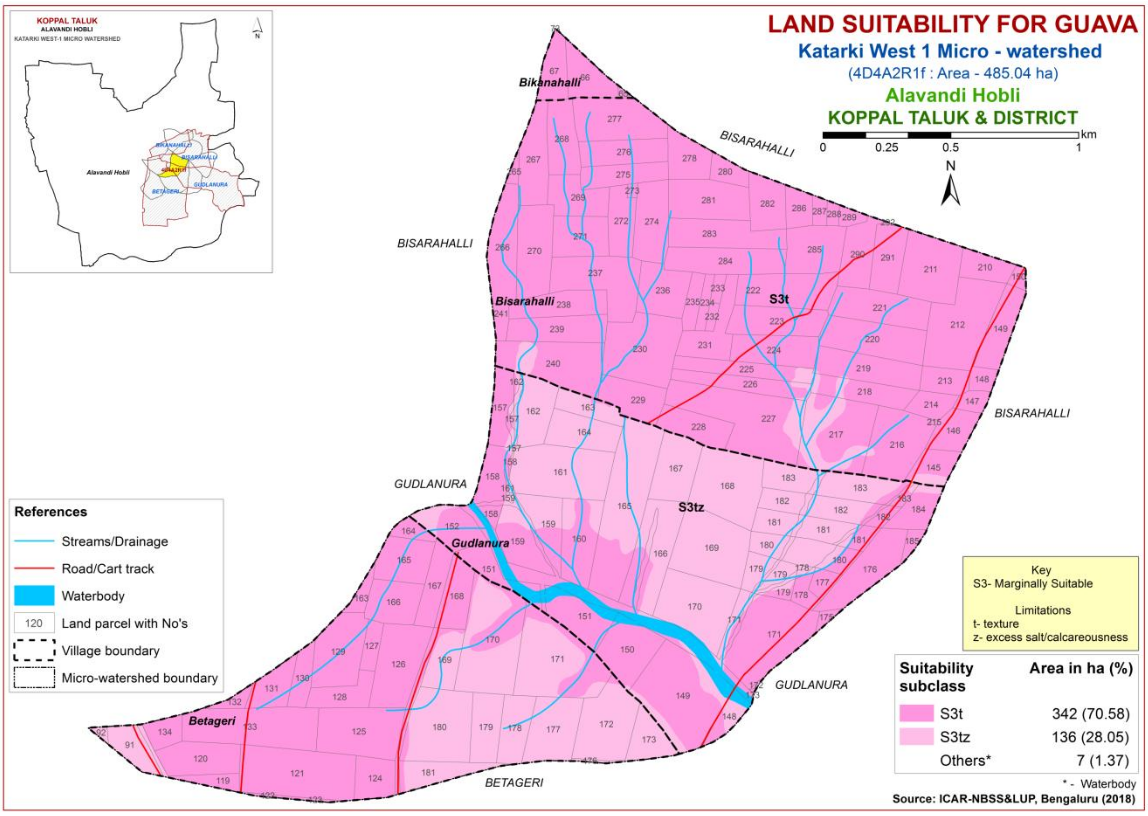


Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Sapota (*Manilkara zapota*)

Sapota is one of the most important fruit crop grown in an area of about 29373 ha in almost all the districts of the state. The crop requirements (Table 7.18) for growing sapota were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sapota was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.17.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Sapota in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture, rooting depth and calcareousness.

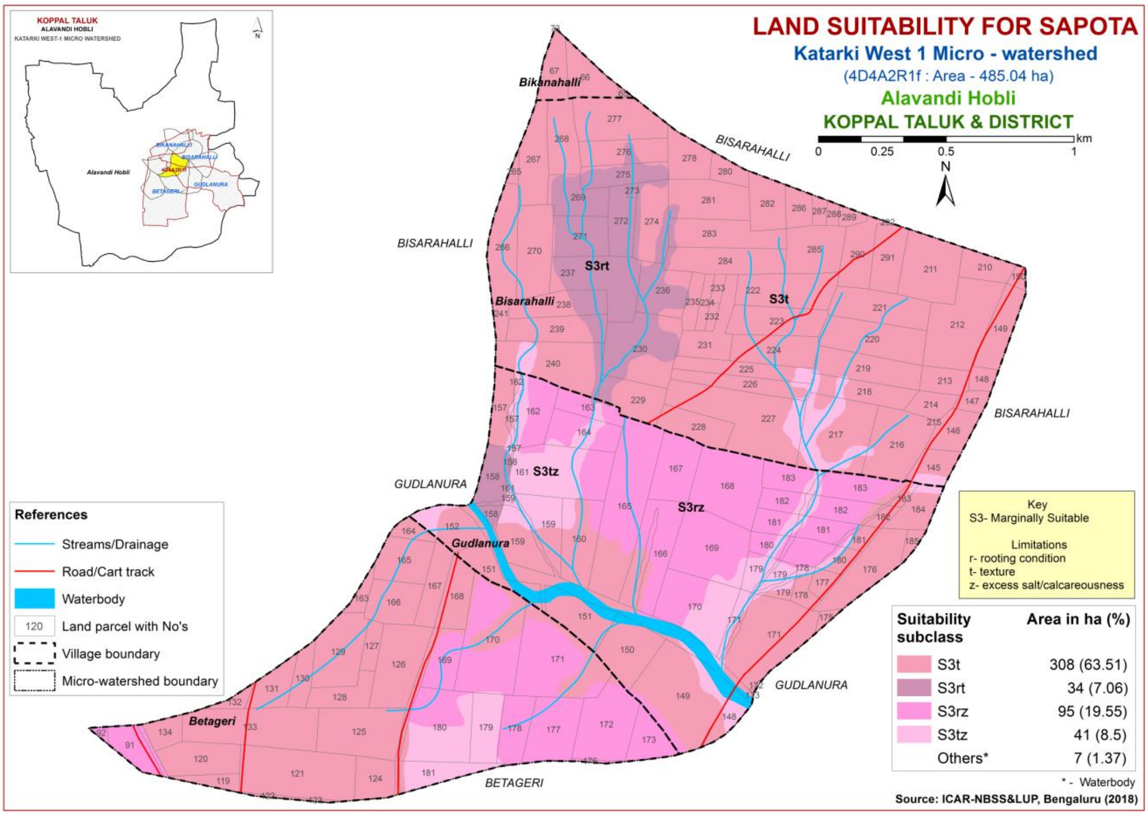


Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in about 18488 ha in Karnataka mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.19) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing pomegranate was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

No highly suitable (Class S1) lands for growing Pomegranate in the microwatershed. Maximum area of about 383 ha (79%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover an area of about 95 ha (20%) and distributed in the central, eastern, western and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness.

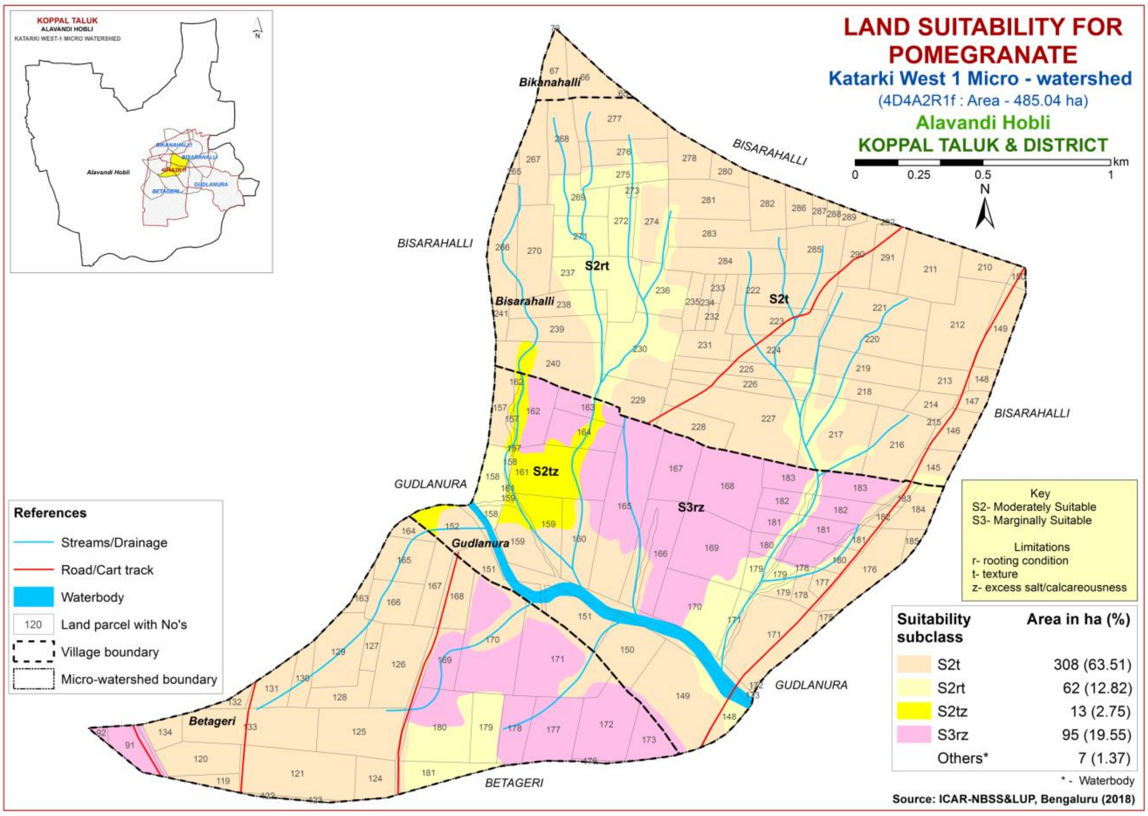


Fig. 7.18 Land Suitability map of Pomegranate

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the most important fruit crop grown in an area of 5446 ha in almost all the districts of the state. The crop requirements (Table 7.20) for growing musambi were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Musambi was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.19.

Maximum area of about 308 ha (63%) is highly suitable (Class S1) lands for growing Musambi and distributed in all parts of the microwatershed. An area of about 75 ha (16%) is moderately suitable (Class S2) and distributed in the northern, southern, eastern and western part of the microwatershed with minor limitations of rooting depth and calcareousness. Marginally suitable (Class S3) lands cover an area of about 95 ha (20%) and distributed in the southern, central, eastern and western part of the microwatershed. They have moderate limitations of rooting depth and calcareousness.

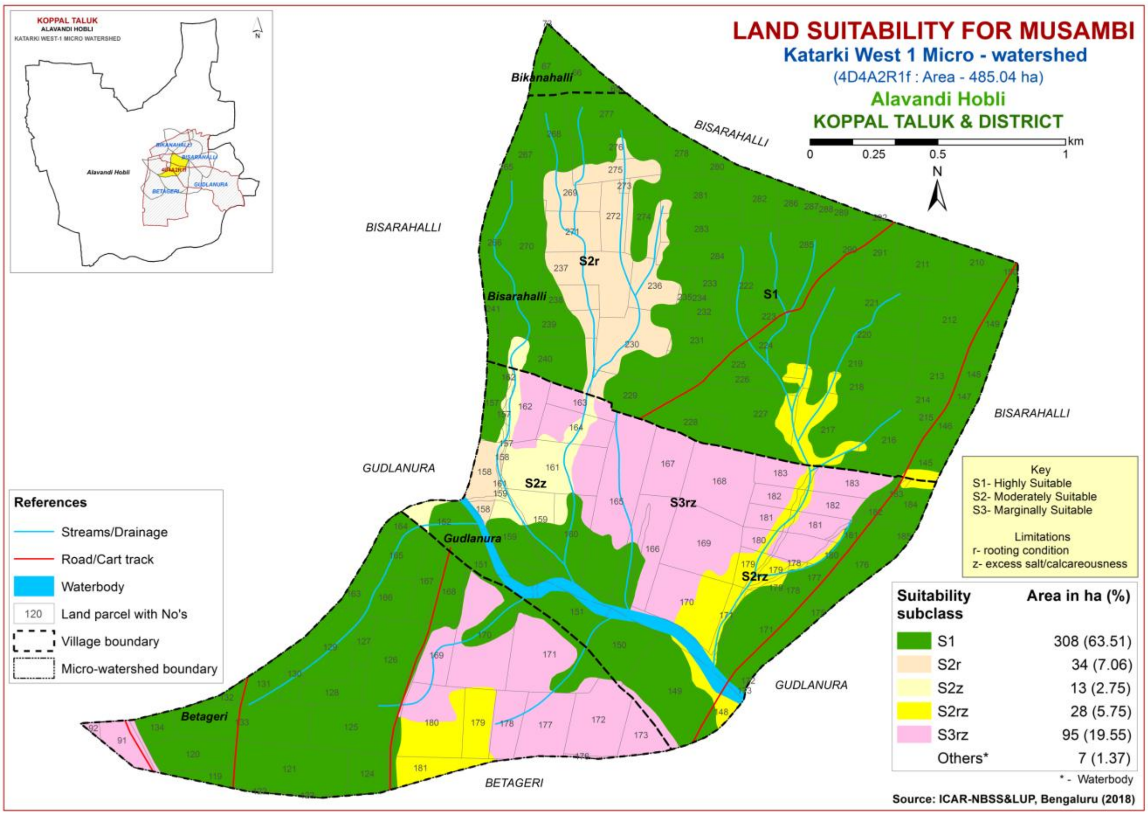


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 11752 ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.20.

Maximum area of about 308 ha (63%) is highly suitable (Class S1) lands for growing Lime and distributed in all parts of the microwatershed. An area of about 75 ha (16%) is moderately suitable (Class S2) and distributed in the northern, southern, eastern and western part of the microwatershed with minor limitations of rooting depth and calcareousness. Marginally suitable (Class S3) lands cover an area of about 95 ha (20%) and distributed in the southern, central, eastern and western part of the microwatershed. They have moderate limitations of rooting depth and calcareousness.

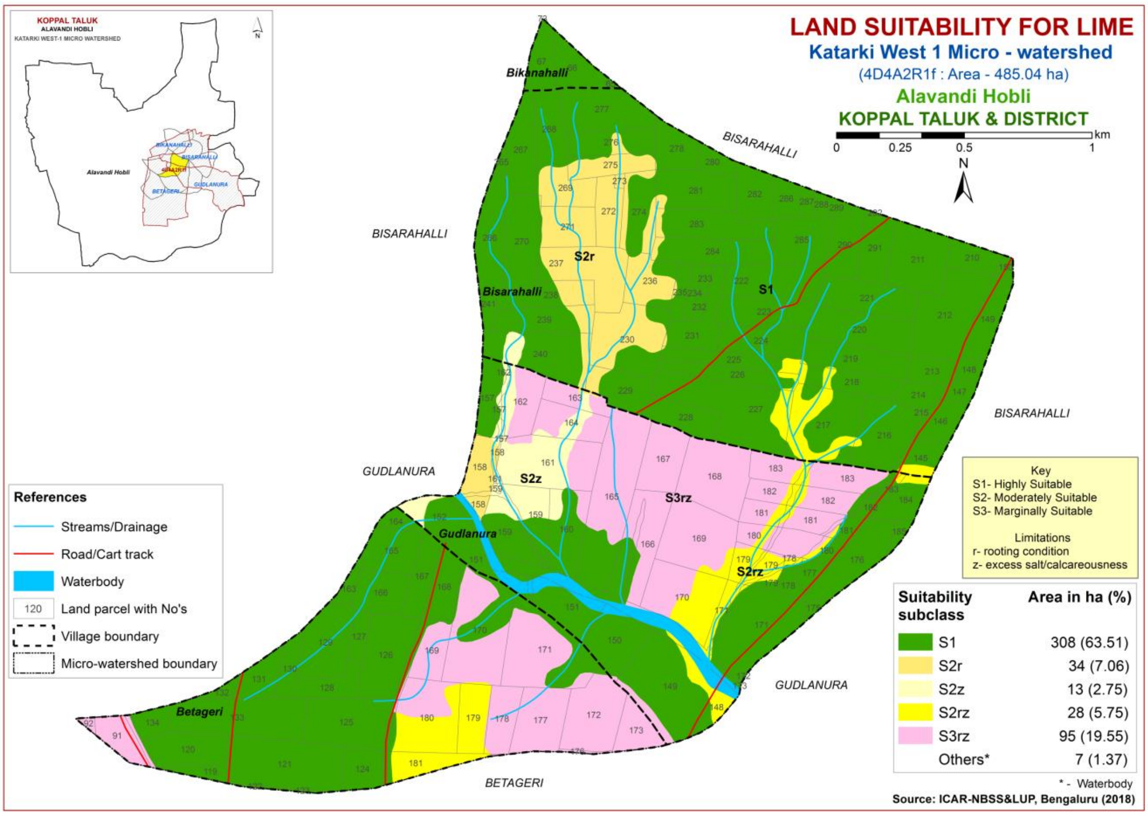


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the most important fruit and medicinal crop grown in an area of 151 ha and distributed in almost all the districts of the state. The crop requirements (Table 7.22) for growing amla were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing amla was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.21.

No highly suitable (Class S1) lands for growing Amla in the microwatershed. Entire area is covered by moderately suitable (Class S2) lands for growing Amla with minor limitations of texture, rooting depth and calcareousness.

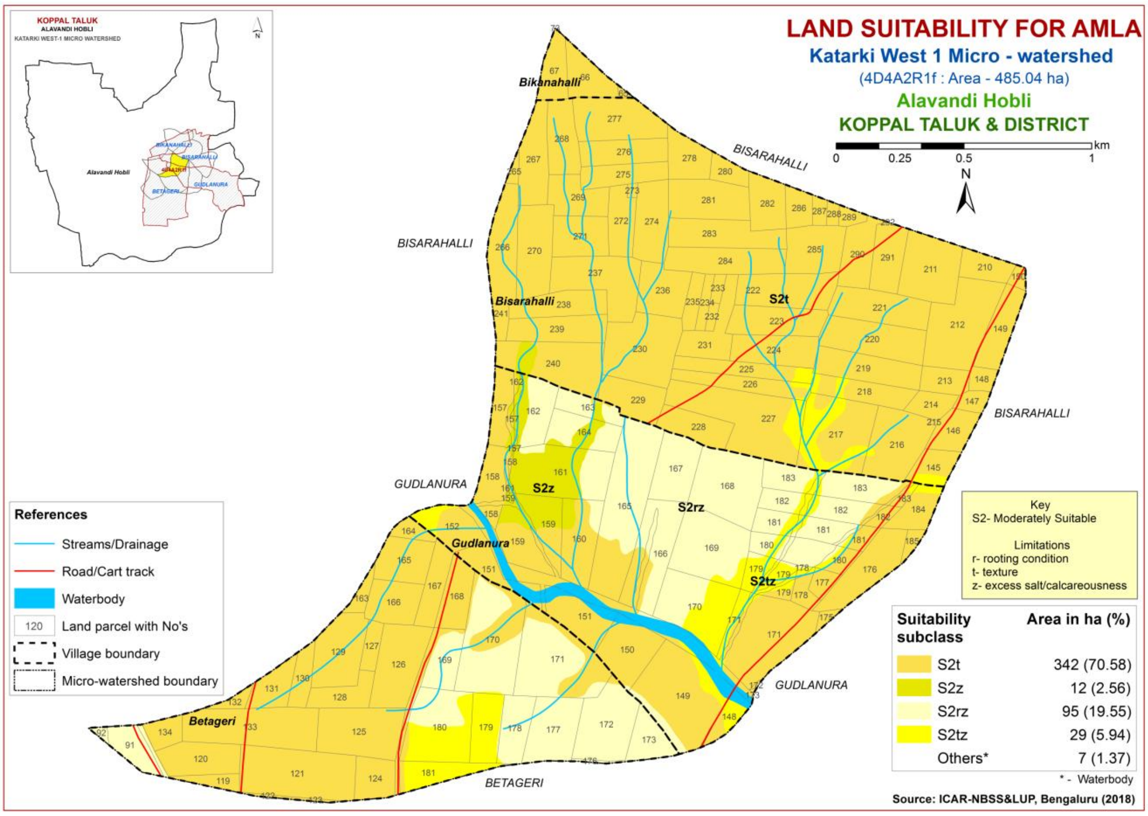


Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut crop grown in an area of 7052 ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.23) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.22.

Entire area is covered by currently not suitable (Class N1) lands for growing Cashew with severe limitations of texture and calcareousness.

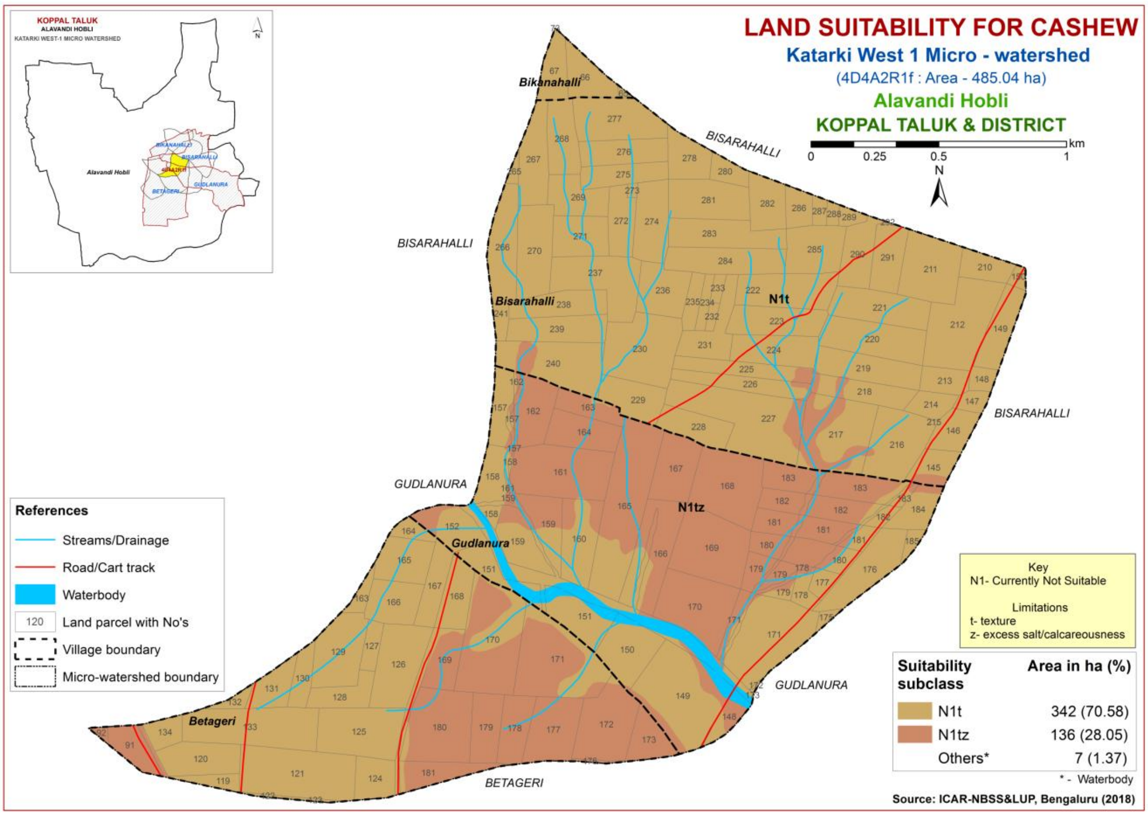


Fig. 7.22 Land Suitability map of Cashew

7.23 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is one of the most important fruit crop grown in 5368 ha in all the districts of the state. The crop requirements (Table.7.24) for growing jackfruit were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in figure 7.23.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Jackfruit in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture and calcareousness.

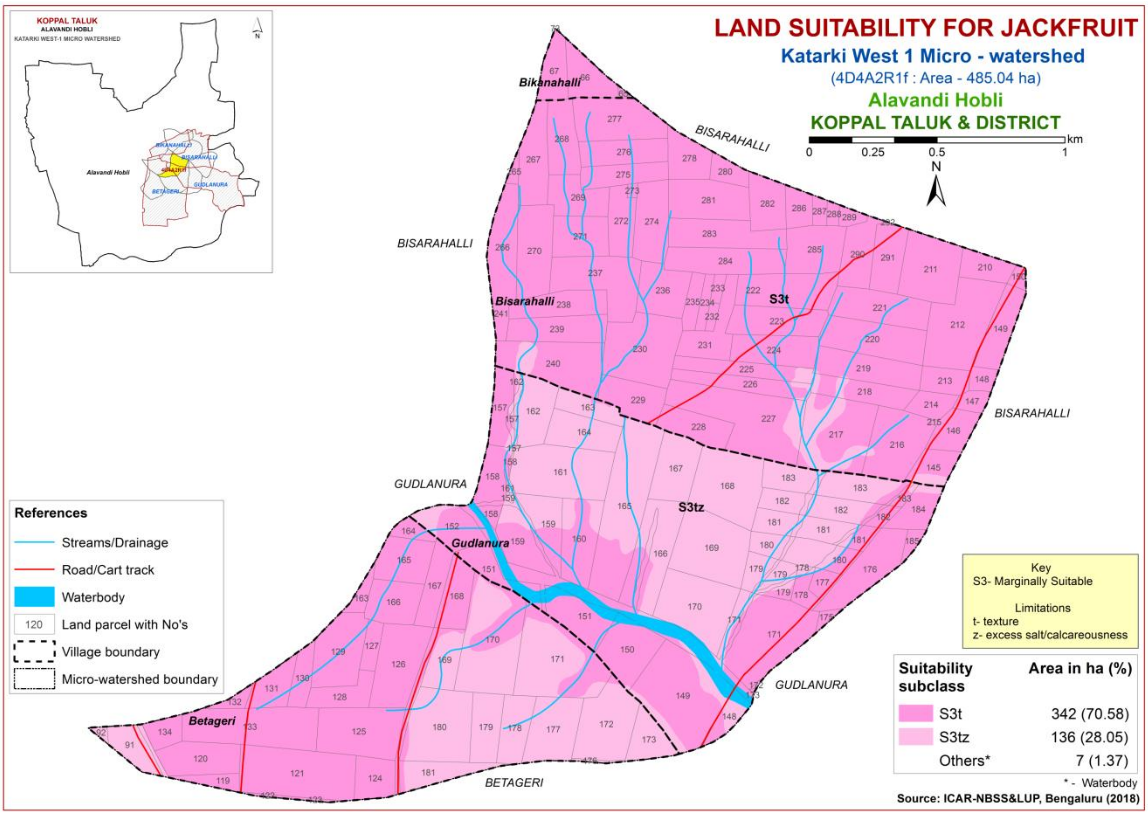


Fig. 7.23 Land Suitability map of Jackfruit

7.24 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the state. The crop requirements (Table 7.25) for growing Jamun were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Jamun was generated .The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.24.

No highly suitable (Class S1) lands for growing Jamun in the microwatershed. Maximum area of about 321 ha (66%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover an area of about 157 ha (33%) and distributed in the northern, eastern, central, southern and western part of the microwatershed. They have moderate limitations of texture, rooting depth and calcareousness.

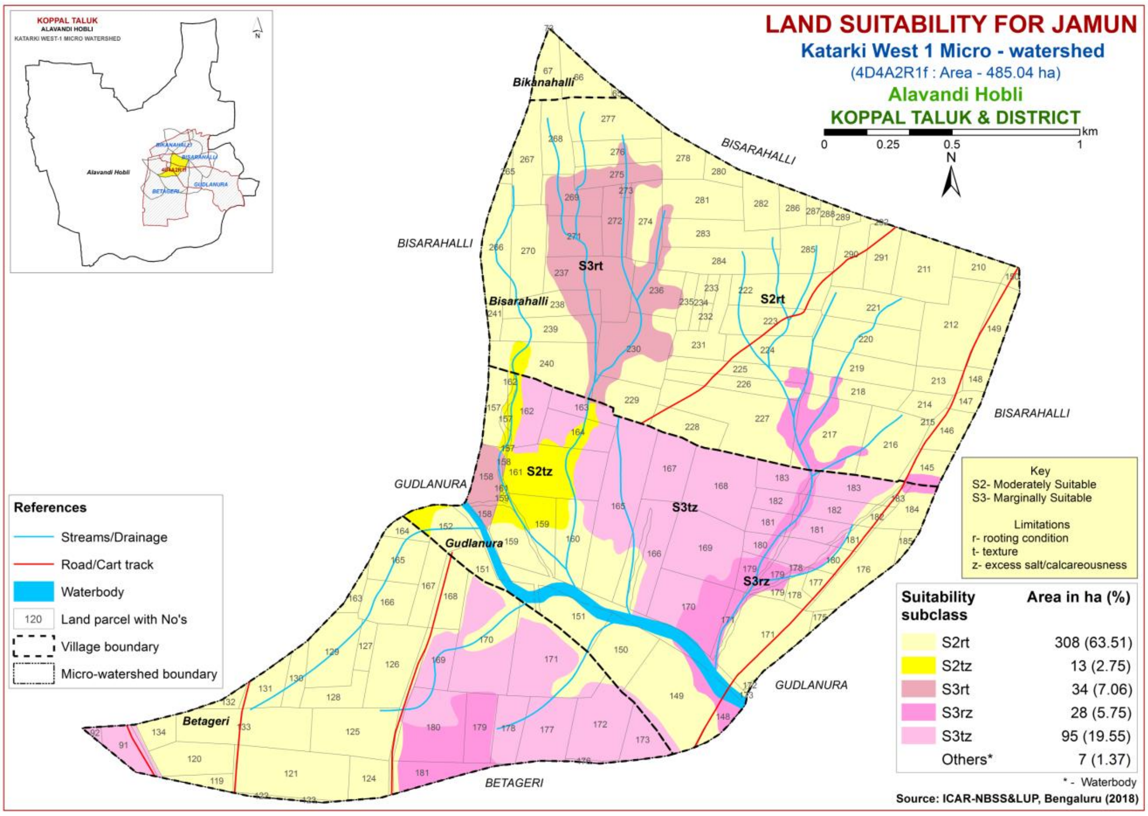


Fig. 7.24 Land Suitability map of Jamun

7.25 Land Suitability for Custard Apple (*Annona reticulata*)

Custard apple is one of the most important fruit crop grown in 1426 ha in almost all the districts of the State. The crop requirements (Table 7.26) for growing custard apple were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated .The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.25.

Maximum area of about 342 ha (71%) is highly suitable (Class S1) for growing Custard Apple and are distributed in all parts of the microwatershed. An area of about 136 ha (28%) is moderately suitable (Class S2) and are distributed in the southern, eastern, central and western part of the microwatershed. They have minor limitations of rooting depth and calcareousness.

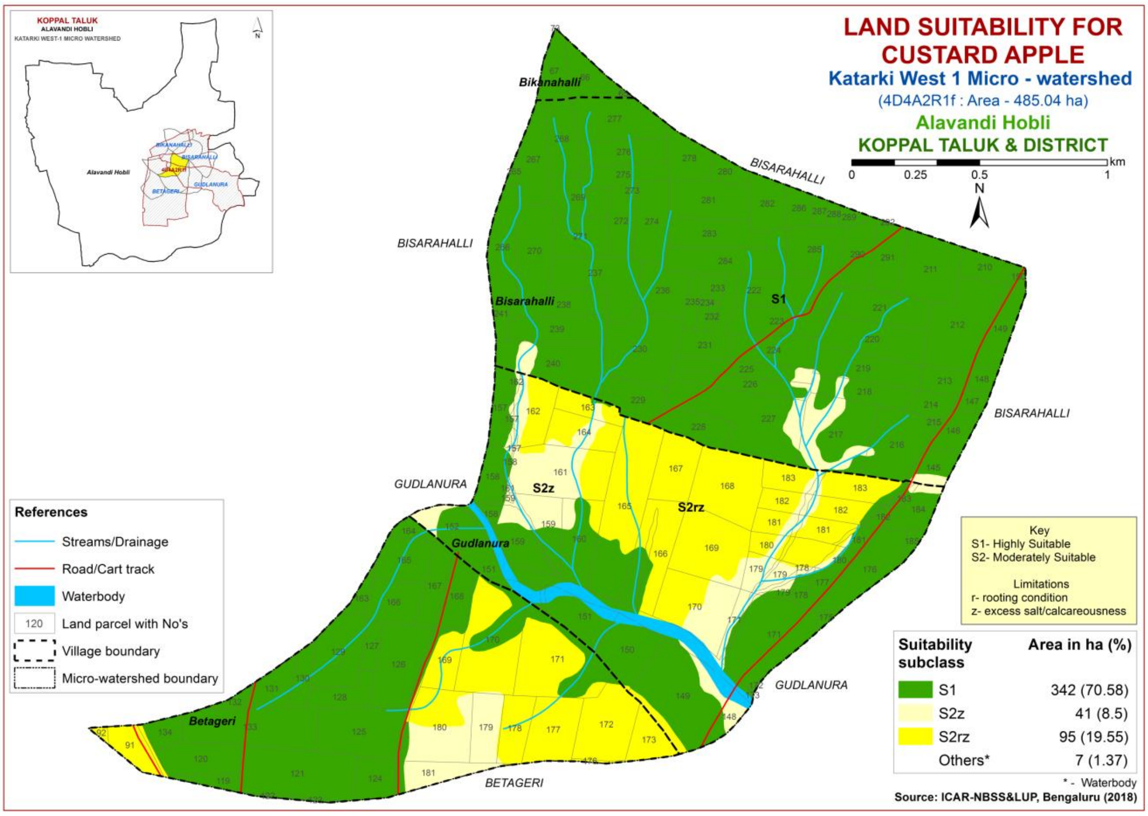


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in 14897 ha in all the districts of the state. The crop requirements (Table 7.27) for growing tamarind were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.26.

No highly suitable (Class S1) lands for growing Tamarind in the microwatershed. Maximum area of about 321 ha (66%) is moderately suitable (Class S2) and distributed in all parts of the microwatershed with minor limitations of rooting depth, texture and calcareousness. Marginally suitable (Class S3) lands cover an area of about 62 ha (13%) and distributed in the northern, eastern, western and southern part of the microwatershed. They have moderate limitations of rooting depth and calcareousness. An area of about 95 ha (19%) is currently not suitable (Class N1) for growing Tamarind and are distributed in the southern, eastern, central and western part of the microwatershed with severe limitations of rooting depth and calcareousness.

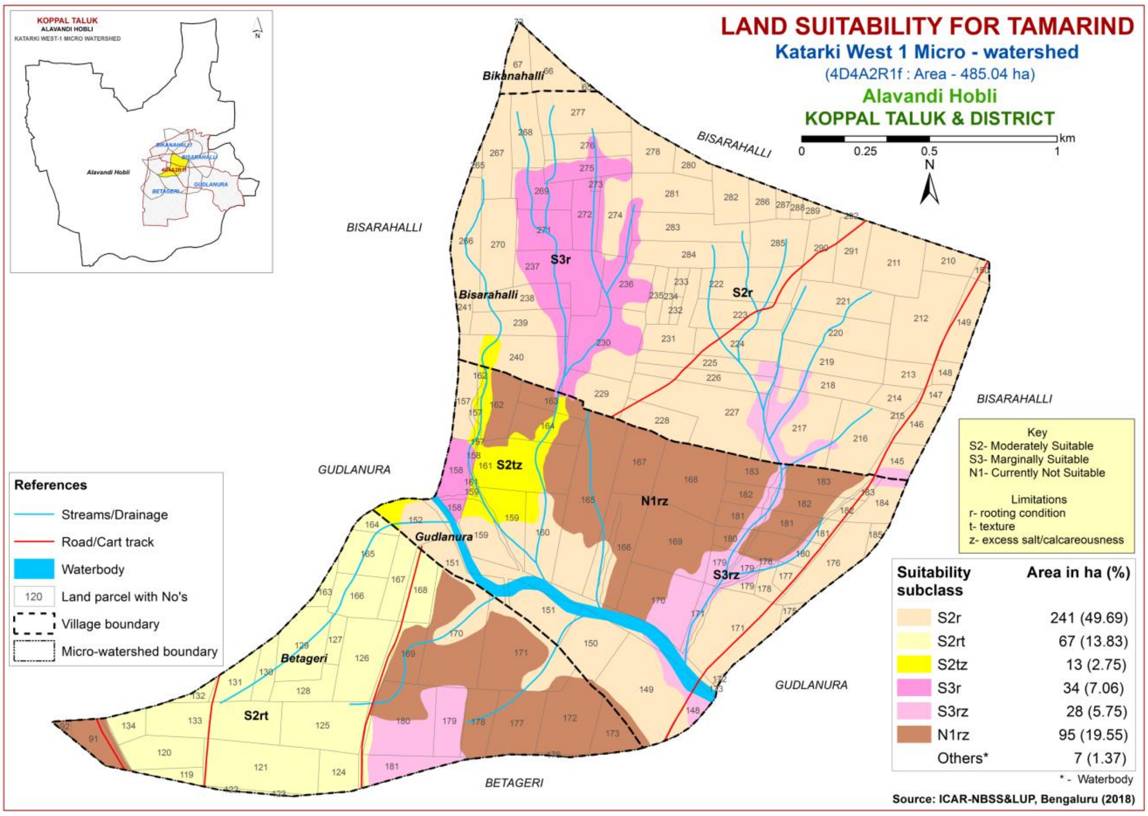


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is the most important leaf crop grown for rearing silkworms in about 1.66 lakh ha in all the districts of the state. The crop requirements for growing mulberry (Table 7.28) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.27.

No highly suitable (Class S1) and moderately suitable (Class S2) lands for growing Mulberry in the microwatershed. Marginally suitable (Class S3) lands cover an entire area of the microwatershed with major limitations of texture, drainage, rooting depth and calcareousness.

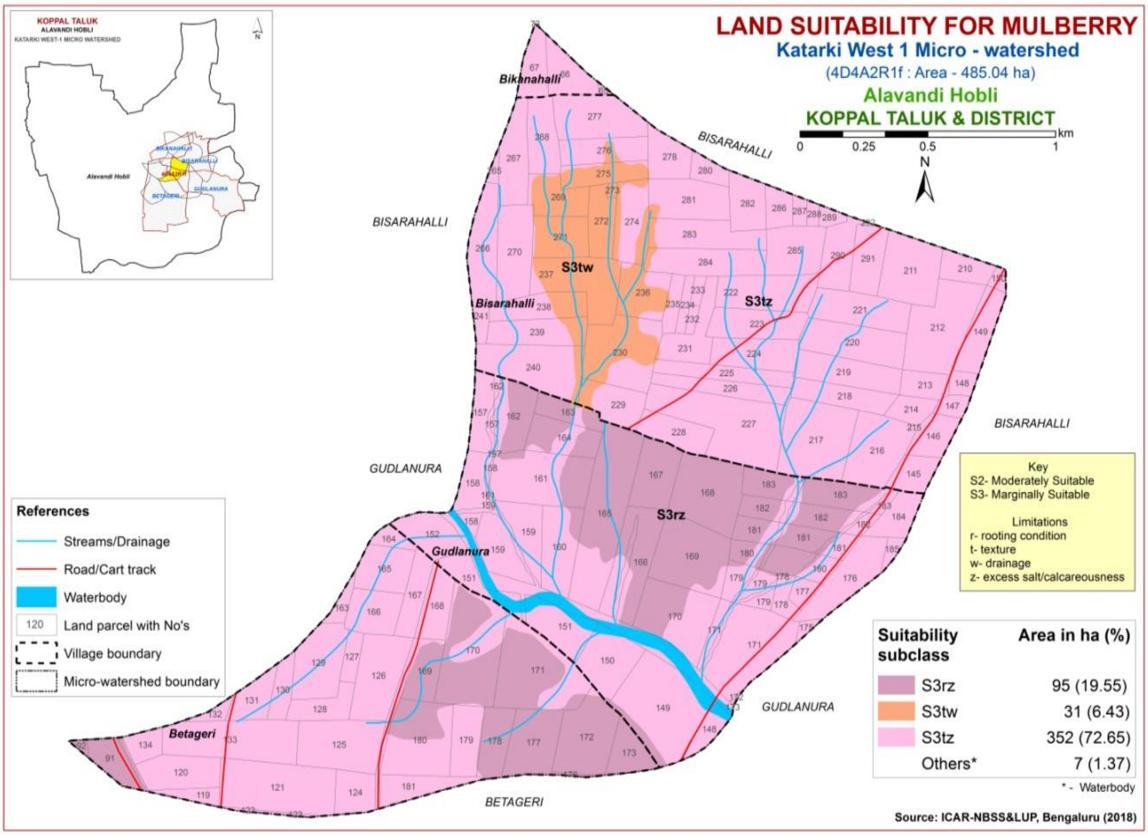


Fig. 7.27 Land Suitability map of Mulberry

7.28 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 9108 ha in almost all the districts of the state. The crop requirements (Table 7.29) for growing marigold were matched with the soil-site characteristics and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.28.

No highly suitable (Class S1) lands for growing Marigold in the microwatershed. Entire area is covered by moderately suitable (Class S2) lands for growing Marigold with minor limitations of texture, drainage, rooting depth and calcareousness.

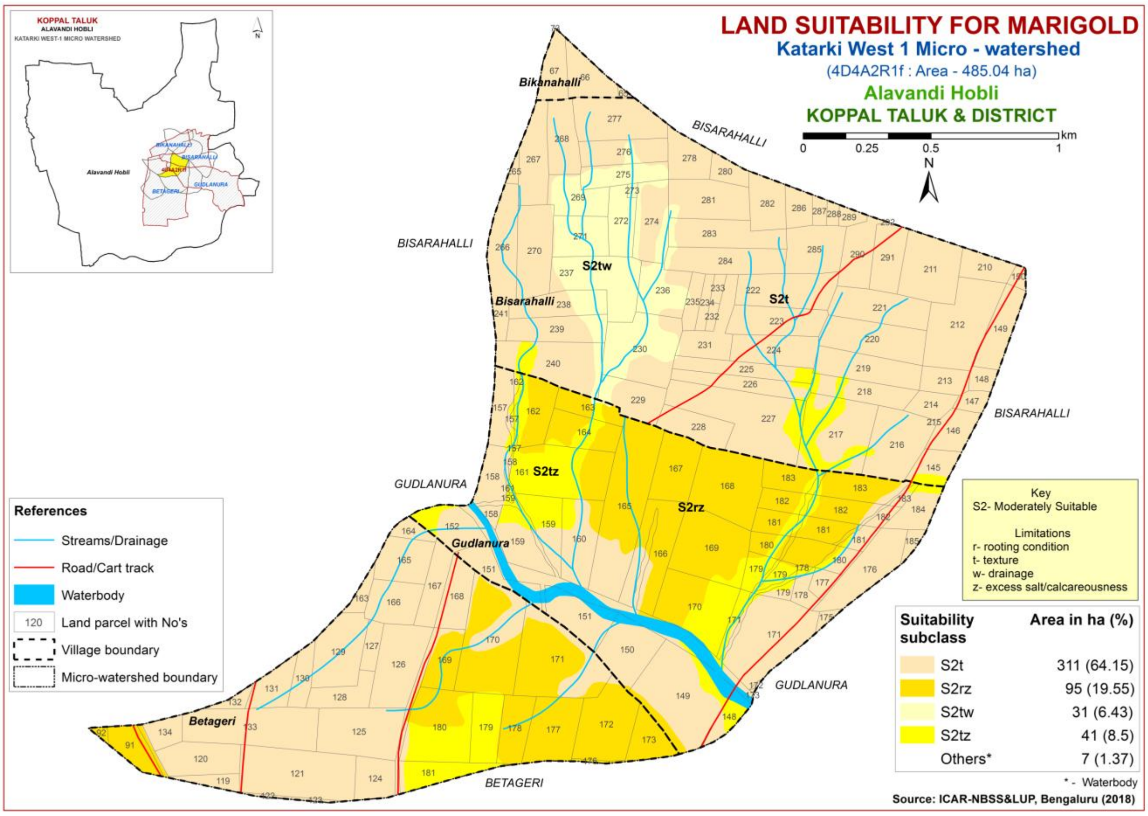


Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements (Table 7.30) for growing chrysanthemum were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.29.

No highly suitable (Class S1) lands for growing Chrysanthemum in the microwatershed. Entire area is covered by moderately suitable (Class S2) lands for growing Chrysanthemum with minor limitations of texture, drainage, rooting depth and calcareousness.

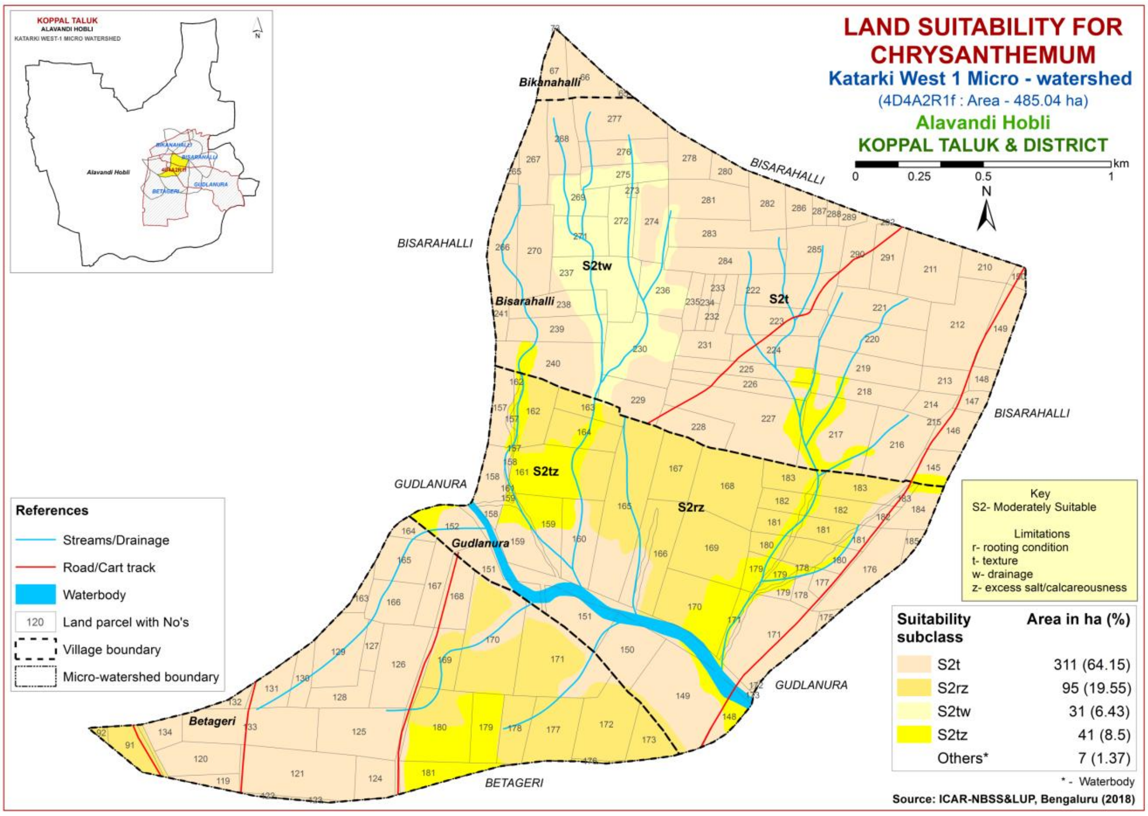


Fig. 7.29 Land Suitability map of Chrysanthemum

7. 30 Land Suitability for Jasmine *(Jasminum sp.)*

Jasmine is one of the most important flower crop grown in an area of 803 ha in almost all the districts of the State. The crop requirements (Table 7.31) for growing jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.30.

No highly suitable (Class S1) lands for growing Jasmine in the microwatershed. Moderately suitable (Class S2) lands cover an area of about 107 ha (23%) for growing Jasmine and distributed in the southern, central, eastern and western part of the microwatershed with minor limitations of texture, rooting depth and calcareousness. Marginally suitable (Class S3) lands occupy a maximum area of about 371 ha (76%) and are distributed in all parts of the microwatershed with moderate limitations of drainage, texture and calcareousness.

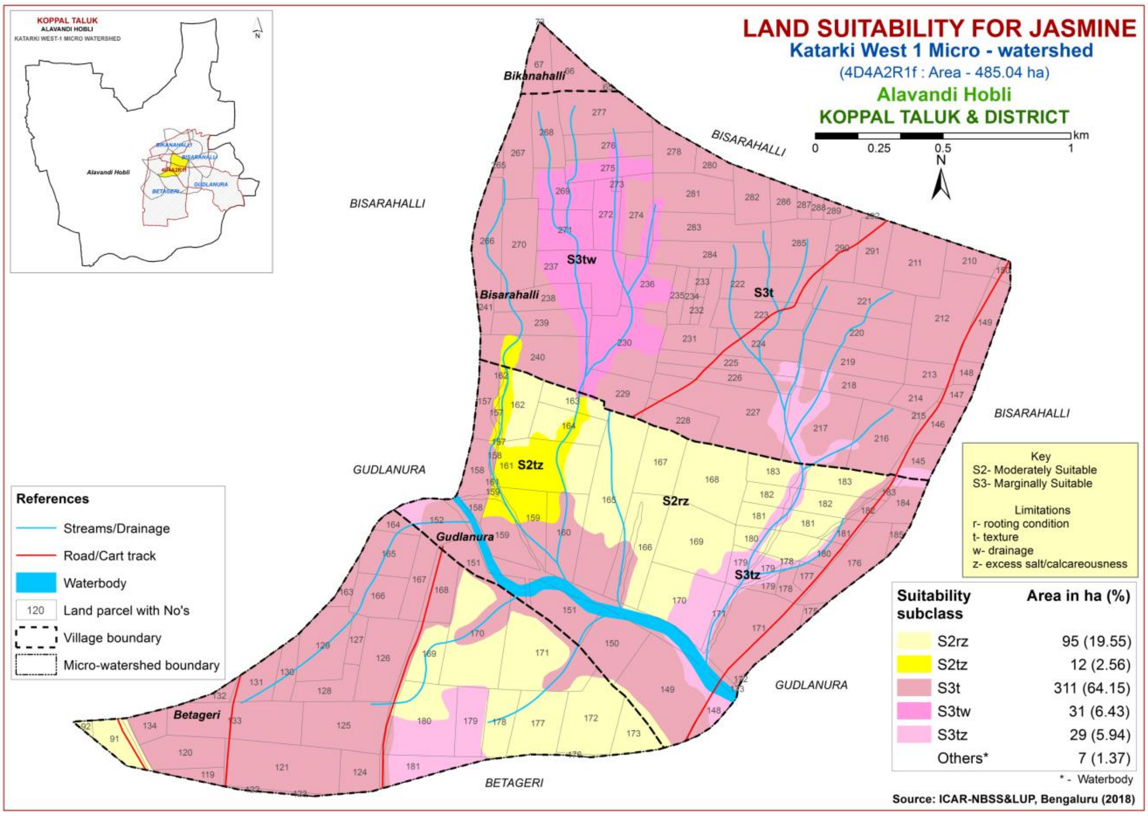


Fig. 7.30 Land Suitability map of Jasmine

7. 31 Land Suitability for Crossandra *(Crossandra infundibuliformis)*

Crossandra is one of the most important flower crop grown in almost all the districts of the State (Table 7.32). Land suitability map for growing crossandra was generated (Table 7.1). The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.31.

No highly suitable (Class S1) lands for growing Crossandra in the microwatershed. Moderately suitable (Class S2) lands cover an area of about 107 ha (23%) for growing Crossandra and distributed in the southern, eastern and western part of the microwatershed with minor limitations of texture and calcareousness. Marginally suitable (Class S3) lands occupy a maximum area of about 371 ha (76%) and are distributed in all parts of the microwatershed with moderate limitations of rooting depth, texture and calcareousness.

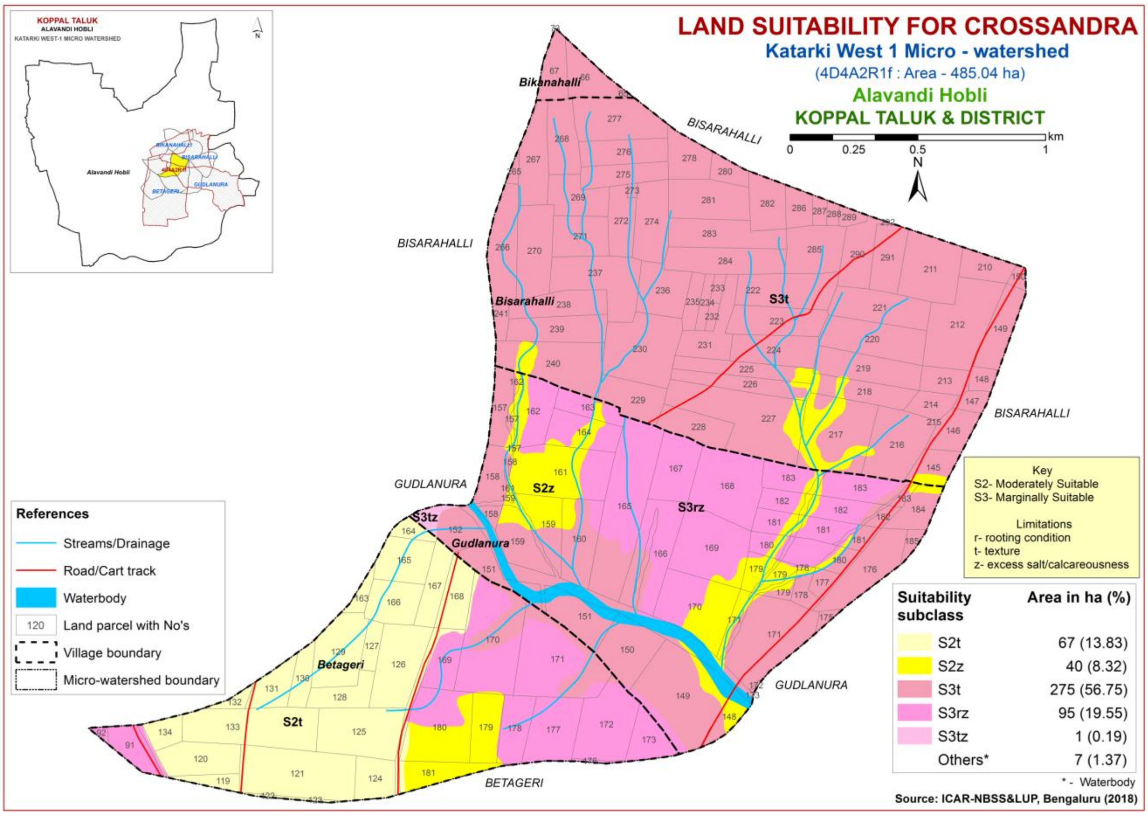


Fig. 7.31 Land Suitability map of Crossandra

Table 7.1 Soil-Site Characteristics of Katarki West-1 Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP	CEC [Cmol $(p^+)kg^{-1}$]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface								
RNKmB2	662	<90	MWD	50-75	c	c	<15	<15	51-100	1-3	moderate	8.86	0.48	7.00	37.00	-
RNKmB2g1	662	<90	MWD	50-75	c	c	15-35	<15	51-100	1-3	moderate	8.86	0.48	7.00	37.00	-
DRLmB1	662	<90	MWD	75-100	c	c	<15	<15	151-200	1-3	slight	8.78	0.42	5.62	49.70	100
DRLmB2g1	662	<90	MWD	75-100	c	c	15-35	<15	151-200	1-3	moderate	8.78	0.42	5.62	49.70	100
NSPmB1	662	<90	MWD	75-100	c	c	<15	<15	101-150	1-3	slight	9.16	0.61	8.60	51.09	-
NSPmB2	662	<90	MWD	75-100	c	c	<15	<15	101-150	1-3	moderate	9.16	0.61	8.60	51.09	-
GRHmA1	662	<90	MWD	100-150	c	c	<15	<15	>200	0-1	slight	9.08	0.23	7.11	63.21	100
GRHmB2	662	<90	MWD	100-150	c	c	<15	<15	>200	1-3	moderate	9.08	0.23	7.11	63.21	100
HDLmB2	662	<90	MWD	100-150	c	c	<15	<15	>200	1-3	moderate	9.06	0.37	12.72	62.33	-
AWDmB1g1	662	<90	MWD	>150	c	c	15-35	<15	>200	1-3	slight	8.10	0.37	1.22	51.30	100
APRmA1	662	<90	MWD	>150	c	c	<15	<15	>200	0-1	slight	-	-	-	-	-

Table 7.2 Land suitability criteria for Sorghum

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	26–30	30–34; 24–26	34–40; 20–24	>40; <20
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sc, c (red), c (black)	scl, cl	ls, sl	-
	pH	1:2.5	5.5-7.8	5.0-5.5 7.8-9.0	>9.0	-
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	10-15
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	5-10	10-15	>15	
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.3 Land suitability criteria for Maize

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	30-34	35-38 26-30	38-40 26-20	
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	Very poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc	c (red), c (black)	ls, sl	-
	pH	1:2.5	5.5-7.8	5.0-5.5 7.8-9.0	>9.0	-
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	5-10	10-15	>15	-
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.4 Land suitability criteria for Bajra

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	28-32	33-38 24-27	39-40 20-23	<20
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm	500-750	400-500	200-400	<200
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	Very poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl, scl, cl,sc,c (red)	c (black)	ls	-
	pH	1:2.5	6.0-7.8	5.0-5.5 7.8-9.0	5.5-6.0 >9.0	
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	15-35	35-60	>60	
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	5-10	10-15	>15	
Erosion hazard	Slope	%	1-3	3-5	5-10	>10

Table 7.5 Land suitability criteria for Groundnut

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	24–33	22–24; 33–35	20–22; 35–40	<20; >40
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod. Well drained	Poorly drained	Very Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl	sl,cl, sc	c (red), c (black), ls	-
	pH	1:2.5	6.0-7.8	5.5-6.0 7.8-8.4	5.0-5.5 8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<35	35-60	>60	
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.6 Land suitability criteria for Sunflower

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	24–30	30–34; 20–24	34–38; 16–20	>38; <16
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	mod. Well drained	-	Poorly to very drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	cl, sc,c (red), c (black)	scl	ls, sl	-
	pH	1:2.5	6.5-7.8	7.8-8.4 5.5-6.5	8.4-9.0; 5.0-5.5	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.7 Land suitability criteria for Redgram

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	30-35(G) 20-25(AV) 15-18 (F&PS) 35-40(M)	25-30(G) 20-25 (AV) 12-15 (F&PS) 30-35(M)	20-25(G) 15-20(AV) 10-12 (F&PS) 25-30(M)	< 20 <15 <10 <25
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod. Well drained	Poorly drained	Very Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sc, c (red)	c (black),sl, scl, cl	ls	-
	pH	1:2.5	6.0-7.8	5.5-6.0 7.8-9.0	5.0-5.5 >9.0	-
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-50	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<1.0	1.0-2.0	>2.0	
	Sodicity (ESP)	%	5-10	10-15	>15	
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.8 Land suitability criteria for Bengal gram

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	20–25	25–30; 15–20	30–35; 10–15	>35; <10
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod. Well drained	Poorly drained	Very Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	c(black)	-	c (red), scl, cl, sc	ls, sl
	pH	1:2.5	6.0-7.8	5.0-6.0 7.8-9.0	>9.0	-
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	5-10	10-15	>15	-
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.9 Land suitability criteria for Cotton

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	22-32	>32	<19	-
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well to moderately well	Poorly drained/Somewhat excessively drained	-	very poorly/excessively drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sc, c (red,black)	cl	scl	ls, sl
	pH	1:2.5	6.5-7.8	7.8-8.4	5.5-6.5 8.4->9.0	<5.5
	CEC	C mol (p+)Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	50-100	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	5-10	10-15	>15	
Erosion hazard	Slope	%	<3	3-5	-	>5

Table 7.10 Land suitability criteria for Chilli

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	25-32	33-35 20-25	35-38 <20	>38
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	Very poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc	c (black), sl	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.11 Land suitability criteria for Tomato

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	25-28	29-32 20-24	15-19 33-36	<15 >36
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl, scl, cl, sc, c (red)	-	ls, c(black)	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.12 Land suitability criteria for Brinjal

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class				
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl, scl, cl, sc c (red)	-	ls, c (black)	-
	pH	1:2.5	6.0-7.3	7.3-8.4 5.0-6.0	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	>60
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.13 Land suitability criteria for Onion

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	20-30	30-35	35-40	>40
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately /imperfectly	-	Poorly to V poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl,scl,cl,sc,c (red)	-	c (Black),ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-7.8	7.8-8.4	>8.4
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<1.0	1.0-2.0	2.0-4.0	<4
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.14 Land suitability criteria for Bhendi

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	25-28	29-32 20-24	15-19 33-36	<15 >36
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly to very poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl,sc, c (red)	c (black)	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.15 Land suitability criteria for Drumstick

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sc, scl, cl, c (red)	sl, c (black)	ls	s
	pH	1:2.5	6.0-7.3	5.0-5.5 7.3-7.8	5.5-6.0 7.8-8.4	>8.4
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<35	35-60	60-80	>80
Soil toxicity	Salinity (EC saturation extract)	ds/m				
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-10	-	>10

Table 7.16 Land suitability criteria for Mango

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	28-32	24-27 33-35	36-40	20-24
	Min temp. before flowering	^{0}C	10-15	15-22	>22	-
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration	Days				
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	-	ls, sl, c (black)	-
	pH	1:2.5	5.5-7.3	5.0-5.5 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>150	100-150	75-100	<75
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.17 Land suitability criteria for Guava

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	28-32	33-36 24-27	37-42 20-23	
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	sl	c (black), ls	-
	pH	1:2.5	6.0-7.8	5.0-6.0	7.8-8.4	>8.4
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.18 Land suitability criteria for Sapota

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	28-32	33-36 24-27	37-42 20-23	>42 <18
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	-	Poorly to very drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	sl	ls, c (black)	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.19 Land suitability criteria for Pomegranate

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	30-34	35-38 25-29	39-40 15-24	
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl,cl, sc, c (red)	c (black),sl	ls	-
	pH	1:2.5	5.5-7.8	7.8-8.4	5.0-5.5 8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.20 Land suitability criteria for Musambi

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	28-30	31-35 24-27	36-40 20-23	>40 <20
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately drained	poorly	Very poorly
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c	sl	ls	-
	pH	1:2.5	6.0-7.8	5.5-6.0 7.8-8.4	5.0-5.5 8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	$CaCO_3$ in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.21 Land suitability criteria for Lime

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	28-30	31-35 24-27	36-40 20-23	>40 <20
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately drained	poorly	Very poorly
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c	sl	ls	-
	pH	1:2.5	6.0-7.8	5.5-6.0 7.8-8.4	5.0-5.5 8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.22 Land suitability criteria for Amla

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V. Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	c (black)	ls, sl	-
	pH	1:2.5	5.5-7.3	5.0-5.5 7.3-7.8	7.8-8.4	>8.4
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15-35	35-60	60-80	-
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.23 Land suitability criteria for Cashew

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	32 to 34	28 to 32; 34 to 38	24 to 28; 38 to 40	<20; >40
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	moderately well drained	Poorly drained	Very poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	-	sl, ls	c (black)
	pH	1:2.5	5.5-6.5	5.0-5.5 6.5-7.3	7.3-7.8	>7.8
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	<3	3-10	>10	-

Table 7.24 Land suitability criteria for Jackfruit

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod. well	Poorly	V. Poorly
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	-	sl, ls, c (black)	-
	pH	1:2.5	5.5-7.3	5.0-5.5 7.3-7.8	7.8-8.4	>8.4
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	>60
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	0-3	3-5	5-10	>10-

Table 7.25 Land suitability criteria for Jamun

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well	Mod. well	Poorly	V.Poorly
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c(red)	sl, c (black)	ls	-
	pH	1:2.5	6.0-7.8	5.0-6.0	7.8-8.4	>8.4
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>150	100-150	50-100	<50
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	>60
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.26 Land suitability criteria for Custard apple

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	Scl, cl, sc, c (red), c (black)	-	Sl, ls	-
	pH	1:2.5	6.0-7.3	5.5-6.0 7.3-8.4	5.0-5.5 8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15-35	35-60	60-80	-
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	0-3	3-5	>5	-

Table 7.27 Land suitability criteria for Tamarind

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Mod.well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl,sc, c (red)	sl, c (black)	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-7.8	7.8-8.4	>8.4
	CEC	C mol (p+)/ Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>150	100-150	75-100	<75
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.28 Land suitability criteria for Mulberry

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	24–28	22–24; 28–32	32–38; 22–18	>38; <18
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sc, cl, scl	c (red)	c (black), sl, ls	-
	pH	1:2.5	5.5-7.3	5.0-5.5 7.8-8.4	7.3-8.4	>8.4
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>100	75-100	50-75	<50
	Stoniness	%				
	Coarse fragments	Vol %	0-35	35-60	60-80	>80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2	2-4	4-8	>8
	Sodicity (ESP)	%	<5	5-10	10-15	>15
Erosion hazard	Slope	%	0-3	3-5	5-10	>10

Table 7.29 Land suitability criteria for Marigold

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	18-23	17-15 24-35	35-40 10-14	>40 <10
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl,scl, cl, sc, c (red)	c (black)	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%				
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.30 Land suitability criteria for Chrysanthemum

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	18-23	17-15 24-35	35-40 10-14	>40 <10
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	sl,scl, cl, sc, c (red)	c (black)	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	ds/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%				
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table 7.31 Land suitability criteria for Jasmine (irrigated)

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C	18-23	17-15 24-35	35-40 10-14	-
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V.Poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	sl	ls, c (black)	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	dS/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%				
Erosion hazard	Slope	%	<3	3-5	5-10	>10

7.32 Land suitability criteria for Crossandra

Land use requirement			Rating			
Soil –site characteristics		Unit	Highly suitable (S1)	Moderately suitable (S2)	Marginally suitable (S3)	Not suitable (N1)
Climatic regime	Mean temperature in growing season	°C				
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately well drained	-	Poorly to very poorly drained
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c(red)	sl,	c (black),ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0 7.3-8.4	8.4-9.0	>9.0
	CEC	C mol (p+)/Kg				
	BS	%				
	CaCO3 in root zone	%		<5	5-10	>10
	OC	%				
Rooting conditions	Effective soil depth	cm	>75	50-75	25-50	<25
	Stoniness	%				
	Coarse fragments	Vol %	<15	15-35	35-60	60-80
Soil toxicity	Salinity (EC saturation extract)	dS/m	<2.0	2-4	4-8	>8.0
	Sodicity (ESP)	%				
Erosion hazard	Slope	%	<3	3-5	5-10	>10

7.32 Land Management Units (LMUs)

The 11 soil map units identified in Katarki West-1 microwatershed have been grouped into 2 Land Management Units (LMUs) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig.7.31) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The map units that have been grouped into 2 Land Management Units along with brief description of soil and site characteristics are given below.

LMU	Mapping unit	Soil and site characteristics
1	463.APRmA1 423.AWDmB1g1 370.GRHmA1 373.GRHmB2 382.HDLmB2 348.DRLmB1 351.DRLmB2g1 360.NSPmB1 362.NSPmB2	Moderately deep to very deep (75 to >150 cm), black calcareous clay soils, slope (0-3%), slight to moderate erosion, gravelly (15-35%)
2	336.RNKmB2 337.RNKmB2g1	Moderately shallow (50-75 cm), black calcareous clay soils, slope (1-3%), moderate erosion, gravelly (15-35%)

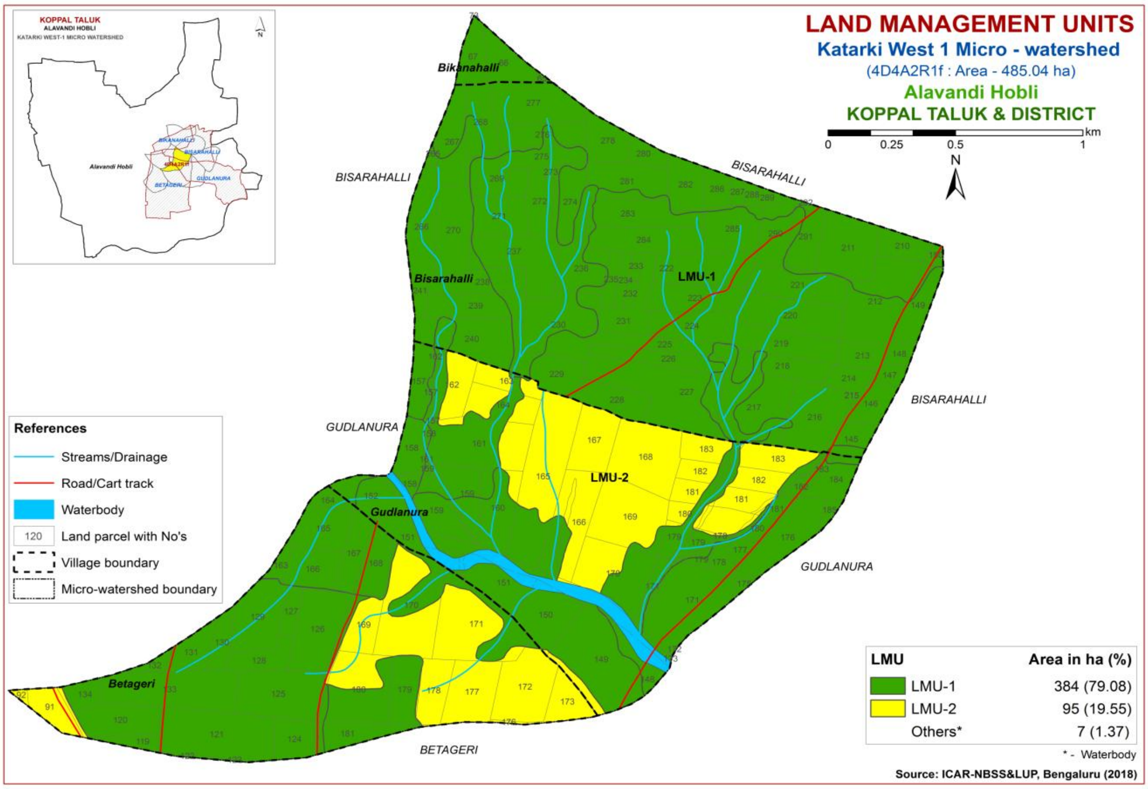


Fig 7.32 Land Management Units map of Katarki West-1 microwatershed

7.33 Proposed Crop Plan for Katarki West-1 Microwatershed

After assessing the land suitability for the 31 crops, the proposed crop plan has been prepared for the 2 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 31 crops. The resultant proposed crop plan is presented in Table 7.33.

Table 7.33 Proposed Crop Plan for Katarki West-1 Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops	Horticulture Crops	Suitable Interventions
1	463.APRmA1 423.AWDmB1g1 370.GRHmA1 373.GRHmB2 382.HDLmB2 348.DRLmB1 351.DRLmB2g1 360.NSPmB1 362.NSPmB2	**Betageri:**119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,163,164,165,166, 167,168,179,180,181 **Bisarahalli**:65,66,67,73,145,146,147,148,149,150,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,265,266,267,268,269,270,271,272,273,274,275,276,277,278,280,281,282,283,284,285,286,287,288,289, 290,291,292 **Gudlanur**:148,149,150,151,152,157,158,159,160,161,170,171,172,173,175,176,177,178,179,184, 185	Maize, Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra, Soybean	**Fruit crops**: Pomegranate, Jamun, Lime, Musambi, Tamarind, Amla, Custard apple **Vegetables**: Drumstick, Chilli, Coriander, Tomato, Bhendi **Flower crops**: Marigold, Chrysanthemum, Crossandra, Jasmine	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
2	336.RNKmB2 337.RNKmB2g1	**Betageri**:91,92,169,170,171,172,173,176,177,178 **Gudlanur** :162,163,164,165,166, 167,168,169,180,181, 182,183	Sorghum, Bajra, Bengal gram, linseed, Safflower, Coriander	**Fruit crops**: Amla, Custard apple **Flower crops**: Marigold, Jasmine Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

Soil health is basic to plant health and plant health is basic to human and bovine health. Soil is fundamental to crop production. Without soil, no food could be produced nor would livestock be fed on a large scale. Because it is finite and fragile, soil is a precious resource that requires special care from its users.

Soil health or the capacity of the soil to function is critical to human survival. Soil health has been defined as: "the capacity of the soil to function as a living system without adverse effect on the ecosystem". Healthy soils maintain a diverse community of soil organisms that help to form beneficial symbiotic associations with plant roots, recycle essential plant nutrients, improve soil structure with positive repercussions for soil, water and nutrient holding capacity and ultimately improve crop production and also contribute to mitigating climate change by maintaining or increasing its carbon content.

Functional interactions of soil biota with organic and inorganic components, air and water determine a soil's potential to store and release nutrients, and water to plants and to promote and sustain plant growth. Thus, maintaining soil health is vital to crop production and conserve soil resource base for sustaining agriculture.

The most important characteristics of a healthy soil are

- Good soil tilth
- Sufficient soil depth
- Good water storage and good drainage
- Adequate supply, but not excess of nutrients
- Large population of beneficial organisms
- Small proportion of plant pathogens and insect pests
- Low weed pressure
- Free of chemicals and toxins that may harm the crop
- Resistance to degradation
- Resilience when unfavourable conditions occur

Characteristics of Katarki West-1 Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of GRH 241 ha (50%), RNK 95 ha (19%), HDL 67 ha (14%), NSP 34 ha (7%), DRL 28 ha (6%), APR 12 ha (3%) and AWD 1 ha (<1%).
- As per land capability classification, entire area in the microwatershed falls under arable land category (Class II and III). The major limitations identified in the arable lands were soil and erosion.
- On the basis of soil reaction, an area of about 25 ha (5%) is strongly alkaline (pH 8.4-9.0) and 453 ha (93%) is very strongly alkaline (pH >9.0).

Soil Health Management

The following actions are required to improve the current land husbandry practices that provide a sound basis for the successful adoption of sustainable crop production system.

Alkaline soils

About 478 ha (98%) is under alkaline soils (strongly to very strongly alkaline soils).

1. Regular addition of organic manure, green manuring, green leaf manuring, crop residue incorporation and mulching needs to be taken up to improve the soil organic matter status.
2. Application of biofertilizers (Azospirullum, Azatobacter, Rhizobium).
3. Application of 25% extra N and P (125 % RDN&P).
4. Application of $ZnSO_4$ – 12.5 kg/ha (once in three years).
5. Application of Boron – 5kg/ha (once in three years).

Besides the above recommendations, the best transfer of technology options are also to be adopted.

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatershed. An area of about 77 ha (16%) is under slight erosion and 401 ha (83%) is under moderate erosion. The areas with moderate erosion need immediate soil and water conservation and other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication of Benefits

Any large scale implementation of soil health management requires that supporting information is made available widely, particularly through channels familiar to farmers and extension workers. Given the very high priority attached to soil health especially by the Central Government on issuing Soil-Health Cards to all the farmers, media outlets like Regional, State and National Newspapers, Radio and Dooradarshan programs in local languages but also modern information and communication technologies such as Cellular phones and the Internet, which can be much more effective in reaching the younger farmers.

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning in IWMP is focusing on preparation of

1. Soil and Water Conservation Treatment Plans for each plot or farm.
2. Productivity enhancement measures/ interventions for existing crops/livestock/other farm enterprises.
3. Diversification of farming mainly with perennial horticultural crops and livestock.
4. Improving livelihood opportunities and income generating activities.

In this connection, how various outputs of Sujala-III are of use in addressing these objectives of Net Planning are briefly presented below.

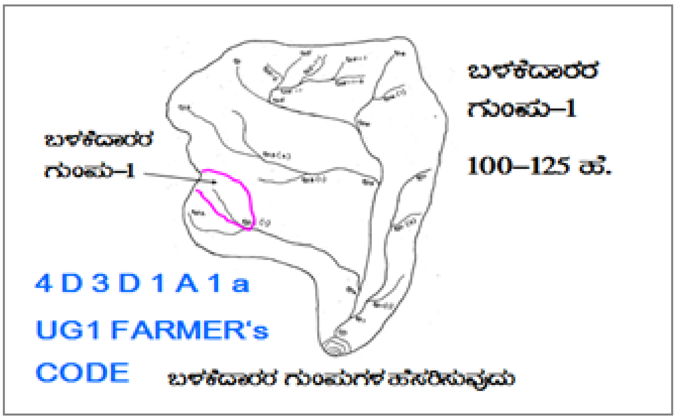
- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.
- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Katarki West-1 Microwatershed.
- **Organic Carbon:** An area of about 289 ha (60%) is low (<0.5%) and 190 ha (39%) is medium (0.5-0.75%) in OC content. The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 479 ha area where OC is less than 0.75 per cent. For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus**: Available phosphorus is low (<23 kg/ha) in entire area of the microwatershed. The areas with low and medium phosphorus content, additional 25% phosphorus from the RDF to be applied.
- **Available Potassium:** Available potassium is medium (145-337 kg/ha) in 284 ha (59%) and high (>337 kg/ha) in 194 ha (40%) area of the microwatershed. The areas with high potassium content reduce 25% from the RDF to avoid the excess application of fertilizer and apply additional 25% potassium in areas where it is low and medium.

- **Available Sulphur:** Available sulphur is low (<10 ppm) in 283 ha (58%) and medium (10-20 ppm) in 195 ha (40%) area of the microwatershed. Areas with low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Iron:** Available iron is deficient (<4.5 ppm) in 357 ha (74%) and sufficient (>4.5 ppm) in 122 ha (25%) area of the microwatershed. Application of iron sulphate @ 25 kg/ha for 2-3 years to correct the deficiency.
- **Available Zinc:** Available zinc is deficient (<0.6 ppm) in the entire area of the microwatershed. Application of zinc sulphate @ 25 kg/ha is to be followed in areas that are deficient in available zinc.
- **Available Boron:** Available boron is low in (<0.5ppm) 210 ha (43%) and medium (0.5-1.0 ppm) in 269 ha (55%) area of the microwatershed. The areas with low and medium in boron content need to be applied with sodium borate @ 10 kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available Manganese**: It is sufficient (>1.0 ppm) in the entire area of the microwatershed.
- **Available Copper:** Available copper is sufficient (>0.2 ppm) in the entire area of the microwatershed.
- **Soil Alkalinity:** An area of 478 ha in the microwatershed has soils that are strongly to very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.
- **Land Suitability for various crops:** Areas that are highly, moderately and marginally suitable and not suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Katarki West-1 microwatershed, the land resource inventory database generated under Sujala-III project has been transformed as information through series of interpretative (thematic) maps using soil phase map as a base. The various thematic maps (1:7920 scale) generated were

- Soil depth
- Surface soil texture
- Available water capacity
- Soil slope
- Soil gravelliness
- Land capability
- Present land use and land cover
- Crop suitability maps
- Rainfall map
- Hydrology
- Water Resources
- Socio-economic data
- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)



Apart from these, Hand Level/ Hydro Marker/ Dumpy Level/ Total Station and Kathedars' List to be collected.

Steps for Survey and Preparation of Treatment Plan

The boundaries of Land User Groups and Survey No. boundaries are traced in the field.

- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge structures

9.1 Treatment Plan

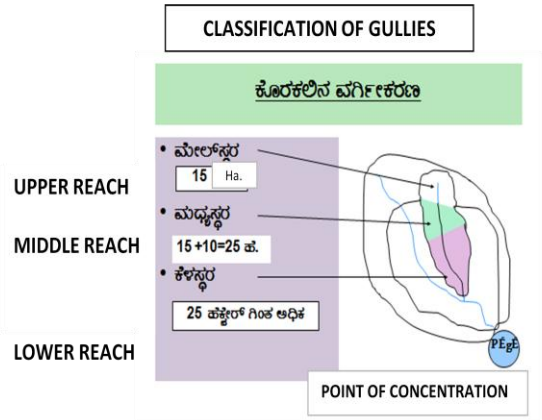
The treatment plan recommended for arable lands is briefly described below.

9.1.1 Arable Land Treatment

A. BUNDING

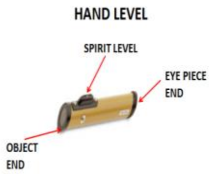
Steps for Survey and Preparation of Treatment Plan	
Cadastral map (1:7920 scale) is enlarged to a scale of 1:2500 scale Existing network of waterways, pothissa boundaries, grass belts, natural drainage lines/ watercourse, cut ups/ terraces are marked on the cadastral map to the scale Drainage lines are demarcated into	
Small gullies	(up to 5 ha catchment)
Medium gullies	(5-15 ha catchment)
Ravines	(15-25 ha catchment) and
Halla/Nala	(more than 25ha catchment)

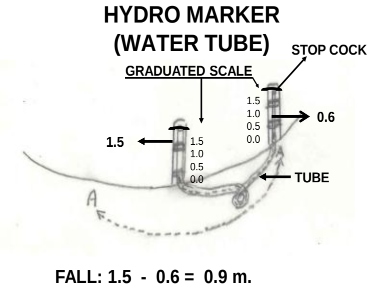
USER GROUP-1



Measurement of Land Slope

Land slope is estimated or determined by the study and interpretation of contours or by measurement in the field using simple instruments like Hand Level or Hydromarker.





Vertical and Horizontal intervals between bunds as recommended by the Watershed Development Department.

Slope percentage	Vertical interval (m)	Corresponding Horizontal Distance (m)
2 - 3%	0.6	24
3 - 4%	0.9	21
4 - 5%	0.9	21
5 - 6%	1.2	21
6 - 7%	1.2	21

Note: i) The above intervals are maximum.

(ii) Considering the slope class and erosion status (A1… A= 0-1% slope, 1= slight erosion) the intervals have to be decided.

Bund length recording: Considering the contour plan and the existing grass belts/partitions, the bunds are aligned and lengths are measured.

Section of the Bund

Bund section is decided considering the soil texture class and gravelliness class (bg_0 ....b = loamy sand, g_0 = <15% gravel). The recommended sections for different soils are given below.

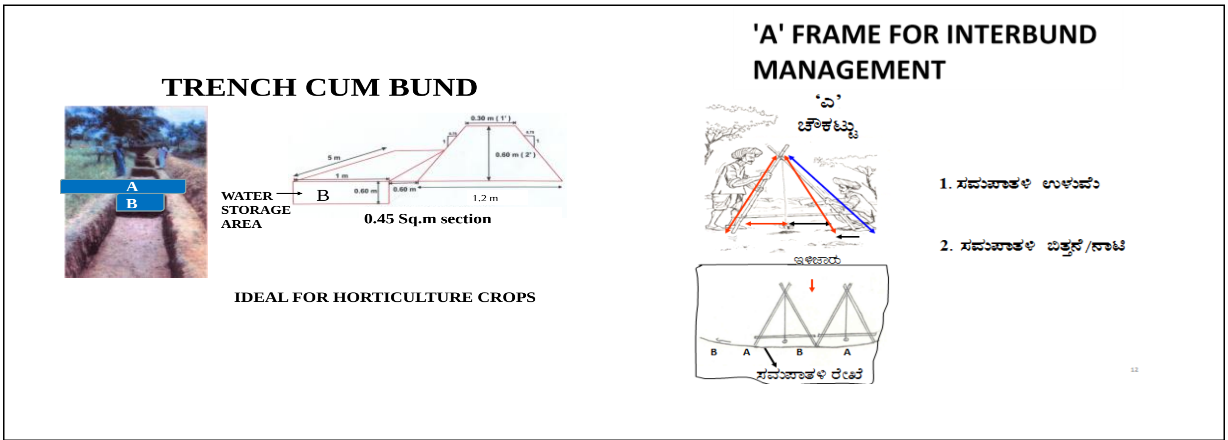
Recommended Bund Section

Top width (m)	Base width (m)	Height (m)	Side slope (Z:1;H:V)	Cross section (sq m)	Soil Texture	Remarks
0.3	0.9	0.3	01:01	0.18	Sandy loam	Vegetative bund
0.3	1.2	0.3	1.5:1	0.225	Sandy clay	
0.3	1.2	0.5	0.9:1	0.375	Red gravelly soils	
0.3	1.2	0.6	0.75:1	0.45		
0.3	1.5	0.6	01:01	0.54	Red sandy loam	
0.3	2.1	0.6	1.5:1	0.72	Very shallow clayey black soils	
0.45	2	0.75	01:01	0.92		
0.45	2.4	0.75	1.3:1	1.07	Shallow clayey black soils	
0.6	3.1	0.7	1.78:1	1.29	Medium clayey black soils	
0.5	3	0.85	1.47:1	1.49		

Formation of Trench cum Bund

Dimensions of the Borrow Pits/ Trenches to be excavated (machinery are decided considering the Bund Section).

Details of Borrow Pit dimensions are given below



Size of Borrow Pits/ Trench recommended for Trench cum Bund (by machinery)

Bund section	Bund length	Earth quantity	Pit				Berm (pit to pit)	Soil depth Class
m^2	m	m^3	L(m)	W(m)	D(m)	Quantity (m^3)	m	
0.375	6	2.25	5.85	0.85	0.45	2.24	0.15	Shallow
0.45	6	2.7	5.4	1.2	0.43	2.79	0.6	Shallow
0.45	6	2.7	5	0.85	0.65	2.76	1	Moderately Shallow
0.54	5.6	3.02	5.5	0.85	0.7	3.27	0.1	Moderately shallow
0.54	5.5	2.97	5	1.2	0.5	3	0.5	Shallow
0.72	6.2	4.46	6	1.2	0.7	5.04	0.2	Moderately shallow
0.72	5.2	3.74	5.1	0.85	0.9	3.9	0.1	Moderately deep

B. Waterways

a) Existing waterways are marked on the cadastral map (1:7920 scale) and their dimensions are recorded.

b) Considering the contour plan of the MWS, additional waterways/ modernization of the existing ones can be thought of.

c) The design details are given in the Manual.

C. Farm Ponds

Waterways and the catchment area will give an indication on the size of the Farm Pond. Location of the pond can be decided based on the contour plan/ field condition and farmers' need/desire.

D. Diversion Channel

Existing EPT/ CPT are marked on the cadastral map. Looking to the need, these can be modernized or fresh diversion channel can be proposed and runoff from this can be stored in *Gokatte*/ Recharge Ponds.

9.1.2 Non-Arable Land Treatment

Depending on the gravelliness and crops preferred by the farmers, the concerned authorities can decide appropriate treatment plan. The recommended treatments may be Contour Trench, Staggered Trench, Crescent Bund, Boulder Bund or Pebble Bund.

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainge lines (gullies/ *nalas/ hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented .
b) The drainage line will be demarcated into Upper Reach, Middle Reach and Lower Reach.
c) Considering the Catchment, *Nala* bed and bank conditions, suitable structures are decided.
d) Number of storage structures (Check dam/ *Nala* bund/ Percolation tank) will be decided considering the commitments and available runoff in water budgeting and quality of water in the wells and site suitability.
e) Detailed Levelling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.
f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.
g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.
h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and earthern checks in the natural water course. Location and design details are given in the Manual.

9.2 Recommended Soil and Water Conservation Measures

The appropriate conservation structures best suited for each of the land parcel/ survey number (Appendix-I) are selected based on the slope per cent, severity of erosion, amount of rainfall, land use and soil type. The different kinds of conservation structures recommended are

1. Graded / Strengthening of Bunds
2. Trench cum Bunds (TCB)
3. Trench cum Bunds / Strengthening
4. Crescent Bunds

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. Maximum area of about 415 ha (86%) needs graded bunding. Strengthening of existing bunds/bunding in an area of about 64 ha (13%).The conservation plan prepared may be presented to all the stakeholders including farmers and after considering their suggestions, the conservation plan for the microwatershed may be finalized in a participatory approach.

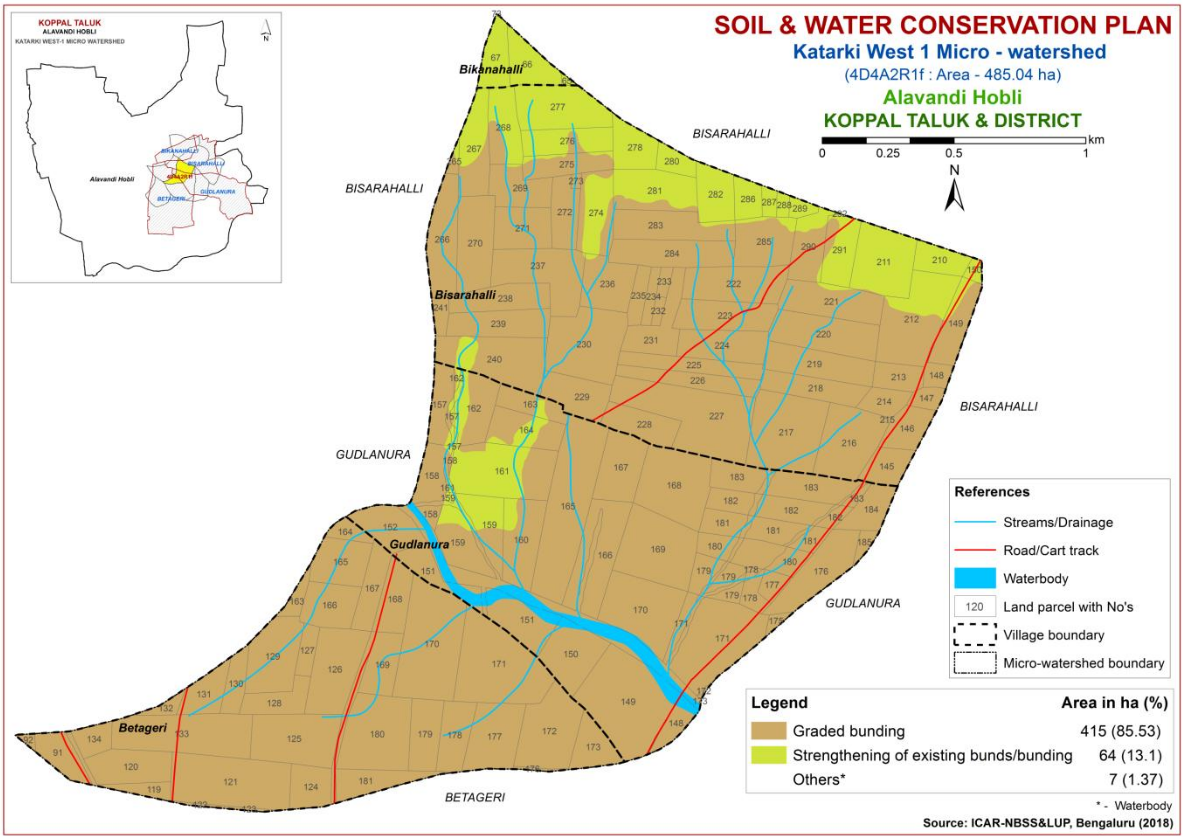


Fig. 9.1 Soil and Water Conservation Plan map of Katarki West-1 Microwatershed

9.3 Greening of Microwatershed

As part of the greening programme in the watersheds, it is envisaged to plant a variety of horticultural and other tree plants that are edible, economical and produce lot of biomass which helps to restore the ecological balance in the watersheds. The lands that are suitable for greening programme are non-arable lands (land capability classes V, VI VII and VIII) and also the lands that are not suitable or marginally suitable for growing annual and perennial crops. The method of planting these trees is given below.

It is recommended to open the pits during the 1st week of March along the contour and heap the dugout soil on the lower side of the slope in order to harness the flowing water and facilitate weathering of soil in the pit. Exposure of soil in the pit also prevents spread of pests and diseases due to scorching sun rays. The pits should be filled with mixture of soil and organic manure during the second week of April and keep ready with sufficiently tall seedlings produced either in poly bags or in root trainer nurseries so that planting can be done during the 2nd or 3rd week of April depending on the rainfall.

The tree species suitable for the area considering rainfall, temperature and adaptability is listed below; waterlogged areas are recommended to be planted with species like Neral (*Sizyzium cumini*) and Bamboo. Dry areas are to be planted with species like Honge, Bevu, Seetaphal *etc*.

Dry Deciduous Species			Temp (°C)	Rainfall (mm)
1.	Bevu	*Azadiracta indica*	21–32	400 –1,200
2.	Tapasi	*Holoptelia integrifolia*	20-30	500 - 1000
3.	Seetaphal	*Anona Squamosa*	20-40	400 - 1000
4.	Honge	*Pongamia pinnata*	20 -50	500–2,500
5.	Kamara	*Hardwikia binata*	25 -35	400 - 1000
6.	Bage	*Albezzia lebbek*	20 - 45	500 - 1000
7.	Ficus	*Ficus bengalensis*	20 - 50	500–2,500
8.	Sisso	*Dalbargia Sissoo*	20 - 50	500 -2000
9.	Ailanthus	*Ailanthus excelsa*	20 - 50	500 - 1000
10.	Hale	*Wrightia tinctoria*	25 - 45	500 - 1000
11.	Uded	*Steriospermum chelanoides*	25 - 45	500 -2000
12.	Dhupa	*Boswella Serrata*	20 - 40	500 - 2000
13.	Nelli	*Emblica Officinalis*	20 - 50	500 -1500
14.	Honne	*Pterocarpus marsupium*	20 - 40	500 - 2000
Moist Deciduous Species			**Temp (°C)**	**Rainfall (mm)**
15.	Teak	*Tectona grandis*	20 - 50	500-5000
16.	Nandi	*Legarstroemia lanceolata*	20 - 40	500 - 4000
17.	Honne	*Pterocarpus marsupium*	20 - 40	500 - 3000
18.	Mathi	*Terminalia alata*	20 -50	500 - 2000
19.	Shivane	*Gmelina arboria*	20 -50	500 -2000
20.	Kindal	*T.Paniculata*	20 - 40	500 - 1500
21.	Beete	*Dalbargia latifolia*	20 - 40	500 - 1500
22.	Tare	*T. belerica*	20 - 40	500 - 2000
23.	Bamboo	*Bambusa arundinasia*	20 - 40	500 - 2500
24.	Bamboo	*Dendrocalamus strictus*	20 – 40	500 – 2500
25.	Muthuga	*Butea monosperma*	20 - 40	400 - 1500
26.	Hippe	*Madhuca latifolia*	20 - 40	500 - 2000
27.	Sandal	*Santalum album*	20 - 50	400 - 1000
28.	Nelli	*Emblica officinalis*	20 - 40	500 - 2000
29.	Nerale	*Sizyzium cumini*	20 - 40	500 - 2000
30.	Dhaman	*Grevia tilifolia*	20 - 40	500 - 2000
31.	Kaval	*Careya arborea*	20 - 40	500 - 2000
32.	Harada	*Terminalia chebula*	20 - 40	500 - 2000

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Appendix I

Katarki west-1 (2R1f) Microwatershed

Soil Phase Information

Village	SY	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Gudlanura	148	1.56	DRLmB2g1	LMU-1	Moderately deep (75-100 cm)	Clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	149	10.2	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	1 Farm Pond	IIes	Graded bunding
Gudlanura	150	4.44	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sparse Vegetation (Sv)	Not Available	IIes	Graded bunding
Gudlanura	151	6.32	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sparse Vegetation (Sv)	Not Available	IIes	Graded bunding
Gudlanura	152	3.24	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Sparse Vegetation (Cf+Sv)	Not Available	IIes	Graded bunding
Gudlanura	157	2.38	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	1 Farm Pond	IIes	Graded bunding
Gudlanura	158	2.82	NSPmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Sparse Vegetation (Sv)	Not Available	IIs	Graded bunding
Gudlanura	159	6.32	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Sparse Vegetation (Cf+Sv)	Not Available	IIes	Graded bunding
Gudlanura	160	4.57	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Sparse Vegetation (Cf+Sv)	Not Available	IIes	Graded bunding
Gudlanura	161	7.52	APRmA1	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sparse Vegetation (Sv)	1 Farm Pond	IIs	Graded bunding
Gudlanura	162	3.73	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	163	2.11	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Sparse Vegetation (Cf+Sv)	Not Available	IIes	Graded bunding
Gudlanura	164	3.49	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Gudlanura	165	10.76	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sparse Vegetation (Sv)	Not Available	IIes	Graded bunding
Gudlanura	166	5.75	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	167	4.05	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sparse Vegetation (Sv)	Not Available	IIes	Graded bunding
Gudlanura	168	6.8	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	169	7.11	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	170	6.65	DRLmB2g1	LMU-1	Moderately deep (75-100 cm)	Clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	171	8.8	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Maize (Cf+Mz)	Not Available	IIes	Graded bunding
Gudlanura	172	0.06	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	173	0.03	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding

Village	SY	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Gudlanura	175	0.4	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	176	4.77	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	177	0.94	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Gudlanura	178	1.08	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Gudlanura	179	2.56	DRLmB2 g1	LMU-1	Moderately deep (75-100 cm)	Clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	180	2.34	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	181	4.02	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Gudlanura	182	4.23	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Gudlanura	183	5.59	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	184	2.36	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Gudlanura	185	0.6	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	91	2.31	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	92	0.26	RNKmB2	LMU-2	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	119	1.12	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	120	3.81	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	121	8.33	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Betageri	122	0.19	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	123	0.19	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	124	2.46	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	125	6.15	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Betageri	126	5.61	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	127	1.21	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	128	2.4	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	129	5.03	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding

Village	SY	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Betageri	130	1.73	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	131	2.4	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	132	0.69	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Betageri	133	7.71	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	1 Farm Pond	IIes	Graded bunding
Betageri	134	1.5	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	163	0.91	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Betageri	164	1	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Betageri	165	3.48	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Betageri	166	3.3	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Betageri	167	2.59	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land+Current fallow (Fl+Cf)	Not Available	IIes	Graded bunding
Betageri	168	2.92	HDLmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	169	2.83	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Betageri	170	9.51	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Betageri	171	9.14	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Betageri	172	5.95	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Betageri	173	2.55	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Betageri	176	0.15	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land+Current fallow (Fl+Cf)	Not Available	IIes	Graded bunding
Betageri	177	4.77	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	178	2.99	RNKmB2 g1	LMU-2	Moderately shallow (50-75 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Betageri	179	3.1	DRLmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow (Cf)	Not Available	IIs	Graded bunding
Betageri	180	7.02	DRLmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Fallow land (Cf+Fl)	1 Farm Pond	IIs	Graded bunding
Betageri	181	2.77	DRLmB1	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Fallow land (Cf+Fl)	Not Available	IIs	Graded bunding
Bikanahalli	65	0.16	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram+Bengalgram +Sunflower (Rg+Bg+Sf)	Not Available	IIs	Graded bunding
Bikanahalli	66	2.74	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize+Sunflower (Mz+Sf)	Not Available	IIs	Graded bunding

Village	SY	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bikanahalli	67	2.41	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bengalgram+Redgram (Bg+Rg)	Not Available	IIs	Graded bunding
Bikanahalli	73	0.001	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Bisarahalli	145	2.13	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	146	2.34	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	147	0.93	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	148	0.91	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	149	3.18	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	150	0.49	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Bajra+Redgram+Current fallow (Bj+Rg+Cf)	Not Available	IIs	Graded bunding
Bisarahalli	210	2.01	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Bisarahalli	211	5.54	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower+Chilli (Sf+Ch)	Not Available	IIs	Graded bunding
Bisarahalli	212	7.46	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Chilli+Current fallow+Fallow land (Ch+Cf+Fl)	Not Available	IIes	Graded bunding
Bisarahalli	213	1.84	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	214	1.58	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	215	0.05	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Bisarahalli	216	5.63	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	217	7.75	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	218	3.23	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	219	4.34	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	Graded bunding
Bisarahalli	220	5.33	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	221	4.66	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	222	5.09	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	223	4.1	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	224	3.86	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	225	3.06	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding

Village	SY	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bisarahalli	226	3.11	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Sunflower (Jw+Sf)	Not Available	IIes	Graded bunding
Bisarahalli	227	9.95	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Bisarahalli	228	3.03	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	229	3.37	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	230	7.12	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	231	3.35	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	232	0.41	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	233	0.49	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	234	0.84	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	235	1.25	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	236	3.68	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	237	6.01	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	238	3.45	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	239	3.85	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Bisarahalli	240	6.63	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Bisarahalli	241	0.81	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	265	0.39	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land+Current fallow (Fl+Cf)	Not Available	IIes	Graded bunding
Bisarahalli	266	4.55	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Bisarahalli	267	3.98	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Currentfallow+Sunflower (Cf+Sf)	Not Available	IIs	Graded bunding
Bisarahalli	268	3.37	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower+Redgram (Sf+Rg)	Not Available	IIs	Graded bunding
Bisarahalli	269	3.17	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	270	4.9	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	271	3.44	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	272	2.69	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding

Village	SY	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Bisarahalli	273	0.21	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	274	4.07	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Fallow land+Redgram (Fl+Rg)	Not Available	IIs	Graded bunding
Bisarahalli	275	2.75	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Bisarahalli	276	3.29	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Bisarahalli	277	5.35	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Currentfallow+Sunflower (Cf+Sf)	Not Available	IIs	Graded bunding
Bisarahalli	278	2.71	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower+Redgram (Sf+Rg)	Not Available	IIs	Graded bunding
Bisarahalli	280	1.3	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Current fallow+Maize (Cf+Mz)	Not Available	IIs	Graded bunding
Bisarahalli	281	4.69	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Current fallow (Cf)	Not Available	IIs	Graded bunding
Bisarahalli	282	2.88	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower+Chilli (Sf+Ch)	Not Available	IIs	Graded bunding
Bisarahalli	283	4.6	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Sunflower (Cf+Sf)	Not Available	IIes	Graded bunding
Bisarahalli	284	4.67	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Graded bunding
Bisarahalli	285	4.09	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land+Redgram (Fl+Rg)	Not Available	IIes	Graded bunding
Bisarahalli	286	1.53	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower (Sf)	Not Available	IIs	Graded bunding
Bisarahalli	287	0.61	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Currentfallow+Sunflower (Cf+Sf)	Not Available	IIs	Graded bunding
Bisarahalli	288	0.43	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Redgram (Rg)	Not Available	IIs	Graded bunding
Bisarahalli	289	0.63	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Bisarahalli	290	3.18	GRHmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Graded bunding
Bisarahalli	291	3.15	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIs	Graded bunding
Bisarahalli	292	0.001	GRHmA1	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Nearly level (0-1%)	Slight	Sunflower+Maize (Sf+Mz)	Not Available	IIs	Graded bunding

Appendix II

Katarki west-1 (2R1f) Microwatershed

Soil Fertility Information

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Gudlanura	148	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	149	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	150	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	151	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	152	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	157	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	158	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	159	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	160	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	161	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	162	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	163	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	164	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	165	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	166	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	167	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	168	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	169	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	170	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	171	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	172	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Gudlanura	173	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Gudlanura	**175**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**176**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**177**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**178**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**179**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**180**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**181**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**182**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**183**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**184**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Gudlanura	**185**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**High (> 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**91**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Medium (0.5 – 0.75 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**92**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Medium (0.5 – 0.75 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**119**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**120**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**121**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**122**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**123**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**124**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**125**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**126**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Low (< 0.5 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**127**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**128**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Low (< 0.5 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**
Betageri	**129**	**Very strongly alkaline (pH > 9.0)**	**Non saline (<2 dsm)**	**Medium (0.5 – 0.75 %)**	**Low (< 23 kg/ha)**	**Medium (145 – 337 kg/ha)**	**Low (<10 ppm)**	**Medium (0.5 – 1.0 ppm)**	**Deficient (< 4.5 ppm)**	**Sufficient (> 1.0 ppm)**	**Sufficient (> 0.2 ppm)**	**Deficient (< 0.6 ppm)**

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Betageri	130	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	131	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	132	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	133	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	134	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	163	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	164	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	165	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	166	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	167	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	168	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	169	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	170	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	171	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	172	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	173	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	176	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	177	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	178	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	179	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	180	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Betageri	181	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bikanahalli	65	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bikanahalli	66	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bikanahalli	67	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bikanahalli	73	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	145	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	146	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	147	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	148	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	149	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	150	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	210	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	211	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	212	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	213	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	214	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	215	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	216	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	217	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	218	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	219	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	220	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	221	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	222	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	223	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	224	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	225	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bisarahalli	226	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	227	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	228	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	229	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	230	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	231	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	232	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	233	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	234	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	235	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	236	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	237	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	238	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	239	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	240	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	241	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	265	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	266	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	267	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	268	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	269	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	270	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	271	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	272	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bisarahalli	273	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	274	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	275	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	276	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	277	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	278	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	280	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	281	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	282	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	283	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	284	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	285	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	286	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	287	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	288	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	289	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	290	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	291	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bisarahalli	292	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Appendix III

Katarki west-1 (2R1f) Microwatershed

Soil Suitability Information

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Gudlanura	148	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Gudlanura	149	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	150	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	151	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	152	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	157	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	158	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3t	S2t	S2t	S2rt	S2t	S3t	S2tz	S2tz	S3t	S2rt	S2t	S3tz
Gudlanura	159	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	160	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	161	S3tz	S3tz	S3tz	S2z	S3tz	S2z	S2tz	S2z	S2z	S2z	S2z	S2z	S3tz	S2z	N1tz	S2tz	S2z	S3tz	S3tz	S2z	S2tz	S2tz	S2tz	S2z	S2tz	S3tz	S2tz	S2z	S2tz	S3tz	S3tz
Gudlanura	162	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	163	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	164	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	165	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	166	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	167	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	168	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	169	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	170	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Gudlanura	171	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	172	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	173	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	175	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	176	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Gudlanura	177	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	178	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	179	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Gudlanura	180	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	181	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	182	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	183	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Gudlanura	184	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Gudlanura	185	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Betageri	91	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	92	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	119	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	120	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	121	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	122	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	123	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	124	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	125	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	126	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	127	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	128	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	129	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	130	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	131	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	132	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	133	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Betageri	134	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	163	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	164	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	165	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	166	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	167	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	168	S3t	S2t	S3t	S1	S3t	S1	S2rt	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2tz	S2tz	S2t	S2t	S2t	S3tz
Betageri	169	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	170	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	171	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	172	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	173	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	176	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	177	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	178	N1rz	S2tz	S3rz	S2rz	S3tz	S2rz	N1rz	S3rz	S2rz	S3rz	S3rz	S2rz	S3tz	S2rz	N1tz	S3tz	S3rz	S3tz	S3tz	S3tz	S2rz	S2rz	S3rz	S2tz	S2rz	S2rt	S2rt	S3rz	S3rz	S3rz	S3tz
Betageri	179	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Betageri	180	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Betageri	181	S3rz	S2tz	S3tz	S2nz	S3tz	S2rz	S3rz	S2rz	S2rz	S2rz	S3rz	S2tz	S3tz	S2z	N1tz	S3rz	S2rz	S3tz	S3tz	S3tz	S2tz	S2tz	S2rt	S2tz	S3tz	S2tz	S2tz	S2z	S2rz	S2tz	S3tz
Bikanahalli	65	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bikanahalli	66	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bikanahalli	67	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bikanahalli	73	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	145	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	146	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	147	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	148	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Bisarahalli	149	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	150	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	210	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	211	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	212	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	213	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	214	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	215	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	216	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	217	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	218	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	219	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	220	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	221	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	222	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	223	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	224	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	225	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	226	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	227	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	228	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	229	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	230	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	231	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	232	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	233	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Bisarahalli	234	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	235	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	236	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	237	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	238	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	239	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	240	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	241	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	265	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	266	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	267	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	268	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	269	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	270	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	271	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	272	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	273	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	274	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	275	S3rt	S2tz	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S2t	S3tw	S2tz	S2tz	S3t	S2rt	S2tw	S3tz
Bisarahalli	276	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	277	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	278	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	280	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	281	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	282	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	283	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Bhendi	Brinjal	Crossandra	Drumstick	Mulberry	Onion
Bisarahalli	284	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	285	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	286	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	287	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	288	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	289	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	290	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	291	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t
Bisarahalli	292	S3t	S2t	S3t	S1	S3t	S1	S2r	S1	S1	S1	S2t	S2t	S3t	S1	N1t	S2rt	S1	S3t	S3t	S3t	S2t	S2t	S2t	S2t	S3t	S2t	S2t	S3t	S2t	S2t	S3t

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

FINDINGS OF THE SOCIO-ECONOMIC SURVEY

- *The survey was conducted in Katarki West-1 is located at North latitude 15^0 15' 40.732" and 15^0 14' 2.333" and East longitude 76^0 4' 10.044" and 76^0 2' 3.61" covering an area of about 485.27 ha coming under Bettageri, Bisarahalli and Gudlanura villages of Koppal taluk.*
- *Socio-economic analysis of Katarki West-1 micro watersheds of Katarki sub-watershed, Koppala taluk & District indicated that, out of the total sample of 39 total respondents, 10 (25.64 %) were marginal, 11 (28.21%)were small, 9 (23.08 %) were Semi medium and 4 (10.26 %) were medium farmers.*
- *The population characteristics of households indicated that, there were 90 (52.63%) men and 81 (47.37 %) were women.*
- *Majority of the respondents (36.26%) were in the age group of 16-35 years.*
- *Education level of the sample households indicated that, there were 25.15 per cent illiterates, 71.92 per cent pre university education and 8.19 per cent attained graduation.*
- *About, 89.74 per cent of household heads practicing agriculture and 10.26 per cent of the household heads were engaged as agricultural labourers.*
- *Agriculture was the major occupation for 26.32 per cent of the household members.*
- *In the study area, 66.67 per cent of the households possess katcha house and 15.38 per cent possess pucca house.*
- *The durable assets owned by the households showed that, 82.05 per cent possess TV, 23.08 per cent possess mixer grinder, 76.92 per cent possess mobile phones and 30.77 per cent possess motor cycles.*
- *Farm implements owned by the households indicated that, 7.69 per cent of the households possess plough, 2.56 per cent possess tractor, 12.82 per cent possess bullock cart and 5.13 per cent possess sprayer.*
- *Regarding livestock possession by the households, 5.13 per cent possess local cow.*
- *The average labour availability in the study area showed that, own men and women labour availability in the micro watershed was 11.32 each, while the hired labour (men) availability was 1.55.*
- *Further, 94.87 per cent of the households opined that hired labour was inadequate during the agricultural season.*
- *Out of the total land holding of the sample respondents 79.69 per cent (60.34 ha) of the area is under dry condition and the remaining 20.31 per cent area is irrigated land.*
- *There were 5 live bore wells and 6 dry bore wells among the sampled households.*

- *Bore/open well was the major source of irrigation for 17.94 per cent of the households.*
- *The major crops grown by sample farmers are Maize, Sunflower, Onion, Bengal gram and Groundnut and cropping intensity was recorded as 94.31 per cent.*
- *Out of the sample households 76.92 percent possessed bank account and 76.92 per cent of them have savings in the account.*
- *About 76.92 per cent of the respondents borrowed credit from various sources.*
- *The per hectare cost of cultivation for Maize, Sunflower, Onion, Bengal gram and Groundnut was Rs.31759.16, 41360.34, 27869.68, 20719.38 and 45897.68 with benefit cost ratio of 1:1.50, 1: 1, 1: 1.80, 1: 2.10 and 1:0.90 respectively.*
- *Further, 10.26 per cent of the households opined that dry fodder was adequate and 2.56 per cent of the households have opined that the green fodder was adequate.*
- *The average annual gross income of the farmers was Rs. 66071.79 in micro-watershed, of which Rs. 54379.49 comes from agriculture.*
- *Sampled households have grown 43 horticulture trees and 57 forestry trees together in the fields and back yards.*
- *Households have an average investment capacity of Rs. 1307.69 for land development and Rs. 230.77 for irrigation facility.*
- *Source of funds for additional investment is concerned, 2.56 per cent depends on bank loan for land development activities.*
- *Regarding marketing channels, 28.21 per cent of the households have sold agricultural produce to the local/village merchants, while, 58.97 per cent have sold in regulated markets.*
- *Further, 79.49 per cent of the households have used tractor for the transport of agriculture commodity.*
- *Majority of the farmers (76.92%) have experienced soil and water erosion problems in the watershed and 74.36 per cent of the households were interested towards soil testing.*
- *Fire was the major source of fuel for domestic use for 100 per cent of the households.*
- *Piped supply was the major source for drinking water for 87.18 per cent of the households.*
- *Electricity was the major source of light for 100 per cent of the households.*
- *In the study area, 100 per cent of the households possess toilet facility.*
- *Regarding possession of PDS card, 97.44 per cent of the households possessed BPL card and 2.56 per cent of the household's possessed APL card.*
- *Households opined that, the requirement of cereals (89.74%), pulses (53.85%) and oilseeds (25.64%) are adequate for consumption.*

- *Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (74.36%) wild animal menace on farm field (53.85%), frequent incidence of pest and diseases (51.28%), inadequacy of irrigation water (17.95%), high cost of fertilizers and plant protection chemicals (35.90%), high rate of interest on credit (10.26%), low price for the agricultural commodities (15.38%), lack of marketing facilities in the area (23.08%), inadequate extension services (17.95%), lack of transport for safe transport of the agricultural produce to the market (51.28%), Less rainfall (71.79%) and Source of Agri-technology information (Newspaper/ TV/Mobile) (38.46%).*

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.

World Bank funded KWDP II, SUJALA III project was implemented in with Broad objective of demonstrating more effective watershed management through greater integration of programmes related to rain-fed agriculture, innovative and science based approaches and strengthen institutional capacities and If successful, it is expected that the systems and tools could be mainstreamed into the overall IWMP in the State of Karnataka and in time, throughout other IWMP operations in India. With this background the socio-economic survey has been carried out with following specific objectives:

1. To understand the demographic features of the households in the micro-watershed
2. To understand the extent of family labour available and additional employment opportunities available within the village.
3. To know the status of assets of households in the micro-watershed for suggesting possible improvements.
4. To study the cropping pattern, cropped area and productivity levels of different households in micro-watershed.
5. To determine the type and extent of livestock owned by different categories of HHs
6. Availability of fodder and level of livestock management.

Scope and importance of survey

Survey helps in identification of different socio-economic and resource use-patterns of farmers at the Micro watershed. Household survey provides demographic features, labour force, and levels of education; land ownership and asset position (including livestock and other household assets) of surveyed households; and cropping patterns, input intensities, and average crop yields from farmers' fields. It also discusses crop utilization and the degree of commercialization of production in the areas; farmers' access to and utilization of credit from formal and informal sources; and the level of adoption and use of soil, water,and pest management technologies.

Chapter 3

METHODOLOGY

The description of the methods, components selected for the survey and procedures followed in conducting the baseline survey are furnished under the following heads.

1. Description of the study area

Koppal district is an administrative district in the state of Karnataka in India. In the past Koppal was referred to as 'Kopana Nagara'. Koppal, now a district headquarters is ancient Kopana a major holy place of the Jainas. The district occupies an area of 7,190 km^2 and has a population of 1,196,089, which 16.58% were urban as of 2001. The Koppal district was formed after split of Raichur district.

Geographers are very particular about the physiography or relief of a region. It plays a very important role in the spatial analysis of agricultural situation of the study area. The undulating topography with black cotton soil shrips, cut across by numerous nalas or streams is the major characteristic feature of the study region. Three physiographic divisions have made considering the local conditions of landforms and crops grown in the district. On the basis of physiography, Koppal district can be divided into three major divisions. They are (a) Koppal & Yelburga plateau, (b) Maidan division, (c) Tungabhadra valley. The district is part of Krishna basin the main streams draining the area are Maskinala, Ilkal-nadi and Hirenala. These are Ephemaral in nature, these come under Tungabhadra sub-basin. The drainage exhibit dentritic to subdentric with drainage density varies from 1.4 to7.0kms/sq.km.

According to the 2011 census Koppal district has a population of 1,391,292, roughly equal to the nation of Swaziland or the US state of Hawaii. This gives it a ranking of 350th in India (out of a total of 640). The district has a population density of 250 inhabitants per square kilometre (650/sq mi). Its population growth rate over the decade 2001-2011 was 16.32%.Koppal has a sex ratio of 983 females for every 1000 males, and a literacy rate of 67.28%.

2. Locale of the survey and description of the micro-watershed and

The study was conducted in Katarki West-1 micro-watershed (Katarki sub-watershed, Koppala taluk & District) is located at North latitude 15^0 15’ 40.732” and 15^0 14’ 2.333” and East longitude 76^0 4’ 10.044" and 76^0 2’ 3.61” covering an area of about 485.27 ha bounded by under Bettageri, Bisarahalli and Gudlanura Villages.

3. Selection of the respondents for the study

The micro-watershed is marked with 320 square meters grids. One farmer from every alternate grid in the micro-watershed was selected for the study and interviewed for socio-economic data. Totally 39 households were interviewed for the survey.

4. The parameters considered for socio-economic survey of households

Two forms of data were collected from the micro-watershed which includes primary data from the farm households and secondary data about the villages under the micro-watershed jurisdiction.

The following parameters were considered for the primary data collection about the socio-economic data of the households, (1) Demographic information, (2) Farm and durable assets owned by households, (3) Livestock possession, (4) Labour availability, (5) Level of migration in the village, Land holding, (7) Cropping pattern, (8) Source of irrigation, (9) Borrowing status, (10) Cost of cultivation of major crops, (11) Economics of subsidiary activities, (12) Fodder availability, (13) Family annual income from different sources, (14) Horticulture and forestry species grown, (15) Additional investment capacity, (16) Marketing practices, (17) Status of soil and water conservation structure, (18) Access to basic needs and (19) Constraints and suggestion.

The following parameters were considered for the secondary data regarding the villages under the micro-watershed jurisdiction, (1) Number of villages in each micro-watershed jurisdiction, (2) Village wise number of households, (3) Geographical area of the villages, (4) Cultivable are a including rainfed and irrigated, (5) Number and type of house in each village, (6) Human and livestock population, (7) Facilities in the village such as roads, transport facility for conveyance, drinking water supply, street light and (8) Community based organizations in the villages.

5. Development of interview schedule and data collection

Taking into the consideration the objectives of the survey, an interview schedule was prepared after thorough consultation with the experts in the field of social sciences. A comprehensive interview schedule covering all the major parameters for measuring the socio-economic situation was developed.

6. Tools used to analyze the data

The statistical components such as frequency and percentage were used to analyze the data.

Abbreviations used in the report

LL=Landless
MF=Marginal Farmers
SF=Small farmers
SMF=Semi medium farmers
MDF=Medium farmers
LF=Large Farmers

FINDINGS OF THE SURVEY

This chapter deals with systematic presentation of results of the survey. Keeping in view the objectives, the salient features of the survey are presented under the following headings.

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Katarki West-1 Micro watershed is presented in Table 1 and it indicated that 39 farmers were sampled in Katarki West-1 micro-watershed among households surveyed 10 (25.64%) were marginal, 11 (28.21%) were small, 9 (23.08 %) were semi medium, 4 (10.26 %) were medium and 0 (0 %) were large farmers. 5 landless farmers were also interviewed for the survey.

Table 1. Households sampled for socio economic survey in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	12.8	10	25.6	11	28.2	9	23.1	4	10.3	39	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Katarki West-1 Micro watershed is presented in Table 2. The data indicated that, there were 90 (52.63%) men and 81 (47.37%) were women.

Table 2. Population characteristics in Katarki West-1 micro-watershed

Sl. No.	Particulars	LL (17)		MF (41)		SF (56)		SMF (39)		MDF (18)		All (171)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	8	47.1	23	56	29	52	23	59	7	38.9	90	52.6
2	Women	9	52.9	18	44	27	48	16	41	11	61.1	81	47.4
Total		17	100	41	100	56	100	39	100	18	100	171	100
Average		3.4		4.1		5.1		4.3		4.5		4.4	

Age wise classification of population: The age wise classification of household members in Katarki West-1 Micro watershed is presented in Table 3. The indicated that, 33 (19.30%) of population were 0-15 years of age, 62 (36.26%) were 16-35 years of age, 57(33.33%) were 36-60 years of age and 19 (11.11 %) were above 61 years of age.

Table 3: Age wise classification of members of the household in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (17)		MF (41)		SF (56)		SMF (39)		MDF (18)		All (171)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	4	23.5	7	17.1	8	14.3	7	17.95	7	39	33	19.3
2	16-35 years of age	3	17.7	14	34.2	25	44.6	17	43.59	3	17	62	36.26
3	36-60 years of age	8	47.1	13	31.7	19	33.9	12	30.77	5	28	57	33.33
4	> 61 years	2	11.8	7	17.1	4	7.14	3	7.69	3	17	19	11.11
Total		17	100	41	100	56	100	39	100	18	100	171	100

Education level of household members: Education level of household members in Katarki West-1 Micro watershed is presented in Table 4. The results indicated that, there were 25.15 per cent of illiterates, 30.99 per cent of them had primary school education, 6.43 per cent middle school education, 16.96 per cent high school education, 8.77 per cent of them had PUC education, 8.19 per cent attained graduation, 0.58 per cent attained ITI, 1.17 per cent attained masters education and 1.75 them had other education.

Table 4. Education level of members of the household in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (17)		MF (41)		SF (56)		SMF (39)		MDF (18)		All (171)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	3	17.7	12	29.3	14	25	9	23.1	5	27.78	43	25.2
2	Primary School	7	41.2	10	24.4	21	37.5	8	20.5	7	38.89	53	31
3	Middle School	0	0	1	2.44	3	5.36	5	12.8	2	11.11	11	6.43
4	High School	2	11.8	10	24.4	10	17.9	5	12.8	2	11.11	29	17
5	PUC	3	17.7	2	4.88	4	7.14	5	12.8	1	5.56	15	8.77
6	ITI	0	0	0	0	0	0	1	2.56	0	0	1	0.58
7	Degree	2	11.8	4	9.76	3	5.36	4	10.3	1	5.56	14	8.19
8	Masters	0	0	0	0	1	1.79	1	2.56	0	0	2	1.17
9	Others	0	0	2	4.88	0	0	1	2.56	0	0	3	1.75
Total		17	100	41	100	56	100	39	100	18	100	171	100

Occupation of head of households: The data regarding the occupation of the household heads in Katarki West-1 Micro watershed is presented in Table 5. The results indicate that, 89.74 per cent of household's heads were practicing agriculture and 10.26 per cent of the household heads were agricultural Labour.

Table 5: Occupation of heads of households in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	2	40	10	100	11	100	8	89	4	100	35	89.74
2	Agricultural Labour	3	60	0	0	0	0	1	11	0	0	4	10.26
Total		5	100	10	100	11	100	9	100	4	100	39	100

Table 6: Occupation of members of the household in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (17)		MF (41)		SF (56)		SMF (39)		MDF (18)		All (171)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	2	11.8	16	39	12	21.43	10	25.64	5	28	45	26.3
2	Agricultural Labour	12	70.6	20	48.8	33	58.93	18	46.15	6	33	89	52.1
3	Student	3	17.7	2	4.88	11	19.64	10	25.64	6	33	32	18.7
4	Others	0	0	0	0	0	0	0	0	1	5.6	1	0.58
5	Housewife	0	0	1	2.44	0	0	0	0	0	0	1	0.58
6	Children	0	0	2	4.88	0	0	1	2.56	0	0	3	1.75
Total		17	100	41	100	56	100	39	100	18	100	171	100

Occupation of the members of the household: The data regarding the occupation of the household members in Katarki West-1 Micro watershed is presented in Table 6. The results indicate that, agriculture was the major occupation for 26.32 per cent of the household members, 52.05 per cent were agricultural labour, 18.71 per cent were working in pursuing education, 0.58 per cent were involved as housewife and 1.75 per cent were children's.

Institutional Participation of household members: The data regarding the institutional participation of the household members in Katarki West-1 Micro watershed is presented in Table 7. The results show that, out of the total family members in the households 100 per cent were not participating in any of the institutions.

Table 7: Institutional Participation of household member in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (17)		MF (41)		SF (56)		SMF (39)		MDF (18)		All (171)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	17	100	41	100	56	100	39	100	18	100	171	100
Total		17	100	41	100	56	100	39	100	18	100	171	100

Type of house owned: The data regarding the type of house owned by the households in Katarki West-1 Micro watershed is presented in Table 8. The results indicate that, 20.51 percent possess thatched house, 66.67 per cent of the households possess katcha house and 15.38 per cent possess pacca house.

Table 8. Type of house owned by households in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	1	20	4	40	0	0	2	22.2	1	25	8	20.51
2	Katcha	3	60	5	50	11	100	4	44.4	3	75	26	66.67
3	Pucca/RCC	1	20	1	10	0	0	3	33.3	1	25	6	15.38
Total		5	100	10	100	11	100	9	100	5	100	40	100

Durable assets owned by the households: The data regarding the Durable Assets owned by the households in Katarki West-1 Micro watershed is presented in Table 9. The results shows that, 82.05 per cent possess TV, 2.56 per cent possess DVD/VCD player, 23.08 per cent possess mixer grinder, 12.82 per cent possess Bicycle, 30.77 per cent possess motor cycle and 76.92 per cent possess mobile phones.

Table 9. Durable assets owned by households in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	5	100	8	80	8	72.7	7	78	4	100	32	82.05
2	DVD/VCD Player	0	0	1	10	0	0	0	0	0	0	1	2.56
3	Mixer/Grinder	1	20	2	20	1	9.09	4	44	1	25	9	23.08
4	Bicycle	0	0	2	20	0	0	2	22	1	25	5	12.82
5	Motor Cycle	1	20	2	20	3	27.3	4	44	2	50	12	30.77
6	Mobile Phone	4	80	8	80	7	63.6	7	78	4	100	30	76.92
7	Blank	0	0	1	10	2	18.2	2	22	0	0	5	12.82

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Katarki West-1 Micro watershed is presented in Table 10. The result shows that, the average value of television was Rs.6296, DVD/VCD player was Rs.2000, mixer grinder was Rs.1966, bicycle was Rs.1100, motor cycle was Rs. 25333 and mobile phone was Rs.2646.

Table 10. Average value of durable assets owned in Katarki West-1 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Television	4000	7750	6125	7000	5375	6296
2	DVD/VCD Player	0	2000	0	0	0	2000
3	Mixer/Grinder	1000	2250	2000	1925	2500	1966
4	Bicycle	0	1500	0	866	1000	1100
5	Motor Cycle	25000	30000	18000	27500	27500	25333
6	Mobile Phone	5250	2500	2812	2358	1533	2646

Farm implements owned: The data regarding the farm implements owned by the households in Katarki West-1 Micro watershed is presented in Table 11. About 12.82 per cent of the households possess Bullock Cart, 7.69 per cent possess plough, 5.13 per cent possess Sprayer, 17.95 per cent possess Weeder and 2.56 per cent possess tractor.

Table 11. Farm implements owned in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	1	10	3	27.27	0	0	1	25	5	12.82
2	Plough	0	0	0	0	1	9.09	0	0	2	50	3	7.69
3	Tractor	0	0	1	10	0	0	0	0	0	0	1	2.56
4	Sprayer	0	0	0	0	0	0	1	11.1	1	25	2	5.13
10	Weeder	0	0	0	0	3	27.27	3	33.3	1	25	7	17.95
11	Blank	5	100	8	80	6	54.55	6	66.7	2	50	27	69.23

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Katarki West-1 Micro watershed is presented in Table 12. The results show that the average value of plough was Rs.2166, bullock Cart was Rs.24200, seed/fertilizer drill was Rs.3000, weeder was Rs.58 and tractor was Rs. 700000.

Table 12. Average value of farm implements in Katarki West-1 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Bullock Cart	0	20000	25333	0	25000	24200
2	Plough	0	0	2500	0	2000	2166
3	Tractor	0	700000	0	0	0	700000
4	Sprayer	0	0	0	3000	3000	3000
5	Weeder	0	0	50	64	50	58

Livestock possession by the households: The data regarding the Livestock possession by the households in Katarki West-1 Micro watershed is presented in Table 13. The results indicate that, 12.82 per cent of the households possess bullocks, 5.13 per cent possess local cow and crossbred cow.

Table 13. Livestock possession by households in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	0	0	3	27.27	0	0	2	50	5	12.82
2	Local cow	0	0	1	10	1	9.09	0	0	0	0	2	5.13
3	Crossbred cow	0	0	0	0	0	0	0	0	2	50	2	5.13

Average Labour availability: The data regarding the average labour availability in Katarki West-1 Micro watershed is presented in Table 14. The indicated that, own labour men available in the micro watershed was 1.55, women available in the micro watershed was 1.44, hired labour (men) available was 9.6 and hired labour (women) available was 9.88.

Table 14. Average labour availability in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Hired labour Female	1.6	9.82	11.82	11.22	12	9.88
2	Own Labour Female	1.2	2.4	1.18	1	1	1.44
3	Own labour Male	1	2.18	1.55	1.33	1	1.55
4	Hired labour Male	1.6	9.18	11.91	10.67	12	9.6

Adequacy of hired labour: The data regarding the adequacy of hired labour in Katarki West-1 Micro watershed is presented in Table 15. The results indicate that, 7.69 per cent of the household opined that hired labour was adequate and 94.87 per cent of the household opined that hired labour was Inadequate.

Table 15. Adequacy of hired labour in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	1	10	0	0	1	11.1	1	25	3	7.69
2	Inadequate	5	100	10	100	11	100	8	88.9	3	75	37	94.9

Distribution of land (ha): The data regarding the distribution of land (ha) in Katarki West-1 Micro watershed is presented in Table 16. The results indicate that, 48.08 ha (79.69%) of dry land and 12.25 ha (20.31 %) of irrigated land.

Table 16. Distribution of land (ha) in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dry	0	0	6.22	93.89	16.12	100	15.84	83.03	9.9	53.5	48.08	79.69
2	Irrigated	0	0	0.4	6.11	0	0	3.24	16.97	8.61	46.5	12.25	20.31
	Total	0	100	6.62	100	16.12	100	19.08	100	18.52	100	60.34	100

Average value of land (ha): The data regarding the average land value (Rs./ha) in Katarki West-1 Micro watershed is presented in Table 17. The results show that the average value of dry land was Rs.255710.84 and the average value of irrigated land was Rs.212088.49.

Table 17. Average value of land (ha) in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Dry	0	514248.9	279131.1	170344.8	191785.9	255710.8
2	Irrigated	0	988000	0	401375	104466.1	212088.5

Status of bore wells: The data regarding the status of bore wells in Katarki West-1 Micro watershed is presented in Table 18. The results indicate that, there were 6 De-functioning bore wells and 5 functioning bore wells among the sampled households in micro watershed.

Table 18. Status of bore wells in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	De-functioning	0	0	0	3	3	6
2	Functioning	0	1	0	2	2	5

Source of irrigation: The data regarding the source of irrigation in Katarki West-1 Micro watershed is presented in Table 19. The results that bore well were major source of irrigation for 12.82 per cent of the households, canal and tank for 2.86 per cent of the households.

Table 19. Source of irrigation in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	1	10	0	0	2	22.2	2	50	5	12.82
2	Canal	0	0	0	0	0	0	0	0	1	25	1	2.56
3	Tank	0	0	0	0	0	0	0	0	1	25	1	2.56

Depth of water (Avg. In meters): The data regarding the depth of water in Katarki West-1 Micro watershed is presented in Table 20. The results revealed that, the depth of bore well was 6.49 meter.

Table 20. Depth of water (Avg. In meters) in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Bore Well	0	10.67	0	9.48	15.24	6.49

Irrigated Area (ha): The data regarding the irrigated area (ha) in Katarki West-1 Micro watershed is presented in Table 21. The results indicate that, the availability of irrigation water was used for kharif crops was 9.52 ha.

Table 21. Irrigated Area (ha) in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Kharif	0	0.4	0	3.24	5.87	9.52
Total		0	0.4	0	3.24	5.87	9.52

Cropping pattern: The data regarding the cropping pattern in Katarki West-1 Micro watershed is presented in Table 22. The results indicate that, farmers have grown maize (28.68 ha), sorghum (5.76 ha), onion (5.11 ha), Bengal gram (3.80 ha), groundnut (2.02 ha), bajra (1.36 ha) and red gram (0.81 ha).

Table 22. Cropping pattern in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Kharif - Maize	0	3.96	10.27	8.58	5.87	28.68
2	Kharif - Sorghum	0	1.89	2.98	0.89	0	5.76
3	Kharif - Onion	0	0	1.32	3.79	0	5.11
4	Kharif - Bengal gram	0	0	0	3.8	0	3.8
5	Kharif - Groundnut	0	0	0	2.02	0	2.02
6	Kharif - Bajra	0	0	1.36	0	0	1.36
7	Kharif - Red gram	0	0.81	0	0	0	0.81

Cropping intensity: The data regarding the cropping intensity in Katarki West-1 Micro watershed is presented in Table 23. The results indicate that, the cropping intensity was 94.31 per cent.

Table 23. Cropping intensity (%) in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Cropping Intensity	0	89.86	100.08	90.07	100	94.31

Possession of bank account and savings: The data regarding the possession of bank account and saving in Katarki West-1 micro-watershed is presented in Table 24. The results indicate that, 76.92 cent of the household's posses bank account and savings.

Table 24. Possession of Bank account and savings in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0	9	90	11	100	7	77.78	3	75	30	76.92
2	Savings	0	0	9	90	11	100	7	77.78	3	75	30	76.92

Borrowing status: The data regarding the borrowing status in Katarki West-1 micro-watershed is presented in Table 25. The results indicate that, 76.92 percent of the sample farmers have borrowed credit from different sources.

Table 25. Borrowing status in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0	9	90	11	100	7	77.8	3	75	30	76.92

Cost of Cultivation of Maize: The data regarding the cost of cultivation (Rs/ha) of Maize in Katarki West-1 micro watershed is presented in Table 26.a. The results indicate that, the total cost of cultivation (Rs/ha) for Maize was Rs. 31759.16. The gross income realized by the farmers was Rs. 47569.53. The net income from Maize cultivation was Rs.15810.36, thus the benefit cost ratio was found to be 1:1.50.

Table 26(a). Cost of Cultivation of Maize in Katarki West-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	48.73	10682.3	33.64
2	Bullock		Pairs/day	0.93	500.77	1.58
3	Tractor		Hours	2.98	2238.56	7.05
4	Machinery		Hours	0.18	106.88	0.34
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	16.96	1910.5	6.02
7	FYM		Quintal	9.27	1664.26	5.24
8	Fertilizer + micronutrients		Quintal	3.68	2793.92	8.8
9	Pesticides (PPC)		Kgs/liters	1.78	4134.56	13.02
13	Depreciation charges			0	100.59	0.32
14	Land revenue and Taxes			0	0.25	0
II	**Cost B1**					
16	Interest on working capital				1261.48	3.97
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				25394.05	79.96
III	**Cost B2**					
18	Rental Value of Land				186.67	0.59
19	**Cost B2 = (Cost B1 + Rental value)**				25580.72	80.55
IV	**Cost C1**					
20	Family Human Labour			12.25	3282.2	10.33
21	**Cost C1 = (Cost B2 + Family Labour)**				28862.92	90.88
V	**Cost C2**					
22	Risk Premium				9.05	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				28871.97	90.91
VI	**Cost C3**					
24	Managerial Cost				2887.2	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				31759.16	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		37.77	45324.41	
		b) Main Crop Sales Price (Rs.)			1200	
	By Product	e) Main Product (q)		29.93	2245.12	
		f) Main Crop Sales Price (Rs.)			75	
b.	Gross Income (Rs.)				47569.53	
c.	Net Income (Rs.)				15810.36	
d.	Cost per Quintal (Rs./q.)				840.85	
e.	Benefit Cost Ratio (BC Ratio)				1:1.5	

Cost of Cultivation of Sunflower: The data regarding the cost of cultivation (Rs/ha) of Sunflower in Katarki West-1 micro watershed is presented in Table 26.b. The results indicate that, the total cost of cultivation (Rs/ha) for Sunflower was Rs. 41360.34. The gross income realized by the farmers was Rs. 42750. The net income from Sunflower cultivation was Rs.1389.66, thus the benefit cost ratio was found to be 1:1.

Table 26(b). Cost of Cultivation of Sunflower in Katarki West-1 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	83.6	18810	45.48
2	Bullock	Pairs/day	0	0	0
3	Tractor	Hours	3.8	2850	6.89
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	3.8	4560	11.03
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	0	0	0
8	Fertilizer + micronutrients	Quintal	3.8	4560	11.03
9	Pesticides (PPC)	Kgs / liters	1.9	1900	4.59
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	0.04	0
14	Land revenue and Taxes		0	0	0
II	**Cost B1**				
16	Interest on working capital			1323.6	3.2
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			34003.64	82.21
III	**Cost B2**				
18	Rental Value of Land			166.67	0.4
19	**Cost B2 = (Cost B1 + Rental value)**			34170.31	82.62
IV	**Cost C1**				
20	Family Human Labour		11.4	3420	8.27
21	**Cost C1 = (Cost B2 + Family Labour)**			37590.31	90.88
V	**Cost C2**				
22	Risk Premium			10	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**			37600.31	90.91
VI	**Cost C3**				
24	Managerial Cost			3760.03	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			41360.34	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	9.5	42750	
		b) Main Crop Sales Price (Rs.)		4500	
b.	Gross Income (Rs.)			42750	
c.	Net Income (Rs.)			1389.66	
d.	Cost per Quintal (Rs./q.)			4353.72	
e.	Benefit Cost Ratio (BC Ratio)			1:1	

Cost of Cultivation of Onion: The data regarding the cost of cultivation (Rs/ha) of Onion in Katarki West-1 micro watershed is presented in Table 26.c. The results indicate, the total cost of cultivation (Rs/ha) for Onion was Rs.27869.68. The gross income realized by the farmers was Rs. 48884.04. The net income from Onion cultivation was Rs. 21014.36, thus the benefit cost ratio was found to be 1:1.80.

Table 26(c). Cost of Cultivation of Onion in Katarki West-1 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	37	7946.92	28.51
2	Bullock	Pairs/day	2.19	1201.75	4.31
3	Tractor	Hours	3.47	2544.85	9.13
4	Machinery	Hours	0.46	275.98	0.99
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	8.55	1924.23	6.9
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	9.2	1839.85	6.6
8	Fertilizer + micronutrients	Quintal	2.45	1786.8	6.41
9	Pesticides (PPC)	Kgs / liters	1.68	3347.84	12.01
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	14.83	0.05
14	Land revenue and Taxes		0	0	0
II	**Cost B1**				
16	Interest on working capital			1069.05	3.84
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			21952.09	78.77
III	**Cost B2**				
18	Rental Value of Land			166.67	0.6
19	**Cost B2 = (Cost B1 + Rental value)**			22118.76	79.36
IV	**Cost C1**				
20	Family Human Labour		12.19	3207.32	11.51
21	**Cost C1 = (Cost B2 + Family Labour)**			25326.07	90.87
V	**Cost C2**				
22	Risk Premium			10	0.04
23	**Cost C2 = (Cost C1 + Risk Premium)**			25336.07	90.91
VI	**Cost C3**				
24	Managerial Cost			2533.61	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			27869.68	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	41.9	48884.04	
		b) Main Crop Sales Price (Rs.)		1166.67	
b.	Gross Income (Rs.)			48884.04	
c.	Net Income (Rs.)			21014.36	
d.	Cost per Quintal (Rs./q.)			665.14	
e.	Benefit Cost Ratio (BC Ratio)			1:1.8	

Cost of Cultivation of Bengal gram: The data regarding the cost of cultivation (Rs/ha) of Bengal gram in Katarki West-1 micro watershed is presented in Table 26.d. The results indicate that, the total cost of cultivation (Rs/ha) for Bengal gram was Rs. 20719.38. The gross income realized by the farmers was Rs.43755.53. The net income from Bengal gram cultivation was Rs. 23036.15, thus the benefit cost ratio was found to be 1:2.10.

Table 26(d). Cost of Cultivation of Bengal gram in Katarki West-1 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	15.98	3395.86	16.39
2	Bullock		Pairs/day	1.65	988	4.77
3	Tractor		Hours	0.58	434.86	2.1
4	Machinery		Hours	0.19	115.96	0.56
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	68.9	8196.61	39.56
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	3.87	773.08	3.73
8	Fertilizer + micronutrients		Quintal	1.21	1104.45	5.33
9	Pesticides (PPC)		Kgs / liters	0.77	579.81	2.8
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	0.24	0
14	Land revenue and Taxes			0	1.65	0.01
II	**Cost B1**					
16	Interest on working capital				1279.13	6.17
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				16869.66	81.42
III	**Cost B2**					
18	Rental Value of Land				250	1.21
19	**Cost B2 = (Cost B1 + Rental value)**				17119.66	82.63
IV	**Cost C1**					
20	Family Human Labour			7.26	1710.64	8.26
21	**Cost C1 = (Cost B2 + Family Labour)**				18830.3	90.88
V	**Cost C2**					
22	Risk Premium				5.5	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				18835.8	90.91
VI	**Cost C3**					
24	Managerial Cost				1883.58	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				20719.38	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		10.18	43755.53	
		b) Main Crop Sales Price (Rs.)			4300	
b.	Gross Income (Rs.)				43755.53	
c.	Net Income (Rs.)				23036.15	
d.	Cost per Quintal (Rs./q.)				2036.16	
e.	Benefit Cost Ratio (BC Ratio)				1:2.1	

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation (Rs/ha) of Groundnut in Katarki West-1 micro watershed is presented in Table 26.e. The results indicate that, the total cost of cultivation (Rs/ha) for Groundnut was Rs.45897.68. The gross income realized by the farmers was Rs. 41835.63. The net income from Groundnut cultivation was Rs. -4062.06, thus the benefit cost ratio was found to be 1:0.90.

Table 26(e). Cost of Cultivation of Groundnut in Katarki West-1 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	38.29	6743.1	14.69
2	Bullock	Pairs/day	3.95	1988.35	4.33
3	Tractor	Hours	1.23	926.25	2.02
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	172.9	18525	40.36
7	FYM	Quintal	23.46	3211	7
8	Fertilizer + micronutrients	Quintal	2.96	2593.5	5.65
9	Pesticides (PPC)	Kgs /liters	1.11	1086.8	2.37
10	Irrigation	Number	0	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	370.5	0.81
14	Land revenue and Taxes		0	2.47	0.01
II	**Cost B1**				
16	Interest on working capital			3050.56	6.65
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			38497.53	83.88
III	**Cost B2**				
18	Rental Value of Land			283.33	0.62
19	**Cost B2 = (Cost B1 + Rental value)**			38780.86	84.49
IV	**Cost C1**				
20	Family Human Labour		13.09	2939.3	6.4
21	**Cost C1 = (Cost B2 + Family Labour)**			41720.16	90.9
V	**Cost C2**				
22	Risk Premium			5	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**			41725.16	90.91
VI	**Cost C3**				
24	Managerial Cost			4172.52	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			45897.68	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	8.03	38130.63	
		b) Main Crop Sales Price (Rs.)		4750	
	By Product	e) Main Product (q)	14.82	3705	
		f) Main Crop Sales Price (Rs.)		250	
b.	Gross Income (Rs.)			41835.63	
c.	Net Income (Rs.)			-4062.06	
d.	Cost per Quintal (Rs./q.)			5717.56	
e.	Benefit Cost Ratio (BC Ratio)			1:0.9	

Adequacy of fodder: The data regarding the adequacy of fodder in Katarki West-1 Micro watershed is presented in Table 27. The results indicate that, 10.26 per cent of the households opined that dry fodder was adequate and 2.56 per cent of them opined dry fodder was inadequate. With respect to green fodder availability and 2.56 percent of them opined it was sufficient.

Table 27. Adequacy of fodder in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	0	0	2	18.18	0	0	2	50	4	10.26
2	Inadequate-Dry Fodder	0	0	0	0	1	9.09	0	0	0	0	1	2.56
3	Adequate-Green Fodder	0	0	0	0	0	0	0	0	1	25	1	2.56

Average annual gross income: The data regarding the annual gross income in Katarki West-1 Micro watershed is presented in Table 28. The results indicate that, the farmers have annual gross income of Rs. 66071.79 in micro-watershed, of which Rs. 54379.49 is from agriculture itself.

Table 28. Average annual gross income in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Service/salary	0	0	0	4444.44	0	1025.64
2	Business	0	0	0	6666.67	1500	1692.31
3	Wage	22000	0	2727.27	6444.44	7000	5794.87
4	Agriculture	5000	30000	57636.4	85644.4	97750	54379.5
5	Dairy Farm	0	2000	1818.18	9333.33	0	3179.49
Income(Rs.)		27000	32000	62181.8	112533	106250	66071.8

Average annual Expenditure: The data regarding the average annual expenditure in Katarki West-1 Micro watershed is presented in Table 29. The results indicate that, the farmers have annual gross expenditure of Rs. 239976.33 in micro-watershed, of which Rs. 22352.56 is from agriculture itself.

Table 29. Average annual Expenditure in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	All (39)
1	Service/salary	0	0	0	20000	0	512.82
2	Business	0	0	0	35000	4000	1000
3	Wage	11750	0	10000	5500	1000	1769.23
4	Agriculture	12000	12000	23090.9	49468.8	22500	22352.6
5	Dairy Farm	0	10000	10000	13666.7	0	1564.1
Total		23750	22000	43090.9	123635	27500	239976

Horticulture species grown: The data regarding horticulture species grown in Katarki West-1 Micro watershed is presented in Table 30. The results indicate that, the total number of horticultural trees grown (both field and backyard) by the sampled households were coconut (42) and Mango (1).

Table 30. Horticulture species grown in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		**All** (39)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	0	0	30	0	0	0	12	0	42	0
2	Mango	0	0	0	0	0	0	0	0	1	0	1	0

***F= Field B=Back Yard**

Forest species grown: The data regarding forest species grown in Katarki West-1 Micro watershed is presented in Table 31. The results indicate that, households have planted 52 neem trees, 5 banyan trees together in both field and backyard.

Table 31. Forest species grown in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		**All** (39)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Neem	0	0	15	0	5	0	9	0	23	0	52	0
2	Banyan	0	0	0	0	3	0	0	0	2	0	5	0

***F= Field B=Back Yard**

Average additional investment capacity: The data regarding average additional investment capacity in Katarki West-1 Micro watershed is presented in Table 32. The results indicate that, households have an average investment capacity of Rs. 1307.69 for land development, Rs. 230.77 for creation of irrigation facility and Rs.692.31 for adoption of improved livestock breeds.

Table 32. Average additional investment capacity of households in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)	MF (10)	SF (11)	SMF (9)	MDF (4)	**All** (39)
1	Land development	0	1100	2181.82	1444.44	750	1307.69
2	Irrigation facility	0	0	272.73	666.67	0	230.77
3	Improved crop production	0	700	1454.55	222.22	500	692.31

Source of funds for additional investment: The data regarding source of funds for additional investment in Katarki West-1 Micro watershed is presented in Table 33. The results indicate that, the sources of finance raised from bank for land development was 5.13 and for crop production was 2.56 per cent. Asset selling for land development and improved crop production was 2.56 per cent. Government subsidy for improved crop production for 2.56 per cent.

Table 33. Source of funds for additional investment in Katarki West-1 micro-watershed

Sl.No	Item	Land development		Improved crop production	
		N	%	N	%
1	Asset selling	1	2.56	1	2.56
2	Government subsidy	0	0	1	2.56
3	Loan from bank	2	5.13	1	2.56

Marketing of agricultural produce: The data regarding marketing of the agricultural produce in Katarki West-1 Micro watershed is presented in Table 34. The results indicated that, 58.33 percent of output of bajra was sold in the market; 68.09 percent of output of Bengal gram was sold in the market; 52 percent of output of groundnut was sold in the market; 97.16 percent of output of maize was sold in the market; 98 per cent of output of onion was sold in the market, 75 per cent of output of red gram was sold in the market, 100 per cent of sunflower was sold in the market and 94 percent of output of sorghum was sold in the market.

Table 34. Marketing of agricultural produce in Katarki West-1 micro-watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	24	10	14	58	1250
2	Bengalgram	47	15	32	68	4300
3	Groundnut	25	12	13	52	4750
4	Maize	1126	32	1094	97	1200
5	Onion	256	5	251	98	1167
6	Redgram	4	1	3	75	4000
7	Sorghum	84	5	79	94	2000
8	Sunflower	5	0	5	100	4500

Marketing channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Katarki West-1 Micro watershed is presented in Table 35. The results indicated that, 28.21 cent of the households have sold agricultural produce to the local/village merchants, 5.13 per per cent have sold to Agent/Traders and 58.97 per cent of regulated market.

Table 35. Marketing channels used for sale of agricultural produce in Katarki West-1 micro-watershed

Sl. No.	**Particulars**	**LL (5)**		**MF (10)**		**SF (11)**		**SMF (9)**		**MDF (4)**		**All (39)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Agent/Traders	0	0	1	10	0	0	1	11.1	0	0	2	5.13
2	Local/village Merchant	0	0	3	30	3	27.3	0	0	5	125	11	28.21
3	Regulated Market	0	0	6	60	8	72.7	8	88.9	1	25	23	58.97

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Katarki West-1 Micro watershed is presented in Table 36. The results indicated that, 79.49 cent of the households have used tractor, 5.13 per cent carry by Head load and 7.69 per cent have used Cart.

Table 36. Mode of transport of agricultural produce in Katarki West-1 micro-watershed

Sl.No.	**Particulars**	**LL (5)**		**MF (10)**		**SF (11)**		**SMF (9)**		**MDF (4)**		**All (39)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Head Load	0	0	1	10	0	0	1	11.1	0	0	2	5.13
2	Cart	0	0	0	0	0	0	0	0	3	75	3	7.69
3	Tractor	0	0	9	90	11	100	8	88.9	3	75	31	79.49

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Katarki West-1 Micro watershed is presented in Table 37. The results indicate that, 76.92 per cent of the households have experienced soil and water erosion problems.

Table 37. Incidence of soil and water erosion problems in Katarki West-1 micro-watershed

Sl. No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF(4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	9	90	10	90.9	8	89	3	75	30	76.9

Interest towards soil testing: The data regarding Interest shown towards soil testing in Katarki West-1 Micro watershed is presented in Table 38. The results indicated that, 74.36 per cent of the households were interested towards soil testing.

Table 38. Interest regarding soil testing in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	8	80	11	100	8	89	2	50	29	74.36

Usage pattern of fuel for domestic use: The data on usage pattern of fuel for domestic use in Katarki West-1 Micro watershed is presented in Table 39. The results indicated that, firewood was the major source of fuel for domestic use for 100 per cent of the households.

Table 39. Usage pattern of fuel for domestic use in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	5	100	10	100	11	100	9	100	4	100	39	100

Source of drinking water: The data on source of drinking water in Katarki West-1 Micro watershed is presented in Table 40. The results indicated that, tank supply of water was the major source for drinking water for 2.56 per cent of the households followed by piped waters supply (87.18 %), bore well water (5.13%).

Table 40. Source of drinking water in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	4	80	8	80	11	100	8	88.9	3	75	34	87.18
2	Bore Well	0	0	1	10	0	0	1	11.1	0	0	2	5.13
3	Lake/ Tank	0	0	1	10	0	0	0	0	0	0	1	2.56

Source of light: The data on source of light in Katarki West-1 Micro watershed is presented in Table 41. The results indicated that, electricity was the major source of light for 100 per cent of the households.

Table 41. Source of light in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100	10	100	11	100	9	100	4	100	39	100

Existence of sanitary toilet facility: The data on availability of toilet facility in Katarki West-1 Micro watershed is presented in Table 42. The results indicated that, 100 per cent of the households possess toilets.

Table 42. Existence of sanitary toilet facility in Katarki West-1 micro-watershed

Sl.No	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	5	100	10	100	11	100	9	100	4	100	39	100

Possession of PDS card: The data regarding possession of PDS card in Katarki West-1 Micro watershed is presented in Table 43. The results indicated that, 97.44 per cent of the households possessed BPL card and 2.56 per cent possessed APL card.

Table 43. Possession of PDS card in Katarki West-1 micro-watershed

Sl.No.	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	APL	0	0	1	10	0	0	0	0	0	0	1	2.56
2	BPL	5	100	9	90	11	100	9	100	4	100	38	97.44

Participation in NREGA programme: The data regarding Participation in NREGA programme in Katarki West-1 Micro watershed is presented in Table 44. The results indicated that, only 20.51 percent of the participate have participated in NREGA programme.

Table 44. Participation in NREGA programme in Katarki West-1 micro-watershed

Sl.No	Particulars	LL (5)		MF (10)		SF (11)		SMF (9)		MDF(4)		All (39)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	1	20	1	10	1	9.09	3	33.3	2	50	8	20.5

Table 45. Adequacy of food items in Katarki West-1 micro-watershed

Sl. No.	**Particulars**	**LL** (5)		**MF** (10)		**SF** (11)		**SMF** (9)		**MDF** (4)		**All (39)**	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	4	80	10	100	11	100	6	66.7	4	100	35	89.74
2	Pulses	2	40	7	70	7	63.64	2	22.2	3	75	21	53.85
3	Oilseed	2	40	3	30	2	18.18	1	11.1	2	50	10	25.64
4	Vegetables	0	0	2	20	1	9.09	2	22.2	1	25	6	15.38
5	Fruits	0	0	7	70	3	27.27	3	33.3	1	25	14	35.9
6	Milk	2	40	2	20	4	36.36	1	11.1	1	25	10	25.64
7	Egg	1	20	4	40	0	0	2	22.2	1	25	8	20.51
8	Meat	0	0	1	10	1	9.09	3	33.3	1	25	6	15.38

Adequacy of food items: The data regarding adequacy of food items in Katarki West-1 Micro watershed is presented in Table 45. The results indicated that, the extent of adequacy of food items for cereals, pulses, Oilseeds and vegetables were 89.74, 53.85, 25.64, 15.38 per cent respectively, similarly for Fruits (35.90%), milk (25.64%), Egg (20.51%), and Meat (15.38%).

Inadequacy of food items: The data regarding in adequacy of food items in Katarki West-1 Micro watershed is presented in Table 46. The results indicated that, the extent of in adequacy of food items for cereals, pulses, Oilseeds and vegetables were 7.69, 46.15, 64.10, 69.23 and 66.67 per cent respectively, similarly for fruits (35.90%), milk (51.28%), egg (74.36%) and meat (66.67%).

Table 46. Inadequacy of food items in Katarki West-1 micro-watershed

Sl. No.	**Particulars**	**LL** (5)		**MF** (10)		**SF** (11)		**SMF** (9)		**MDF** (4)		**All (39)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Cereals	1	20	0	0	0	0	2	22.2	0	0	3	7.69
2	Pulses	3	60	3	30	5	45.45	6	66.7	1	25	18	46.15
3	Oilseed	3	60	7	70	7	63.64	6	66.7	2	50	25	64.1
4	Vegetables	3	60	6	60	11	100	4	44.4	3	75	27	69.23
5	Fruits	3	60	3	30	4	36.36	3	33.3	1	25	14	35.9
6	Milk	3	60	4	40	7	63.64	3	33.3	3	75	20	51.28
7	Egg	4	80	6	60	11	100	5	55.6	3	75	29	74.36
8	Meat	3	60	7	70	10	90.91	3	33.3	3	75	26	66.67

Response on market surplus of food items: The data regarding adequacy of food items in Katarki West-1 Micro watershed is presented in Table 47. The results indicated that, the extent of adequacy of food items for vegetables were 2.56 per cent respectively.

Table 47. Response on market surplus of food items in Katarki West-1 micro-watershed

Sl. No.	**Particulars**	**LL** (5)		**MF** (10)		**SF** (11)		**SMF** (9)		**MDF** (4)		**All (39)**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1	Vegetables	0	0	0	0	0	0	1	11.1	0	0	1	2.56

Farming constraints: The data regarding farming constraints experienced by households in Katarki West-1 Micro watershed is presented in Table 48. The results indicated that, lower fertility status of the soil was the constraint experienced by (74.36 %) per cent of the households, wild animal menace on farm field (53.85%), frequent incidence of pest and diseases (51.28%), inadequacy of irrigation water (17.95%), high cost of fertilizers and plant protection chemicals (35.90%), high rate of interest on credit (10.26%), low price for the agricultural commodities (15.38 %), lack of marketing facilities in the area (23.08%), inadequate extension services (17.95 %), lack of transport for safe transport of the agricultural produce to the market (51.28%), less rainfall (71.79%), source of agri-technology information (38.46%).

Table 48. Farming constraints experienced in Katarki West-1 micro-watershed

SN	Particulars	MF (10)		SF (11)		SMF (9)		MDF (4)		All (39)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	8	80	10	90.91	7	77.78	2	50	29	74.36
2	Wild animal menace on farm field	7	70	7	63.64	2	22.22	3	75	21	53.85
3	Frequent incidence of pest and diseases	6	60	6	54.55	7	77.78	0	0	20	51.28
4	Inadequacy of irrigation water	2	20	1	9.09	3	33.33	1	25	7	17.95
5	High cost of Fertilizers and plant protection chemicals	6	60	3	27.27	2	22.22	1	25	14	35.9
6	High rate of interest on credit	0	0	1	9.09	2	22.22	1	25	4	10.26
7	Low price for the agricultural commodities	0	0	2	18.18	2	22.22	2	50	6	15.38
8	Lack of marketing facilities in the area	4	40	4	36.36	0	0	1	25	9	23.08
9	Inadequate extension services	2	20	1	9.09	3	33.33	1	25	7	17.95
10	Lack of transport for safe transport of the Agril produce to the market.	5	50	7	63.64	6	66.67	1	25	20	51.28
11	Less rainfall	9	90	7	63.64	7	77.78	3	75	28	71.79
12	Source of Agri-technology information	5	50	6	54.55	2	22.22	1	25	15	38.46

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 39 households located in the micro watershed were interviewed for the survey. The study was conducted in Katarki West-1 micro-watershed (Katarki sub-watershed, Koppala taluk & District) is located at North latitude 15^0 15' 40.732" and 15^0 14' 2.333" and East longitude 76^0 4' 10.044" and 76^0 2' 3.61" covering an area of about 485.27 ha bounded by under Bettageri, Bisarahalli and Gudlanura Villages.

Socio-economic analysis indicated that, out of the total sample of 39 respondents, 10 (25.64%) were marginal, 11(28.21%) were small and 9 (23.08%) were semi medium and 4 (10.26%) were medium farmers. The population characteristics of households indicated that, there were 90 (52.63%) men and 81 (47.37%) were women. Majority of the respondents (36.26%) were in the age group of 35-60 years. Education level of the sample households indicated that, majority there were 25.15 per cent illiterates and only 8.19 per cent attained graduation. About, 89.74 per cent of household heads practicing agriculture and 10.26 per cent of the household heads were engaged as agricultural labourers. Agriculture was the major occupation for 26.32 per cent of the household members.

In the study area, 66.67 per cent of the households possess katcha house and 15.38 per cent possess pucca house. The durable assets owned by the households showed that, 82.05 per cent possess TV, 23.08 per cent possess mixer grinder and 76.92 per cent possess mobile phones. Farm implements owned by the households indicated that, 7.69 per cent of the households possess plough and only 5.13 per cent sprayer. Regarding livestock possession by the households and 5.13 per cent possess local cow.

The average labour availability in the study area showed that**,** own labour men available in the micro watershed was 1.55, women available in the micro watershed was 1.44, hired labour (men) available was 9.6 and hired labour (women) available was 9.88. Further, 94.87 per cent of the households opined that hired labour was inadequate during the agricultural season.

Out of the total land holding of the sample respondents (60.34 ha), 79.69 per cent of the area is under dry condition and the remaining 20.31 per cent area is irrigated land. There were 5 bore wells among the sampled households. Bore well was the major source of irrigation for 12.82 per cent of the households. The major crops grown by sample farmers are Maize, Sunflower, Onion, Bengal gram and Groundnut and cropping intensity was recorded as 94.31 per cent.

The sample households possessed 76.92 per cent bank account and 76.92 per cent of them have savings in the account. About 76.92 per cent of the respondents borrowed credit from various sources.

The per hectare cost of cultivation for Maize, Sunflower, Onion, Bengal gram and Groundnut was Rs.31759.16, 41360.34, 27869.68, 20719.38 and 45897.68 with benefit cost ratio of 1:1.50, 1: 1, 1: 1.80, 1: 2.10 and 1:0.90 respectively.

Further, 10.26 per cent of the households opined that dry fodder was adequate and 2.56 per cent of the households have opined that the green fodder was adequate.

The average annual gross income of the farmers was Rs. 66071.79 in micro-watershed, of which Rs. 54379.49 comes from agriculture.

The total number of horticultural trees grown (both field and backyard) by the sampled households were coconut (42) and Mango (1) and forest species are grown 52 neem trees, 5 banyan trees together in both field and backyard.

Households have an average investment capacity of Rs. 1307.69 for land development, Rs. 230.77 for creation of irrigation facility and Rs.692.31 for adoption of improved livestock breeds. Source of funds raised from bank for land development was 5.13 and for crop production was 2.56 per cent. Asset selling for land development and improved crop production was 2.56 per cent. Government subsidy for improved crop production for 2.56 per cent.

Regarding marketing channels, 28.21 per cent of the households have sold agricultural produce to the local/village merchants, while, 58.97 per cent have sold by Agents/Traders. Further, 79.49 per cent of the households have used tractor for the transport of agriculture commodity.

Majority of the farmers (76.92 %) have experienced soil and water erosion problems in the watershed and 74.36 per cent of the households were interested towards soil testing.

Firewood connection was the major source of fuel for domestic use for 100 per cent of the households. Piped supply was the major source for drinking water for 87.18 per cent of the households. Electricity was the major source of light for 100 per cent of the households. In the study area, 100 per cent of the households possess toilet facility. Regarding possession of PDS card, 97.44 per cent of the households possessed BPL card. Cereals (89.74%), pulses (53.85%), oilseeds (25.64%) were adequate for consumption.

Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (74.36%) wild animal menace on farm field (53.85%), frequent incidence of pest and diseases (51.28%), inadequacy of irrigation water (17.95%), high cost of fertilizers and plant protection chemicals (35.90%), high rate of interest on credit (10.26%), low price for the agricultural commodities (15.38%), lack of marketing facilities in the area (23.08%), inadequate extension services (17.95%), lack of transport for safe transport of the agricultural produce to the market (51.28%), Less rainfall (71.79%) and Source of Agri-technology information(Newspaper/TV/Mobile) (38.46%).

Implications of the survey

- ✓ Result indicated that, there were 25.15 per cent were illiterate hence, extension methodologies such as demonstration, street play, drama, video shows will be effective in dissemination of the technologies in the micro watershed.
- ✓ The data indicate that, 66.67 per cent of the households possess katcha house. Hence, the development department while implementing the watershed plan should focus on agriculture to enhance the productivity of major crops in the area to increase the income of the farmers.
- ✓ Results indicated that the local institutional participation of the household members in the micro watershed is minimal hence, activities like membership campaign, awareness creation about the benefits of membership in local institutions and strengths of organized groups must be conveyed.
- ✓ Majority of the households in the watershed have experience in use of mobile phones, and television hence, these mass media can be effectively utilized for transfer of technology as well as for information dissemination.
- ✓ The farm machinery/implement possession in the micro watershed was found to be minimum the reasons may lack of knowledge or lack of financial ability which can be addressed through training on use of different farm implements, providing information on different sources of finance for purchase of farm implements.
- ✓ The possession of livestock such as crossbred cow found is less hence, farmers must be made aware of the benefits of crossbred cow in increased milk production.
- ✓ The possession of livestock such as sheep, goat and poultry was found to be low hence, farmers may be informed the role of subsidiary enterprises in enhancing the income and information on financial support for subsidiary activities.
- ✓ sThe results indicate that there was a change in quality of life due to migration hence, the developmental departments should take actions to arrest migration and to improve the quality of the life in rural areas.
- ✓ Households possess 48.08ha (79.69 %) of dry land and 12.25ha (20.31 %) of irrigated land hence, the availability of the dryland agricultural technologies such as short duration crops, high yielding drought resistance crop varieties, drip irrigation

technology and subsidy information will be helpful for the farmers to enhance the productivity of land and as well as farmers income.

- ✓ Few of the bore well in micro watershed found non functional hence, farmers may be trained on possibility of bore well rejuvenation.
- ✓ Bore well was major source of irrigation for 12.82 per cent of the households. hence, in order to increase the area under irrigation as well as to increase the water use efficiency farmers may trained on drip irrigation and provide the information on subsidy for drip irrigation equipment's along with the information on different agencies which provides the financial assistance for drip irrigation.
- ✓ The total number of horticultural trees grown (both field and backyard) by the sampled households were coconut (42) and Mango (1) and forest species are grown 52 neem trees, 5 banyan trees together in both field and backyard. Hence, production technologies related to these crops can be made available to the farmers for better adoption.
- ✓ The cropping intensity in the micro watershed was found to be (94.31 %) hence, care must be taken by the implementing agency to bring uncultivated land into cultivation through suitable measures.
- ✓ Many of the household members have borrowed loan from cooperative banks which has higher rate of interest hence, farmers may be sensitized on the different sources of credit with lesser interest rate such SHGs etc.
- ✓ The results indicated the non availability of both green and dry fodder throughout the year hence, fodder development activities can be taken up in the micro watershed.
- ✓ The average annual gross income of the households Rs.54379.49 from agriculture, Rs.1692.31 from business and Rs. 5794.87 from wages and. Agriculture was found to be the major source of income for households hence; the development activities should focus on productivity enhancement, marketing arrangements and agricultural technology dissemination to have a direct impact on the farmers.
- ✓ The cultivation of forest species is found minimal hence, information and production technology related to agro-forestry and integrated farming system.
- ✓ The data indicated that, 76.92 per cent of the households have experienced soil and water erosion problems. Hence, those farmers who reported the soil and water erosion problems may be given attention while implementation of the watershed development plan.
- ✓ The data indicated that, 74.36 per cent of the households have interest in soil testing hence, farmers must be provided with the information on various institutions which are involved in soil testing for the benefit of the farmers.
- ✓ Except summer ploughing the adoption of other soil and water conservation structures is minimum hence, the farmers in the micro watershed should be sensitized on the use of different conservation structures for soil water conservation.

- ✓ Cereals and pulses found be adequate for per cent of the households respectively hence, farm households and the farm women must be trained on importance of balanced nutrition and role of vegetable, milk, egg, meat in balanced diet.
- ✓ Lower fertility status of the soil (74.36%), wild animal menace on farm field (53.85%), frequent incidence of pest and diseases (51.28%), high cost of fertilizers and plant protection chemicals (35.90%), high rate of interest on credit (10.26%), low price for the agricultural commodities (15.38%), lack of marketing facilities in the area (23.08%), inadequate extension services (17.95%), lack of transport for safe transport of the agricultural produce to the market (51.28%) were the major farming constraints experienced hence, these constraints must be addressed immediately for the welfare of the farmers. Awareness to be created among the farmers to approach nearest KVKs/RSKs and other developmental departments for technical and for subsidized inputs and utilize the well established regulated markets, approaching the contract firms, direct markets to avoid the involvement of middlemen.