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

HIRE WADRAKAL (4D3A9R1c) 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

ICAR - NBSS & LUP

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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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 Hire wadrakal microwatershed in Koppal Taluk, and 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: 45-10-2019 Director, ICAR - NBSS&LUP Nagpur

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Hire Wadarkal microwatershed 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 708 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 90 per cent is covered by soils, 7 per cent by rock outcrops and 3 per cent is by habitation and settlements. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 16 soil series and 29 soil phases (management units) and 8 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.*
- *An area of about 90 per cent is suitable for agriculture.*
- *About 24 per cent of the soils are shallow to moderately shallow (25-75 cm) and 66 per cent of the soils are moderately deep to deep (75-150 cm).*
- *About 2 per cent area in the microwatershed has sandy soils, 74 per cent area in the microwatershed has loamy soils and 14 per cent clayey soils at the surface.*
- *About 18 per cent area has non-gravelly (<15% gravel) soils and 72 per cent has gravelly to very gravelly (15-60% gravel) soils.*
- *About 79 per cent area is very low to low (<50-100 mm/m) and 11 per cent area is medium (101-150 mm/m) in available water capacity.*

- *About 2 per cent area of the microwatershed has nearly level (0-1% slope) lands, 84 per cent area of the microwatershed has very gently sloping(1-3% slope) lands and 4 per cent area of the microwatershed has gently sloping (3-5% slope) lands.*
- *An area of about 3 per cent area is severely (e3) eroded, 68 per cent area is moderately (e2) eroded and about 19 per cent area is slightly (e1) eroded.*
- *An area of about 35 per cent soils are neutral (pH 6.5-7.3) and 56 per cent soil are slightly alkaline to strongly alkaline (pH 7.3-9.0) in soil reaction.*
- *The Electrical Conductivity (EC) of the soils in the entire cultivated area of the microwatershed is dominantly <2 dsm^{-1} indicating that the soils are non-saline.*
- *Organic carbon is low (0.5%) in 26 per cent area, medium (0.5-0.75%) in 47 per cent area and high (>0.75%) in 17 per cent area.*
- *An area of about 30 per cent is medium (23-57 kg/ha) and 60 per cent is low (<23 kg/ha) in available phosphorus.*
- *An area of about 11 per cent is low (<145 kg/ha), 74 per cent is medium (145-337 kg/ha) and 6 per cent is high (>337 kg/ha) in available potassium.*
- *Available sulphur is low (<10 ppm) in 42 per cent area, medium (10 -20 ppm) in 26 per cent area and high (>20 ppm) in 23 per cent area of the microwatershed.*
- *An area of about 68 per cent is low (<0.5ppm), 20 per cent is medium (0.5-1.0 ppm) and 1 per cent is high (>1.0 ppm) in available boron content.*
- *An area of about 48 per cent is sufficient (>4.5 ppm) and 42 per cent is deficient (<4.5 ppm) in available iron content.*
- *Entire cultivated area of the microwatershed is sufficient (>1.0 ppm) in available manganese content.*
- *Entire cultivated area of the microwatershed is sufficient (>0.2 ppm) in available copper content.*
- *Entire cultivated area of the microwatershed is deficient (<0.6 ppm) in available zinc content.*
- *The land suitability for 31 major crops grown in the microwatershed was assessed and the areas that are highly suitable (S1) and moderately suitable (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	*54(8)*	*231(33)*		*Sapota*	*38(5)*	*353(50)*
Maize	*54(8)*	*231(33)*		*Pomegranate*	*38(5)*	*353(50)*
Bajra	*101(14)*	*425(60)*		*Guava*	*38(5)*	*354(50)*
Groundnut	*81(11)*	*456(64)*		*Jackfruit*	*38(5)*	*353(50)*
Sunflower	*38(5)*	*114(16)*		*Jamun*	-	*340(48)*
Cotton	-	*249(35)*		*Musambi*	*38(5)*	*353(50)*
Red gram	*38(5)*	*78(11)*		*Lime*	*38(5)*	*353(50)*
Bengalgram	*16(2)*	*170(24)*		*Cashew*	*4(1)*	*364(51)*
Chilli	*42(6)*	*231(33)*		*Custard apple*	*100(14)*	*500(70)*
Tomato	*57(8)*	*215(30)*		*Amla*	*89(13)*	*511(72)*
Brinjal	*79(11)*	*256(36)*		*Tamarind*	*61(9)*	*405(51)*
Onion	*64(9)*	*259(36)*		*Marigold*	*38(5)*	*247(35)*
Bhendi	*64(9)*	*221(31)*		*Chrysanthemum*	*38(5)*	*247(35)*
Drumstick	*43(6)*	*135(19)*		*Jasmine*	*38(5)*	*247(35)*
Mulberry	*62(9)*	*405(57)*		*Crossandra*	*38(5)*	*199(28)*
Mango	-	*61(9)*				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the 8 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 for these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation 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

Soil is a finite natural resource that is central to sustainable agriculture and food security. Over the years, this precious resource is faced with the problems of erosion, salinity, alkalinity, degradation, depletion of nutrients and even decline in availability of land for agriculture. It is a known fact, that it takes thousands of years to form a few centimetres of soil, thus, soil is a precious gift of nature. The area available for agriculture is about 51 per cent of the total geographical area and more than 60 per cent of the people are still dependant on agriculture for their livelihood. However, the capacity of a soil to produce is limited and the limits to the production are set by its intrinsic characteristics, agro-climatic setting, and use and management. There is, therefore, tremendous pressure on land and water resources, which is causing decline in soil-health and stagnation in productivity. As much as 121 m ha of land is reportedly degraded which leads to impaired soil quality. It is imperative that steps are urgently taken to check and reverse land degradation without any further loss of time. The improvements in productivity will have to come from sustainable intensification measures that make the most effective use of land and water resources. 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.

Added to this, every year there is a significant diversion of farm lands and water resources for non-agricultural purposes. Thus, developing strategies to slow down the degradation process or reclaim the soils to normal condition and ensure sustainability of production system are the major issues today. This demands a systematic appraisal of our soil and land resources with respect to their extent, geographic distribution, characteristics, behaviour and uses potential, which is very important for developing an effective land use and cropping systems for augmenting agricultural production on a sustainable basis. The soil and land resource inventories made so far in Karnataka had limited utility because the surveys were of different types, scales and intensities carried out at different times with specific objectives. Hence, there is an urgent need to generate

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 all the parameters which are critical for productivity *viz.,* soils, site characteristics like slope, erosion, gravelliness and stoniness, climate, water, 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 Hire Wadarkal microwatershed in Koppal Taluk and 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 scales 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 Hire Wadarkal Microwatershed is located in the central part of northern Karnataka in Koppal Taluk, Koppal District, Karnataka State (Fig.2.1). It comprises parts of Hirevadrakala, Katagihal, Thippanahala, Chikkabommanahala & Hirebommanala villages. It lies between $15^0$35' – $15^0$37' North latitudes and $76^0$16'– $76^0$18' East longitudes and covers an area of 708 ha. It is about 46 km from Koppal town and is surrounded by Hirevadrakala village on the north, northeast and east, Hirebommanala village on the south and southwest, Thippanahala village on the west, Katagihal village on the north and northwest and Chikkabommanahala village on the southeast and southern side of the microwatershed.

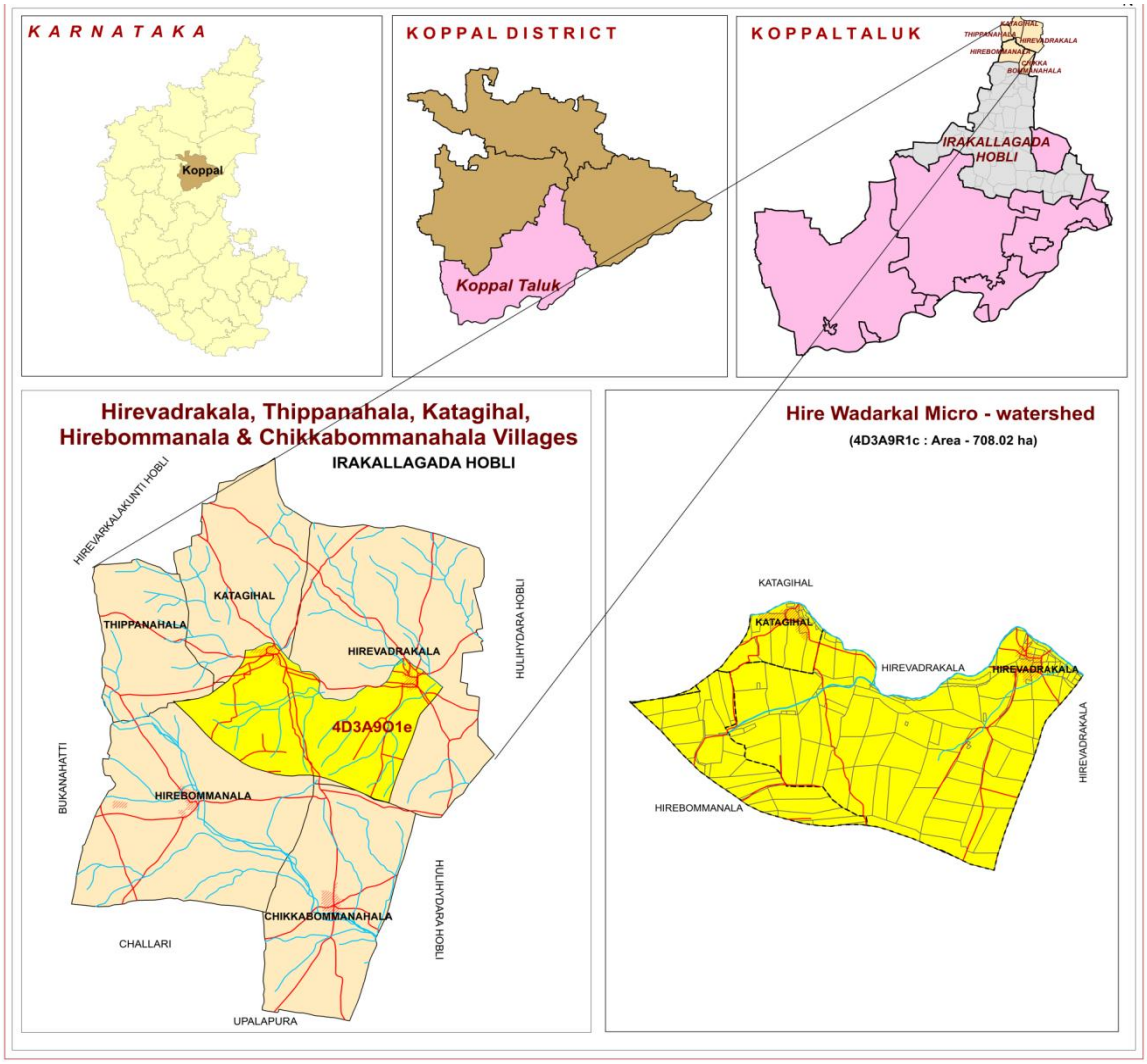

Fig.2.1 Location map of Hire Wadarkal Microwatershed

2.2 Geology

Major rock formation observed in the microwatershed are granite gneiss and alluvium (Figs.2.2 a & b). Granite gneisses are essentially pink to gray and are coarse to

medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to occur in Bettageri village. The soil 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 palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2a Granite and granite gneiss rocks

Fig.2.2b Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes 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 536-568 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 takes place 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 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 and 193 mm in the months 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**	

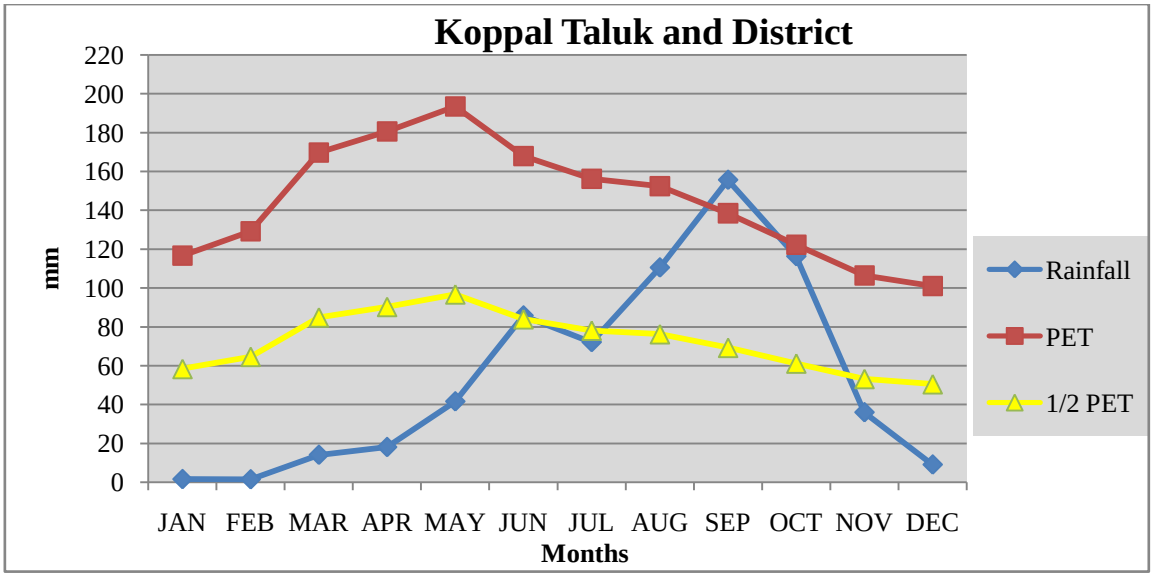

Fig. 2.3 Rainfall distribution in Koppal Taluk and District

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 Hire Wadarkal 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 bouldery 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, marigold 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 Hire Wadarkal Microwatershed is presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells and open wells) and other soil and water conservation structures in the microwatershed is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells in Hire Wadarkal Microwatershed is given 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

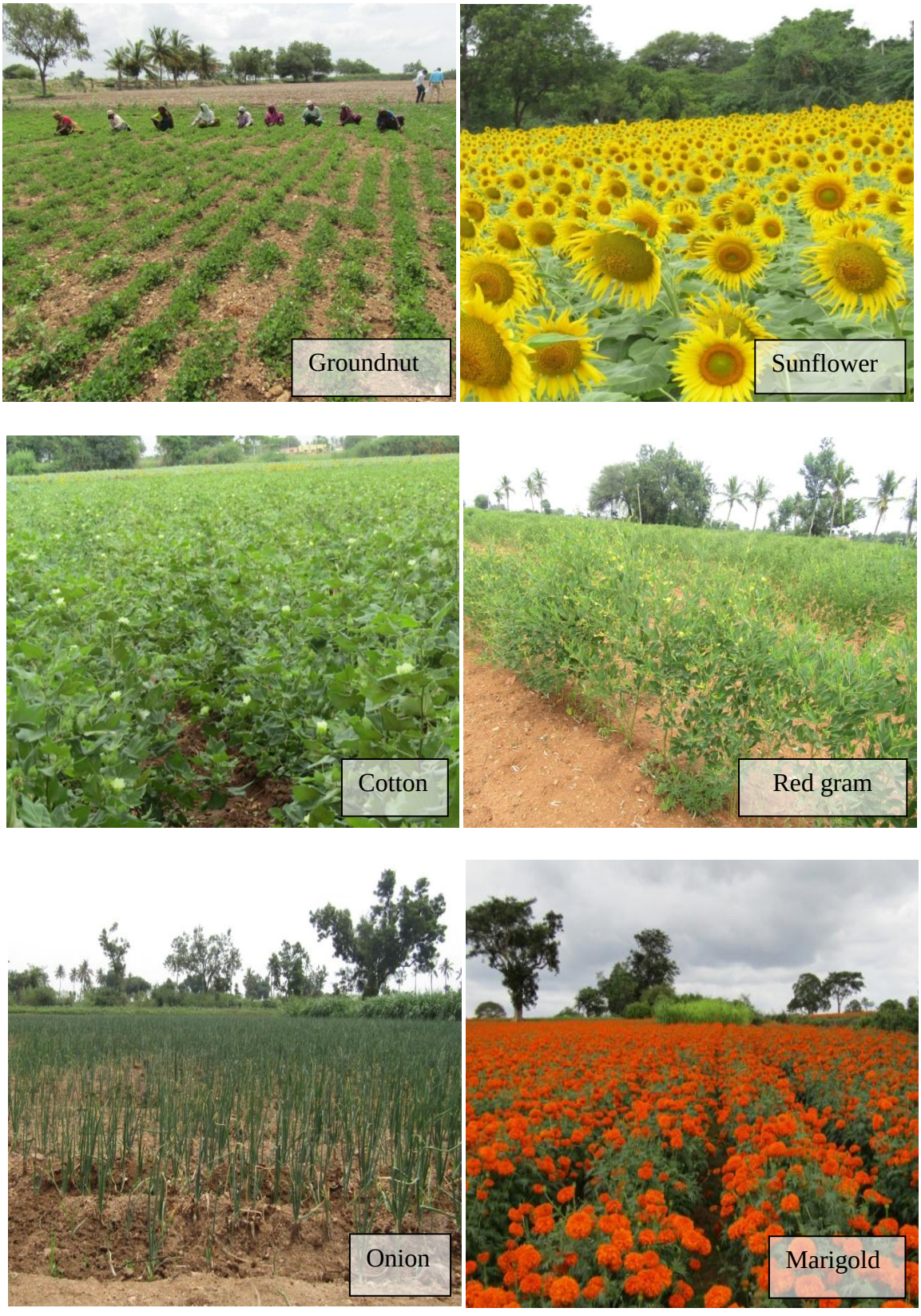

Fig.2.5 Different crops and cropping systems in Hire Wadarkal Microwatershed

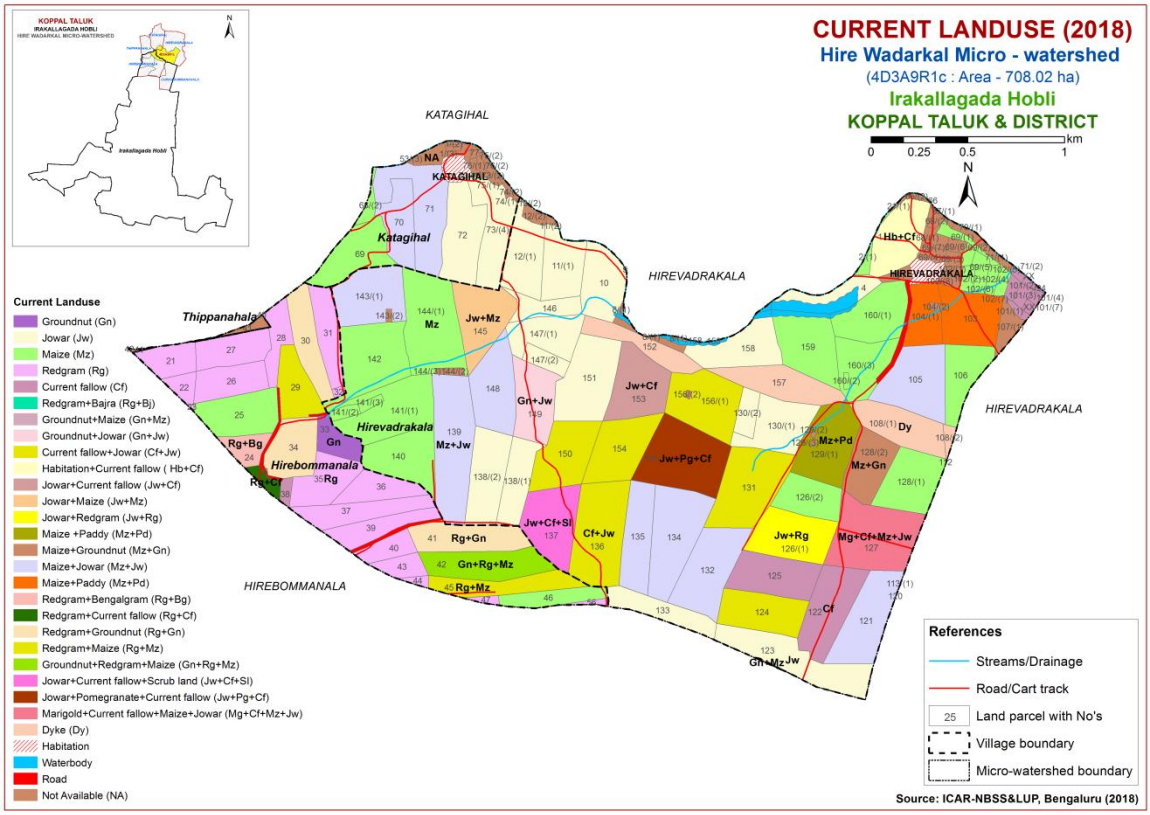

Fig.2.6 Current Land Use – Hire Wadarkal Microwatershed

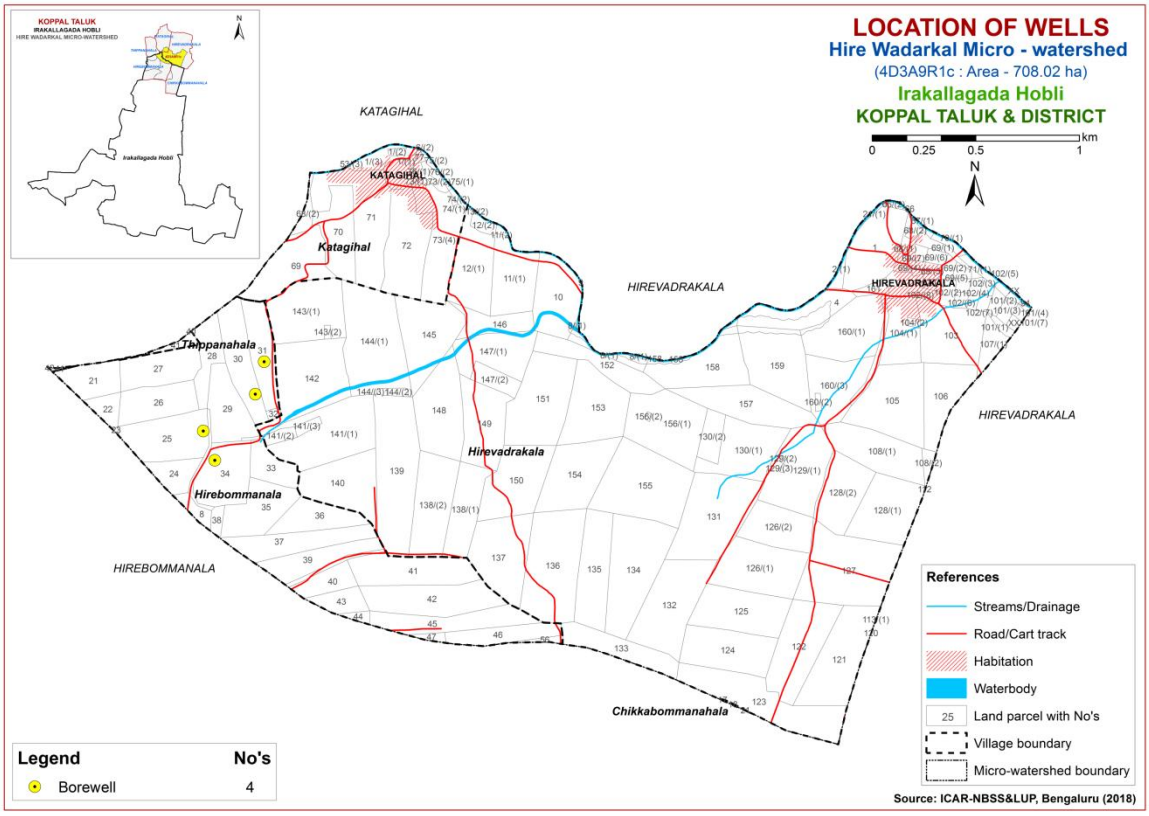

Fig.2.7 Location of wells - Hire Wadarkal Microwatershed

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 Hire Wadarkal 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 708 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 granite gneiss and alluvial landscapes and is divided into landforms such as uplands, summits and very gently sloping 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

G- Granite gneiss landscape

- G1 Hills/ Ridges/ Mounds
  - G11 Summits
  - G12 Side slopes
    - G121 Side slopes with dark grey tones
- G2 Uplands
  - G21 Summits
  - G22 Gently sloping uplands
    - G221 Gently sloping uplands, yellowish green (eroded)
    - G222 Gently sloping uplands, yellowish white (severely eroded)
  - G23 Very gently sloping uplands
    - G231 Very gently sloping uplands, yellowish green
    - G232 Very gently sloping uplands, medium green and pink
    - G233 Very gently sloping uplands, pink and green (scrub land)
    - G234 Very gently sloping uplands, medium greenish grey
    - G235 Very gently sloping uplands, yellowish white (eroded)
    - G236 Very gently sloping uplands, dark green
    - G237 Very gently sloping uplands, medium pink (coconut garden)
    - G238 Very gently sloping uplands, pink and bluish white (eroded)

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 gently 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

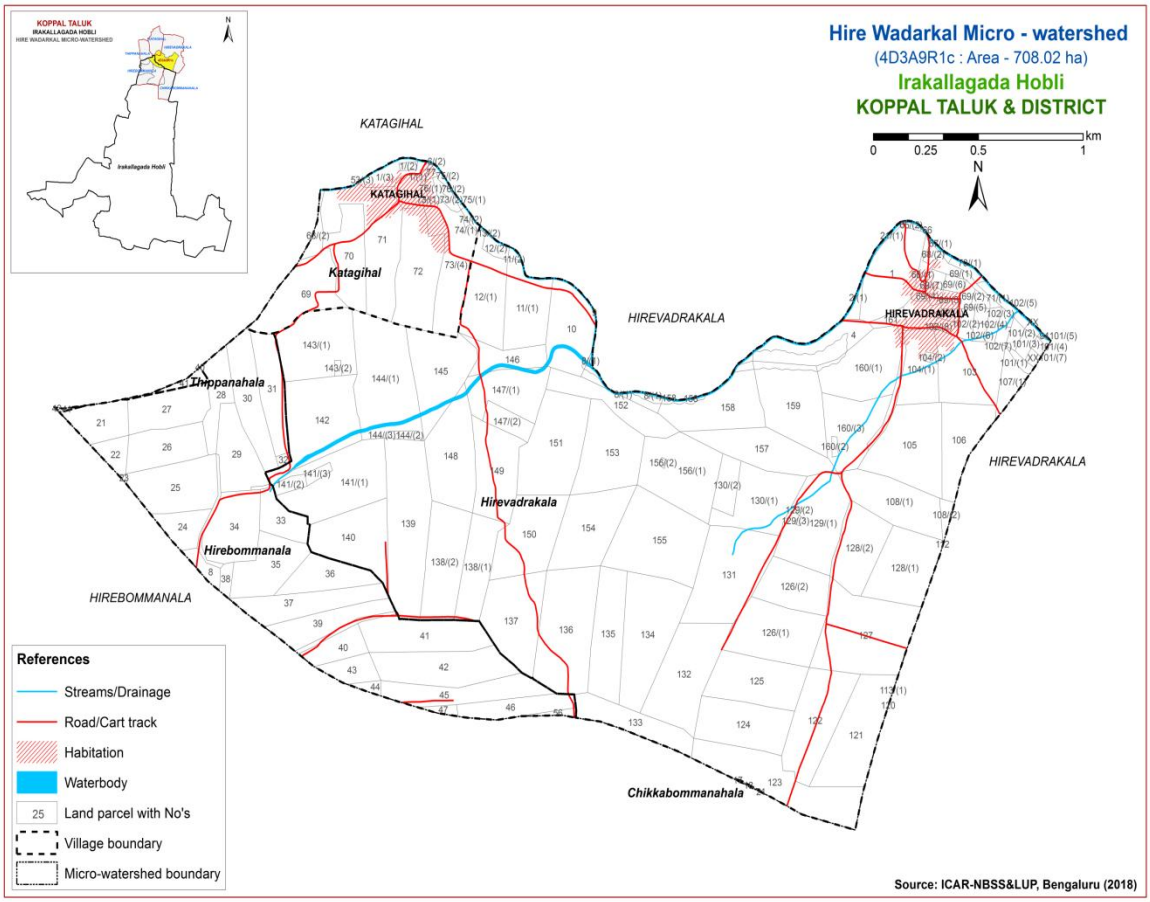

Fig 3.1 Scanned and Digitized Cadastral map of Hire Wadarkal Microwatershed

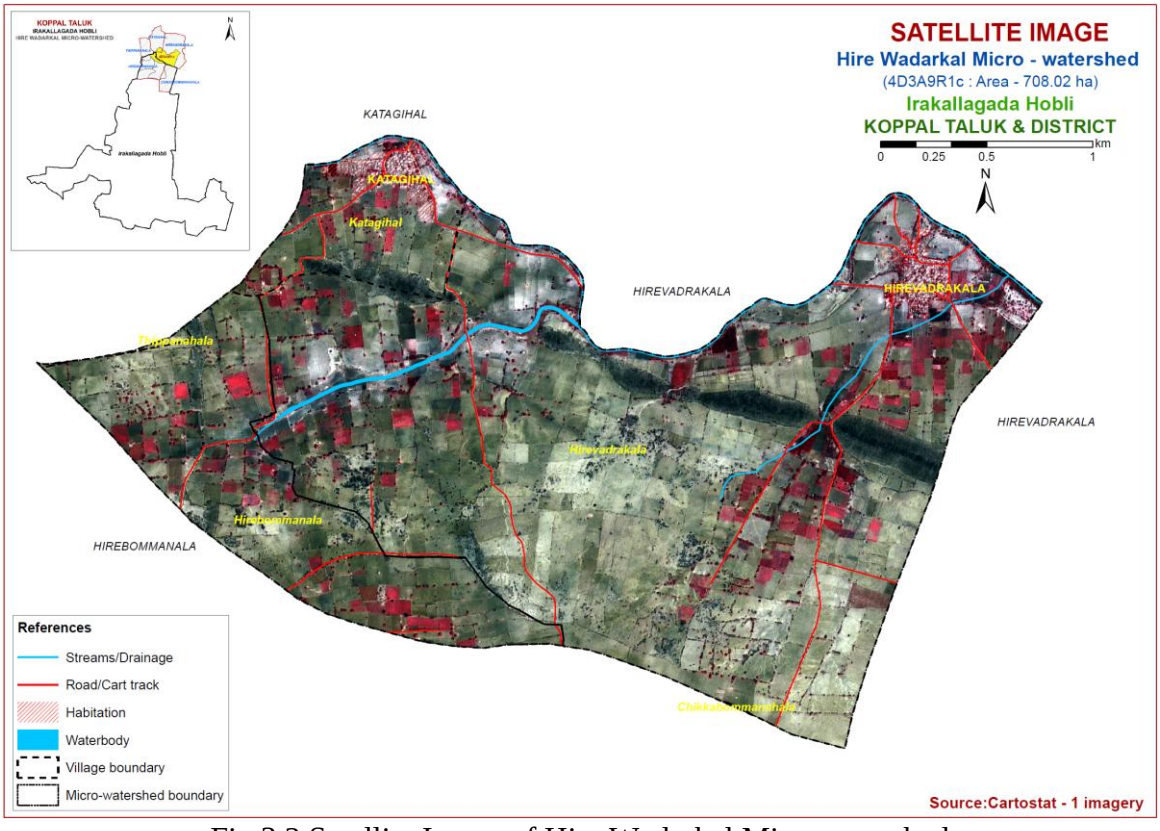

Fig.3.2 Satellite Image of Hire Wadarkal Microwatershed

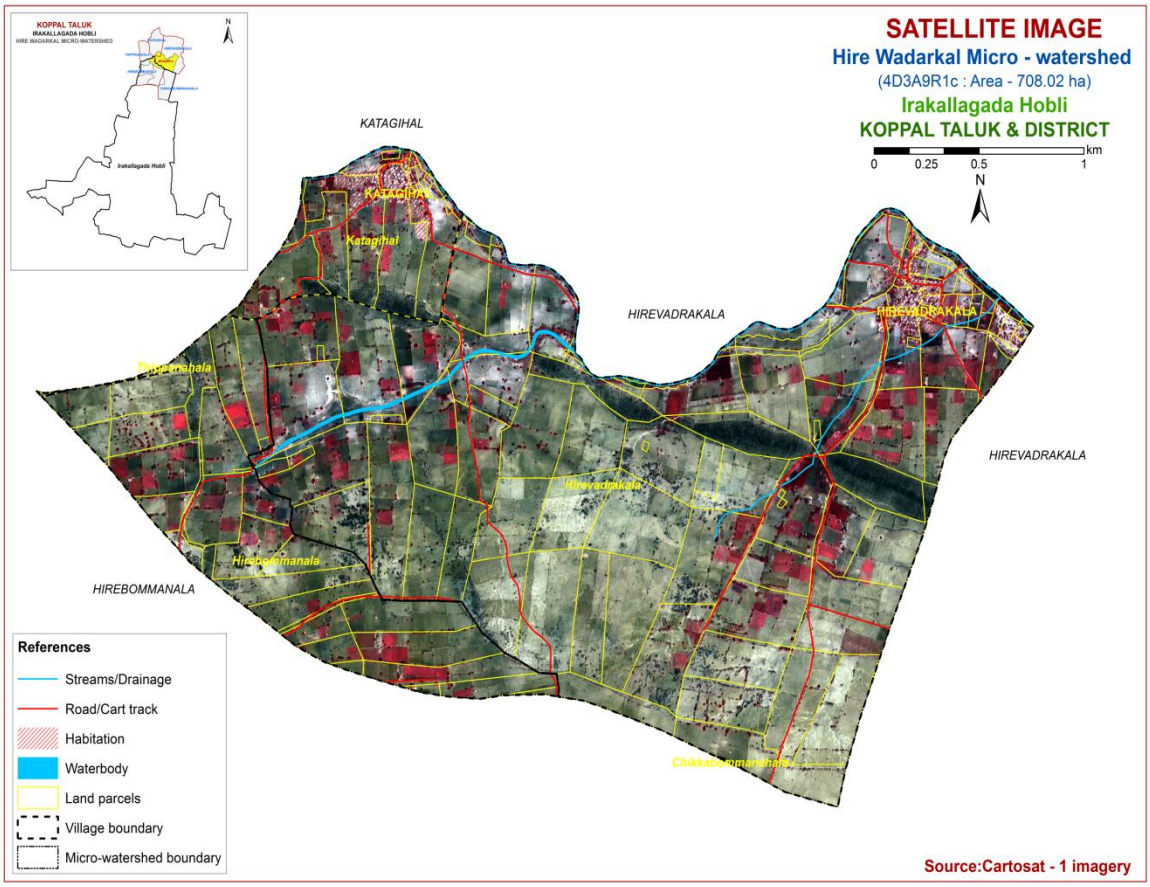

Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Hire Wadarkal Microwatershed

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 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).

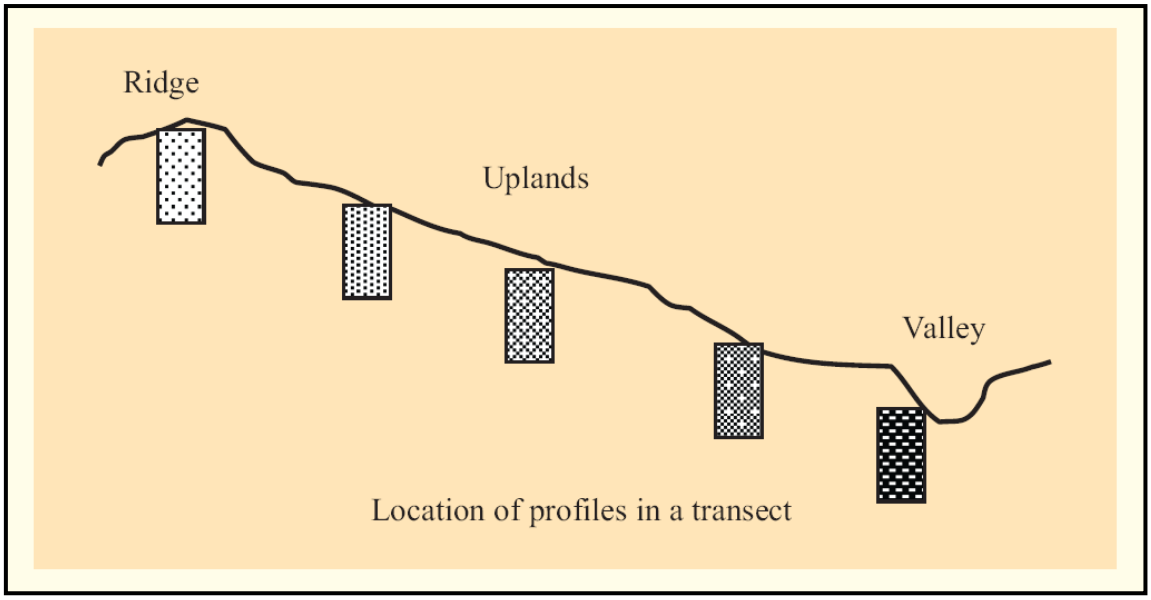

Fig: 3.4. Location of profiles in a transect

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 up to 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, 16 soil series were identified in Hire Wadarkal Microwatershed.

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

Sl. No.	Soil Series	Depth (cm)	Colour (moist)	Texture	Gravel (%)	Horizon sequence	Calcareou-sness
SOILS OF GRANITE GNEISS LANDSCAPE							
1	Chikkasavanur (CSR)	25-50	7.5YR3/2,3/3,3/4	scl	<15	Ap-Bw-Cr	-
2	Lakkur (LKR)	50-75	2.5YR 2.5/3, 2.5/4, 3/4, 3/6	gsc	40-60	Ap-Bt-Bc-Cr	-
3	Mukhadahalli (MKH)	50-75	5YR3/3,3/4,4/3,5/4,6/6 2.5YR3/4	gsc	>35	Ap-Bt-Cr	-
4	Kethanapura (KTP)	50-75	2.5YR3/4, 3/6	gsc	15-35	Ap-Bt-Cr	-
5	Thammadahalli (TDH)	50-75	2.5YR2.5/4,3/6	sc-c	<15	Ap-Bt-Cr	-
6	Hooradhahalli (HDH)	75-100	2.5YR2.5/4,3/4, 3/6	gsc-gc	>35	Ap-Bt-Cr	-
7	Bidanagere (BDG)	75-100	5YR3/3,3/4,4/3,5/4 2.5YR3/4	gc	35-60	Ap-Bt-Cr	-
8	Gollarahatti (GHT)	75-100	2.5YR3/4,3/6, 4/4,4/6	gscl	15-35	Ap-Bt-Cr	-
9	Bisarahalli (BSR)	75-100	5 YR 3/3, 3/4	gsc	15-35	Ap-Bt-Cr	-
10	Huliyapura (HLP)	75-100	7.5YR3/3,4/6 10YR4/6	scl	<15	Ap-Bw-C	-
11	Kumchahalli (KMH)	100-150	2.5YR3/4, 3/6	sc	<15	Bt-Cr	-
12	Mornal (MNL)	100-150	5YR 3/4, 2.5 YR 3/4, 4/6	gsc	15-35	Ap-Bt-Cr	-
13	Balapur (BPR)	100-150	2.5YR2.5/4,3/4	gsc-gc	>35	Ap-Bt-Cr	-
14	Nagalapur (NGP)	100-150	5YR2.5/2,3/2, 2.5YR3/6,4/6	gsc	>35	Ap-Bt-Cr	-
SOILS OF ALLUVIAL LANDSCAPE							
15	Muttal (MTL)	25-50	10YR3/2,3/3,4/2 7.5YR3/2,3/3,6/4	gc	15-35	Ap-Bw-Ck	e-ev
16	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

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 minipits 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 minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map. The soil map shows the geographic distribution and area extent of 29 mapping units representing 16 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 29 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 phase will have similar management needs and have to be treated accordingly.

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 Hire Wadarkal farmer's fields (72 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.

3.6 Land Management Units (LMUs)

The 29 soil phases identified and mapped in the microwatershed were regrouped into 8 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 choosen for identification and delineation of LMUs. For Hire Wadarkal Microwatershed, five soil and site characteristics, namely soil depth, soil texture, slope erosion and gravel content have been considered for defining LMUs. The land management units are expected to behave similarly for a given level of management.

Table 3.2 Soil map unit description of Hire Wadarkal Microwatershed

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
SOILS OF GRANITE GNEISS LANDSCAPE				
	CSR	Chikkasavanur soils are shallow (25-50 cm), well drained, have dark brown to light yellowish brown, red sandy clay loam soils occurring on nearly level to very gently sloping uplands under cultivation		**12(1.74)**
36		CSRcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	12(1.74)
	LKR	Lakkur soils are moderately shallow (50-75 cm), well drained,		**1(0.1)**

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
		have dark reddish brown to dark red, red gravelly sandy clay soils occurring on very gently to moderately sloping uplands under cultivation		
44		LKRcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	1(0.1)
	MKH	Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown, red gravelly sandy clay soils occurring on gently very gently to gently sloping uplands under cultivation		**24(3.37)**
89		MKHiB2	Sandy clay surface, slope 1-3%, moderate erosion	16(2.24)
90		MKHiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	8(1.13)
	KTP	Kethanapura soils are moderately shallow (50-75 cm), well drained, have dark reddish brown, red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**64(9.0)**
71		KTPcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	63(8.91)
72		KTPhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	1(0.09)
	TDH	Thammadahalli soils are moderately shallow (50-75cm), well drained, have dark red to dark reddish brown, red sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**33(4.67)**
56		TDHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	33(4.67)
	HDH	Hooradhahalli soils are moderately deep (75-100 cm), well drained, have dark red to dark reddish brown, red gravelly sandy clay to clay soils occurring on nearly level to moderately sloping uplands under cultivation		**241 (33.93)**
105		HDHbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	3(0.47)
110		HDHcB2	Sandy loam surface, slope 1-3%, moderate erosion	26(3.7)
111		HDHcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	107 (15.11)
112		HDHcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	5(0.65)
116		HDHcC3g1	Sandy loam surface, slope 3-5%, severe erosion, gravelly (15-35%)	24(3.34)
123		HDHhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	65(9.11)
124		HDHhB2g2	Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	11(1.55)
	BDG	Bidanagere soils are moderately deep (75-100 cm), well		**50(7.0)**

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
		drained, have dark reddish brown, red gravelly clay soils occurring on nearly level to gently sloping uplands under cultivation		
180		BDGcB1g1	Sandy loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	16(2.19)
188		BDGhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	34(4.81)
	GHT	Gollarahatti soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay loam soils occurring on nearly level very gently sloping uplands under cultivation		**60(8.42)**
136		GHTcB1g2	Sandy loam surface, slope 1-3%, slight erosion, very gravelly (35-60%)	36(5.03)
138		GHTcB2g1	Sandy loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	24(3.39)
	BSR	Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown, red gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**15(2.06)**
158		BSRbB2g1	Loamy sand surface, slope 1-3%, moderate erosion, gravelly (15-35%)	11(1.53)
162		BSRhB2g1	Sandy clay loam surface, slope 1-3%, moderate erosion, gravelly (15-35%)	4(0.53)
	HLP	Huliyapura soils are moderately deep (75-100 cm), well drained, have dark yellowish brown to dark brown, sandy clay loam soils occurring on very gently sloping lowlands under cultivation		**16(2.19)**
466		HLPmA1	Clay surface, slope 0-1%, slight erosion,	16(2.19)
	KMH	Kumchahalli soils are deep (100-150cm), well drained, have dark reddish brown to dark red, sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**4(0.62)**
198		KMHhB1g1	Sandy clay loam surface, slope 1-3%, slight erosion, gravelly (15-35%)	4(0.62)
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red, gravelly sandy clay soils occurring on very gently sloping uplands under cultivation		**57(8.09)**
204		MNLcB2	Sandy loam surface, slope 1-3%, moderate erosion	38(5.4)
209		MNLiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	19(2.69)
	BPR	Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay to clay soils occurring on nearly level to gently sloping uplands under cultivation		**18(2.5)**
226		BPRcB2g2	Sandy loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	18(2.5)

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
	NGP	Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay soils occurring on nearly level to gently sloping uplands under cultivation		**7(0.95)**
254		NGPcC2g2R1	Sandy loam surface, slope 3-5%, moderate erosion, very gravelly (35-60%), fairly rocky (2-10%)	7(0.95)
SOILS OF ALLUVIAL LANDSCAPE				
	MTL	Muttal soils are shallow (25-50 cm), well drained, have very dark grayish brown to dark brown, calcareous, black gravelly clay soils occurring on nearly level to gently sloping plains under cultivation		**27(3.84)**
304		MTLiB2	Sandy clay surface, slope 1-3%, moderate erosion,	27(3.84)
	RNK	Ravanaki soils are moderately shallow (50-75 cm), moderately well drained, have dark brown to very dark grayish brown and dark gray, calcareous, black clay soils occurring on nearly level to very gently sloping plains under cultivation		**13(1.73)**
331		RNKiB2g1	Sandy clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	9(1.22)
336		RNKmB2	Clay surface, slope 1-3%, moderate erosion,	4(0.51)
999		Rock-outcrops	Rock lands, both massive and bouldery with little or no soil	**46(6.51)**
1000		Others	Habitation and water body	**23(3.25)**

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

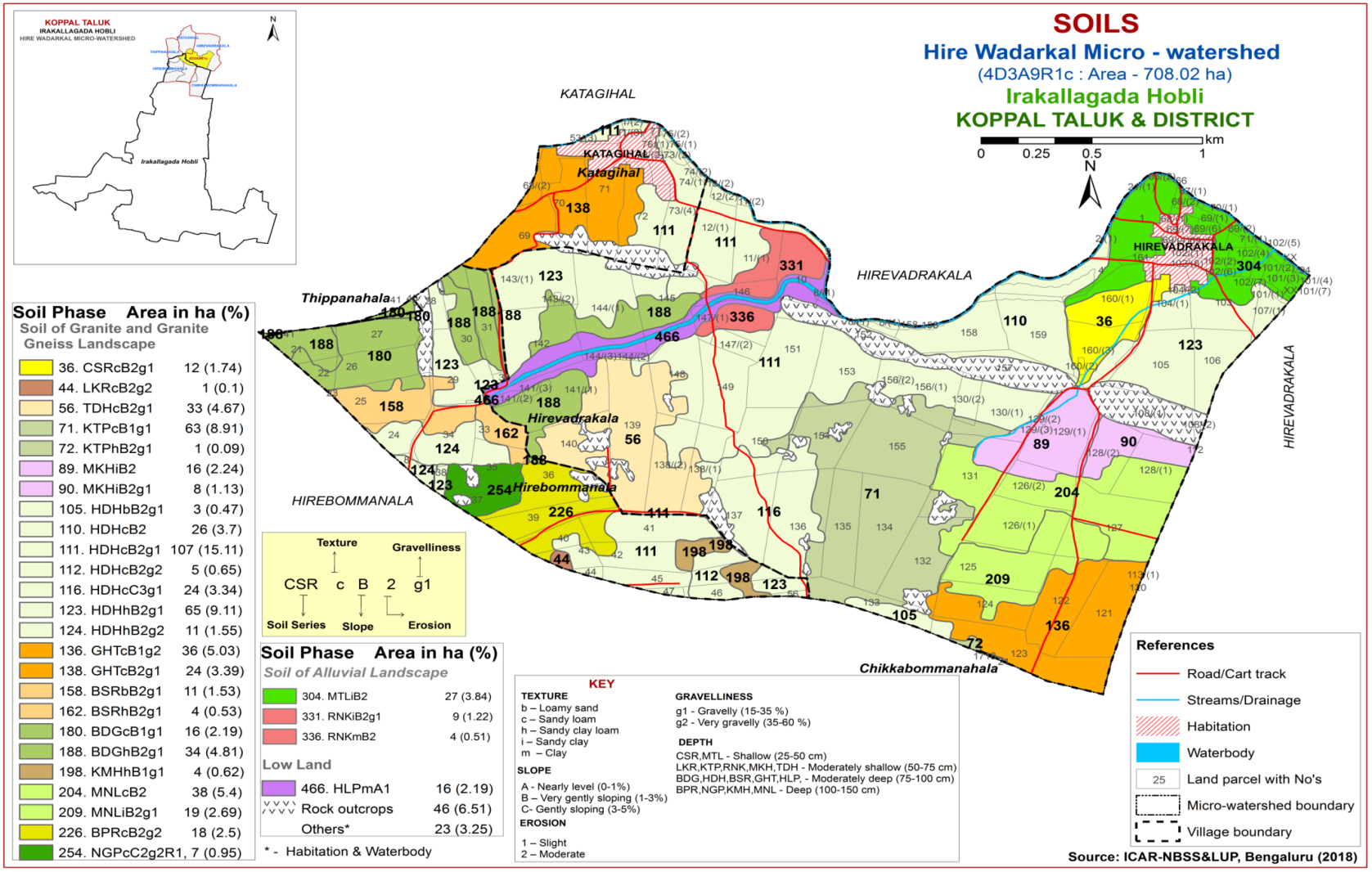

Fig 3.5 Soil Phase or Management Units- Hire Wadarkal Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Hire Wadarkal Microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss and alluvial landscapes based on geology. In all, 16 soil series are 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 16 soil series identified followed by 29 soil phases (management units) mapped (Fig. 3.5) are furnished below. The physical and chemical characteristics of soil series identified in Hire Wadarkal 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 Granite gneiss landscape

In this landscape, 14 soil series are identified and mapped. Of these, Hooradhahalli (HDH) series occupies major area of 241 ha (34%) followed by Kethanapura (KTP) 64 ha (9%), Gollarahatti (GHT) 60 ha (8%), Mornal (MNL) 57 ha (8%), Bidanagere (BDG) 50 ha (7%), Thammadahalli (TDH) 33 ha (5%), Mukhadahalli (MKH) 24 ha (3%), Balapur (BPR) 18 ha (3%), Huliyapura (HLP) 16 ha (2%), Bisarahalli (BSR) 15 ha (2%), Chikkasavanur (CSR) 12 ha (2%), Nagalapura (NGP) 7 ha (1%), Kumchahalli (KMH) 4 ha (1%) and Lakkur (LKR) 1 ha (<1%). The brief description of each soil series along with the soil phases identified and mapped is given below.

4.1.1 Chikkasavanur (CSR) Series: Chikkasavanur soils are shallow (25-50 cm), well drained, have dark brown to light yellowish brown, sandy clay loam soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands. The Chikkasavanur series has been classified as a member of the loamy, mixed, isohyperthermic family of (Paralithic) Haplustepts.

The thickness of the solum ranges from 32 to 49 cm. The thickness of A-horizon ranges from 12 to 23 cm. Its colour is in 7.5 YR and 10 YR hue with value 2.5 to 4 and chroma 3 to 6. The texture varies from sandy loam to clay with 10 to 20 per cent gravel. The thickness of B horizon ranges from 16 to 32 cm. Its colour is in 7.5 YR and 5 YR hue

with value 3 and chroma 2 to 4. Its texture is sandy clay loam with gravel content of < 15 per cent. The available water capacity is low (50-100 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Chikkasavanur (CSR) Series

4.1.2 Lakkur (LKR) Series: Lakkur soils are moderately shallow (50-75cm), well drained, have reddish brown to dark red, gravelly sandy clay soils. They have developed from weathered granite gneiss and occur on nearly level to very gently and gently sloping uplands. The Lakkur series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 51 to 74 cm. The thickness of A-horizon ranges from 12 to 18 cm. Its colour is in 5YR and 2.5 YR hue with value 3 to 4 and chroma 4 to 6. The texture varies from loamy sand to sandy clay loam with 15 to 50 per cent gravel. The thickness of B horizon ranges from 39 to 58 cm. Its colour is in 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture is sandy clay with 40 to 60 per cent gravel. The available water capacity is low (50-100 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Lakkur (LKR) Series

4.1.3 Mukhadahalli (MKH) Series: Mukhadahalli soils are moderately shallow (50-75 cm), well drained, have dark brown to reddish brown, gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Mukhadahalli series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Typic Haplustalfs.

The thickness of the solum ranges from 51 to 72 cm. The thickness of A-horizon ranges from 12 to 17 cm. Its colour is in 5 YR and 7.5 YR hue with value 3 to 4 and chroma 2 to 4. The texture varies from loamy sand to sandy loam with 20 to 45 per cent gravel. The thickness of B horizon ranges from 40 to 68 cm. Its colour is in 2.5 YR and 5 YR hue with value and chroma 3 to 6. Texture is sandy clay loam to sandy clay with 35 to 50 per cent gravel. The available water capacity is low (<50 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Mukhadahalli (MKH) Series

4.1.4 Kethanapura (KTP) Series: Kethanapura soils are moderately shallow (50-75cm), well drained, have dark reddish brown, gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Kethanapura series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 53 to 72 cm. The thickness of A-horizon ranges from 11 to 16 cm. Its colour is in 5YR and 2.5 YR hue with value 3 to 4 and chroma 3 to 6. The texture varies from loamy sand to sandy clay loam with 15 to 40 per cent gravel. The thickness of B-horizon varies from 41 to 56 cm. Its colour is in 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture is dominantly sandy clay loam with 15 to 35 per cent gravel. The available water capacity is medium (101-150 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Kethanapura (KTP) Series

4.1.5 Thammadahalli (TDH) Series: Thammadahalli soils are moderately shallow (50-75cm), well drained, have brown to very dark brown and dark reddish brown, sandy clay to clay soils. They have developed from weathered granite gneiss and occur on nearly level to gently sloping uplands. The Thammadahalli series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 54 to 75 cm. The thickness of A-horizon ranges from 11 to 19 cm. Its colour is in 7.5 YR, 5YR and 2.5 YR hue with value 2.5 to 4 and chroma 2 to 6. The texture varies from sandy clay loam to clay with 10 to 20 per cent gravel. The thickness of B horizon ranges from 43 to 60 cm. Its colour is in 2.5 YR hue with value 3 and chroma 4 to 6. Its texture is sandy clay to clay. The available water capacity is medium (100-150 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Thammadahalli (TDH) Series

4.1.6 Hooradhahalli (HDH) Series: Hooradhahalli soils are moderately deep (75-100 cm), well drained, have red to dark red and reddish brown, gravelly sandy clay to clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Hooradhahalli series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 76 to 100 cm. The thickness of A-horizon ranges from 11 to 19 cm. Its colour is in 5 YR and 2.5 YR hue with value 3 to 4 and chroma 3 to 6. The texture varies from loamy sand to sandy clay with 15 to 50 per cent gravel. The thickness of B horizon varies from 65 to 83 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Texture is sandy clay to clay with 35 to 50 per cent gravel. The available water capacity is low (50-100mm/m). Seven soil phases were identified and mapped.

Landscape and soil profile characteristics of Hooradhahalli (HDH) Series

4.1.7 Bidanagere (BDG) Series: Bidanagere soils are moderately deep (75-100 cm), well drained, have dark reddish brown, gravelly clay soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Bidanagere series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 78 to 99 cm. The thickness of A-horizon ranges from 12 to 19 cm. Its colour is in 2.5 YR and 5 YR hue with value 2 to 3 and chroma 3 to 4. The texture varies from sandy clay loam to sandy clay with 10 to 20 per cent gravel. The thickness of B-horizon ranges from 68 to 85 cm. Its colour is in 5 YR and 2.5 YR hue with value 3 to 5 and chroma 3 to 4. Its texture is gravelly clay with gravel content of 35-60 per cent. The available water capacity is very low (<50 mm/m). Two soil phases were identified and mapped.

Landscape Soil Profile Characteristics of Bidanagere (BDG) Series

4.1.8 Gollarahatti (GHT) Series: Gollarahatti soils are moderately deep (75-100 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Gollarahatti series has been classified as a fine-loamy, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 78 to 98 cm. The thickness of A-horizon ranges from 12 to 18cm. Its colour is in 5 YR and 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture varies from loamy sand to sandy clay with 15 to 35 per cent gravel. The thickness of B horizon ranges from 66 to 81cm. Its colour is in 2.5 YR hue with value 3 to 4 and chroma 4 to 6. Texture is sandy clay loam with 15 to 35 per cent gravel. The available water capacity is medium (51-100 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Gollarahatti (GHT) Series

4.1.9 Bisarahalli (BSR) Series: Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown, red gravelly sandy clay soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Bisarahalli series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Paleustalfs.

The thickness of the solum ranges from 75 to 98 cm. The thickness of A-horizon ranges from 17 to 25 cm. Its colour is in 5 YR hue with value 3 to 4 and chroma 3 to 6. The texture ranges from sandy clay loam to sandy clay with 15 to 35 per cent gravel. The thickness of B horizon ranges from 61 to 79 cm. Its colour is in 5 YR hue with value 3 and chroma 3 to 4. Its texture is gravelly sandy clay with gravel content of 15-35 per cent. The available water capacity is low (50-100 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Bisarahalli (BSR) Series

4.1.10 Huliyapura (HLP) Series: Huliyapura soils are moderately deep (75-100 cm), well drained, have dark brown to strong brown and dark yellowish brown, sandy clay loam soils. They have developed from weathered granite gneiss and occur on very gently sloping low lands under cultivation. The Huliyapura series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 75 to 98 cm. The thickness of A-horizon ranges from 18 to 22 cm. Its colour is in 5 YR and 10 YR hue with value 3 to 4 and chroma 4. The texture is sandy clay loam. The thickness of B-horizon ranges from 56 to 75 cm. Its colour is in 5 YR, 7.5 YR and10 YR hue with value 3 to 4 and chroma 2 to 6. Its texture is sandy clay. The available water capacity is low (50-100 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Huliyapura (HLP) Series

4.1.11 Kumchahalli (KMH) Series: Kumchahalli soils are deep (100-150cm), well drained, have dark reddish brown to dark red, sandy clay soils. They have developed from weathered granite gneiss and occur on nearly level to very gently sloping uplands. The Kumchahalli series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 102 to 150 cm. The thickness of A-horizon ranges from 11 to 23 cm. Its colour is in 5 YR and 2.5 YR hue with value 2.5 to 3 and chroma 3 to 6. The texture is dominantly sandy clay. The thickness of B horizon ranges from 95 to 132 cm. Its colour is in 2.5 YR hue with value 3 and chroma 4 to 6. Its texture is dominantly sandy clay loam to sandy clay. The available water capacity is high (150-200 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Kumchahalli (KMH) Series

4.1.12 Mornal (MNL) Series: Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Mornal series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 112 to 149 cm. The thickness of A-horizon ranges from 15 to 25 cm. Its colour is in 5 YR, 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture is sandy clay loam, sandy clay and clay with 15 to 30 per cent gravel. The thickness of B-horizon ranges from 103 to 131 cm. Its colour is in 2.5 YR and 5 YR hue with value 2.5 to 4 and chroma 3 to 6. Texture is sandy clay loam to sandy clay with 15 to 35 per cent gravel. The available water capacity is medium (101-150 mm/m). Two soil phases were identified and mapped.

Landscape and soil profile characteristics of Mornal (MNL) Series

4.1.13 Balapur (BPR) Series: Balapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay to clay soils. These soils are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Balapur series has been classified as a member of the clayey-skeletal, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 102 to 147 cm. The thickness of A-horizon ranges from 12 to 17cm. Its colour is in 5 YR and 2.5 YR hue with value and chroma 3 to 4. The texture ranges from loamy sand to sandy clay with 15 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 132 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 4 to 6. Texture is sandy clay to clay with 35 to 50 per cent gravel. The available water capacity is medium (100-150 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Balapur (BPR) Series

4.1.14 Nagalapur (NGP) Series: Nagalapur soils are deep (100-150 cm), well drained, have dark reddish brown to dark red, gravelly sandy clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands. The Nagalapur series has been classified as a member of the clay-skeletal, mixed, isohyperthermic family of Typic Paleustalfs.

The thickness of the solum ranges from 105 to 145 cm. The thickness of A-horizon ranges from 14 to 20 cm. Its colour is in 7.5 YR hue with value and chroma 3 to 4. The texture ranges from sandy loam to sandy clay with 10 to 50 per cent gravel. The thickness of B horizon ranges from 90 to 128 cm. Its colour is in 2.5 YR, 5 YR and 7.5 YR hue with value 3 to 5 and chroma 3 to 6. Texture is sandy clay to clay with 35 to 80 per cent gravel. The available water capacity is low (51-100 mm/m). Only one soil phase was identified and mapped.

Landscape Soil Profile Characteristics of Nagalapur (NGP) Series

4.2 Soils of Alluvial landscape

In this landscape, 2 soil series were identified and mapped. Of these, Muttal (MTL) series occupies major area of 27 ha (4%) and Ravanaki (RNK) 13 ha (2%)**.** The brief description along with the soil phases identified and mapped is given below.

4.2.1 Muttal (MTL) Series: Muttal soils are shallow (25-50 cm), well drained, have dark brown to very dark grayish brown, calcareous, gravelly clay soils. They have developed from alluvium and occur on nearly level to very gently sloping plains. The Muttal series has been classified as a member of the clayey, mixed (calc), isohyperthermic family of (Paralithic) Haplustepts.

The thickness of the solum ranges from 30 to 50 cm. The thickness of A-horizon ranges from 15 to 18 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 18 to 32 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. The available water capacity is low (51-100 mm/m). Only one soil phase was identified and mapped.

Landscape and soil profile characteristics of Muttal (MTL) Series

4.2.2 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 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 low (51-100 mm/m). Two soil phases were identified and mapped.

Landscape and Soil Profile Characteristics of Ravanaki (RNK) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Hire Wadarkal Microwatershed

Soil Series: Lakkur (LKR), **Pedon:** RM-8.
Location: $15^0$04'26.3"N, $75^0$37'84.1"E, (4D4A3I1f), Belhatti village, Shirahatti taluk, Gadag distrtict
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Typic Rhodustalfs

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
0-21	Ap	74.00	8.34	17.66	9.62	11.57	15.76	23.13	13.92	20	sl	-	-
21-35	Bt	54.37	10.48	35.14	16.33	8.64	9.69	11.59	8.11	40	sc	-	-
35-56	Bc	48.37	13.46	38.17	10.96	7.69	9.17	11.28	9.27	60	sc	-	-

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}							%	%
0-21	8.18	-	-	0.30	0.56	0.94	-	-	0.31	0.55	0.86	12.19	0.69	100.00	4.51
21-35	8.17	-	-	0.30	0.52	1.29	-	-	0.19	0.84	1.03	22.18	0.63	100.00	3.79
35-56	7.95	-	-	0.46	0.48	1.99	-	-	0.24	0.58	0.82	22.94	0.60	100.00	2.53

Contd....

Series Name: Mukahadahalli (MKH), **Pedon:** R-11
Location: $15^0$22'05.4"N, $76^0$04'10.3"E, Halageri village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey-skeletal, mixed, isohyperthermic Typic Haplustalfs

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
0-19	Ap	65.71	8.83	25.46	9.27	9.06	14.42	21.52	11.43	70	scl	16.54	8.60
19-32	Bt	55.89	11.13	32.98	6.47	9.18	11.89	19.19	9.18	50	scl	19.24	12.78
32-58	Bt	47.95	10.41	41.63	17.52	3.78	9.13	9.55	7.97	50	sc	24.03	16.02

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}							%	%
0-19	7.38	-	-	0.09	0.2	0.00	8.97	4.32	0.26	0.22	13.77	14.84	0.58	93	1.49
19-32	7.5	-	-	0.106	0.41	0.00	15.98	3.27	0.16	0.50	19.91	20.88	0.63	95	2.38
32-58	7.46	-	-	0.173	0.49	0.00	19.71	4.53	0.23	1.32	25.79	25.76	0.62	100	5.11

Contd....

Series Name: Kethanapura (KTP) **Pedon:** R-9
Location: $15^0$25'28.81"N, $76^0$22'00.76" E Jabbaragudda village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

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	83.64	10.52	5.84	25.61	22.36	15.24	13.52	6.91	10	ls	7.92	2.58
18-38	Bt1	46.06	5.63	48.31	21.58	9.54	3.53	4.15	7.26	30	sc	19.62	14.48
38-73	Bt2	52.31	6.91	40.78	24.56	12.74	5.96	5.55	3.49	30	sc	17.73	11.95

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	6.42	-		0.07	1.24	-	2.95	0.93	0.57	0.02	4.48	4.41	0.75	100.00	0.05
18-38	6.63	-	-	0.09	0.70	-	11.71	3.53	0.98	0.08	16.31	16.59	0.34	98.30	0.50
38-73	6.88	-	-	0.15	0.48	-	11.36	3.30	0.72	0.13	15.50	15.75	0.39	98.42	0.80

Contd....

Soil Series: Thammadahalli (TDH), **Pedon:** $TR_1/1$
Location: $15^0$03'41.7"N, $75^0$36'65.2"E, (4D4A3G2d), Nilogal village, Shirahatti taluk, Gadag district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

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	85.71	7.34	6.94	14.79	13.28	16.10	24.75	16.80	20	ls	-	-
25-65	Bt	47.76	7.96	44.28	15.30	9.78	6.24	7.91	8.53	10	sc	-	-

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	9.19	-	-	0.18	0.35	1.29	-	-	0.08	0.52	0.60	3.57	0.51	100.00	5.82
25-65	8.00	-	-	0.17	0.35	0.58	-	-	0.15	1.31	1.46	13.87	0.31	100.00	3.78

Contd....

Soil Series: Hooradhahalli (HDH), **Pedon:** RM-69

Location: $13^0$24'31"N, $76^0$33'41"E, (4D3D8G2d), Hesarahalli village, Chikkanayakanahalli taluk, Tumukura district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic Paleustalfs

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	72.56	15.17	12.27	4.57	8.33	17.38	23.88	18.39	35	sl	-	-
18-33	Bt1	56.29	10.75	32.96	7.88	10.24	13.41	14.43	10.34	55	scl	-	-
33-58	Bt2	46.66	10.79	42.55	10.79	9.87	8.43	9.04	8.53	55	sc	-	-
58-90	Bt3	43.09	13.63	43.27	9.90	8.25	7.32	8.76	8.87	45	c	-	-

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	6.54	-	-	0.07	0.60	0.00	2.68	1.38	0.44	0.42	4.91	5.84	0.48	84.07	7.11
18-33	5.90	-	-	0.07	0.52	0.00	3.99	1.27	0.09	0.37	5.71	8.61	0.26	66.32	4.29
33-58	6.16	-	-	0.07	0.44	0.00	4.92	1.67	0.08	0.55	7.22	10.00	0.24	72.23	5.50
58-90	6.39	-	-	0.06	0.40	0.00	4.30	2.02	0.08	0.46	6.87	9.21	0.21	74.61	5.05

Contd....

Series: Bidanagere (BDG), **Pedon**: RM-3
Location: $13^0$22'11"N, $76^0$38'03"E, (4D3D8G1a), Tharabenahalli village, Chikkanayakanahalli Taluk, Tumakuru District.
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Rhodic Paleustalfs

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
0-20	Ap	81.19	11.25	7.56	12.54	15.07	17.90	21.94	13.75	50	ls	-	-
20-35	Bt1	57.45	11.45	31.10	12.76	11.02	10.92	12.45	10.31	50	scl	-	-
35-92	Bt2	44.63	7.85	47.52	12.40	9.61	8.37	7.75	6.51	60	c	-	-

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}							%	%
0-20	6.24	-	-	0.06	0.60	0.00	1.61	0.26	0.10	0.01	1.98	3.76	0.50	52.56	0.35
20-35	5.99	-	-	0.02	0.40	0.00	4.25	0.46	0.08	0.28	5.07	8.02	0.26	63.18	3.46
35-92	6.70	-	-	0.03	0.20	0.00	5.45	0.31	0.10	0.22	6.09	9.90	0.21	61.48	2.24

Contd....

Soil Series: Gollarahatti (GHT), **Pedon:** RM-2
Location: $50^0$04'88.8"N, $75^0$37'65.2"E, (4D4A3I1f), Belhatti village, Shirahatti taluk, Gadag district.
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed, isohyperthermic Typic Rhodustalfs

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
0-26	Ap	83.22	5.74	11.05	9.71	11.73	16.68	27.10	16.58	30	ls	-	-
26-63	Bt1	55.91	13.36	30.73	13.05	9.66	11.10	14.29	7.81	20	scl	-	-
63-84	Bt2	57.17	11.38	31.45	10.53	10.11	12.28	13.83	10.42	20	scl	-	-

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}							%	%
0-26	5.70	-	-	0.06	0.20	0.00	1.50	0.60	0.09	0.13	2.32	3.17	0.29	73.00	4.10
26-63	6.26	-	-	0.04	0.24	0.00	7.35	1.55	0.09	0.17	9.15	9.89	0.32	93.00	1.72
63-84	6.50	-	-	0.05	0.20	0.47	-	-	0.09	0.21	0.30	10.18	0.32	100.00	2.06

Contd....

Series Name: Bisarahalli (BSR) **Pedon:** R-9
Location: $15^0$25'21.0"N, $76^0$11'42.0"E Hatti village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Typic Paleustalfs

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
0-14	Ap	70.11	9.29	20.60	22.31	15.97	11.98	9.83	10.03	20	scl	13.22	7.81
14-57	Bt1	47.27	7.52	45.20	27.04	8.28	4.61	2.10	5.24	25	sc	16.39	13.31
57-80	Bt2	41.93	8.67	49.40	21.95	6.83	4.76	4.66	3.73	30	c	21.41	15.41
80-99	Bt3	49.02	9.87	41.11	19.90	10.78	6.84	6.42	5.08	40	sc	21.82	14.24

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}							%	%
0-14	6.59	-	-	0.12	0.73	-	4.47	1.77	0.06	0.53	6.82	8.80	0.43	77.55	6.00
14-57	7.02	-	-	0.04	0.48	-	5.85	2.31	0.06	0.20	8.43	14.70	0.33	57.32	1.36
57-80	7.00	-	-	0.05	0.28	-	11.74	2.26	0.08	0.22	14.31	15.60	0.32	91.73	1.44
80-99	6.90	-	-	0.06	0.18	-	13.70	2.16	0.08	0.14	16.08	16.50	0.40	97.44	0.83

Contd....

S**eries Name:** Kumchahalli (KMH), **Pedon:** RM-9
Location: $15^0$20'05"N, $76^0$13'21"E, Basapura village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Typic Rhodustalfs

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
0-13	Ap	51.76	9.05	39.19	7.99	8.84	13.42	14.38	7.14	-	sc	20.08	13.69
13-27	A21	53.50	8.12	38.38	7.00	11.05	15.21	14.33	5.91	-	sc	17.05	12.32
27-43	A22	63.60	5.01	31.40	3.85	11.56	24.52	18.52	5.14	-	scl	11.76	9.09
43-64	Bt1	48.74	5.91	45.35	8.87	9.31	12.49	12.27	5.81	10	sc	16.68	13.35
64-84	Bt2	45.13	8.90	45.97	9.86	7.12	10.95	10.62	6.57	20	sc	17.45	13.42
84-114	BC	65.04	6.94	28.02	10.49	16.21	17.80	13.88	6.67	40	scl	13.20	9.75

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}							%	%
0-13	7.2	-	-	0.193	0.81	3.00	9.69	3.93	1.41	0.08	15.10	15.07	0.38	100	0.54
13-27	7.13	-	-	0.161	0.7	3.00	8.69	3.57	1.29	0.16	13.70	13.75	0.36	100	1.14
27-43	7.31	-	-	0.096	0.89	2.64	5.19	2.36	1.07	0.24	8.86	9.46	0.30	94	2.51
43-64	7.65	-	-	0.089	1.16	2.52	8.25	2.88	0.72	0.35	12.20	12.65	0.28	96	2.79
64-84	7.98	-	-	0.1	0.38	3.12	10.49	2.88	0.26	0.41	14.04	14.63	0.32	96	2.78
84-114	8.23	-	-	0.121	0.58	2.88	8.02	1.87	0.09	0.43	10.41	10.67	0.38	98	4.02

Contd....

Series Name: Mornal (MNL), **Pedon:** R-12
Location: $15^0$22'75"N, $76^0$05'16.1" Halageri village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

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	81.48	5.14	13.39	14.07	12.15	17.00	27.53	10.73	70	sl	9.64	4.93
17-31	Bt1	51.43	10.24	38.33	6.67	7.72	9.52	19.26	8.25	30	sc	23.97	11.70
31-56	Bt2	45.62	8.77	45.62	17.85	7.31	8.14	8.87	3.44	30	sc	25.94	12.45
56-104	Bt3	53.10	10.62	36.28	21.87	10.30	8.10	7.99	4.84	<30	sc	20.95	10.16
104-126	Bc	54.21	12.88	32.91	12.28	8.84	15.92	10.20	6.97	<30	scl	19.96	10.21

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	7.89	-	-	0.137	0.33	0.00	4.92	3.35	0.35	0.45	9.07	9.01	0.67	100	5.04
17-31	8.19	-	-	0.31	0.45	0.00	7.24	5.16	0.16	0.15	12.70	13.57	0.35	94	1.12
31-56	8.2	-	-	0.414	0.53	0.00	6.49	5.32	0.11	0.13	12.05	18.55	0.41	65	0.71
56-104	8.64	-	-	0.422	0.37	0.00	6.21	4.64	0.16	0.14	11.15	15.16	0.42	74	0.95
104-126	8.71	-	-	0.436	0.2	0.00	7.06	6.31	0.09	0.33	13.79	14.52	0.44	95	2.31

Contd....

Soil Series: Balapur (BPR), **Pedon**: RM-78
Location: $13^0$26'39"N, $76^0$35'03"E, (4D3D8G2c), Kasaba, Chikkanayakanahalli taluk, Tumakuru district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Clayey-skeletal, mixed, isohyperthermic Typic Rhodustalfs

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
0-12	Ap	65.66	18.66	15.68	4.14	6.16	13.33	21.82	20.20	-	sl	-	-
12-34	Bt1	61.91	11.52	26.57	2.36	6.78	12.53	21.36	18.89	-	scl	-	-
34-60	Bt2	51.81	11.24	36.94	4.66	5.70	12.23	15.96	13.26	30	sc	-	-
60-84	Bt3	46.61	9.02	44.37	14.70	6.88	7.51	8.97	8.55	55	sc	-	-
84-112	Bt4	48.75	12.92	38.33	15.73	8.13	6.87	8.23	9.79	60	sc	-	-
112-127	Bc	50.98	24.74	24.28	5.25	4.63	5.15	10.92	25.03	50	scl	-	-

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}							%	%
0-12	6.64	-	-	0.03	0.56	0.00	1.90	1.32	0.21	0.03	3.46	5.45	0.35	63.48	0.51
12-34	6.99	-	-	0.02	0.48	0.00	3.66	1.90	0.07	0.08	5.70	7.82	0.29	72.93	0.96
34-60	7.29	-	-	0.02	0.40	0.00	5.13	2.08	0.11	0.20	7.52	11.19	0.30	67.18	1.75
60-84	7.50	-	-	0.02	0.32	0.00	5.83	6.36	0.13	0.23	12.55	12.38	0.28	101.43	1.83
84-112	7.54	-	-	0.02	0.24	0.00	6.02	6.59	0.11	0.25	12.96	12.77	0.33	101.49	1.97
112-127	7.90	-	-	0.02	0.20	0.00	8.04	3.62	0.07	0.32	12.04	12.47	0.51	96.56	2.55

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Series Name: Nagalapur (NGP) **Pedon :** R-10
Location: $15^0$26'38.0"N, $76^0$10'27.0" E Budashettynala village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey- skeletal, mixed, isohyperthermic Typic Paleustalfs

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
0-16	Ap	78.43	6.36	15.21	25.23	18.82	14.04	13.22	7.12	30	sl	9.32	5.56
16-38	Bt1	46.97	8.53	44.51	14.33	12.34	7.43	6.80	6.07	30	sc	18.70	13.79
38-58	Bt2	51.92	7.48	40.60	20.98	10.07	7.37	7.48	6.02	40	sc	17.93	13.75
58-81	Bt3	54.05	7.18	38.77	27.07	10.58	5.91	5.81	4.67	50	sc	17.92	11.87
81-104	Bt4	59.03	8.93	32.04	21.88	13.11	8.88	8.05	7.12	50	scl	16.63	10.55
104-126	BC	62.35	9.26	28.40	21.19	14.51	9.88	8.13	8.64	60	scl	15.03	10.06

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}							%	%
0-16	6.77	-	-	0.09	0.82	-	3.52	2.14	0.18	0.03	5.87	7.10	0.47	82.70	0.46
16-38	6.89	-	-	0.06	0.57	-	9.35	3.85	0.10	0.21	13.50	14.70	0.33	91.87	1.40
38-58	6.80	-	-	0.06	0.52	-	8.76	3.42	0.10	0.26	12.55	14.20	0.35	88.35	1.85
58-81	6.84	-	-	0.06	0.32	-	7.67	2.77	0.10	0.58	11.12	12.90	0.33	86.18	4.48
81-104	6.86	-	-	0.05	0.20	-	6.97	2.07	0.09	0.95	10.07	11.90	0.37	84.59	7.95
104-126	6.70	-	-	0.07	0.10	-	5.53	1.77	0.07	0.73	8.09	9.40	0.33	86.09	7.77

Contd....

Series Name: Muttal (MTL), **Pedon:** RM-13
Location: $15^0$14'30.8"N, $75^0$56'50.6"E, Gatareddihalla village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey, mixed (calc), isohyperthermic (Paralithic) 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
0-20	Ap	39.05	13.74	47.21	3.05	5.05	8.21	14.63	8.11	15-30	c	29.95	17.94
20-34	Bwk	28.77	19.57	51.66	4.81	4.71	4.92	9.09	5.24	10	c	33.44	21.56

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}							%	%
0-20	8.27	-	-	0.202	0.79	6.10	-	-	0.62	0.25	-	36.64	0.78	-	0.69
20-34	8.36	-	-	0.177	0.99	23.04	-	-	0.29	0.38	-	39.60	0.77	-	0.96

Contd....

Series Name: Ravanaki (RNK), **Pedon:** RM-20
Location: $15^0$14'22.7"N, $75^0$57'45.8"E, Gatareddihalla village, Koppal Taluk and District
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very-fine, smectitic (calc), isohyperthermic 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

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 and 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 recognised 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/alkali 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 identified 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 29 soil map units identified in the Hire Wadarkal microwatershed are grouped under 2 Land capability classes and 5 land capability subclasses (Fig. 5.1). Entire cultivated area of about 640 ha (90%) is suitable for agriculture. An area of about 46 ha (7%) is under rock lands and 23 ha (3%) is under habitation and settlements.

Maximum area of about 501 ha (71%) is good lands (Class II) with minor problems of soil, drainage and erosion and distributed in the major part of the microwatershed. An area about 139 ha (20%) is moderately good lands (Class III) with moderate limitations of soil and erosion and distributed in the eastern, northeastern, western and southwestern part of the microwatershed.

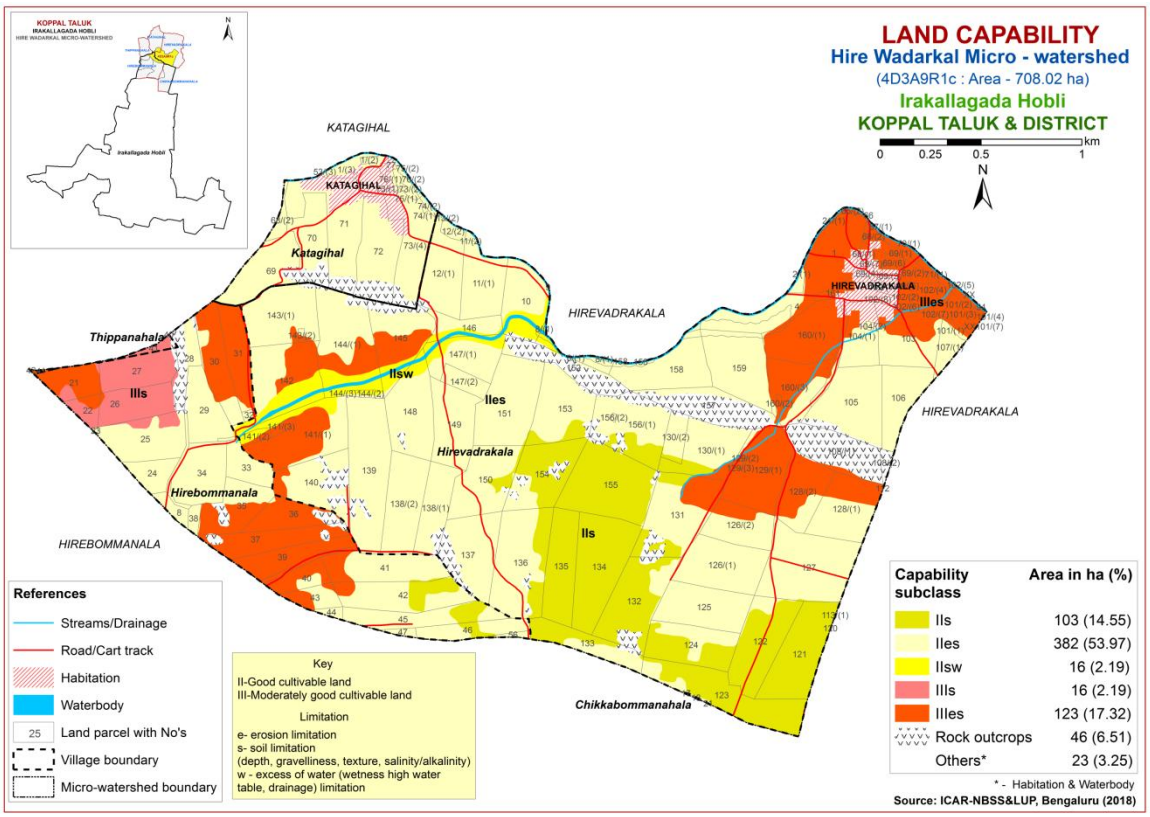


Fig. 5.1 Land Capability map of Hire Wadarkal Microwatershed

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).

An area of about 40 ha (6%) is under shallow (25-50 cm) soils and distributed in the northeastern part of the microwatershed. Moderately shallow (50-75 cm) soils cover an area of about 134 ha (19%) and occur in the central, southern, northern, eastern, western and southwestern part of the microwatershed. Moderately deep (75-100 cm) soils cover a major area of about 380 ha (54%) and distributed in the major part of the microwatershed. An area of about 86 ha (12%) is under deep (100-150 cm) soils and occur in the southwestern, southern, southeastern and eastern part of the microwatershed.

The most productive lands cover an area of about 86 ha (12%) where all climatically adapted long duration crops can be grown. The problem soils cover about 40 ha (6%) area where only short duration crops can be grown and the probability of crop failure is high.

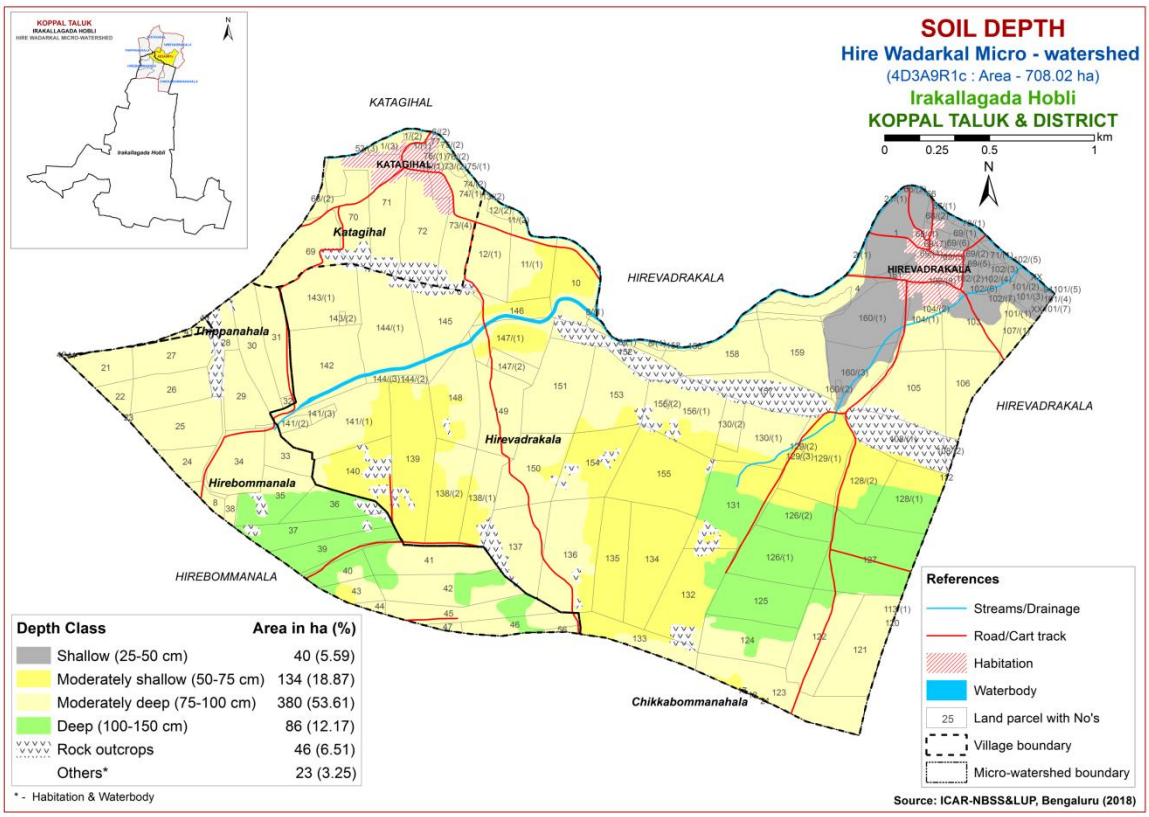


Fig. 5.2 Soil Depth map of Hire Wadarkal Microwatershed

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 behaviour, microbial activity and crop suitability. The textural classes used for LRI were used to classify and a surface soil texture map showing sandy, loamy and clayey at the surface was generated. The area extent and their geographical distribution in the microwatershed is shown in Fig.5.3.

An area of about 14 ha (2%) has soils that are sandy at the surface and distributed in the southern and western part of the microwatershed. Maximum area of about 526 ha (74%) is loamy and distributed in the major part of the microwatershed. An area of 98 ha (14%) has soils that are clayey at the surface and occur in the northern, northwestern, western, northeastern, eastern and southeastern part of the microwatershed.

Entire area has most productive lands with respect to surface soil texture except 2 per cent area where they are sandy soils. The clayey soils (14%) 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. The other productive lands are loamy soils (74%) which also have high potential for soil-

water retention and nutrient availability but have no drainage or other physical problems. The sandy soils (2%) are also productive for root and tuber crops, but these soils have the major limitations of moisture and nutrient retention capacity, hence frequent and shallow irrigation with balanced fertilizer application is to be followed in order to get better crop yields.

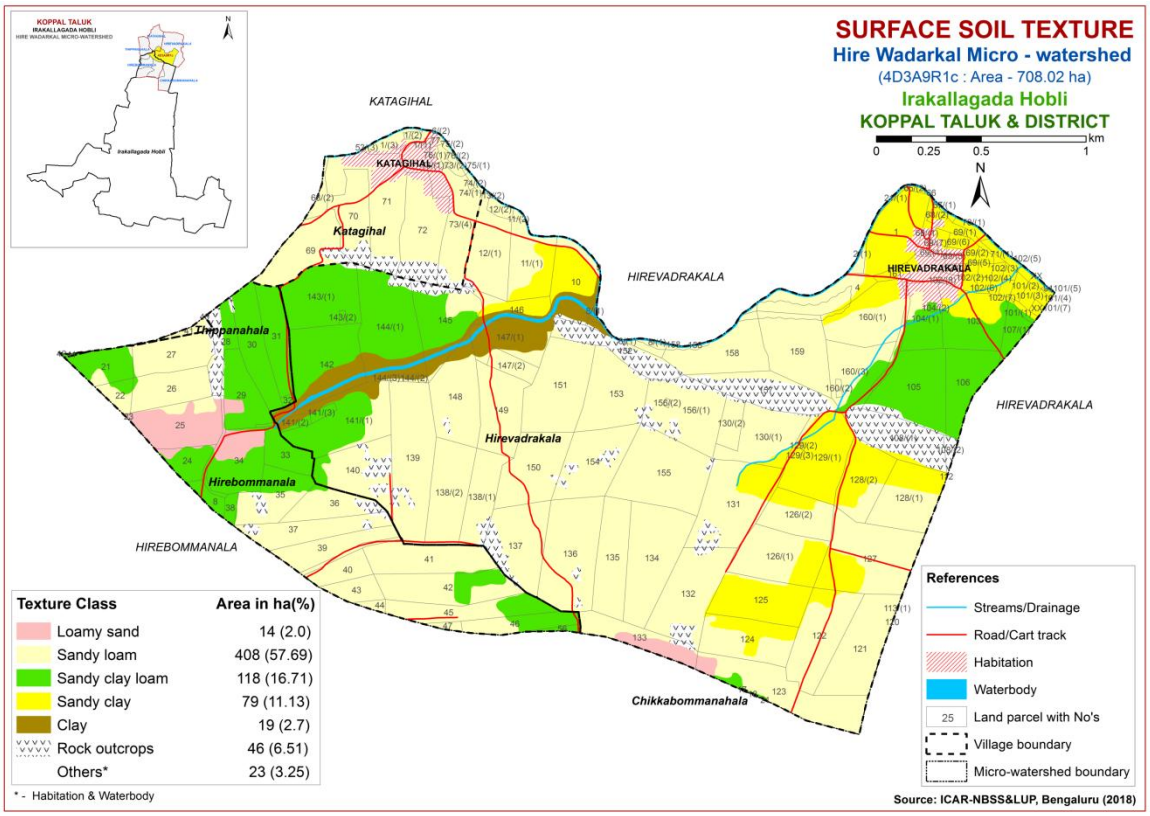


Fig. 5.3 Surface Soil Texture map of Hire Wadarkal Microwatershed

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 spatial distribution in the microwatershed is shown in Fig.5.4.

An area of about 127 ha (18%) has non gravelly (<15%) soils and occur in the western, northwestern, northern, northeastern and eastern part of the microwatershed. Maximum area of about 436 ha (62%) has gravelly (15-35%) soils and distributed in the major part of the microwatershed. An area of about 76 ha (11%) has very gravelly (35-60%) soils and occur in the southwestern, southern and southeastern part of the microwatershed.

An area of about 127 ha (18%) are most productive lands with respect to gravelliness. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem lands cover about 512 ha (72%) that are gravelly to very gravelly where only medium or short duration crops can be grown.

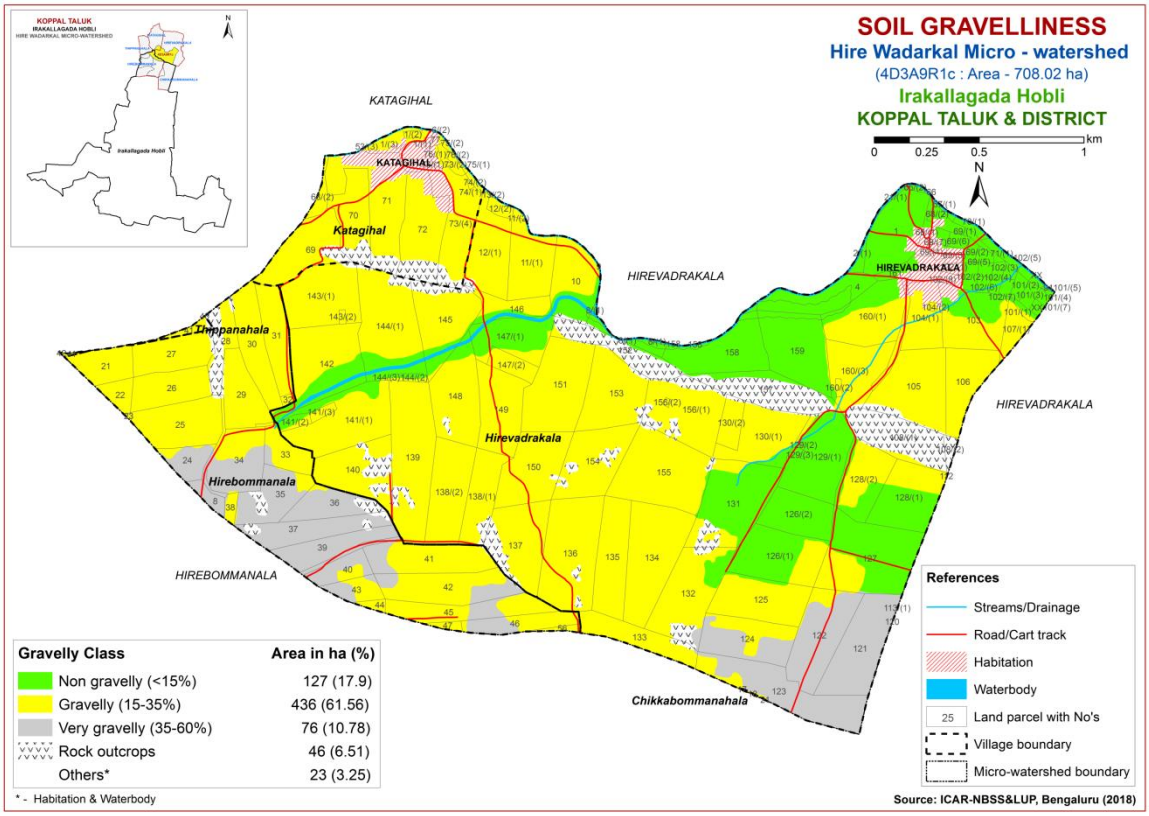


Fig. 5.4 Soil Gravelliness map of Hire Wadarkal Microwatershed

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 (Fig. 5.5).

Maximum area of about 327 ha (46%) has soils that are very low (<50 mm/m) in available water capacity and distributed in the southern, southwestern, western, northwestern, northern, northeastern and eastern part of the microwatershed. Low (51-100 mm/m) in available water capacity cover an area of about 235 ha (33%) and occur in the central, southeastern, southern, southwestern, western, northwestern and northeastern part of the microwatershed. An area of about 77 ha (11%) is medium (101-150 mm/m) in

available water capacity and occur in the eastern, southeastern, southern, western, northwestern and northern part of the microwatershed.

An area of about 562 ha (79%) 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.

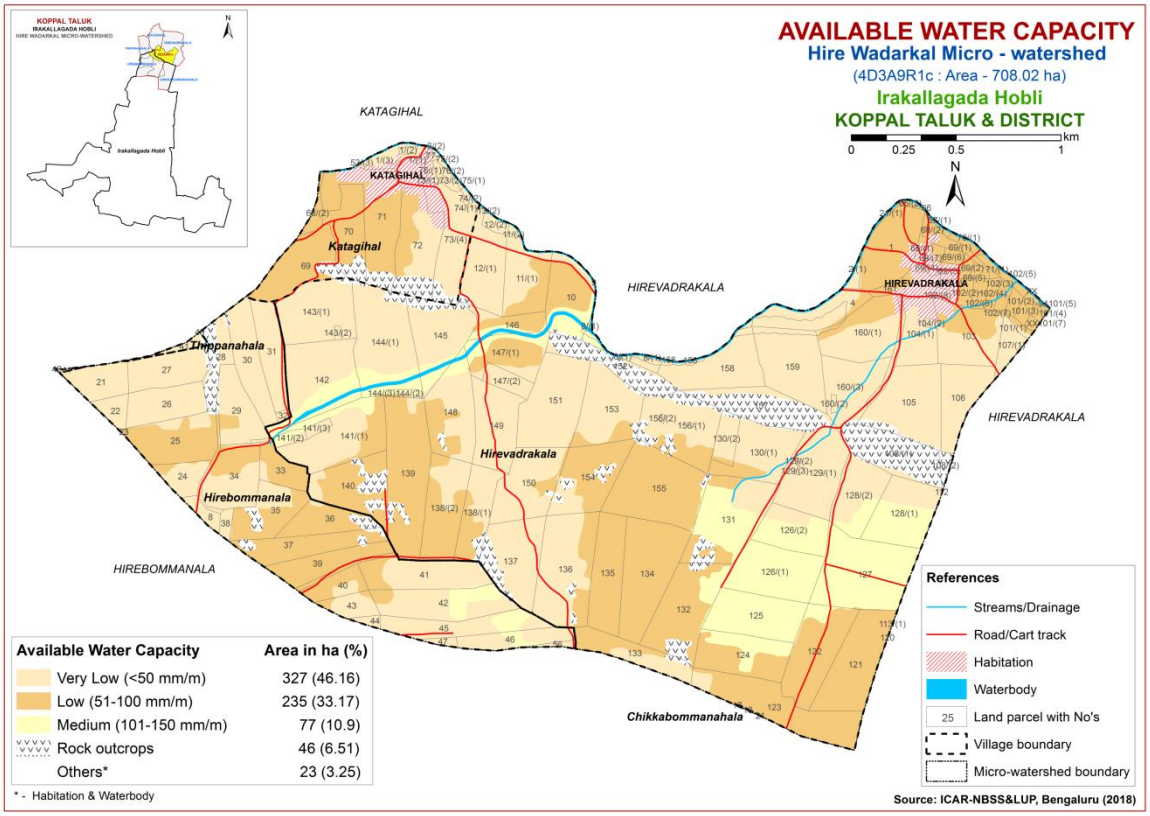


Fig. 5.5 Soil Available Water Capacity map of Hire Wadarkal Microwatershed

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 different 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 16 ha (2%) falls under nearly level (0-1% slope) lands and distributed in the western, northwestern and northern part of the microwatershed. Maximum area of about 593 ha (84%) falls under very gently sloping (1-3% slope) lands and distributed in the major part of the microwatershed. An area of about 30 ha (4%) falls under gently sloping (3-5%) lands and occur in the southern and southwestern part of the microwatershed.

An area of about 609 ha (86%) in the microwatershed has soils that have high potential in respect of soil slopes. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures. An area of about 30 ha (4%) in the microwatershed are problematic and require soil and water conservation measures in order to increase the productivity of soils.

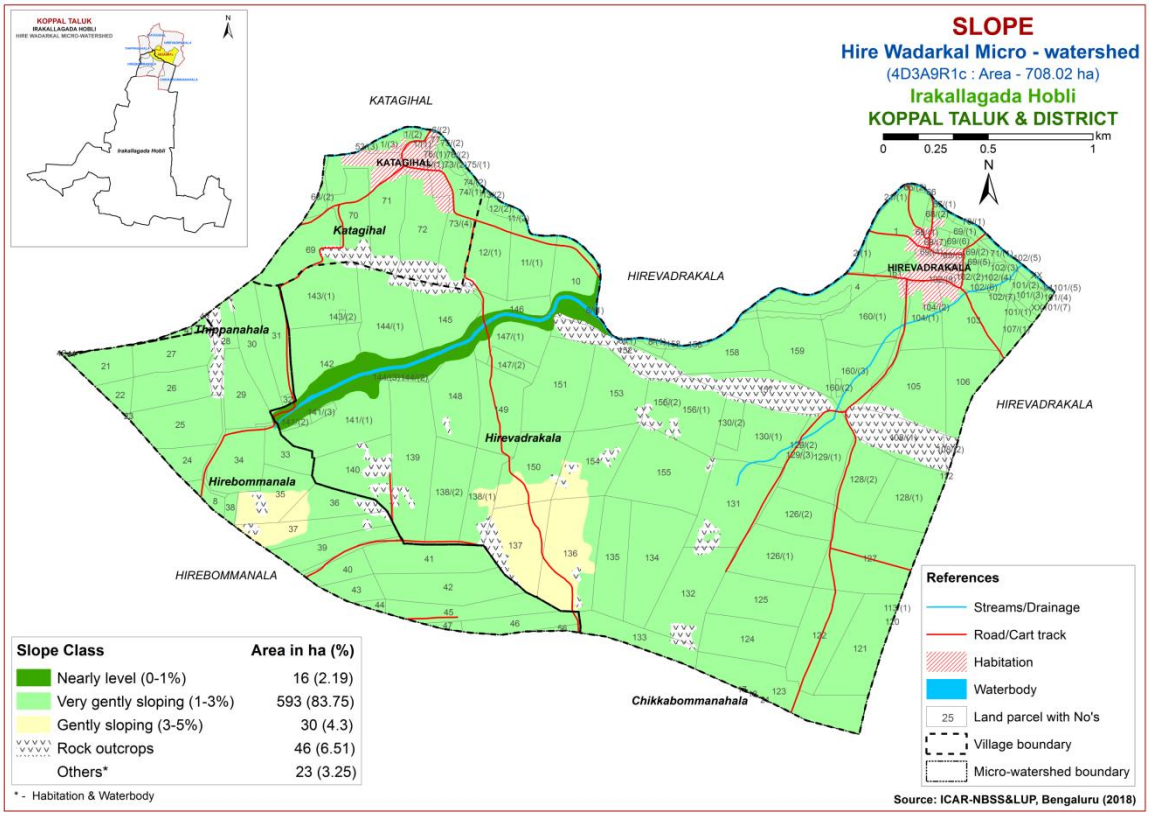


Fig. 5.6 Soil Slope map of Hire Wadarkal Microwatershed

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.

Soils that are slightly eroded (e1 class) cover an area of 134 ha (19%) and distributed in the central, southeastern, southern, western, northwestern and northern part of the microwatershed. Soils that are moderately eroded (e2 class) cover a major area of

481 ha (68%) and distributed in the major part of the microwatershed. Soils that are severely eroded (e3 class) cover an area of 24 ha (3%) and distributed in the southern part of the microwatershed.

Maximum area of about 505 ha (71%) in the microwatershed is problematic because of moderate and severe erosion. For these areas, taking up soil and water conservation and other land development measures are needed.

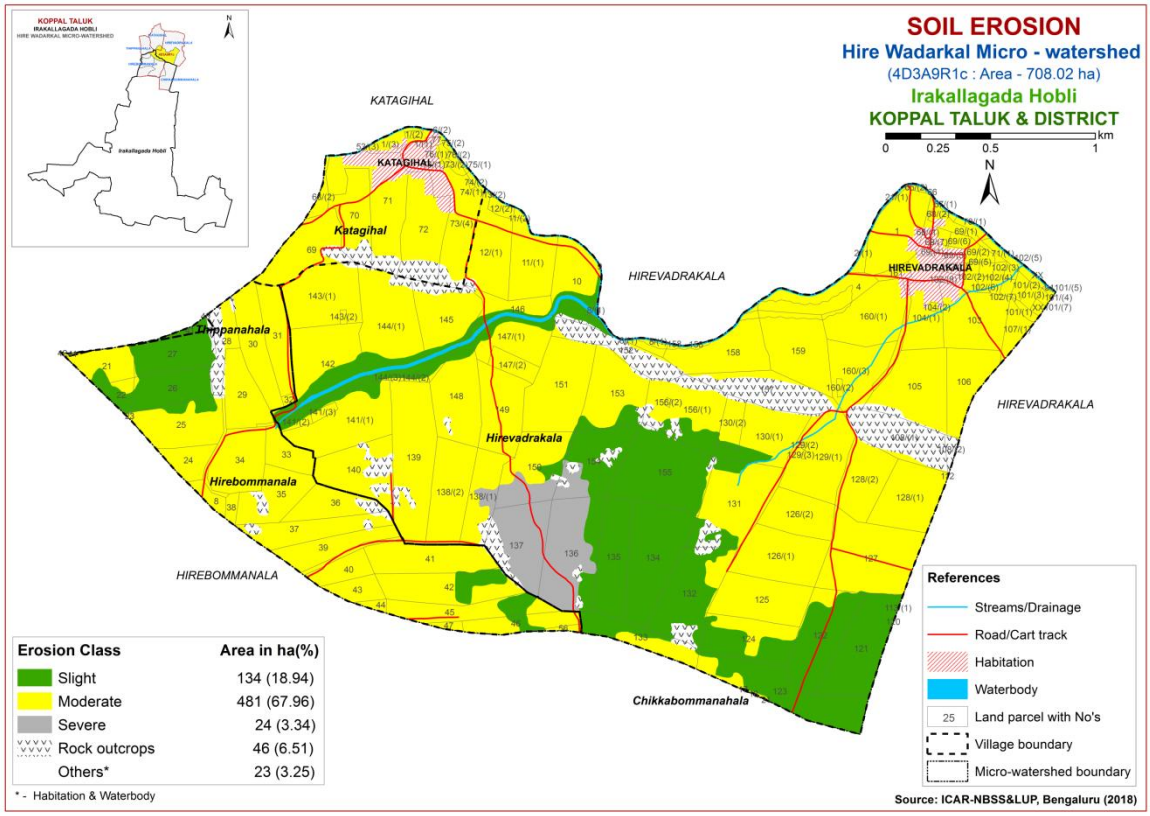


Fig. 5.7 Soil Erosion map of Hire Wadarkal Microwatershed

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 characterised 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 2018 were analysed 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 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 Hire Wadarkal microwatershed for soil reaction (pH) showed that an area of about 245 ha (35%) is under neutral (pH 6.5-7.3) in soil reaction and distributed in the central, southeastern and southern part of the microwatershed. Maximum area of about 394 ha (56%) is under slightly alkaline to strongly alkaline (pH 7.3-9.0) in soil reaction and occur in the major part of the microwatershed (Fig.6.1). Thus, major soils covering 394 ha (56%) area under alkaline and 245 ha (35%) is under neutral condition.

6.2 Electrical Conductivity (EC)

The Electrical Conductivity of the soils of the entire microwatershed area is <2 dS m^{-1} (Fig 6.2) and as such the soils are non-saline.

6.3 Organic Carbon (OC)

The soil organic carbon content (an index of available Nitrogen) of the microwatershed is low (0.5%) in an area of about 186 ha (26%) and distributed in the central, northern, northeastern, eastern, southeastern and southern part of the microwatershed. Medium (0.5-0.75%) in organic carbon cover a major area of about 333 ha (47%) and occur in the central, southern, southwestern, western, northwestern, northern, northeastern and eastern part of the microwatershed. An area of about 120 ha (17%) is high (>0.75%) in organic carbon and distributed in the southwestern, southern and western part of the microwatershed (Fig.6.3).

6.4 Available Phosphorus

An area of about 212 ha (30%) is medium (23-57 kg/ha) in available phosphorus and distributed in the northeastern, southwestern, western and northwestern part of the microwatershed. Low (<23 kg/ha) in available phosphorus cover a major area of about 427 ha (60%) and distributed in the major part of the microwatershed (Fig 6.4).

6.5 Available Potassium

An area of about 77 ha (11%) is low (<145 kg/ha) in available potassium and distributed in the central, southern and southeastern part of the microwatershed. Maximum area of about 521 ha (74%) is medium (145-337 kg/ha) and distributed in the major part of the microwatershed. An area of about 41 ha (6%) is high (>337 kg/ha) and distributed in the northeastern part of the microwatershed (Fig.6.5).

6.6 Available Sulphur

Maximum area of about 295 ha (42%) is low (<10 ppm) in available sulpur and distributed in the central, eastern, southeastern, southern, southwestern and western part of the microwatershed. An area of about 184 ha (26%) is medium (10-20 ppm) in available sulpur and occur in the central, northern, western and eastern part of the microwatershed. An area of about 160 ha (23%) is high (>20 ppm) and distributed in the western, northwestern, northern, northeastern and eastern part of the microwatershed (Fig.6.6).

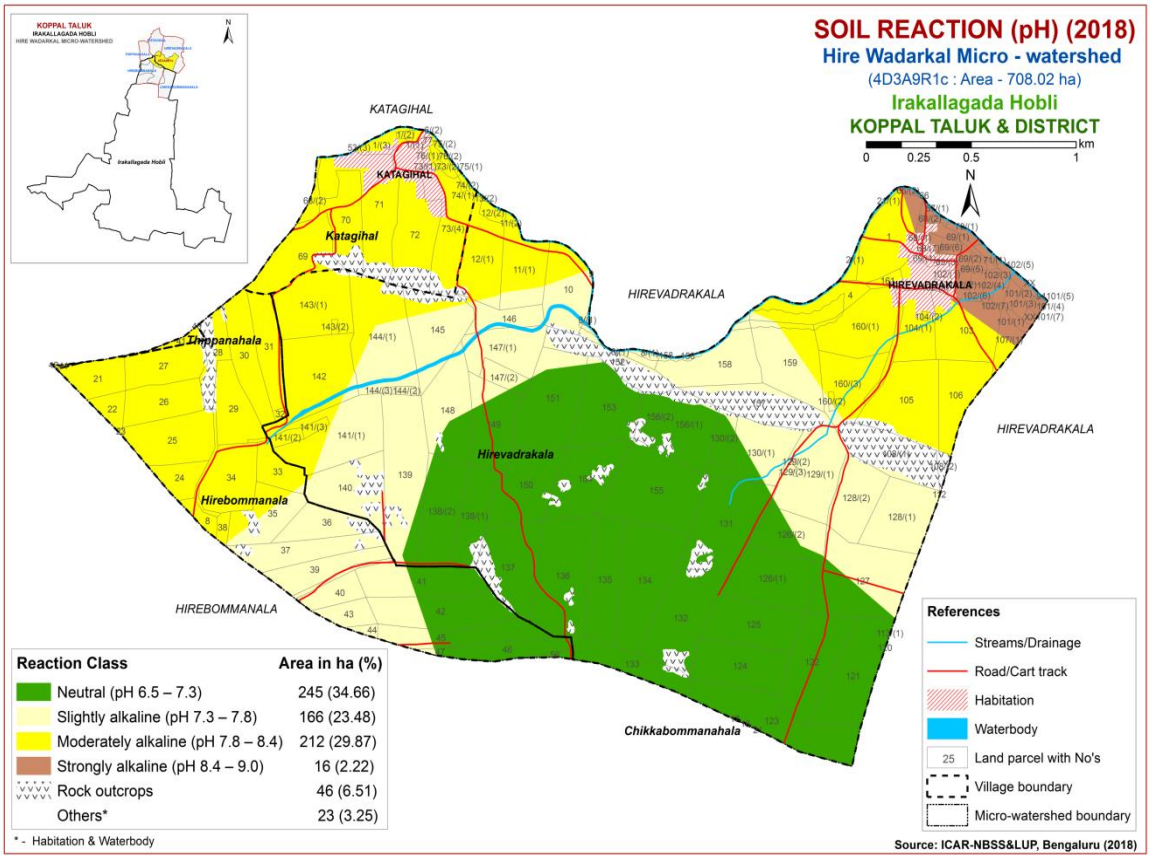


Fig.6.1 Soil Reaction (pH) map of Hire Wadarkal Microwatershed

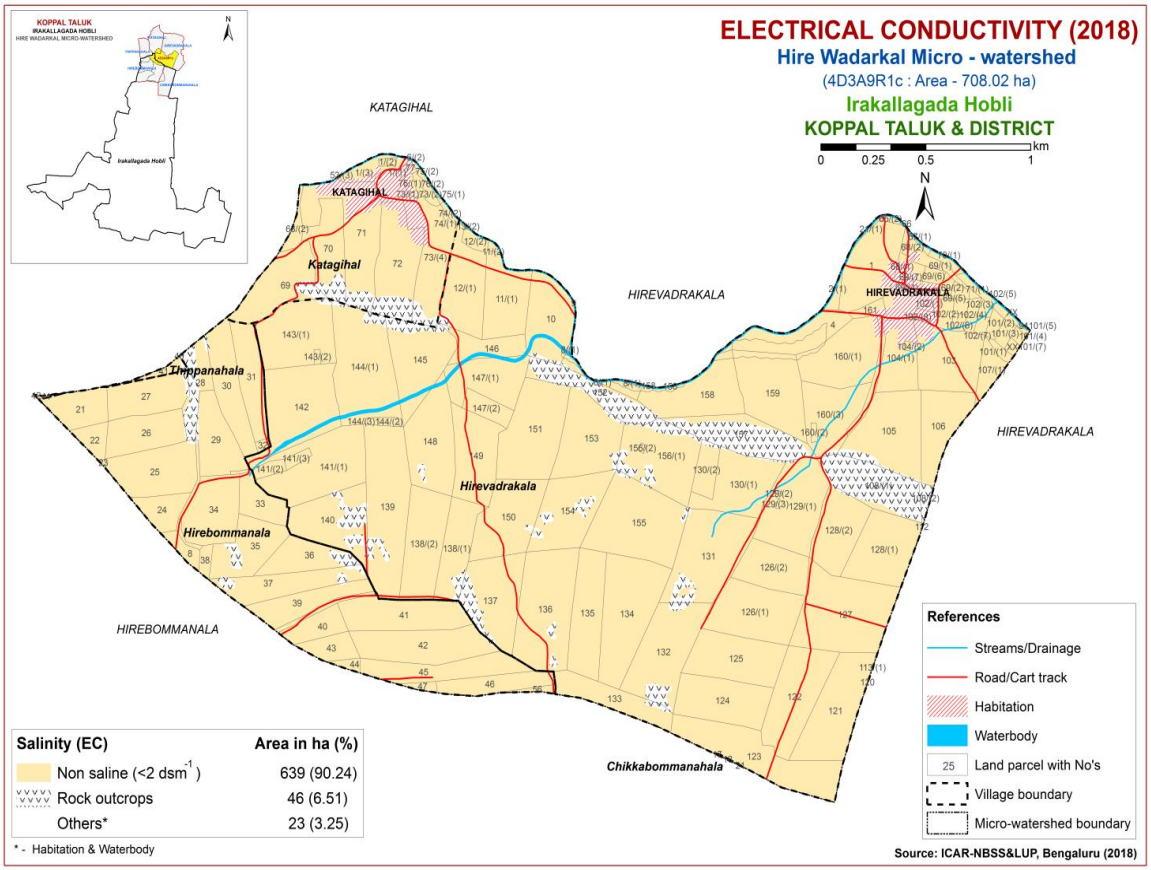


Fig.6.2 Electrical Conductivity (EC) map of Hire Wadarkal Microwatershed

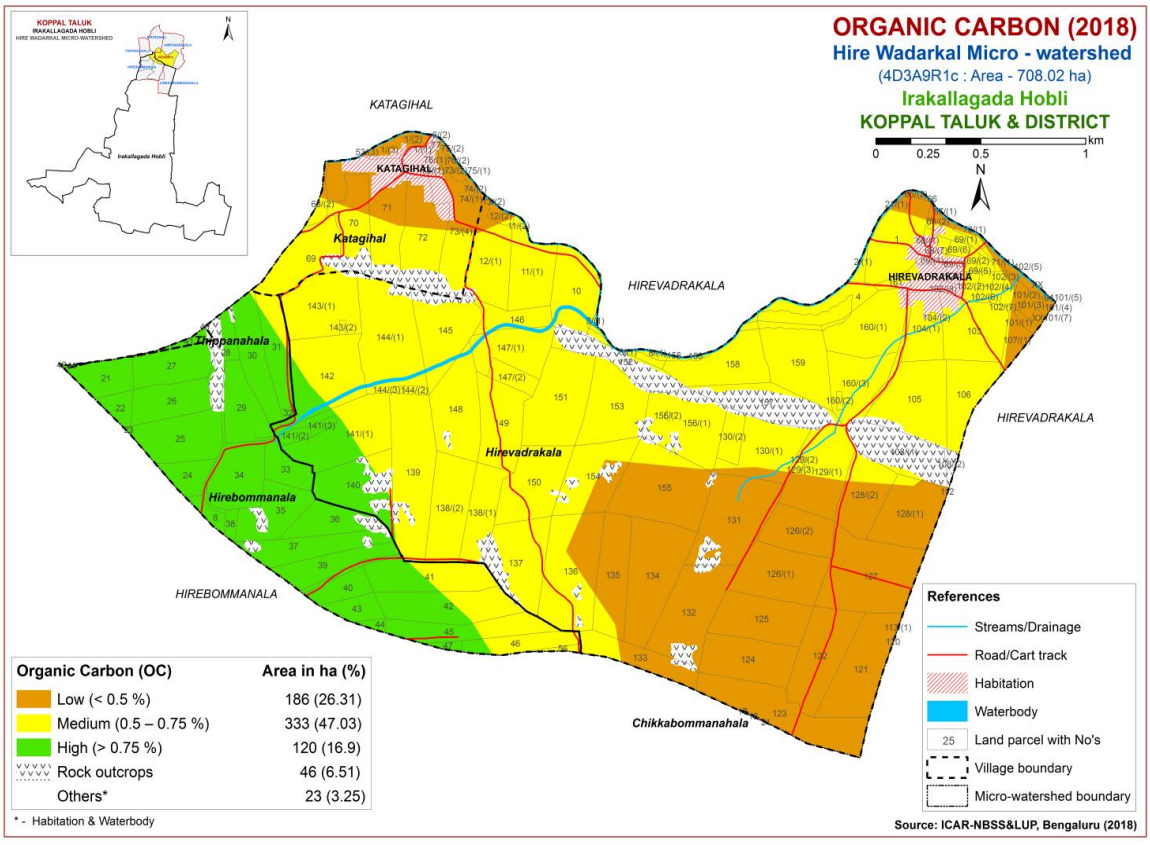


Fig.6.3 Soil Organic Carbon (OC) map of Hire Wadarkal Microwatershed

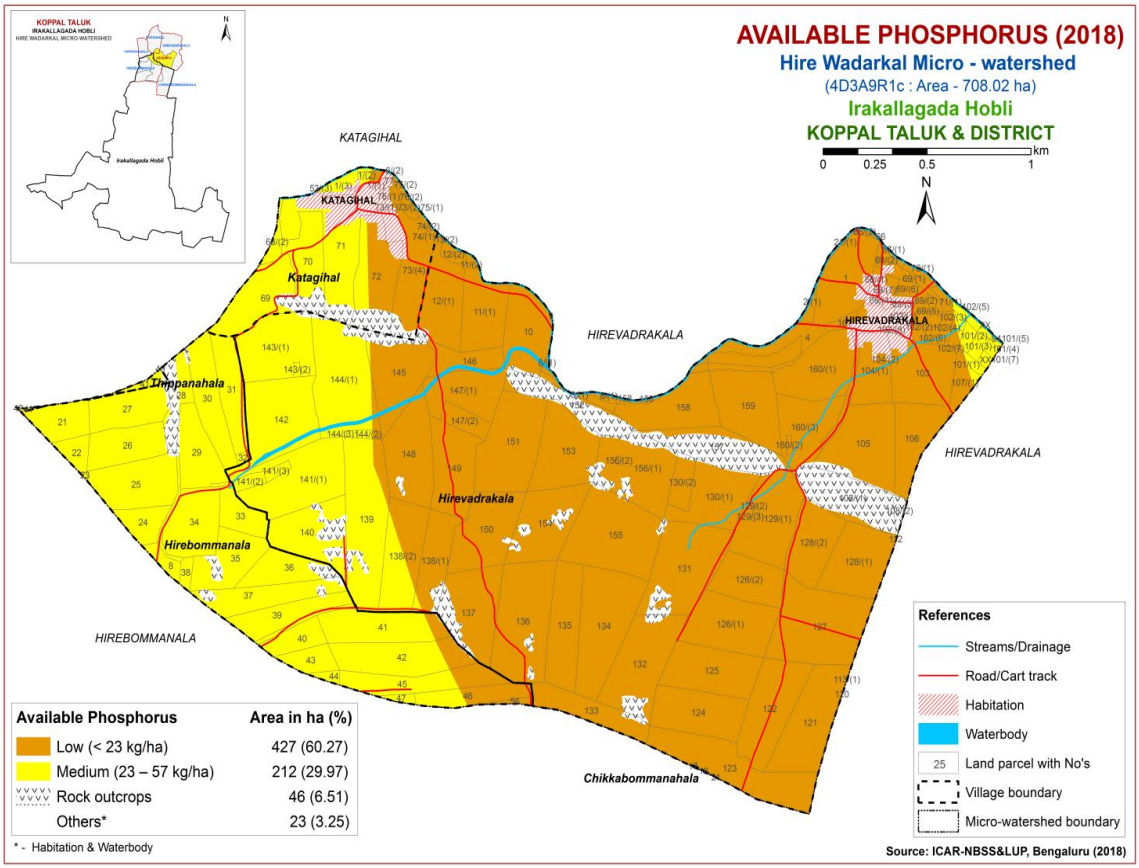


Fig.6.4 Soil Available Phosphorus map of Hire Wadarkal Microwatershed

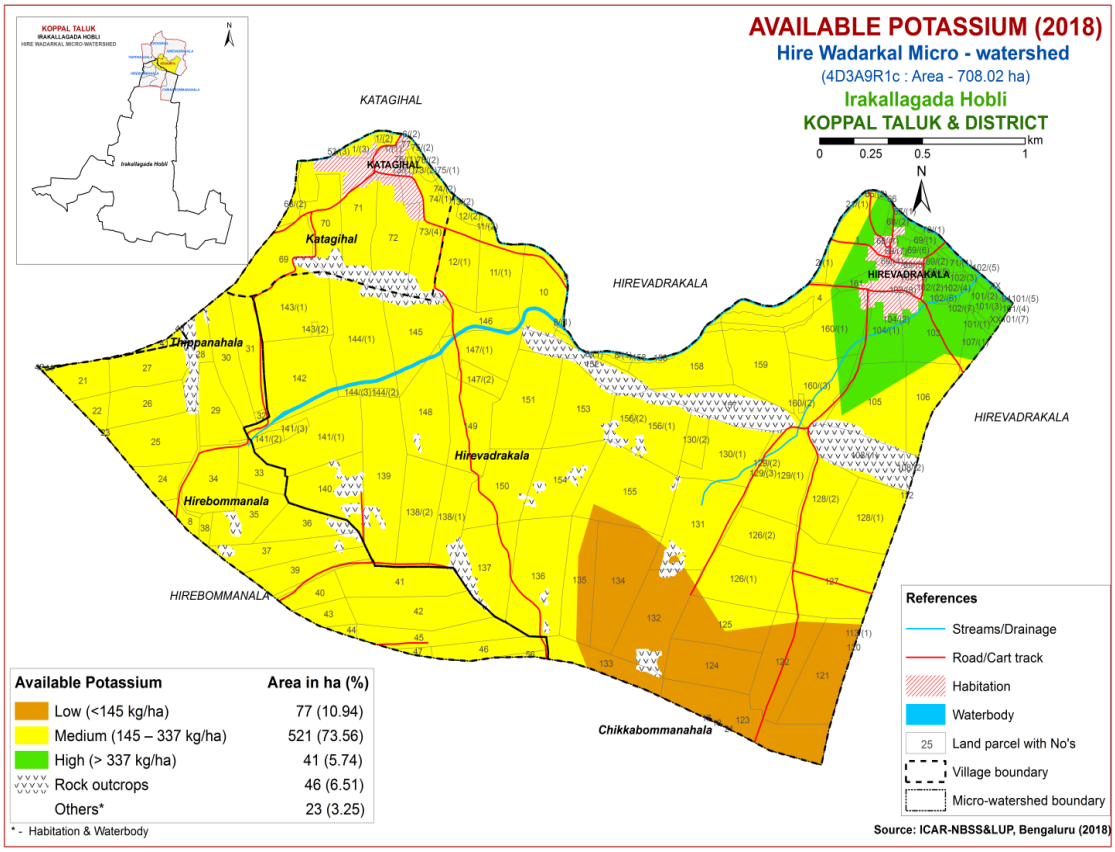


Fig.6.5 Soil Available Potassium map of Hire Wadarkal Microwatershed

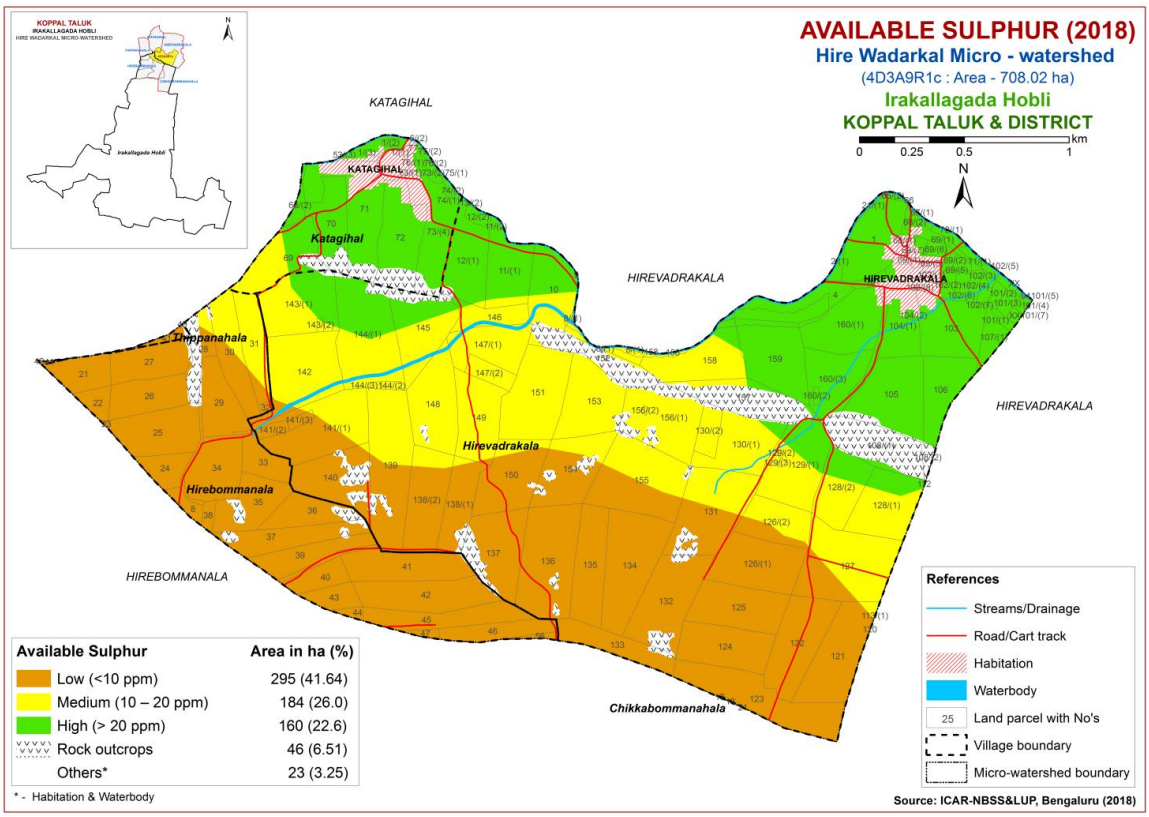


Fig.6.6 Soil Available Sulphur map of Hire Wadarkal Microwatershed

6.7 Available Boron

Available boron is low (<0.5 ppm) in a major area of about 484 ha (68%) and distributed in the major part of the microwatershed. An area of about 145 ha (20%) is medium (0.5-1.0 ppm) and occur in the northwestern, northern, northeastern, eastern, southern and southwestern part of the microwatershed. An area of about 10 ha (1%) is high (>1.0 ppm) and distributed in the northeastern part of the microwatershed (Fig.6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in major area of about 343 ha (48%) and distributed in the central, northeastern, eastern, southeastern, southern and southwestern part of the microwatershed. An area of about 296 ha (42%) is deficient (<4.5 ppm) and distributed in the southwestern, western, northwestern, northern and northeastern part of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

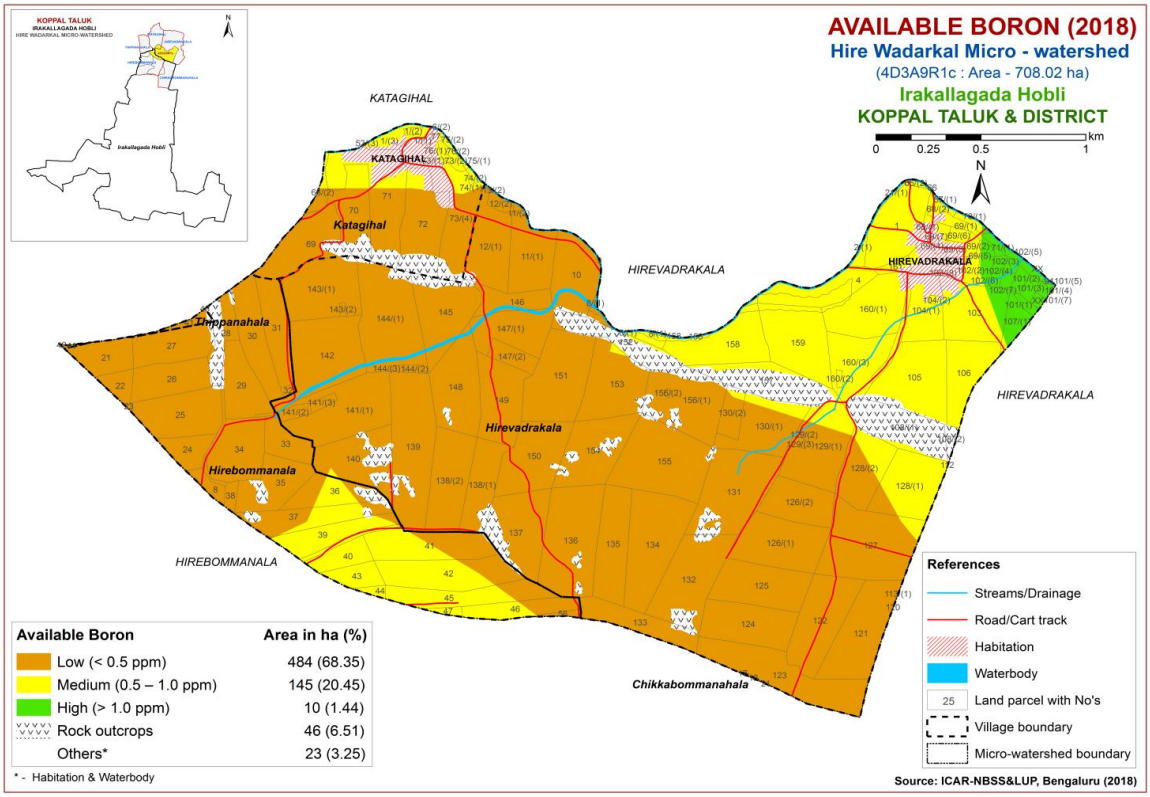


Fig.6.7 Soil Available Boron map of Hire Wadarkal Microwatershed

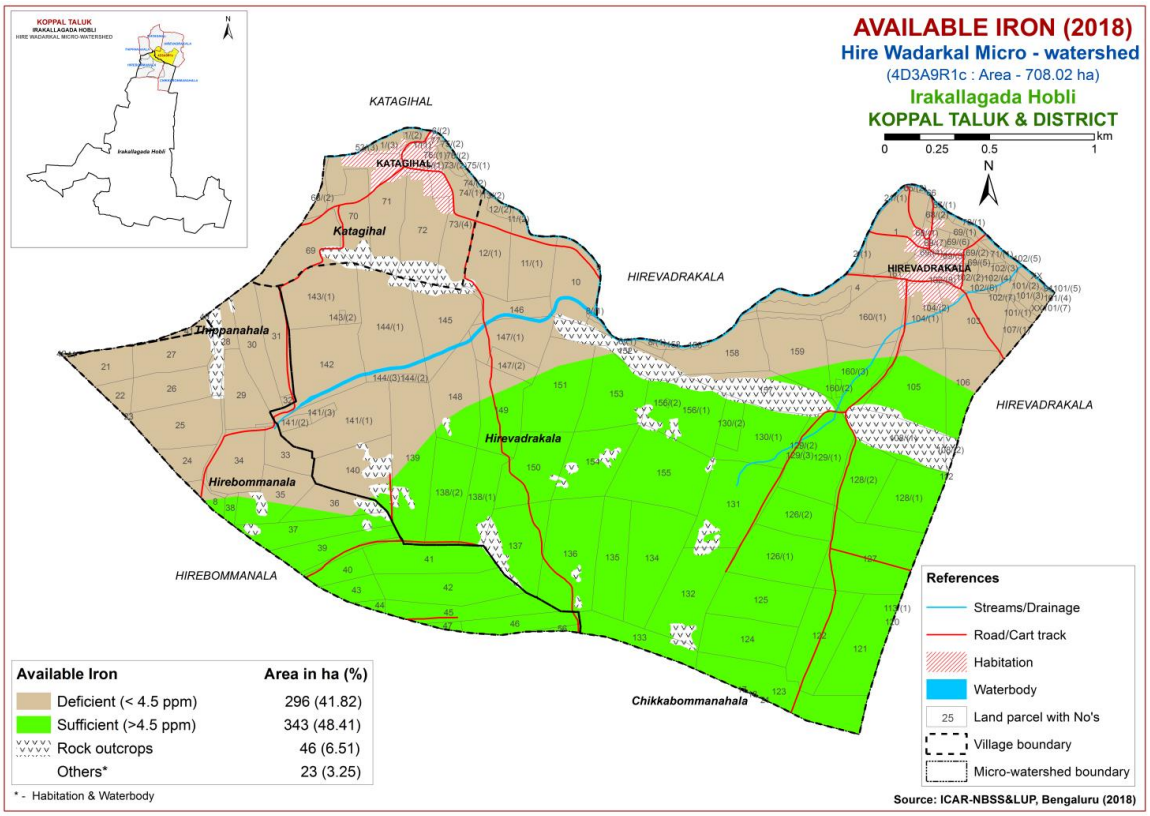


Fig.6.8 Soil Available Iron map of Hire Wadarkal Microwatershed

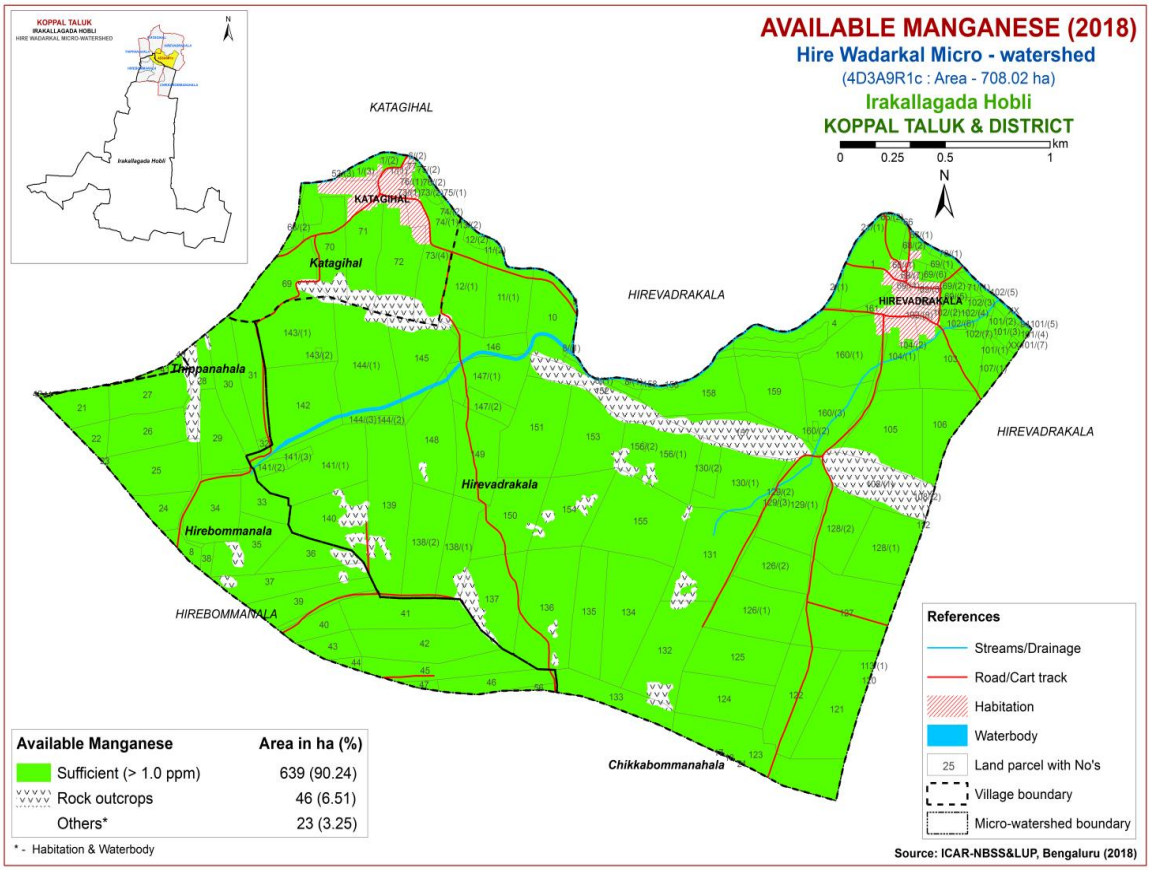


Fig.6.9 Soil Available Manganese map of Hire Wadarkal Microwatershed

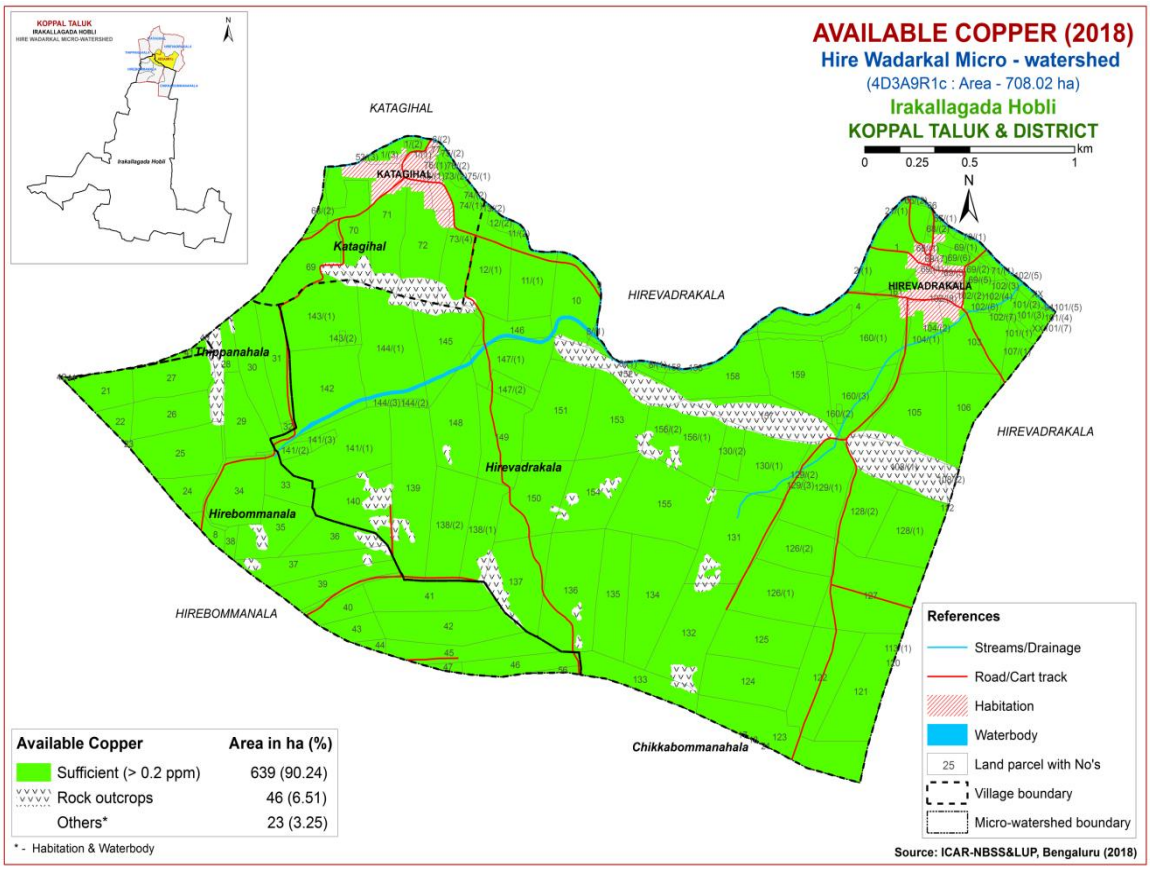


Fig.6.10 Soil Available Copper map of Hire Wadarkal Microwatershed

6.11 Available Zinc

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

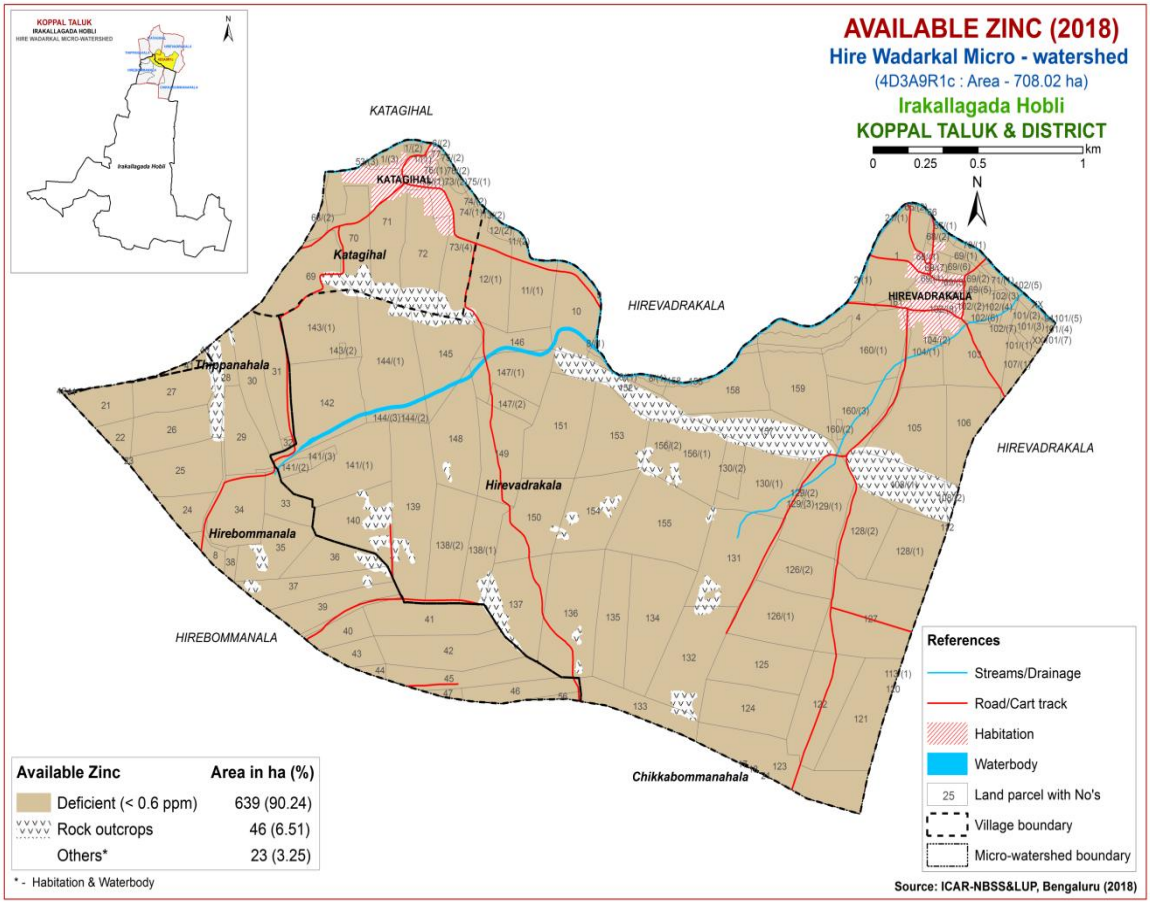


Fig.6.11 Soil Available Zinc map of Hire Wadarkal Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Hire Wadarkal 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 (Table 7.1) were matched with the crop requirements (Tables 7.2 to 7.32) to arrive at the crop suitability. The soil and land characteristics table and crop requirements 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, N1 and N2 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, '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 land a 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.

An area of about 54 ha (8%) is highly suitable (Class S1) for growing sorghum and occur in the eastern, western, northwestern and northern part of the microwatershed. An area of about 231 ha (33%) is moderately suitable (Class S2) for growing sorghum

and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern, northern and northeastern part of the microwatershed. They have minor limitations of rooting depth, gravelliness and calcareousness. Major area of about 354 ha (50%) is marginally suitable (Class S3) for growing sorghum and occur in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness.

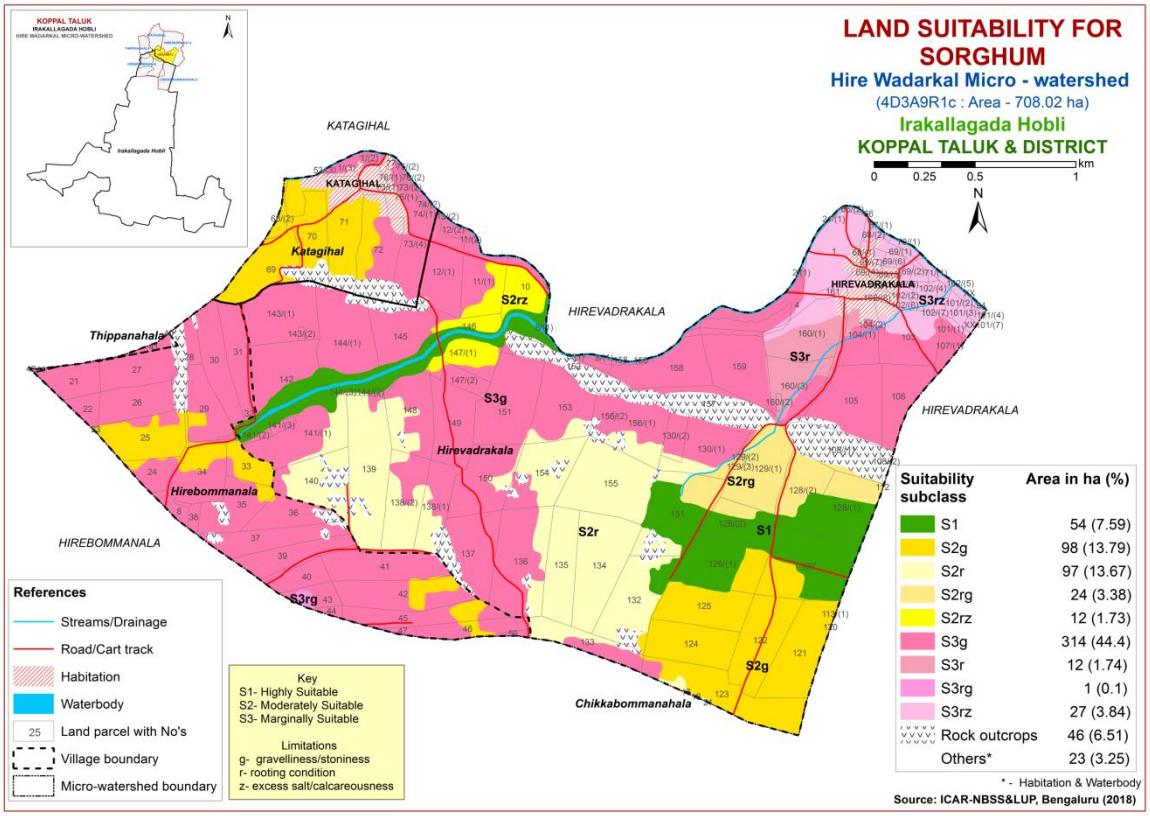


Fig. 7.1 Land Suitability map of Sorghum

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 is given in Figure 7.2.

An area of about 54 ha (8%) is highly suitable (Class S1) for growing maize and occur in the eastern, western, northwestern and northern part of the microwatershed. An area of about 231 ha (33%) is moderately suitable (Class S2) for growing maize and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with minor limitations of texture, rooting depth, calcareousness and gravelliness. Maximum area of about 354 ha (50%) is marginally suitable (Class S3) for growing maize and occur in the major part of the

microwatershed with moderate limitations of rooting depth, calcareousness, texture and gravelliness.

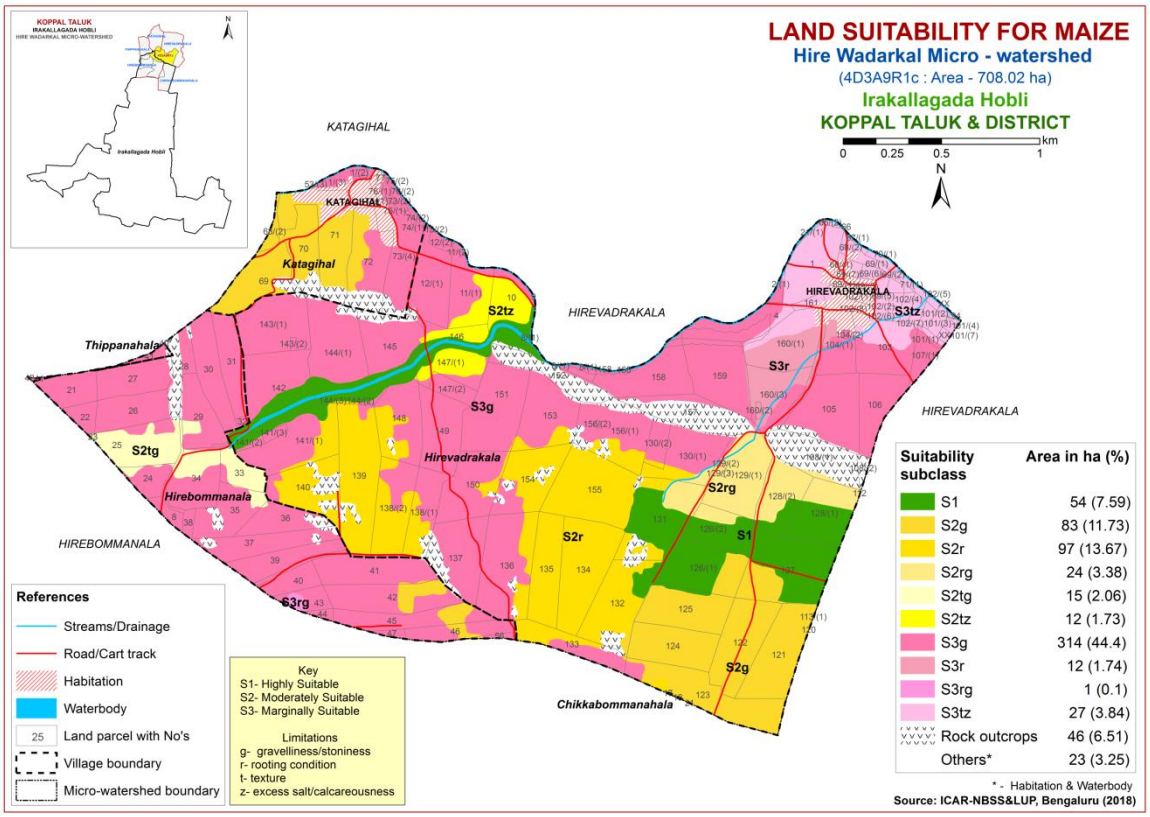


Fig. 7.2 Land Suitability map of Maize

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 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.

An area of about 101 ha (14%) is highly suitable (Class S1) for growing bajra and distributed in the eastern, southeastern, western, northwestern and northern part of the microwatershed. Maximum area of about 425 ha (60%) is moderately suitable (Class S2) for growing bajra and distributed in the major part of the microwatershed with minor limitations of texture, rooting depth, calcareousness and gravelliness. An area of about 113 ha (16%) is marginally suitable (Class S3) for growing bajra and distributed in the northeastern, southwestern, western and northwestern part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness.

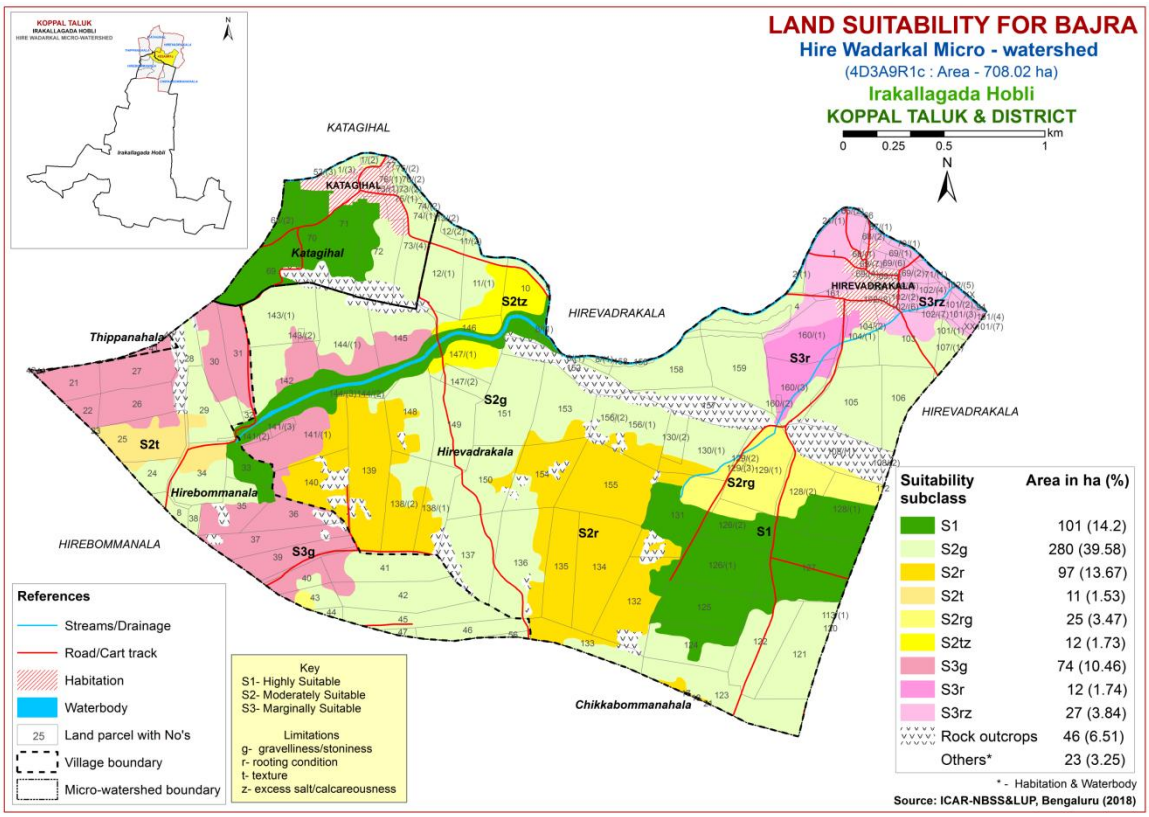


Fig. 7.3 Land Suitability map of Bajra

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.

An area of about 81 ha (11%) is highly suitable (Class S1) for growing groundnut and distributed in the northwestern, eastern and southeastern part of the microwatershed. Maximum area of about 456 ha (64%) is moderately suitable (Class S2) for growing groundnut and distributed in the major part of the microwatershed. They have minor limitations of texture, rooting depth, drainage and gravelliness. An area of about 102 ha (14%) is marginally suitable (Class S3) for growing groundnut and distributed in the northeastern, southwestern, western, northwestern and northern part of the microwatershed with moderate limitations of rooting depth, gravelliness, calcareousness and texture.

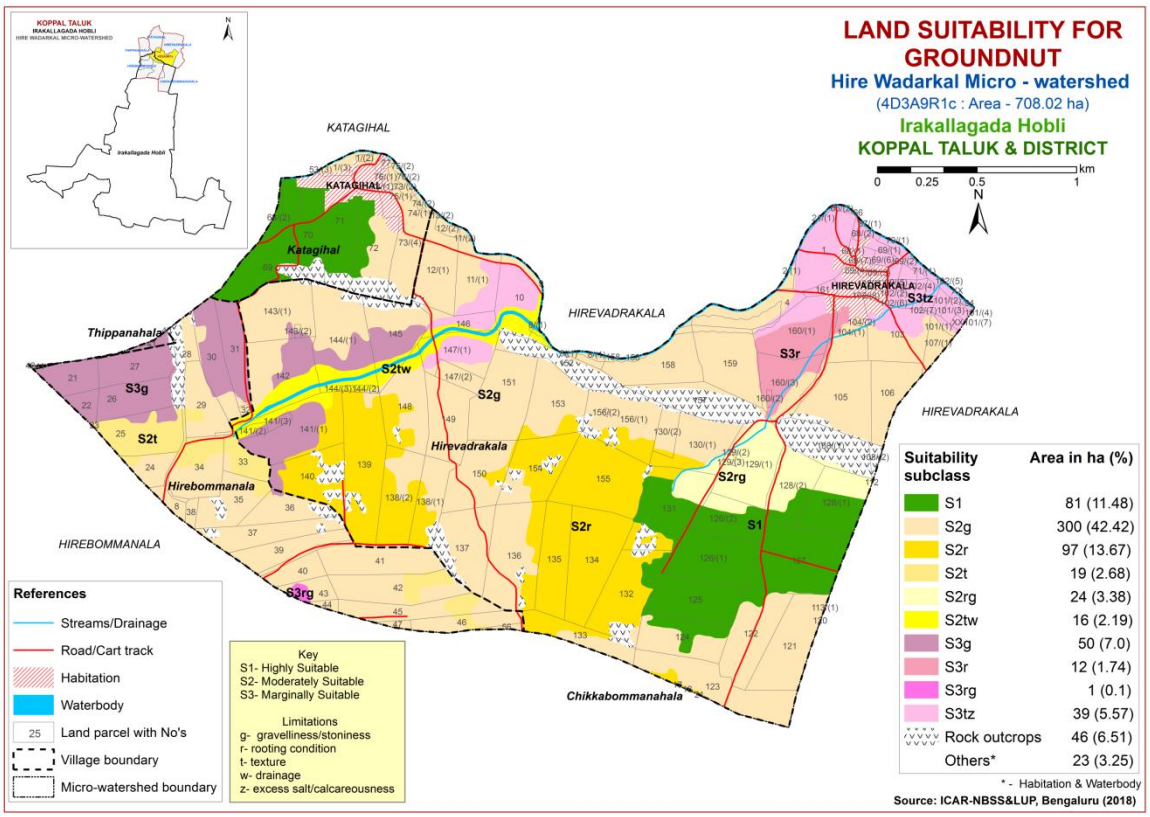


Fig. 7.4 Land Suitability map of Groundnut

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.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing sunflower and distributed in the eastern part of the microwatershed. An area of about 114 ha (16%) is moderately suitable (Class S2) for growing sunflower and distributed in the southeastern, southern, western, northwestern and northern part of the microwatershed with minor limitations of gravelliness, rooting depth and drainage. Maximum area of about 448 ha (63%) is marginally suitable (Class S3) for growing sunflower and occur in the major part of the microwatershed with moderate limitations of gravelliness, calcareousness and rooting depth. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing sunflower with severe limitations of rooting depth and calcareousness and occur in the northeastern part of the microwatershed.

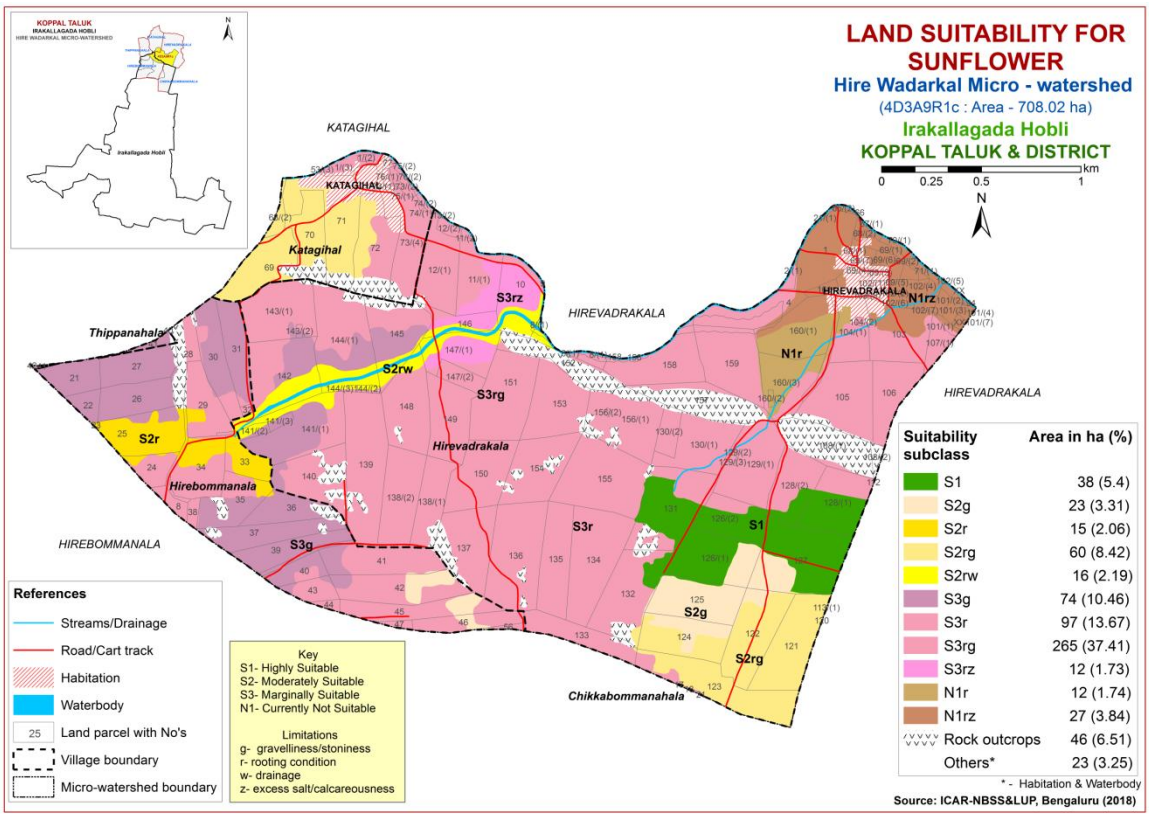


Fig. 7.5 Land Suitability map of Sunflower

7.6 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, Kalaburagi, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.7) 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 7.6.

An area of about 249 ha (35%) is moderately suitable (Class S2) for growing cotton and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with minor limitations of gravelliness, texture, calcareousness, drainage and rooting depth. Major area of about 389 ha (55%) is marginally suitable (Class S3) for growing cotton and occur in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness.

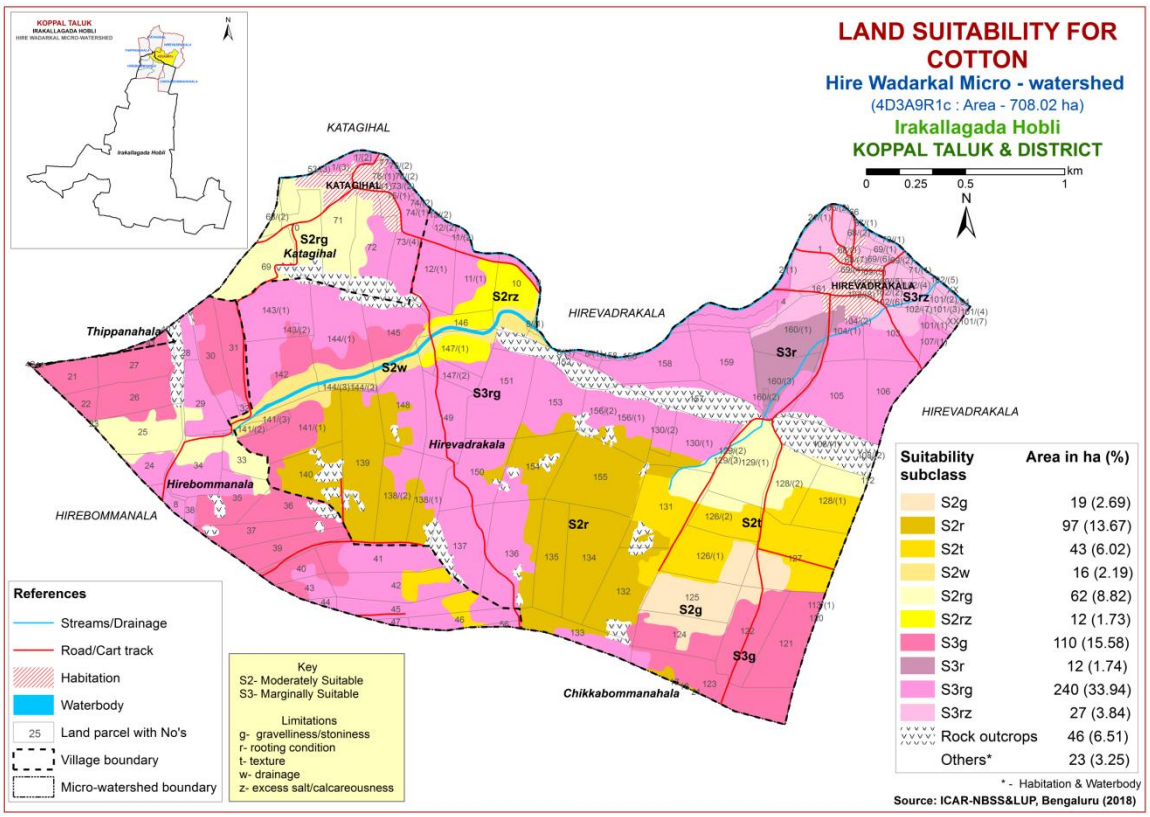


Fig. 7.6 Land Suitability map of Cotton

7.7 Land Suitability for Red gram (*Cajanus cajana*)

Red gram is one of the major pulse crop grown in an area of 7.28 lakh ha mainly in northern Karnataka in Bijapur, Kalaburagi, Raichur, Bidar, Belgaum, Dharwad and Bellary districts. The crop requirements for growing red 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 red gram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed is given in Figure 7.7.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing red gram and occur in the eastern part of the microwatershed. An area of about 78 ha (11%) is moderately suitable (Class S2) for growing red gram and occur in the southeastern, southern, western, northwestern and northern part of the microwatershed. They have minor limitations of texture, rooting depth, drainage and gravelliness. Major area of about 484 ha (68%) is marginally suitable (Class S3) for growing red gram and distributed in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing red gram and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

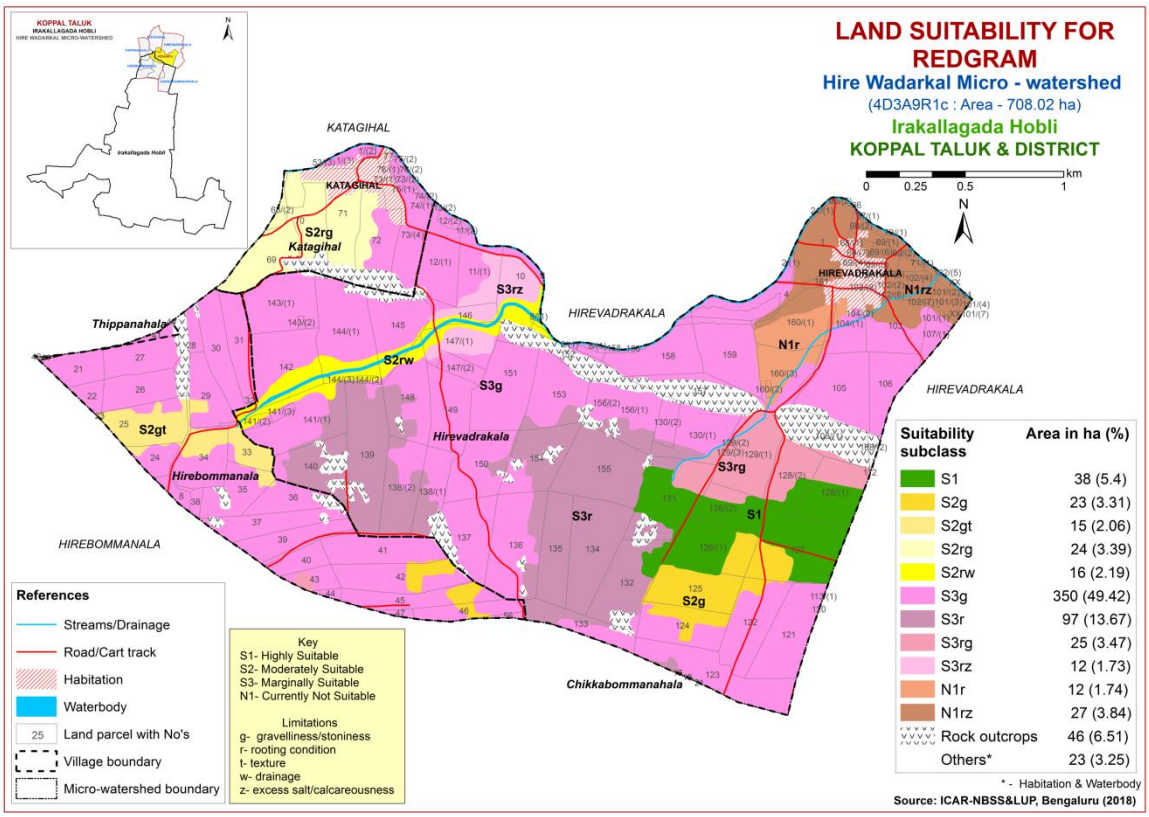


Fig. 7.7 Land Suitability map of Red gram

7.8 Land Suitability for Bengal gram (*Cicer aerativum*)

Bengal gram is one of the most important pulse crop grown in about 9.39 lakh ha area in Bijapur, Raichur, Kalaburagi, Dharwad, Belgaum and Bellary districts. The crop requirements for growing Bengal gram (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing Bengal gram 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 for growing Bengal gram occur in an area of 16 ha (2%) and distributed in the western, northwestern and northern part of the microwatershed. An area of about 170 ha (24%) is moderately suitable (Class S2) for growing Bengal gram and distributed in all parts of the microwatershed. They have minor limitations of rooting depth, gravelliness, calcareousness and texture. Maximum area of about 453 ha (64%) is marginally suitable (Class S3) for growing Bengal gram and occur in the major part of the microwatershed with moderate limitations of rooting depth, texture, calcareousness and gravelliness.

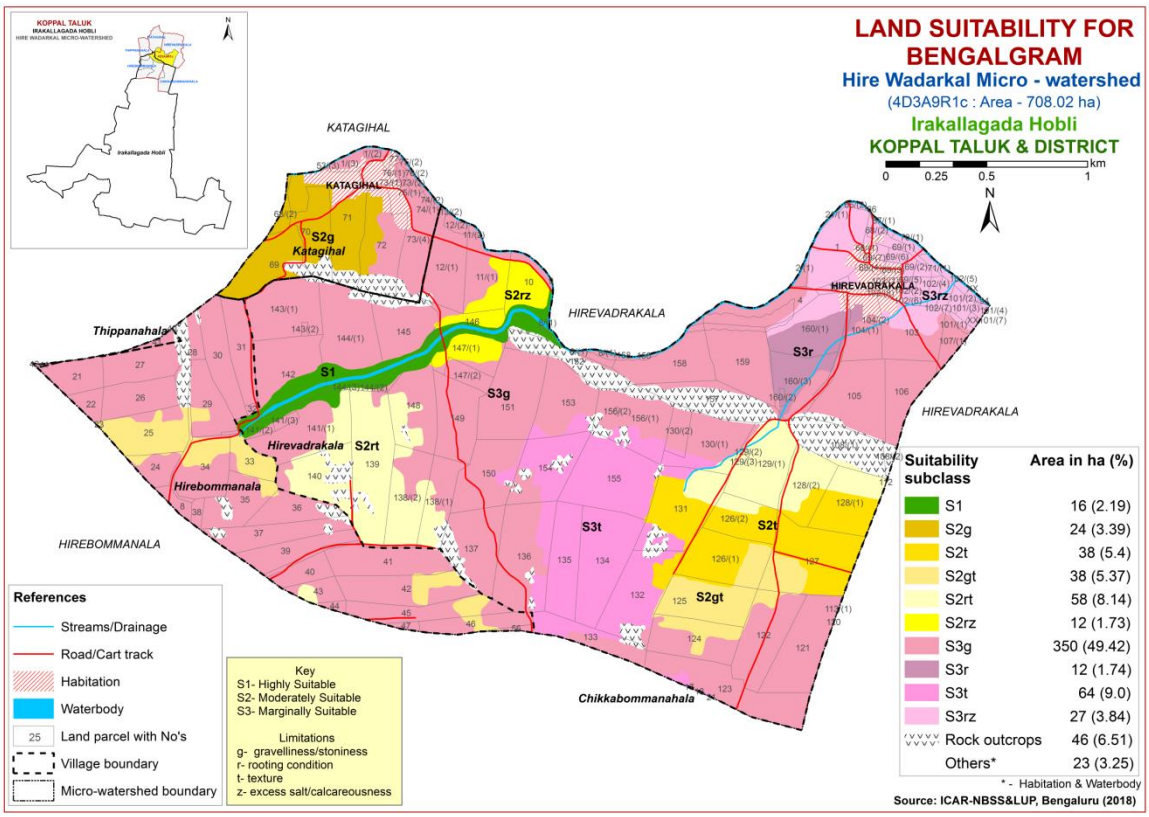


Fig. 7.8 Land Suitability map of Bengal gram

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

Chilli is one of the major 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.

An area of about 42 ha (6%) is highly suitable (Class S1) for growing chilli and distributed in the western and eastern part of the microwatershed. An area of about 231 ha (33%) is moderately suitable (Class S2) for growing chilli and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with minor limitations of gravelliness, texture, drainage and rooting depth. Major area of about 366 ha (52%) is marginally suitable (Class S3) for growing chilli and occur in the major part of the microwatershed with moderate limitations of texture, rooting depth, calcareousness and gravelliness.

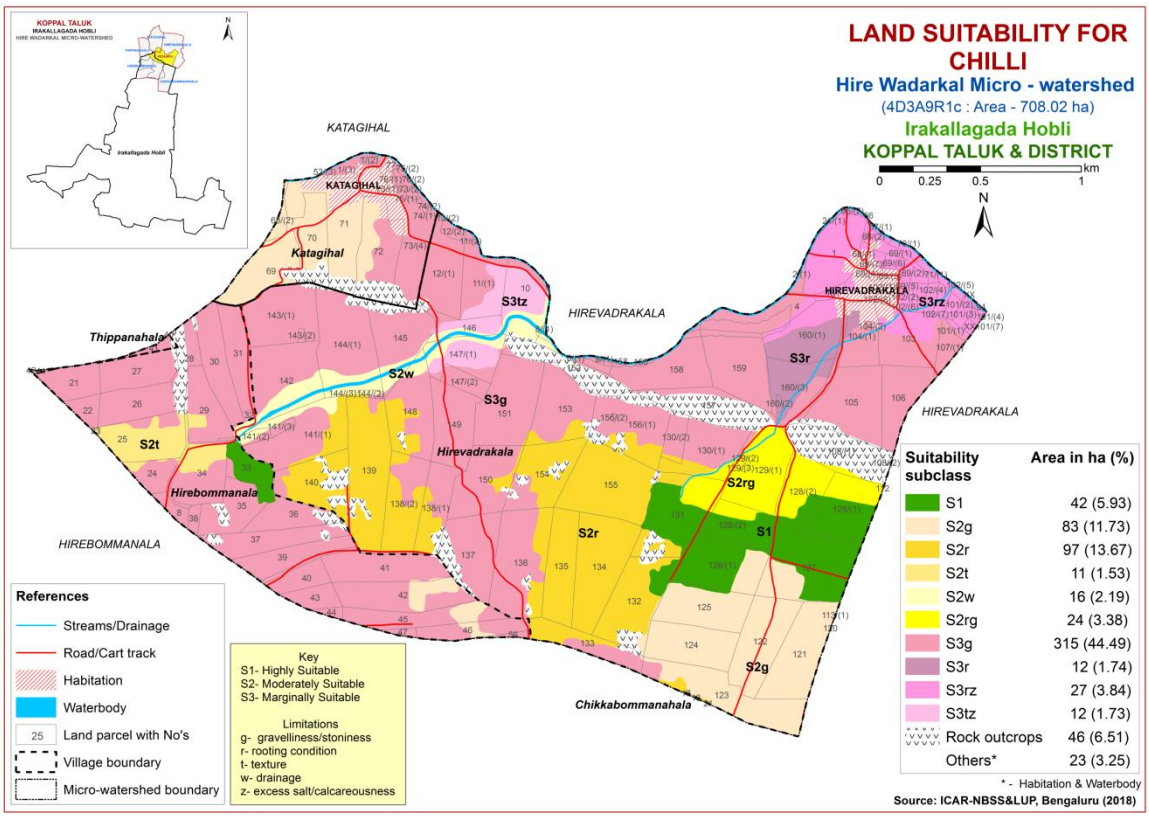


Fig. 7.9 Land Suitability map of Chilli

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.

An area of about 57 ha (8%) is highly suitable (Class S1) for growing tomato and distributed in the western, northwestern, northern and eastern part of the microwatershed. An area of about 215 ha (30%) is moderately suitable (Class S2) for growing tomato and distributed in the central, eastern, southeastern, southern, southwestern, western and northwestern part of the microwatershed with minor limitations of gravelliness, texture and rooting depth. Major area of about 366 ha (52%) is marginally suitable (Class S3) for growing tomato and occur in the major part of the microwatershed with moderate limitations of texture, rooting depth, calcareousness and gravelliness.

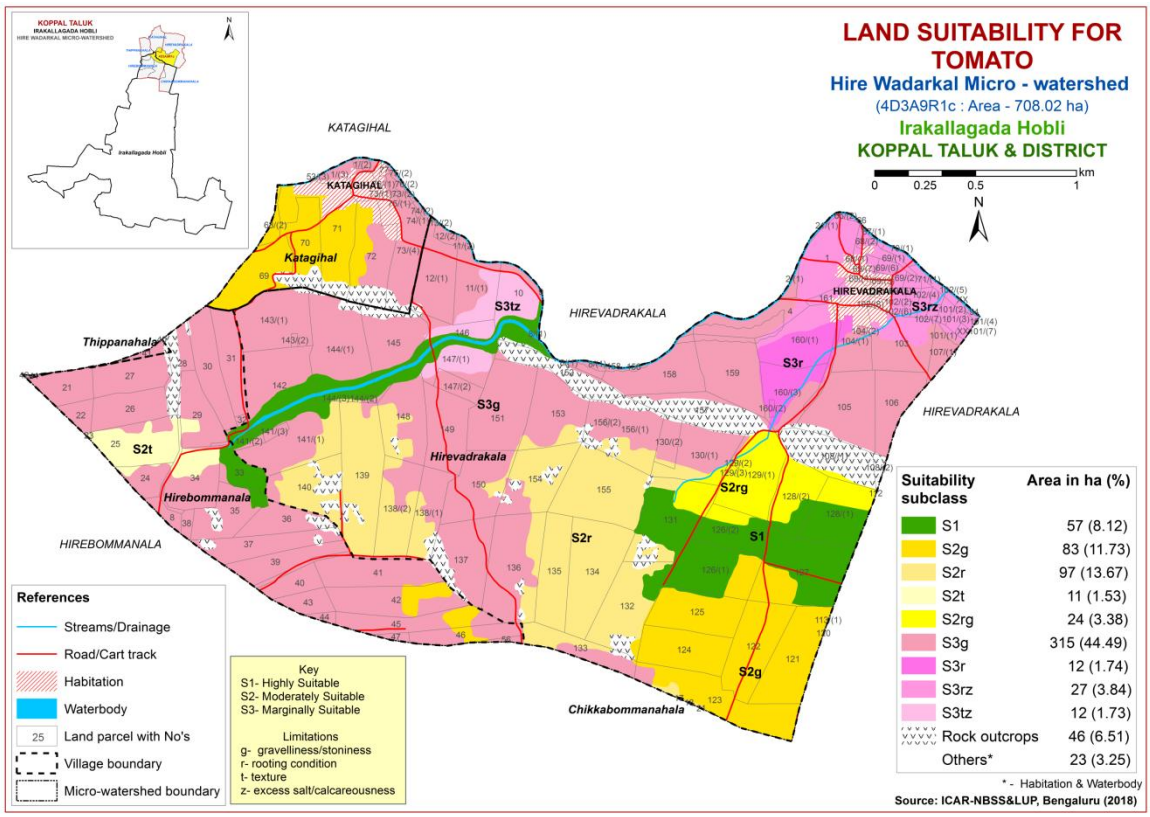


Fig. 7.10 Land Suitability map of Tomato

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.

Highly suitable (Class S1) lands for growing brinjal occur in an area of 79 ha (11%) and distributed in the southeastern, southern, western and northwestern part of the microwatershed. An area of about 256 ha (36%) is moderately suitable (Class S2) for brinjal and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, calcareousness, drainage and texture. Major area about of 305 ha (43%) is marginally suitable (Class S3) and distributed in the southern, southwestern, western, northwestern, northern, northeastern and eastern part of the microwatershed with moderate limitations of rooting depth and gravelliness.

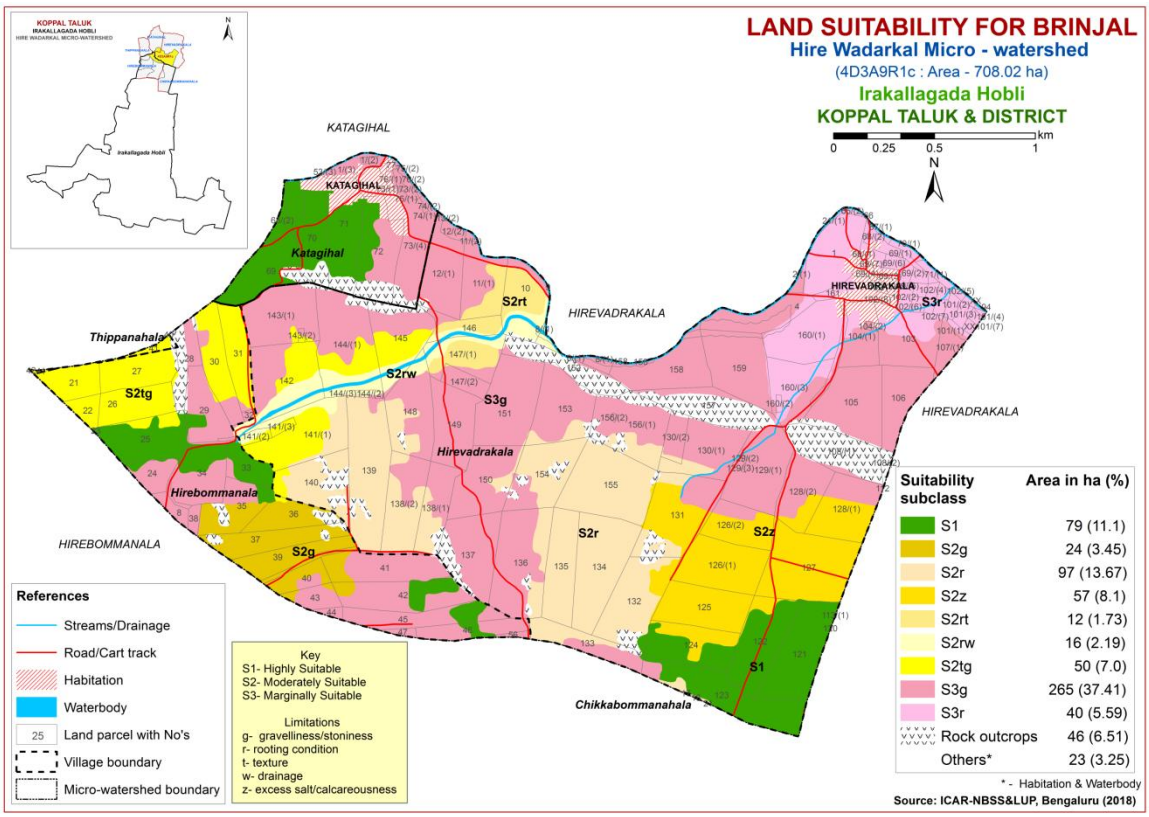


Fig 7.11 Land Suitability map of Brinjal

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.

Highly suitable (Class S1) lands for growing onion occur in an area of 64 ha (9%) and distributed in the southeastern, southern and northwestern part of the microwatershed. An area of about 259 ha (36%) is moderately suitable (Class S2) for onion and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have minor limitations of rooting depth, texture, calcareousness, drainage and gravelliness. Major area of about 316 ha (45%) is marginally suitable (Class S3) and distributed in the southern, southwestern, western, northwestern, northern, northeastern and eastern part of the microwatershed with moderate limitations of rooting depth, gravelliness, calcareousness and texture.

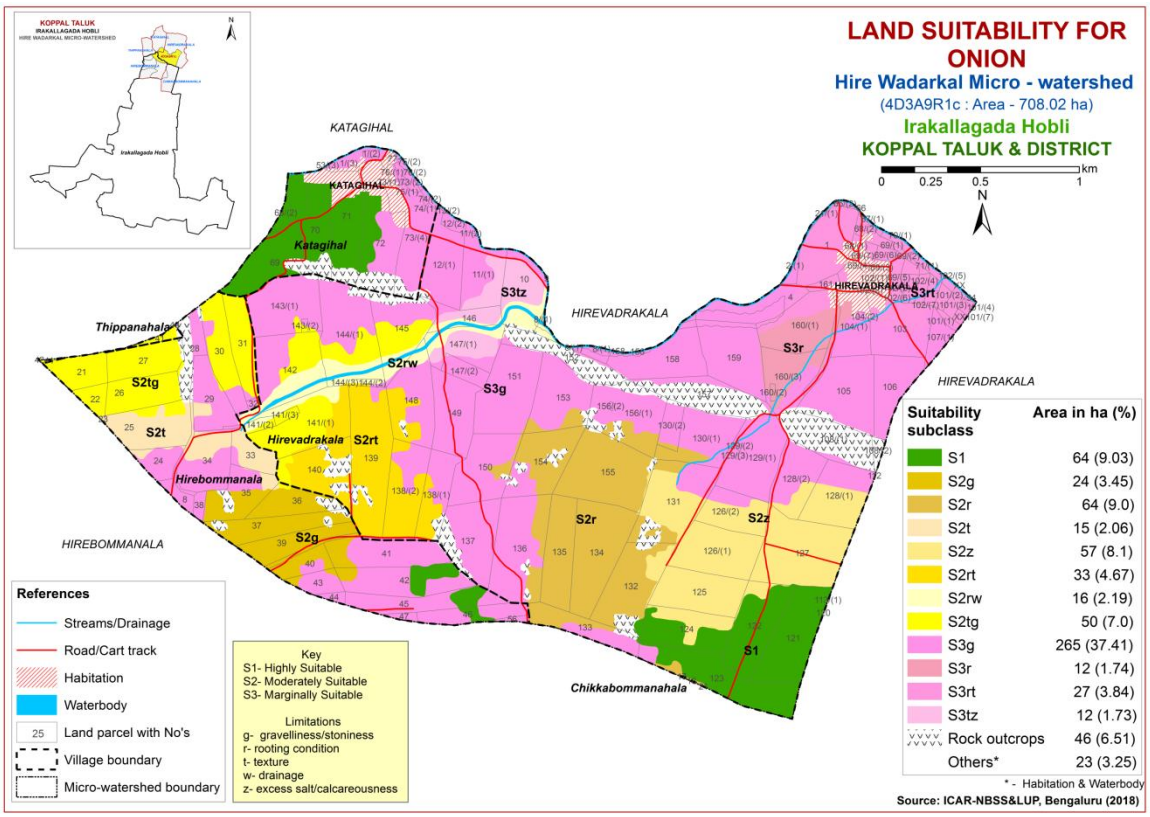


Fig 7.12 Land Suitability map of Onion

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.

Highly suitable (Class S1) lands for growing bhendi occur in an area of 64 ha (9%) and distributed in the southeastern, southern and northwestern part of the microwatershed. An area of about 221 ha (31%) is moderately suitable (Class S2) for bhendi and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have minor limitations of gravelliness, rooting depth, calcareousness, drainage and texture. Major area about of 355 ha (50%) is marginally suitable (Class S3) and distributed in the major part of the microwatershed with moderate limitations of rooting depth, texture and gravelliness.

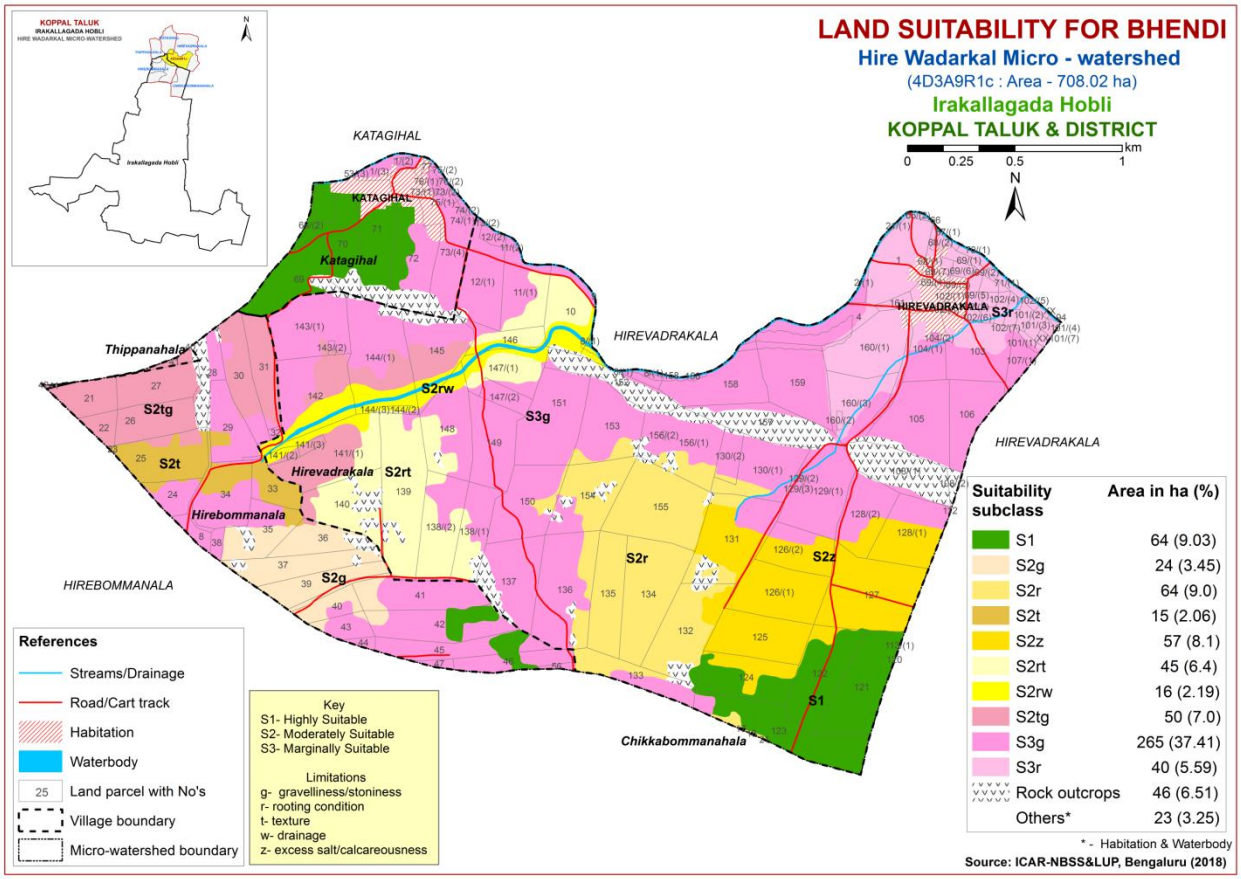


Fig 7.13 Land Suitability map of Bhendi

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 is given in Figure 7.14.

An area of about 43 ha (6%) is highly suitable (Class S1) for growing drumstick and distributed in the southern and eastern part of the microwatershed. An area of 135 ha (19%) is moderately suitable (Class S2) for growing drumstick and distributed in the southeastern, southwestern, western, northwestern and northern part of the microwatershed with minor limitations of rooting depth, drainage and gravelliness. Major area of about 424 ha (60%) is marginally suitable (Class S3) for growing drumstick and occur in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing drumstick and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

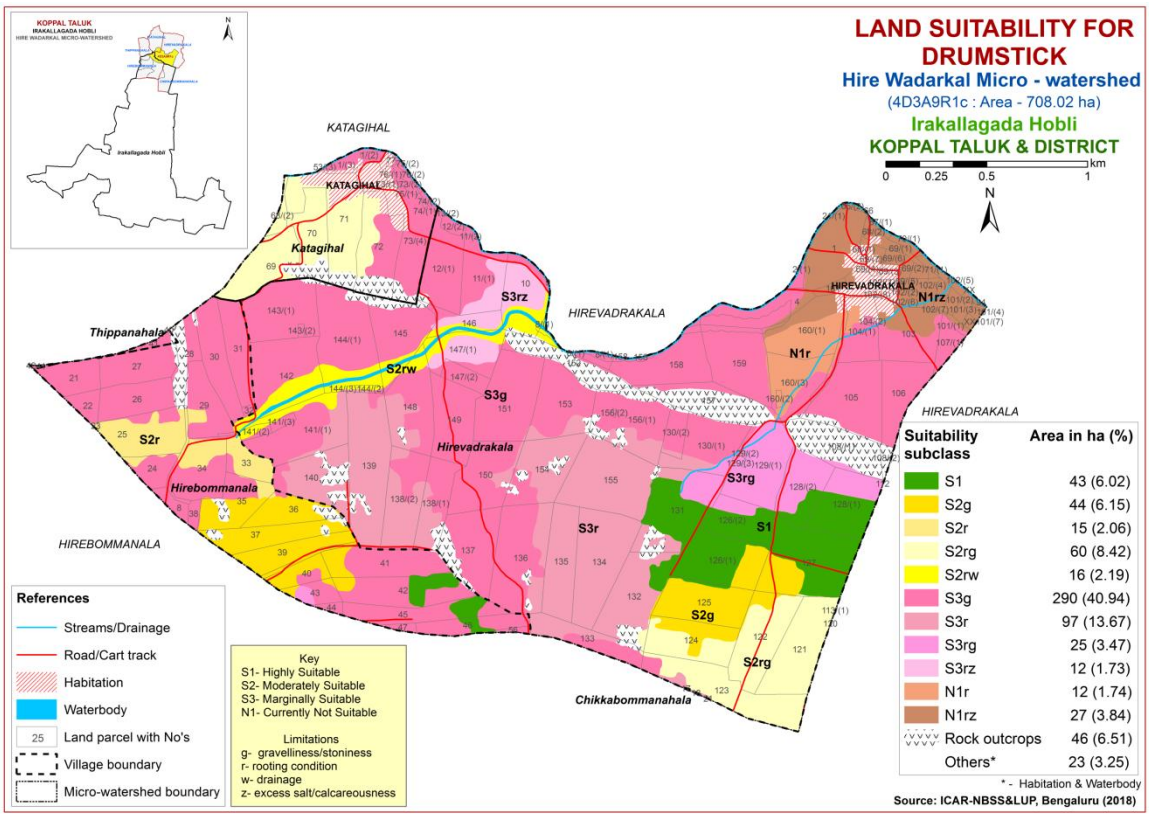


Fig. 7.14 Land Suitability map of Drumstick

7.15 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 7.16) 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 7.15.

Highly suitable (Class S1) lands for growing mulberry occur in an area of 62 ha (9%) and distributed in the southern and eastern part of the microwatershed. Moderately suitable (Class S2) lands occupy a major area of about 405 ha (57%) and occur in the major part of the microwatershed. They have minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover an area of about 134 ha (19%) and occur in the central, eastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing mulberry and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

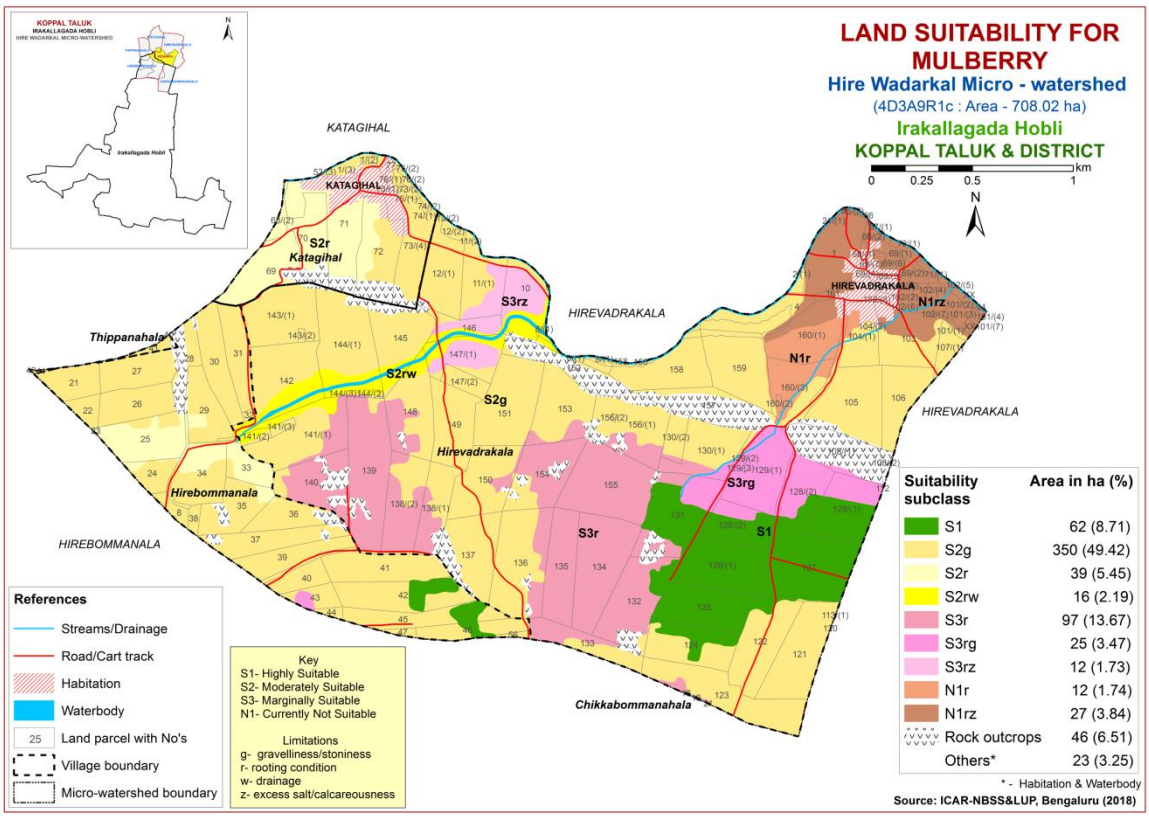


Fig. 7.15 Land Suitability map of Mulberry

7.16 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 7.17) 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 7.16.

Moderately suitable (Class S2) lands occupy an area of about 61 ha (9%) and occur in the eastern, southeastern and southern part of the microwatershed. They have minor limitations of rooting depth and gravelliness. Marginally suitable (Class S3) lands cover a major area of about 405 ha (57%) and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, drainage and gravelliness. An area of about 173 ha (24%) is currently not suitable (Class N1) for growing mango and occur in the central, southern, southwestern, western, northwestern, northern, northeastern and eastern part of the microwatershed with severe limitations of gravelliness, texture, calcareousness and rooting depth.

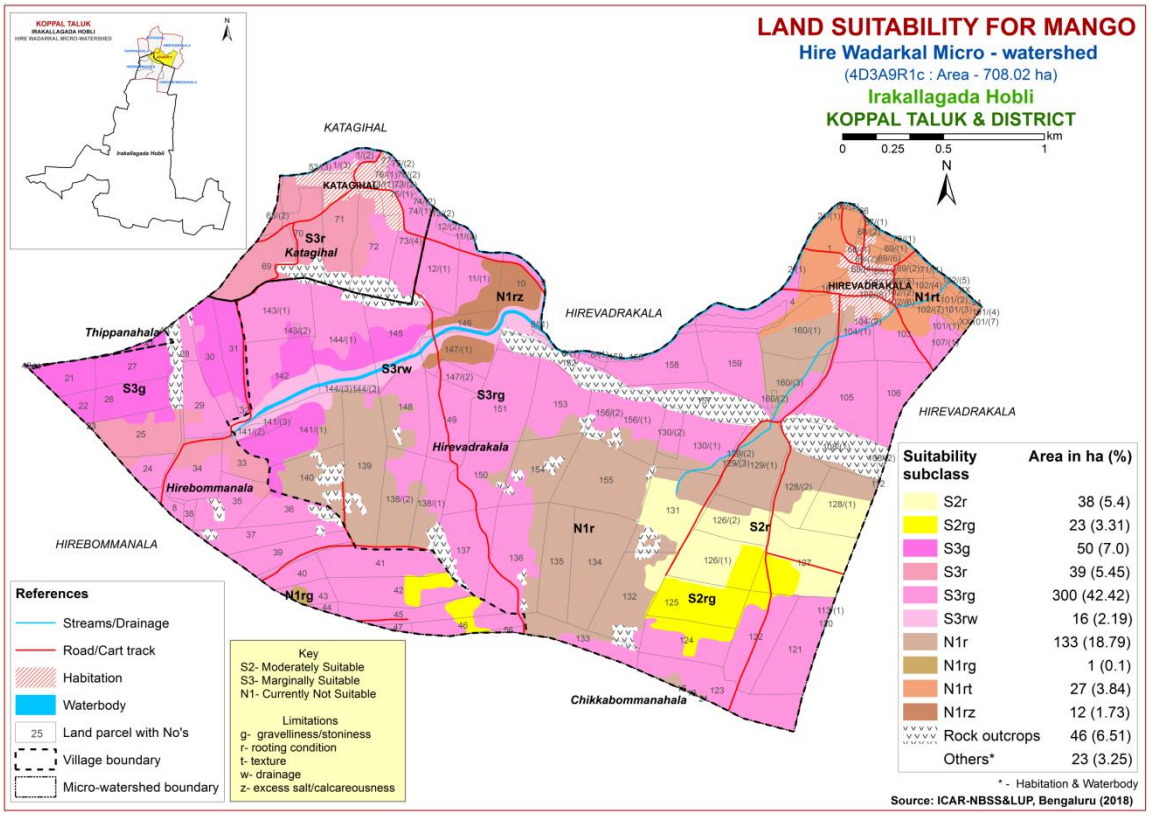


Fig. 7.16 Land Suitability map of Mango

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.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing sapota and distributed in the eastern part of the microwatershed. Maximum area of about 353 ha (50%) is moderately suitable (Class S2) for growing sapota and distributed in the major part of the microwatershed with minor limitations of gravelliness, drainage and rooting depth. An area of about 208 ha (29%) is marginally (Class S3) suitable for growing sapota and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing sapota and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

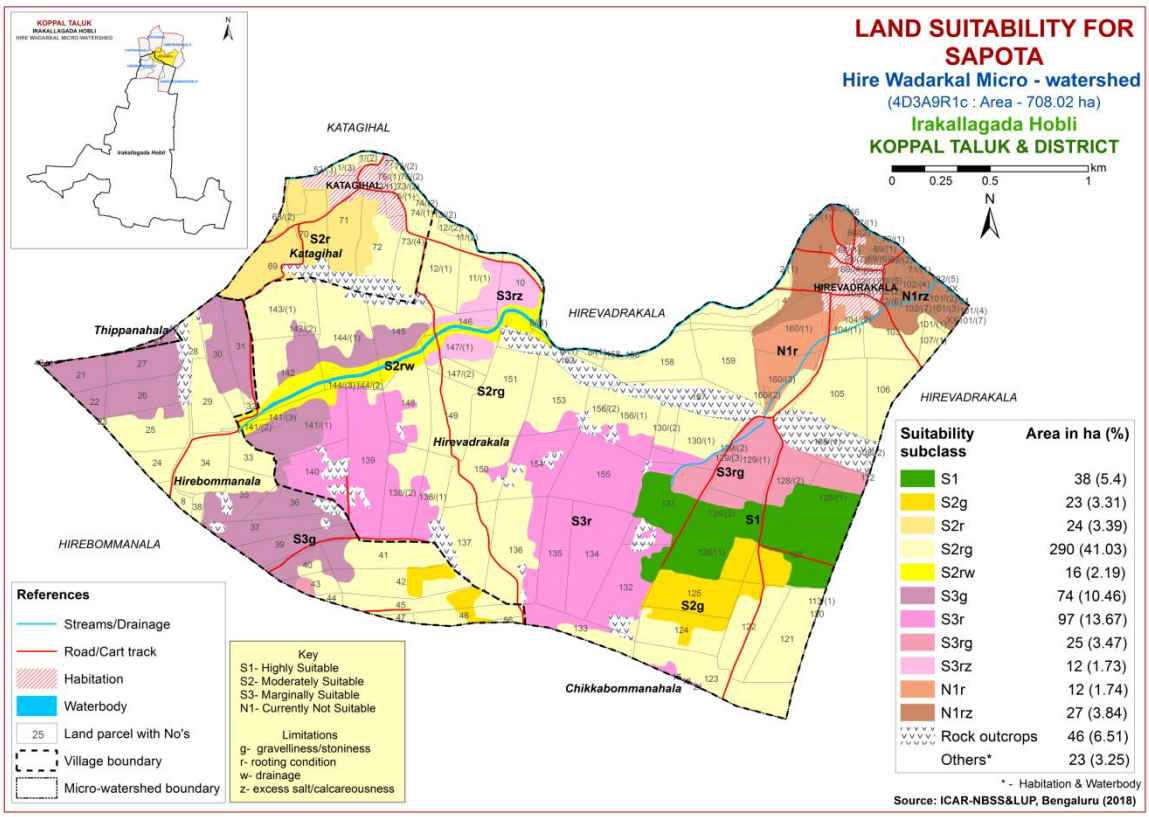


Fig. 7.17 Land Suitability map of Sapota

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.

Highly suitable (Class S1) lands for growing pomegranate occur in an area of about 38 ha (5%) and distributed in the eastern part of the microwatershed. Maximum area of about 353 ha (50%) is moderately suitable (Class S2) for growing pomegranate and occur in the major part of the microwatershed with minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover an area of about 208 ha (29%) and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing pomegranate and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

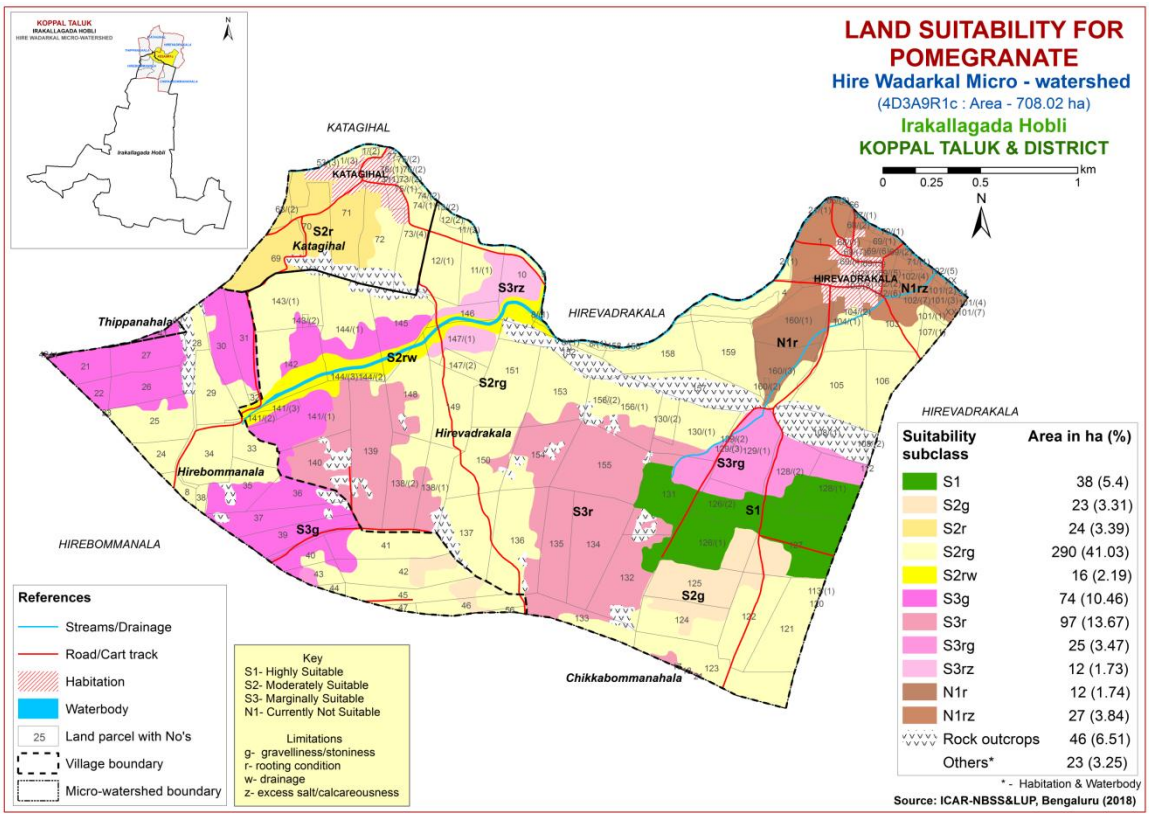


Fig. 7.18 Land Suitability map of Pomegranate

7.19 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 7.20) 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 7.19.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing guava and distributed in the eastern part of the microwatershed. Maximum area of about 354 ha (50%) is moderately suitable (Class S2) for growing guava and distributed in the major part of the microwatershed with minor limitations of rooting depth, texture, drainage and gravelliness. An area of 208 ha (29%) is marginally (Class S3) suitable for growing guava and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with moderate limitations of texture, rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing guava and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and texture.

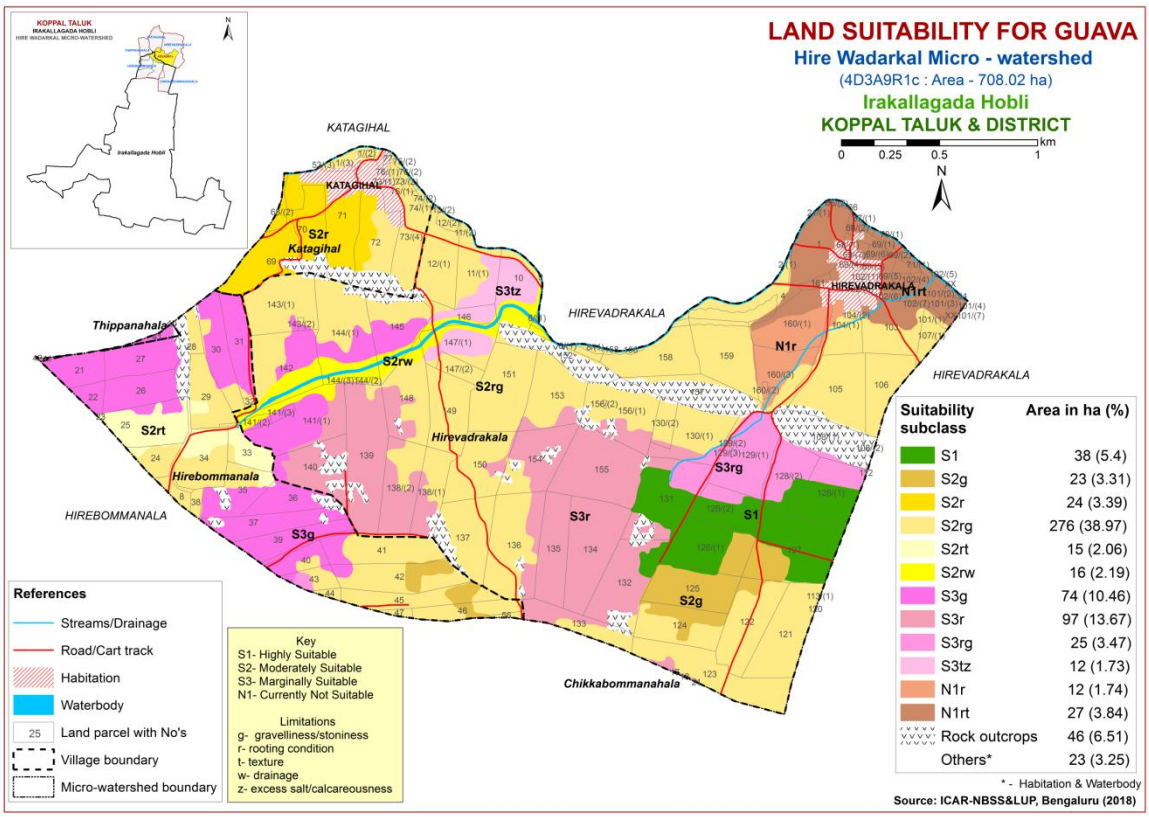


Fig. 7.19 Land Suitability map of Guava

7.20 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 7.21) 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 7.20.

Highly suitable (Class S1) lands for growing jackfruit occur in an area of about 38 ha (5%) and distributed in the eastern part of the microwatershed. Maximum area of about 353 ha (50%) is moderately suitable (Class S2) for growing jackfruit and distributed in the major part of the microwatershed with minor limitations of gravelliness, drainage and rooting depth. An area of about 208 ha (29%) is marginally (Class S3) suitable for growing jackfruit and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with moderate limitations of texture, rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing jackfruit and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and texture.

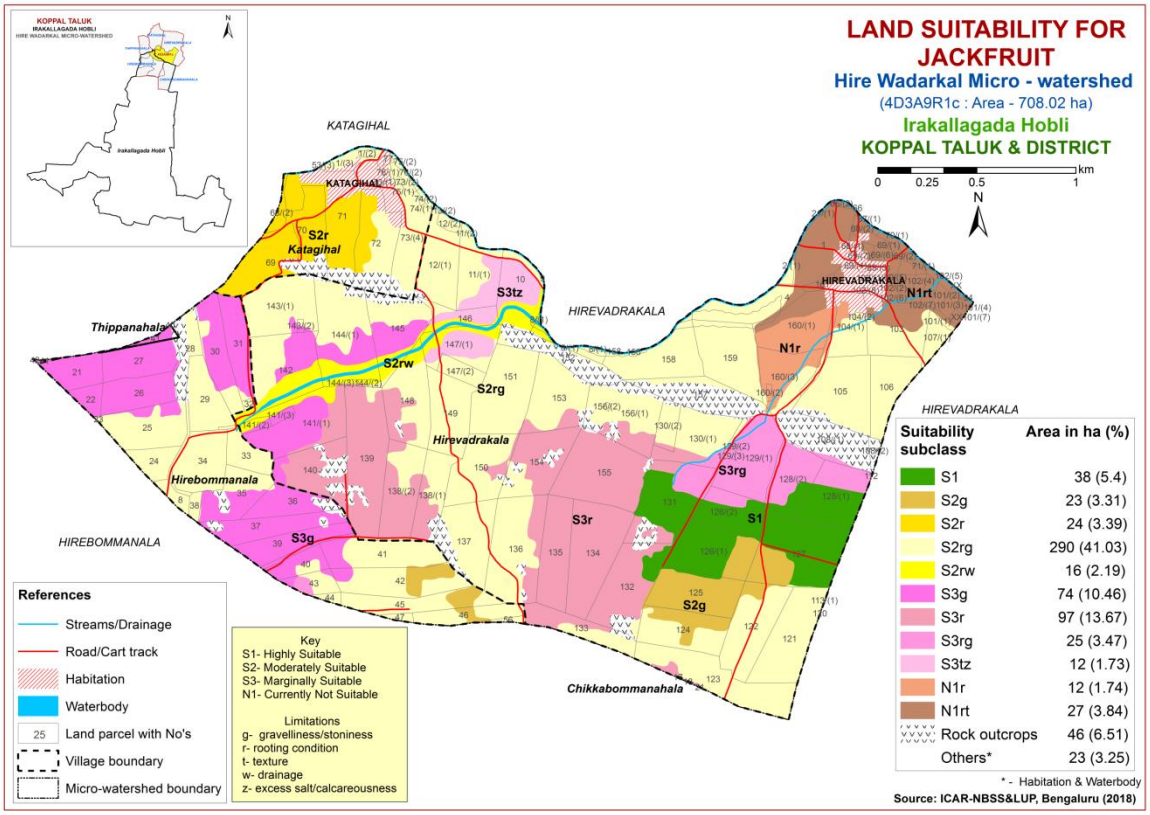


Fig. 7.20 Land Suitability map of Jackfruit

7.21 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is one of the important fruit crop grown in almost all the districts of the state. The crop requirements (Table 7.22) 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 7.21.

Maximum area of 340 ha (48%) is moderately suitable (Class S2) for growing jamun and occur in all parts of the microwatershed with minor limitations of rooting depth and gravelliness. Marginally suitable (Class S3) lands cover an area of about 259 ha (37%) and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness, texture, drainage and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing jamun and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and texture.

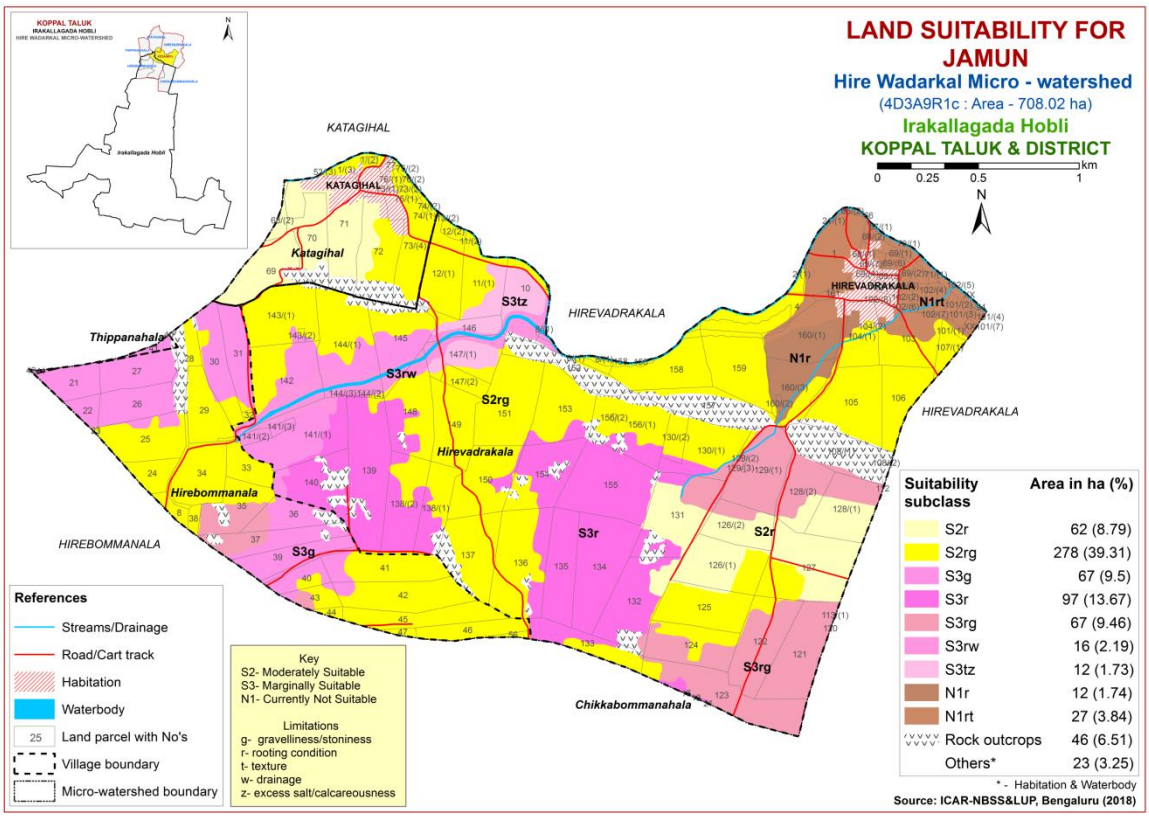


Fig. 7.21 Land Suitability map of Jamun

7.22 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 7.23) 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 7.22.

Highly suitable (Class S1) lands for growing musambi cover an area of about 38 ha (5%) and occur in the eastern part of the microwatershed. Maximum area of about 353 ha (50%) is moderately suitable (Class S2) for growing musambi and occur in the major part of the microwatershed with minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover an area of about 208 ha (29%) and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing musambi and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

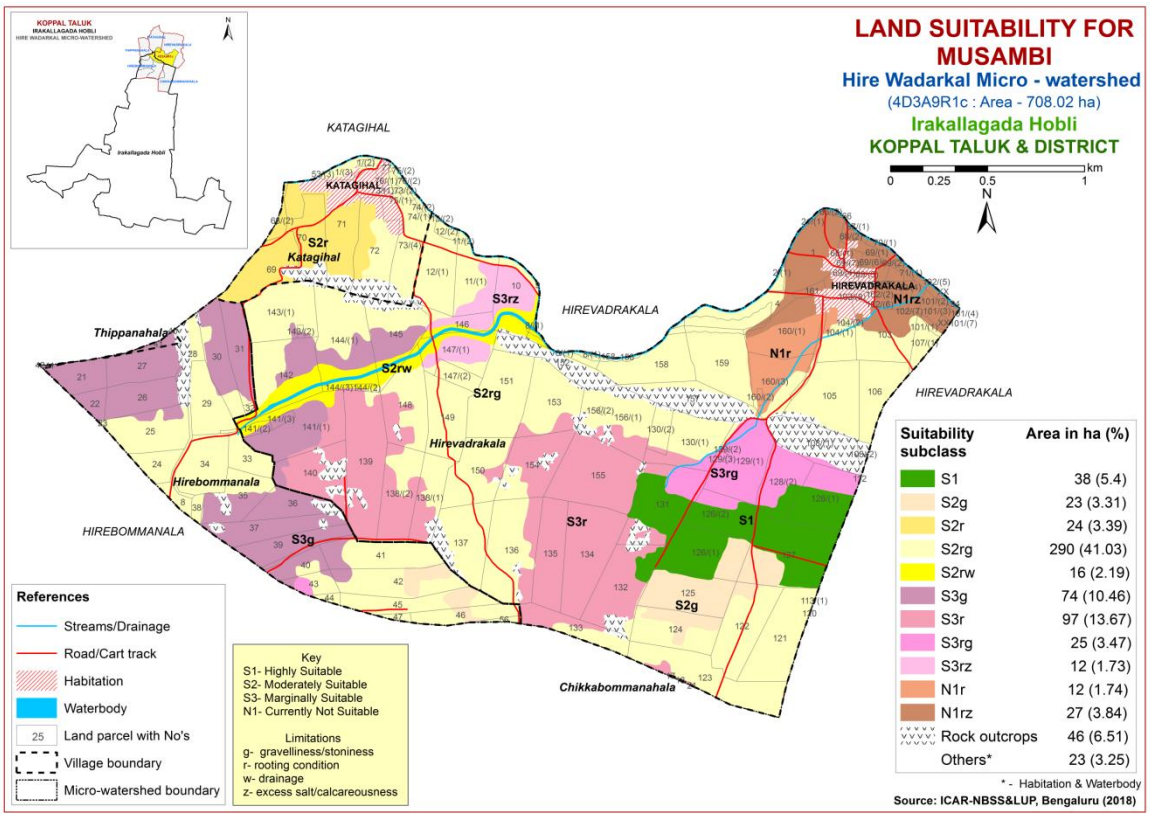


Fig. 7.22 Land Suitability map of Musambi

7.23 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 (Table 7.24) for growing lime (Table 7.15) 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 7.23.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing lime and occur in the eastern part of the microwatershed. Maximum area of about 353 ha (50%) is moderately suitable (Class S2) for growing lime and occur in the major part of the microwatershed with minor limitations of rooting depth, drainage and gravelliness. Marginally suitable (Class S3) lands cover an area of about 208 ha (29%) and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness. An area of about 39 ha (6%) is currently not suitable (Class N1) for growing lime and occur in the northeastern part of the microwatershed with severe limitations of rooting depth and calcareousness.

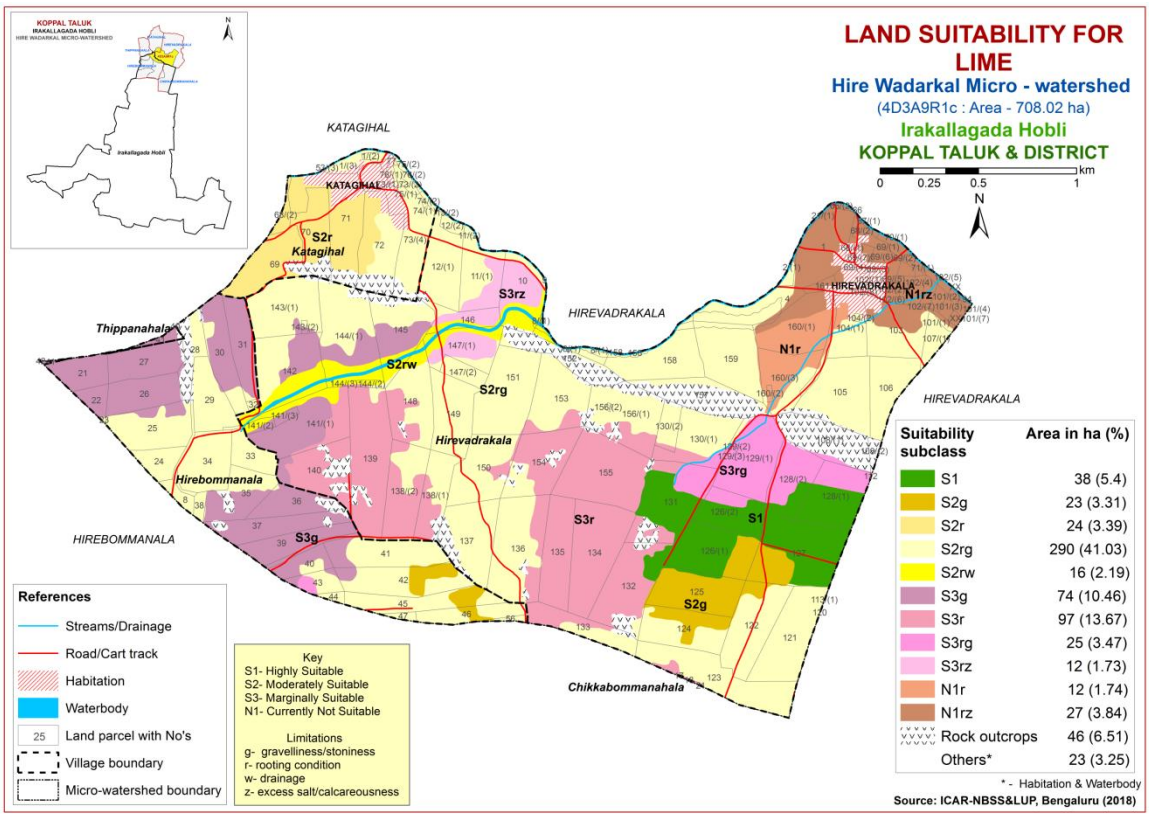


Fig. 7.23 Land Suitability map of Lime

7.24 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 (Table 7.25) for growing cashew 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 7.24.

Highly suitable (Class S1) lands for growing cashew cover an area of about 4 ha (1%) and occur in the southern part of the microwatershed. Maximum area of about 364 ha (51%) is moderately suitable (Class S2) for growing cashew and distributed in the major part of the microwatershed with minor limitations of rooting depth, texture and gravelliness. An area of about 146 ha (21%) is marginally suitable (Class S3) for growing cashew and distributed in the central, eastern, southeastern, southern, southwestern and western part of the microwatershed with moderate limitations of rooting depth and gravelliness. Currently not suitable (Class N1) lands cover an area of about 124 ha (18%) and distributed in the eastern, southeastern, western, northwestern, northern and northeastern part of the microwatershed with severe limitations of texture, rooting depth, calcareousness and drainage.

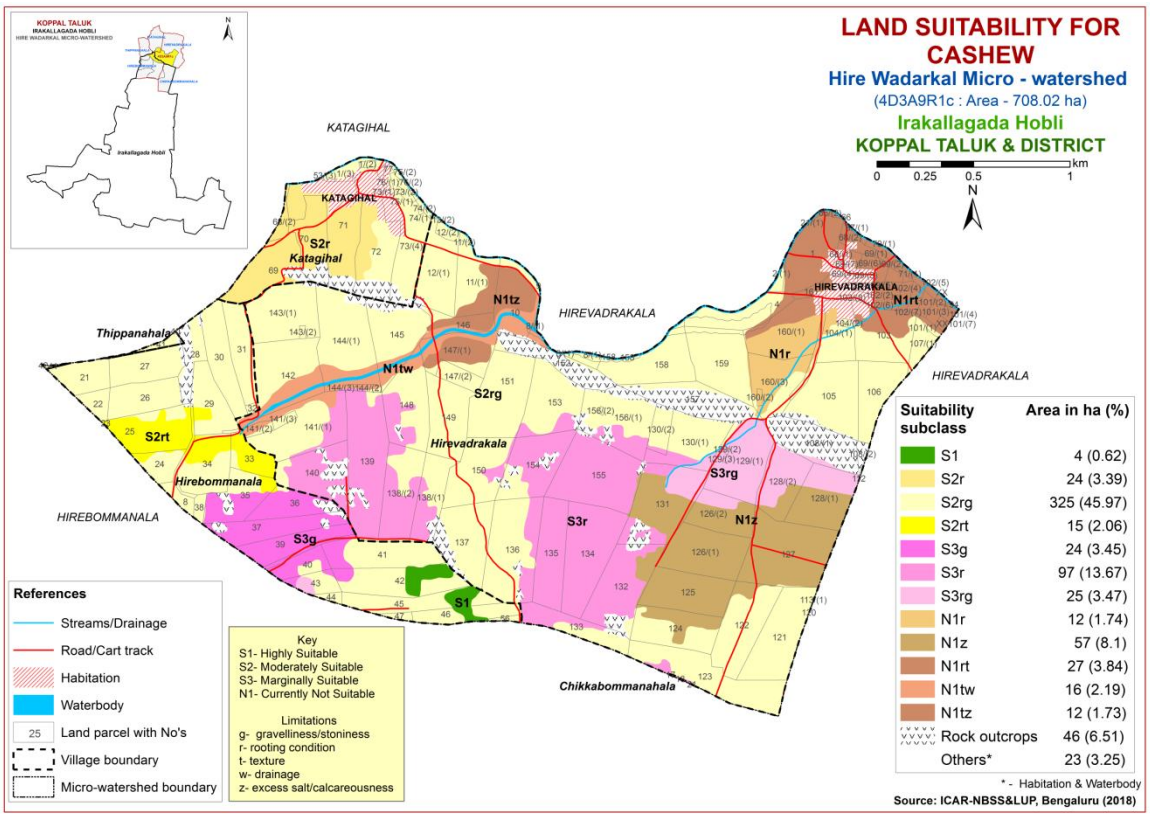


Fig. 7.24 Land Suitability map of Cashew

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.

An area of about 100 ha (14%) is highly suitable (Class S1) for growing custard apple and occur in the eastern, southeastern, southern, western and northwestern part of the microwatershed. Major area of about 500 ha (70%) is moderately suitable (Class S2) for growing custard apple and occur in the major part of the microwatershed with minor limitations of rooting depth, calcareousness, drainage and gravelliness. Marginally suitable (Class S3) lands cover an area of about 39 ha (6%) for growing custard apple and occur in the northeastern part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness.

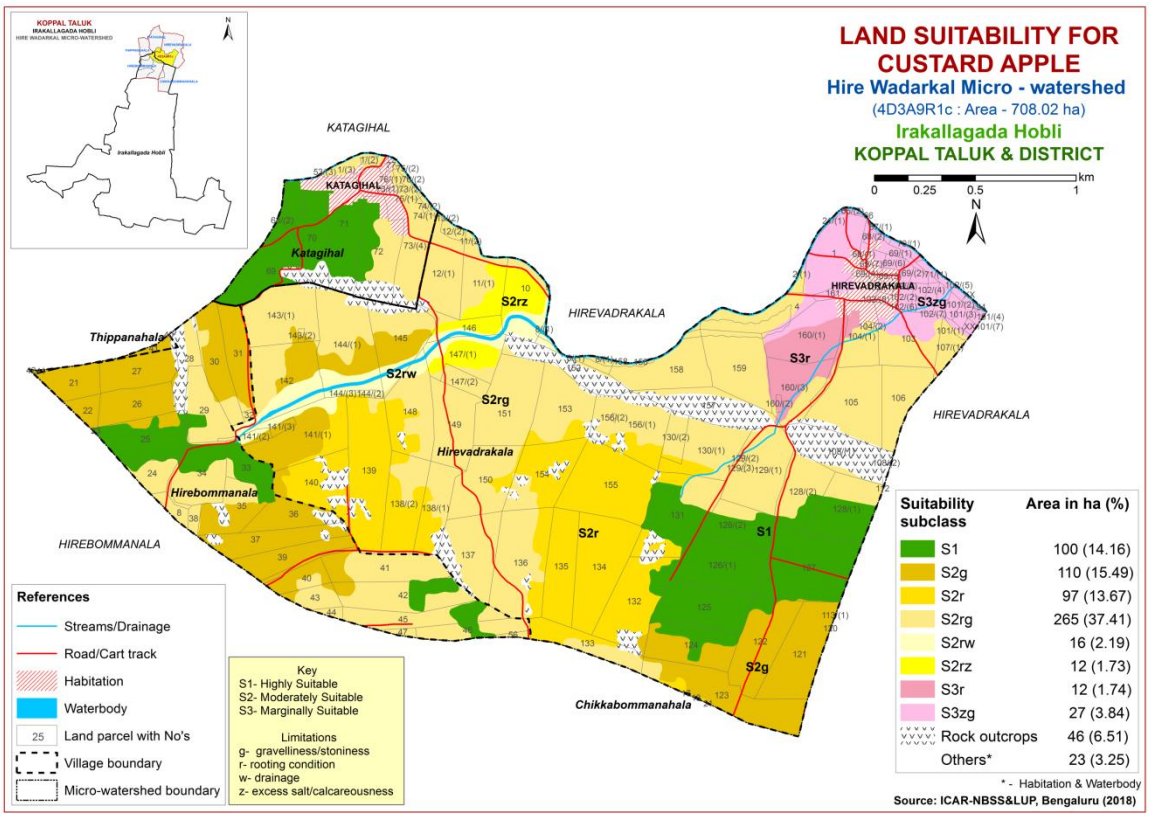


Fig. 7.25 Land Suitability map of Custard Apple

7.26 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 for (Table 7.27) 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 7.26.

Highly suitable (Class S1) lands for growing amla cover an area of about 89 ha (13%) and occur in the eastern, southeastern, southern, western and northwestern part of the microwatershed. Major area of about 511 ha (72%) is moderately suitable (Class S2) for growing amla and occur in the major part of the microwatershed with minor limitations of rooting depth, calcareousness, texture, drainage and gravelliness. An area of about 39 ha (6%) is marginally suitable (Class S3) for growing amla and occur in the northeastern part of the microwatershed with moderate limitations of rooting depth, calcareousness and texture.

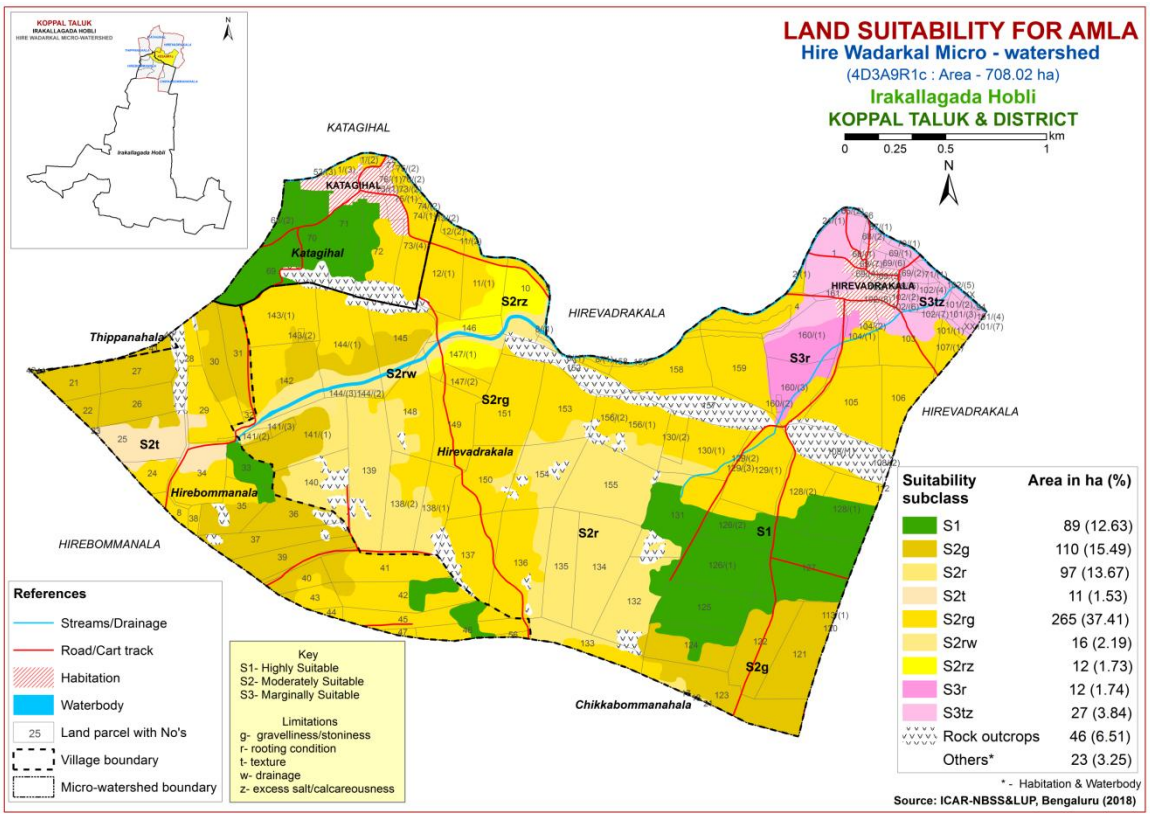


Fig. 7.26 Land Suitability map of Amla

7.27 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 7.28) 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 is given in Figure 7.27.

An area of about 61 ha (9%) is moderately suitable (Class S2) for growing tamarind and occur in the eastern, southeastern and southern part of the microwatershed with minor limitations of rooting depth and gravelliness. Marginally suitable (Class S3) lands cover a major area of 405 ha (57%) for growing tamarind and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, drainage and gravelliness. An area of about 173 ha (24%) is currently not suitable (Class N1) for growing tamarind and distributed in the central, southern, southwestern, western, northwestern, northern, northeastern and eastern part of the microwatershed. They have severe limitations of rooting depth, calcareousness and gravelliness.

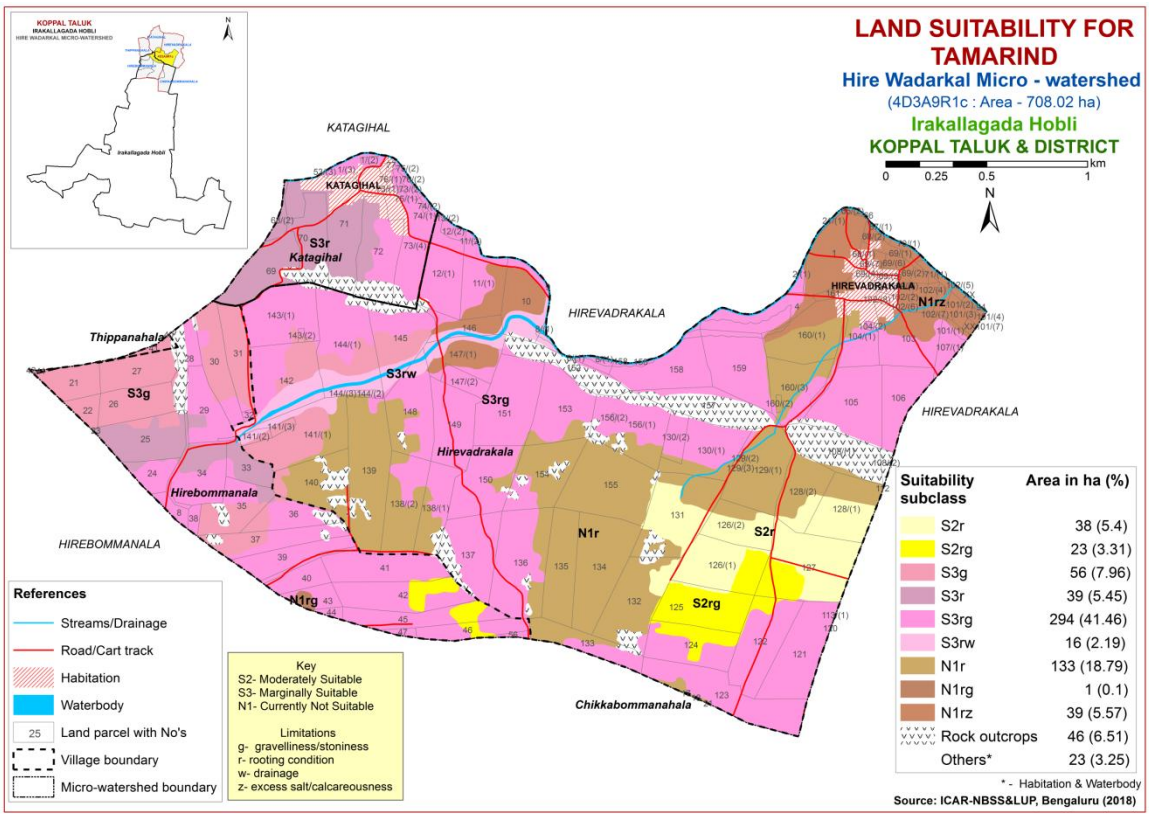


Fig. 7.27 Land Suitability map of Tamarind

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 (Table 7.1) 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.

Highly suitable (Class S1) lands for growing marigold cover an area of about 38 ha (5%) and occur in the eastern part of the microwatershed. An area of about 247 ha (35%) is moderately suitable (Class S2) for growing marigold and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with minor limitations of texture, rooting depth, calcareousness, drainage and gravelliness. Maximum area of about 354 ha (50%) is marginally suitable (Class S3) for growing marigold and occur in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness.

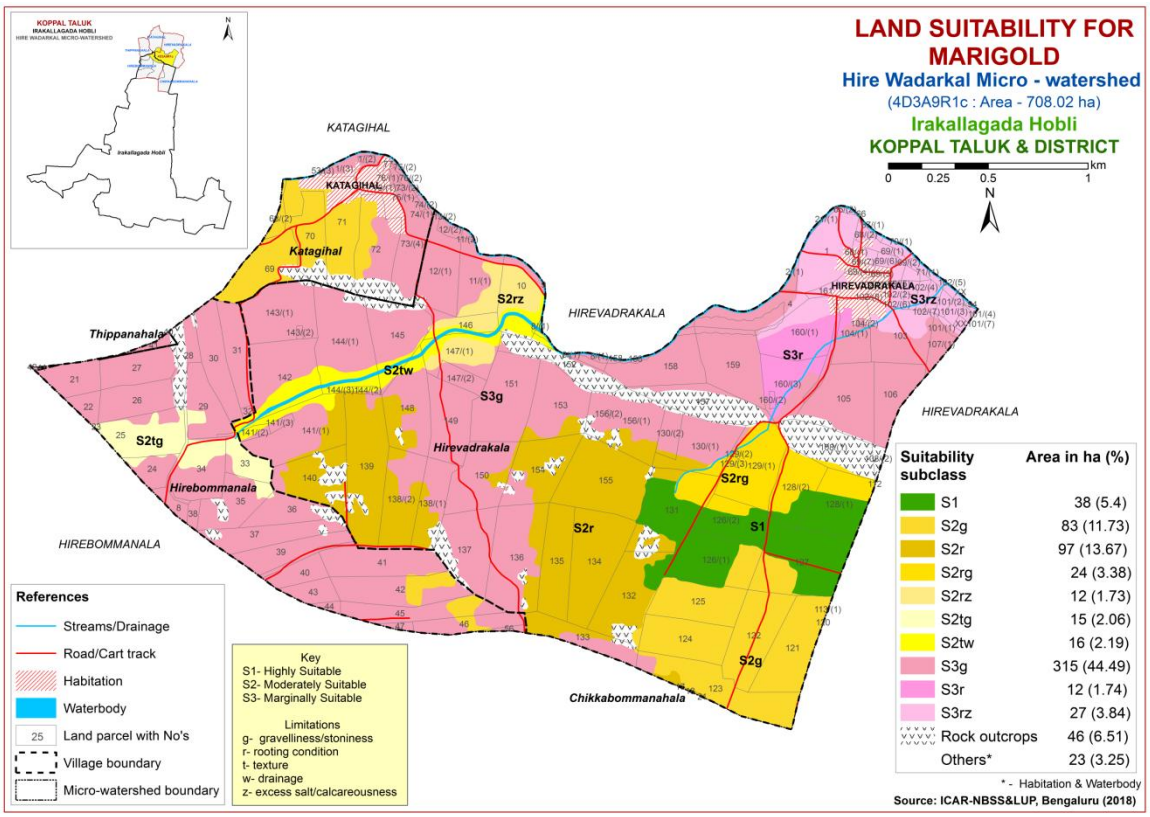


Fig. 7.28 Land Suitability map of Marigold

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.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing chrysanthemum and occur in the eastern part of the microwatershed. An area of about 247 ha (35%) is moderately suitable (Class S2) for growing chrysanthemum and distributed in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed with minor limitations of texture, rooting depth, calcareousness, drainage and gravelliness. Maximum area of about 354 ha (50%) is marginally suitable (Class S3) for growing chrysanthemum and occur in the major part of the microwatershed with moderate limitations of rooting depth, calcareousness and gravelliness.

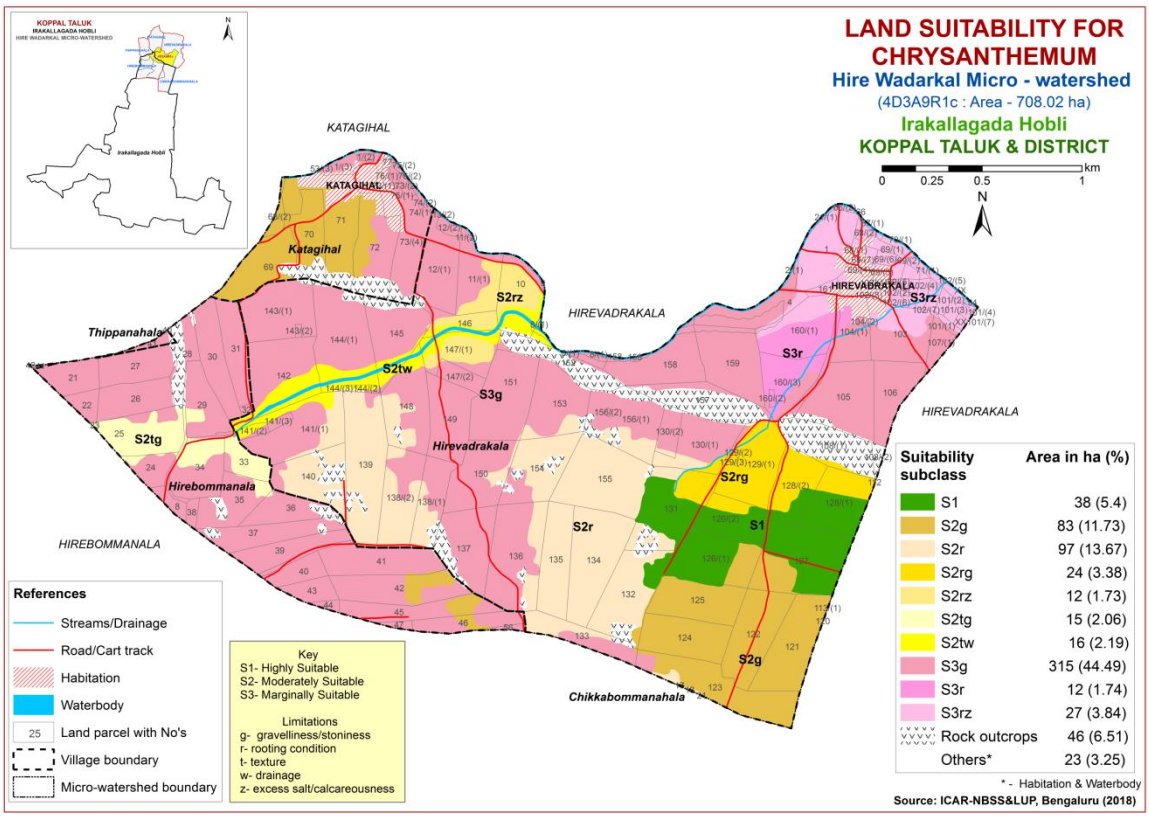


Fig. 7.29 Land Suitability map of Chrysanthemum

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.

Highly suitable (Class S1) lands for growing jasmine cover an area of about 38 ha (5%) and occur in the eastern part of the microwatershed. An area of about 247 ha (35%) is moderately suitable (Class S2) for growing jasmine and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have minor limitations of gravelliness, texture, drainage, calcareousness and rooting depth. Major area of about 354 ha (50%) is marginally suitable (Class S3) for growing jasmine and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness.

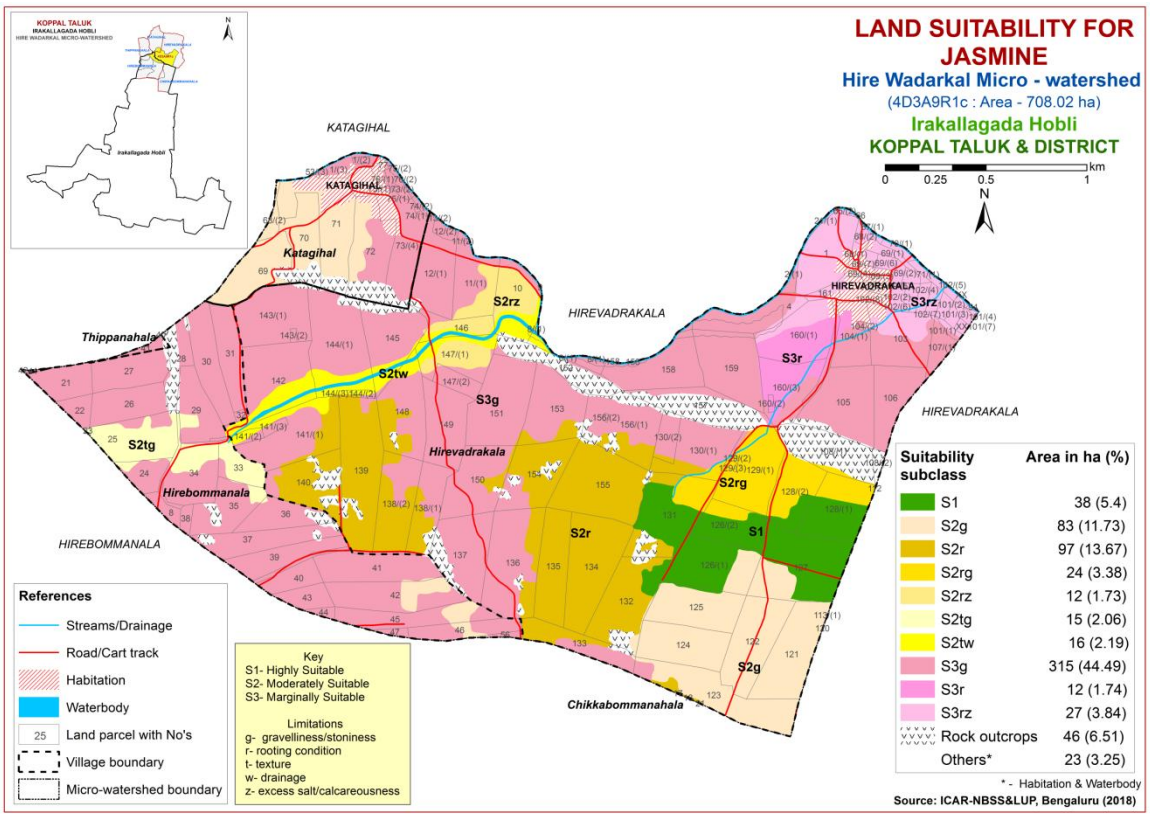


Fig. 7.30 Land Suitability map of Jasmine

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

Crossandra is one of the most important flower crop grown in all the districts of the state. The crop requirements (Table 7.32) for growing crossandra were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing crossandra was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.31.

An area of about 38 ha (5%) is highly suitable (Class S1) for growing crossandra and occur in the eastern part of the microwatershed. An area of about 199 ha (28%) is moderately suitable (Class S2) for growing crossandra and occur in the central, eastern, southeastern, southern, southwestern, western, northwestern and northern part of the microwatershed. They have minor limitations of gravelliness, texture, drainage and rooting depth. Major area of about 402 ha (57%) is marginally suitable (Class S3) for growing crossandra and occur in the major part of the microwatershed. They have moderate limitations of rooting depth, calcareousness and gravelliness.

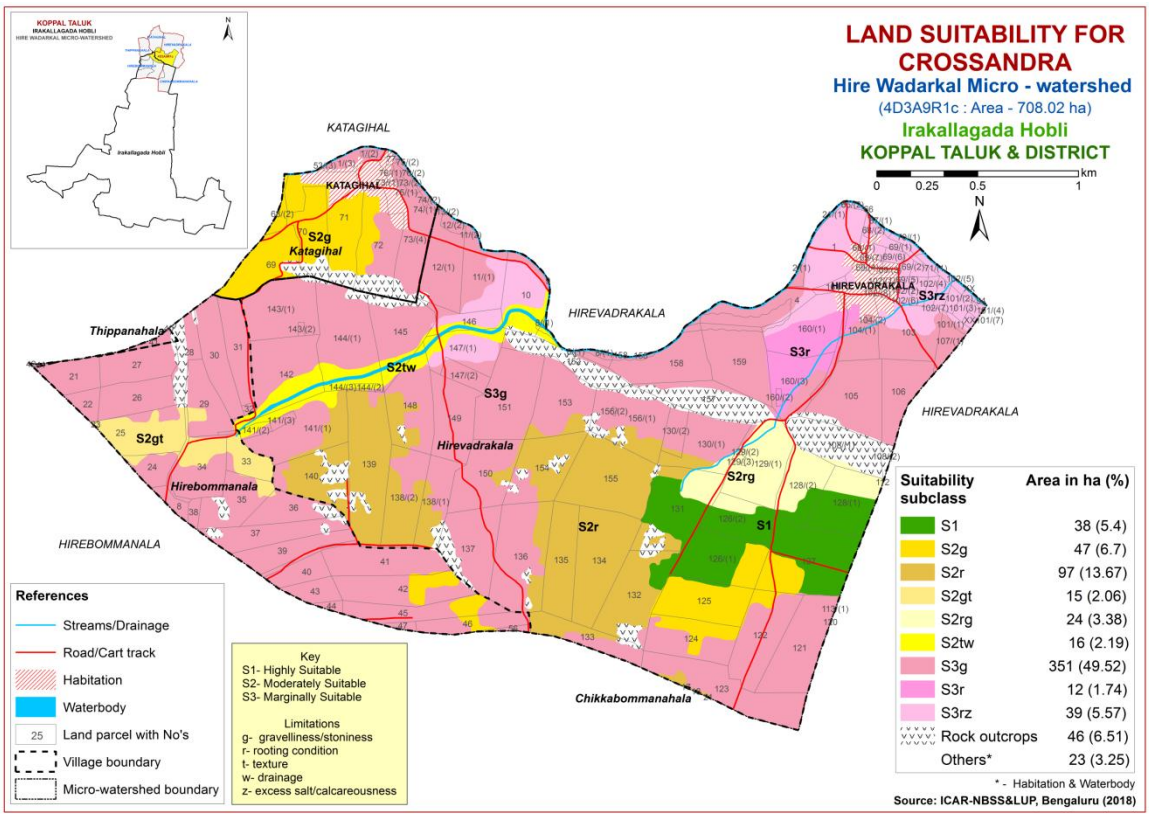


Fig. 7.31 Land Suitability map of Crossandra

Table 7.1 Soil-Site Characteristics of Hire Wadarkal Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		Rocks (%)	AWC (mm/m	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol (p+)kg-1]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface									
CSRcB2g1	662	<90	WD	25-50	sl	scl	15-35	<15	<2	51-100	1-3	Moderate	-	-	-	-	-
LKRcB2g2	662	<90	WD	50-75	sl	gsc	35-60	40-60	<2	51-100	1-3	Moderate	8.18	0.30	4.51	12.19	100
MKHiB2	662	<90	WD	50-75	sc	gsc	<15	>35	<2	51-100	1-3	Moderate	7.38	0.09	1.49	14.84	93
MKHiB2g1	662	<90	WD	50-75	sc	gsc	15-35	>35	<2	51-100	1-3	Moderate	7.38	0.09	1.49	14.84	93
KTPcB1g1	662	<90	WD	50-75	sl	gsc	15-35	15-35	<2	101-150	1-3	Slight	6.42	0.07	0.05	4.41	100
KTPhB2g1	662	<90	WD	50-75	scl	gsc	15-35	15-35	<2	101-150	1-3	Moderate	6.42	0.07	0.05	4.41	100
TDHcB2g1	662	<90	WD	50-75	sl	sc-c	15-35	<15	<2	101-150	1-3	Moderate	9.19	0.18	5.82	3.57	100
HDHbB2g1	662	<90	WD	75-100	ls	gsc-gc	15-35	>35	<2	51-100	1-3	Moderate	6.54	0.07	7.11	5.84	84.07
HDHcB2	662	<90	WD	75-100	sl	gsc-gc	<15	>35	<2	51-100	1-3	Moderate	6.54	0.07	7.11	5.84	84.07
HDHcB2g1	662	<90	WD	75-100	sl	gsc-gc	15-35	>35	<2	51-100	1-3	Moderate	6.54	0.07	7.11	5.84	84.07
HDHcB2g2	662	<90	WD	75-100	sl	gsc-gc	35-60	>35	<2	51-100	1-3	Moderate	6.54	0.07	7.11	5.84	84.07
HDHcC3g1	662	<90	WD	75-100	sl	gsc-gc	15-35	>35	<2	51-100	3-5	Severe	6.54	0.07	7.11	5.84	84.07
HDHhB2g1	662	<90	WD	75-100	scl	gsc-gc	15-35	>35	<2	51-100	1-3	Moderate	6.54	0.07	7.11	5.84	84.07
HDHhB2g2	662	<90	WD	75-100	scl	gsc-gc	35-60	>35	<2	51-100	1-3	Moderate	6.54	0.07	7.11	5.84	84.07
BDGcB1g1	662	<90	WD	75-100	sl	gc	15-35	35-60	<2	<50	1-3	Slight	6.24	0.06	0.35	3.76	52.56
BDGhB2g1	662	<90	WD	75-100	scl	gc	15-35	35-60	<2	<50	1-3	Moderate	6.24	0.06	0.35	3.76	52.56
GHTcB1g2	662	<90	WD	75-100	sl	gscl	35-60	15-35	<2	101-150	1-3	Slight	5.70	0.06	4.10	3.17	73
GHTcB2g1	662	<90	WD	75-100	sl	gscl	15-35	15-35	<2	101-150	1-3	Moderate	5.70	0.06	4.10	3.17	73
BSRbB2g1	662	<90	WD	75-100	ls	gsc	15-35	15-35	<2	51-100	1-3	Moderate	6.59	0.12	6.00	8.80	77.55
BSRhB2g1	662	<90	WD	75-100	scl	gsc	15-35	15-35	<2	51-100	1-3	Moderate	6.59	0.12	6.00	8.80	77.55
HLPmA1	662	<90	WD	75-100	c	scl	<15	<15	<2	51-100	0-1	Slight	-	-	-	-	-

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		Rocks (%)	AWC (mm/m	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol (p+)kg-1]	BS (%)
					Surf-ace	Sub-surface	Sur-face	Sub-surface									
KMHhB1g1	662	<90	WD	100-150	scl	sc	15-35	<15	<2	151-200	1-3	Slight	7.2	0.193	0.54	15.07	100
MNLcB2	662	<90	WD	100-150	sl	gsc	<15	15-35	<2	101-150	1-3	Moderate	7.89	0.137	5.04	9.01	100
MNLiB2g1	662	<90	WD	100-150	sc	gsc	15-35	15-35	<2	101-150	1-3	Moderate	7.89	0.137	5.04	9.01	100
BPRcB2g2	662	<90	WD	100-150	sl	gsc-gc	35-60	>35	<2	101-150	1-3	Moderate	6.64	0.03	0.51	5.45	63.48
NGPcC2g2R1	662	<90	WD	100-150	sl	gsc	35-60	>35	2-10	51-100	3-5	Severe	6.77	0.09	0.46	7.10	82.70
MTLiB2	662	<90	WD	25-50	sc	gc	<15	15-35	<2	51-100	1-3	Moderate	8.27	0.202	0.69	36.64	-
RNKiB2g1	662	<90	MWD	50-75	sc	c	15-35	<15	<2	51-100	1-3	Moderate	8.86	0.483	6.78	37.00	-
RNKmB2	662	<90	MWD	50-75	c	c	<15	<15	<2	51-100	1-3	Moderate	8.86	0.483	6.78	37.00	-

*Symbols and abbreviations are according to Field Guide for LRI under Sujala-III

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 characteristics					
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 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 7.8 Land suitability criteria for Red 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	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 7.9 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 7.10 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 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

Note: Suitability evaluation only for Mulberry leaf not for Silk worm rearing

Table 7.17 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 7.18 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 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 7.21 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 7.22 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 7.23 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	%				
	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 7.24 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 7.25 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 7.26 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 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 7.28 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 7.29 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

Table 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 29 soil map units identified in Hire Wadarkal microwatershed have been grouped into 8 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 Unit map (Fig.7.32) 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 8 Land Management Units along with brief description of soil and site characteristics are given below.

LMUs	Mapping unit	Soil and site characteristics
1	226.BPRcB2g2 180.BDGcB1g1 188.BDGhB2g1 105.HDHbB2g1 110.HDHcB2 111.HDHcB2g1 112.HDHcB2g2 116.HDHcC3g1 123.HDHhB2g1 124.HDHhB2g2 254.NGPcC2g2R1	Moderately deep to deep red gravelly sandy clay to clay soils, 1-5% slope, slight to severe erosion, non-gravelly to very gravelly(<15-60%), nil to very few rocks and fairly rocky (<2-10%).
2	198.KMHhB1g1 204.MNLcB2 209.MNLiB2g1 158.BSRbB2g1 162.BSRhB2g1 136.GHTcB1g2 138.GHTcB2g1	Moderately deep to deep, red sandy clay soils, 1-3% slope, slight to moderate erosion, non-gravelly to very gravelly (<15-60%), nil to very few rocks (<2%).
3	466.HLPmA1	Moderately deep lowland clay soils, 0-1% slope, slight erosion, non-gravelly (<15%), nil to very few rocks (<2%).
4	71.KTPcB1g1 72.KTPhB2g1 56.TDHcB2g1	Moderately shallow, red sandy clay to sandy clay loam soils, 1-3% slope, slight to moderate erosion, gravelly (15-35%), nil to very few rocks (<2%).
5	331.RNKiB2g1 336.RNKmB2	Moderately shallow, black calcareous clay soils, 1-3% slope, moderate erosion, non-gravelly to gravelly (<15-35%), nil to very few rocks (<2%).
6	44.LKRcB2g2 89.MKHiB2 90.MKHiB2g1	Moderately shallow, red gravelly sandy clay to sandy clay loam soils, 1-3% slope, moderate erosion, non-gravelly to very gravelly (15-60%), nil to very few rocks (<2%).
7	304.MTLiB2	Shallow, black calcareous clay soils, 1-3% slope, moderate erosion, non- gravelly (<15%), nil to very few rocks (<2%).
8	36.CSRcB2g1	Shallow, red loam soils, 1-3% slope, moderate erosion, gravelly (15-35%), nil to very few rocks (<2%).

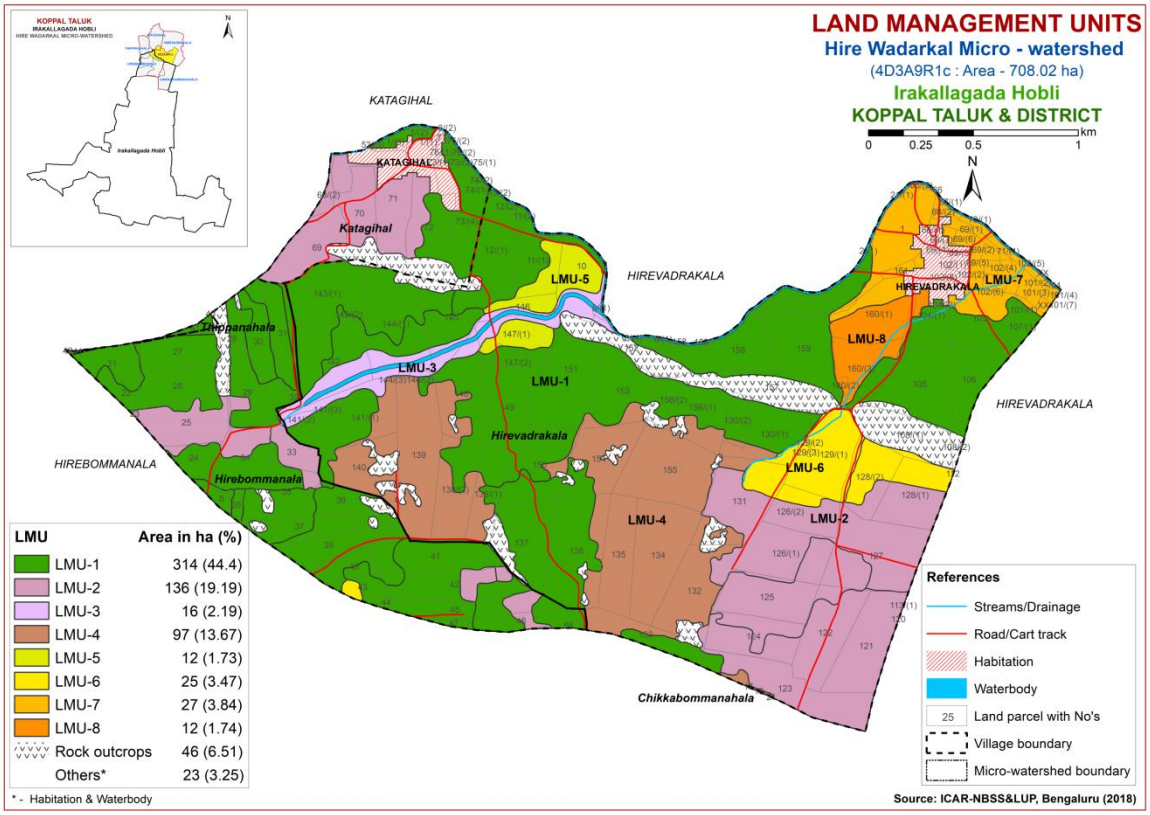


Fig 7.32 Land Management Units map of Hire Wadarkal microwatershed

7.33 Proposed Crop Plan for Hire Wadarkal Microwatershed

After assessing the land suitability for the 31 crops, the proposed crop plan has been prepared for the 8 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 Hire Wadarkal Microwatershed

LMU	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops	Horticulture Crops	Suitable Interventions
1	226.BPRcB2g2 180.BDGcB1g1 188.BDGhB2g1 105.HDHbB2g1 110.HDHcB2 111.HDHcB2g1 112.HDHcB2g2 116.HDHcC3g1 123.HDHhB2g1 124.HDHhB2g2 254.NGPcC2g2R1	**Hirebommanala**:8,21,22,24,26,27,29,30,31,32,34,35,36,37,38,39,40,41,42,43,44,45,46,47,56,142 **Hirevadrakala**:2/(1),4,8/(1),11/(1),11/(2),12/(1),12/(2),103,104/(1),104/(2),105,106,107/(1),130/(1),130/(2),136,137,138/(1),141/(1),141/(3),142,143/(1),143/(2),144/(1),145,147/(2),148,149,150,151,153,156/(1),156/(2),158,159 **Katagihal**:1/(2),1/(3),72,73/(1),73/(2),73/(4),74/(1),74/(2),75/(1),75/(2),76/(2) **Thippanahala**: 40,41,42	Moderately deep to deep red gravelly sandy clay to clay soils, 1-5% slope, slight to severe erosion, non-gravelly to very gravelly(<15-60%), nil to very few rocks and fairly rocky (<2-10%).	Groundnut, Bajra, Horse gram, Castor, Mulberry	**Fruit crops**: Musambi, Lime, Jamun, Jackfruit, Amla, Custard apple, Tamarind **Vegetable crops**: Drumstick, Curry leaves	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
2	198.KMHhB1g1 204.MNLcB2 209.MNLiB2g1 158.BSRbB2g1 162.BSRhB2g1 136.GHTcB1g2 138.GHTcB2g1	**Hirebommanala** :23,25,33 **Hirevadrakala**:113/(1),120,121,122,123,124,125,126/(1),126/(2),127,128/(1),131 **Katagihal** : 68/(2),69,70,71	Moderately deep to deep, red sandy clay soils, 1-3% slope, slight to moderate erosion, non-gravelly to very gravelly (<15-60%), nil to very few rocks (<2%).	Maize, Sorghum, Sunflower, Bajra, Finger millet, Groundnut, Red gram, Cowpea, Field bean, Castor,	**Fruit crops**: Mango, Pomegranate, Guava, Sapota, Jackfruit, Jamun, Tamarind, Lime, Musambi, Amla, Custard apple, Cashew **Vegetable crops**: Drumstick, Tomato, Bhendi, Chilli, Brinjal, Onion, Curry leaves	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)

LMU	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops	Horticulture Crops	Suitable Interventions
				Mulberry	**Flower crops**:Marigold, Chrysanthemum, Jasmine, Crossandra	
3	466.HLPmA1	**Hirevadrakala**:141/(2),144/(2),144/(3)	Moderately deep lowland clay soils, 0-1% slope, slight erosion, non-gravelly (<15%), nil to very few rocks (<2%).	Maize, sorghum, bajra, cotton	**Fruit crops**: Custard Apple, Amla, Musambi, Lime **Vegetable crops**: Brinjal, Tomato, Chillies, Drumstick, Coriander **Flower crops**: Marigold, Chrysanthemum, Jasmine	Providing proper drainage, addition of organic manures, green leaf manuring, suitable conservation practices
4	71.KTPcB1g1 72.KTPhB2g1 56.TDHcB2g1	**Hirevadrakala**:17,18,21,132,133,134,135,138/(2),139, 140,154,155	Moderately shallow, red sandy clay to sandy clay loam soils, 1-3% slope, slight to moderate erosion, gravelly (15-35%), nil to very few rocks (<2%).	Sorghum, Groundnut, Bajra, Green gram, Black gram, Cowpea, Horse gram, Castor,	**Fruit crops**: Lime, Musambi, Amla, Custard apple, Cashew **Flower crops**: Marigold, Chrysanthemum, Crossandra, Jasmine	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
5	331.RNKiB2g1 336.RNKmB2	**Hirevadrakala** : 10,146,147/(1)	Moderately shallow, black calcareous clay soils, 1-3% slope, moderate erosion, non-gravelly to gravelly (<15-35%), nil to very few rocks (<2%).	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

LMU	Soil Map Units	Survey Number	Soil and site characteristics	Field Crops	Horticulture Crops	Suitable Interventions
6	44.LKRcB2g2 89.MKHiB2 90.MKHiB2g1	**Hirevadrakala**:112,128/(2),129/(1),129/(2),129/(3)	Moderately shallow, red gravelly sandy clay to sandy clay loam soils, 1-3% slope, moderate erosion, non-gravelly to very gravelly (15-60%), nil to very few rocks (<2%).	Sorghum, Groundnut, Bajra, Castor	**Fruit crops**: Lime, Musambi, Amla, Cashew, Custard apple	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
7	304.MTLiB2	**Hirevadrakala**:1,65/(2),67/(1),68/(2),69/(1),69/(2),69/(5),69/(6),69/(7),70/(1),71/(1),71/(2),101/(1),101/(2),101/(3),101/(4),101/(5),101/(7),102/(2),102/(3),102/(4),102/(5),102/(6),102/(7),161	Shallow, black calcareous clay soils, 1-3% slope, moderate erosion, non- gravelly (<15%), nil to very few rocks (<2%).	Bengal gram	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata*, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope
8	36.CSRcB2g1	**Hirevadrakala** : 160/(1),160/(2),160/(3)	Shallow, red loam soils, 1-3% slope, moderate erosion, gravelly (15-35%), nil to very few rocks (<2%).	Green gram, Black gram, Horse gram	**Agri-Silvi-Pasture:** Custard apple, Amla, Hybrid Napier, *Styloxanthes hamata*, *Glyricidia*, *Styloxanthes scabra*	Use of short duration varieties, sowing across the slope and split application of nitrogen fertilizers

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 unfavorable conditions occur

Characteristics of Hire Wadarkal Microwatershed

- The soil phases with sizeable area identified in the microwatershed belonged to the soil series of Hooradhahalli (HDH) series occupies major area of 241 ha (34%) followed by Kethanapura (KTP) 64 ha (9%), Gollarahatti (GHT) 60 ha (8%), Mornal (MNL) 57 ha (8%), Bidanagere (BDG) 50 ha (7%), Thammadahalli (TDH) 33 ha (5%), Muttal (MTL) 27 ha (4%), Mukhadahalli (MKH) 24 ha (3%), Balapur (BPR) 18 ha (3%), Huliyapura (HLP) 16 ha (2%), Bisarahalli (BSR) 15 ha (2%), Ravanaki (RNK) 13 ha (2%), Chikkasavanur (CSR) 12 ha (2%), Nagalapura (NGP) 7 ha (1%), Kumchahalli (KMH) 4 ha (1%) and Lakkur (LKR) 1 ha (<1%).

- ❖ As per land capability classification, maximum area of about 501 ha (71%) in the microwatershed falls under good lands (Class II) with minor limitations of soil, drainage and erosion. An area of about 139 ha (20%) is under moderately good lands (Class III) with severe limitations of soil and erosion.
- ❖ On the basis of soil reaction, an area of about 245 ha (35%) are neutral (pH 6.5-7.3) and 394 ha (56%) are slightly alkaline to strongly alkaline (pH 7.3-9.0) in soil reaction.

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.

Neutral soils

Neutral soils occur in about 245 ha (35%) area in the microwatershed.

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, Azotobacter, Rhizobium).
3. Application of 100 per cent RDF.
4. Need based micronutrient applications.

Alkaline soils

Slightly alkaline to strongly alkaline soils cover an area of about 394 ha (56%) in the microwatershed.

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, Azotobacter, Rhizobium).
3. Application of 25% extra N and P (125 % RDN&P).
4. Application of ZnSO4 – 12.5 kg/ha (once in three years).
5. Application of Boron – 5 kg/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 505 ha (71%) is suffering from moderate and severe erosion. These areas 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, radish, 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 Hire Wadarkal Microwatershed.

- **Organic Carbon:** The OC content is low (<0.5%) in an area of about 186 ha (26%) and medium (0.5-0.75%) in 333 ha (47%). These areas needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping and high (>0.75%) in 120 ha (17%) area.
- **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 519 ha (73%) area where OC is low and medium (<0.5-0.75%). 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**: An area of about 212 ha (30%) is medium (23-57 kg/ha) and 427 ha (60%) is low (<23 kg/ha) in available phosphorus content. Hence all the plots, where available phosphorus is low and medium, for all the crops, 25% additional P-needs to be applied
- **Available Potassium:** Available potassium content is low (<145 kg/ha) in an area of about 77 ha (11%), medium (145-337 kg/ha) in 521 ha (74%) and high (>337 kg/ha) in 41 ha (6%) area of the microwatershed. All the plots, where available potassium is low and medium, for all the crops, additional 25% of potassium may be applied.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops, Available sulphur content is high (>20 ppm) in an area of about 160 ha (23%), medium (10-20ppm) in 184 ha (26%) and low (<10 ppm) in 295 ha (42%) area of the microwatershed. Low and medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% of sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** An area of about 484 ha (68%) is low (<0.5 ppm), 145 ha (20%) is medium (0.5-1.0 ppm) and 10 ha (1%) is high (>1.0 ppm) in available boron content. Low and medium (<0.5-1.0 ppm) areas need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency.
- **Available Iron:** Available iron content is deficient (<4.5 ppm) in 296 ha (42%) and sufficient (>4.5 ppm) in 343 ha (48%) area of the microwatershed. For deficient areas, iron sulphate @ 25 kg/ha needs to be applied for 2-3 years to correct the deficiency.
- **Available Manganese:** Entire cultivated area of the microwatershed is sufficient (>1.0 ppm) in the available manganese content.
- **Available Copper:** Entire cultivated area of the microwatershed is sufficient (>0.2 ppm) in the available copper content.

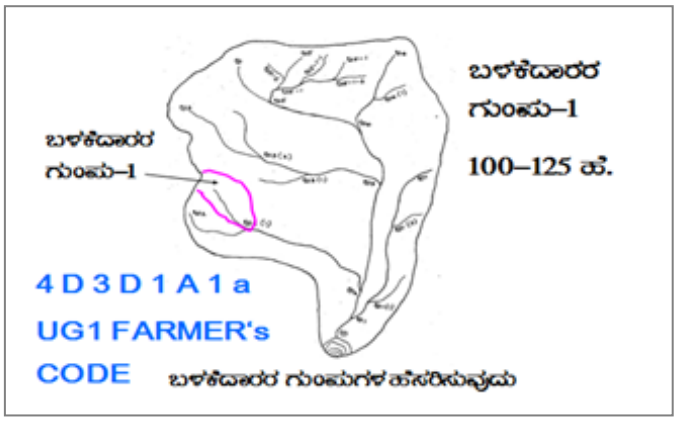
- **Available Zinc:** Available zinc content is deficient (<0.6 ppm) in the entire cultivated area of the microwatershed. For deficient areas, application of zinc sulphate @ 25kg/ha is recommended.
- **Soil Alkalinity:** An area of about 394 ha (56%) in the microwatershed has soils that are slightly alkaline to 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.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Hire Wadarkal 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 needs 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.

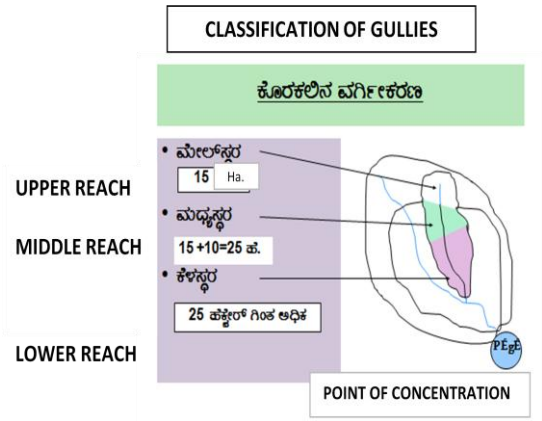
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

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

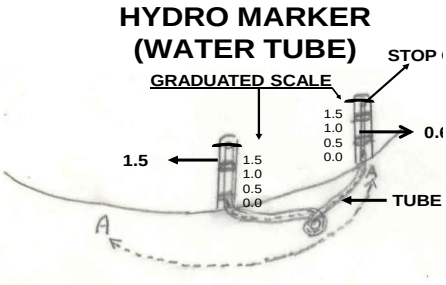
9.1.1 Arable Land Treatment

A. BUNDING

Steps for Survey and Preparation of Treatment Plan		USER GROUP-1
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)	

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.



FALL: 1.5 - 0.6 = 0.9 m.

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 (bg0 .....b= loamy sand, g0 = <15% gravel). The recommended sections for different soils are given below.

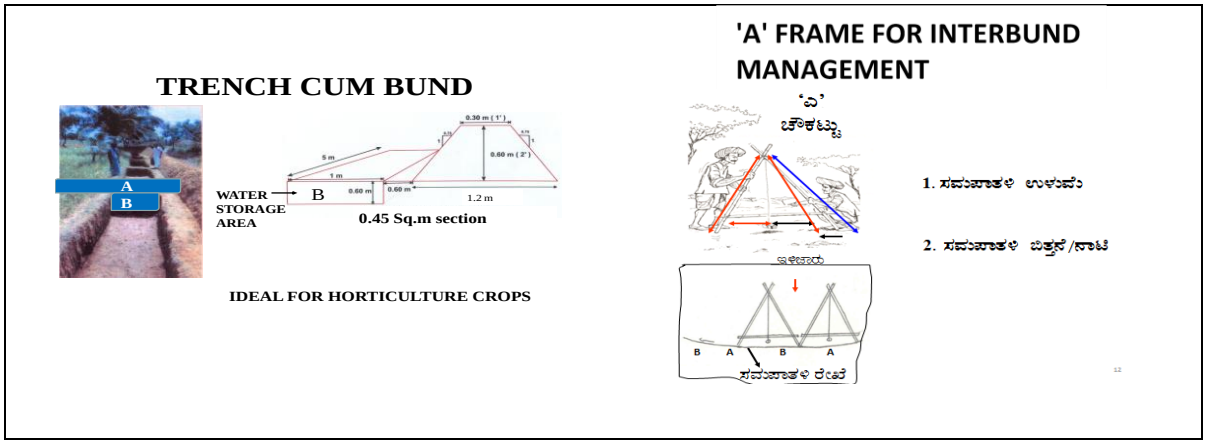
Recommended Bund Section

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 black clayey soils	
0.45	2	0.75	01:01	0.92		
0.45	2.4	0.75	1.3:1	1.07	Shallow black clayey soils	
0.6	3.1	0.7	1.78:1	1.29	Medium black clayey 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
m2	m	m3	L(m)	W(m)	D(m)	Quantity (m3)	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 drainage 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 Leveling 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 584 ha (82%) needs Trench cum Bunding, 39 ha (6%) needs Graded Bunding and 16 ha (2%) needs strengthening of existing bunds.

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 finalised in a participatory approach.

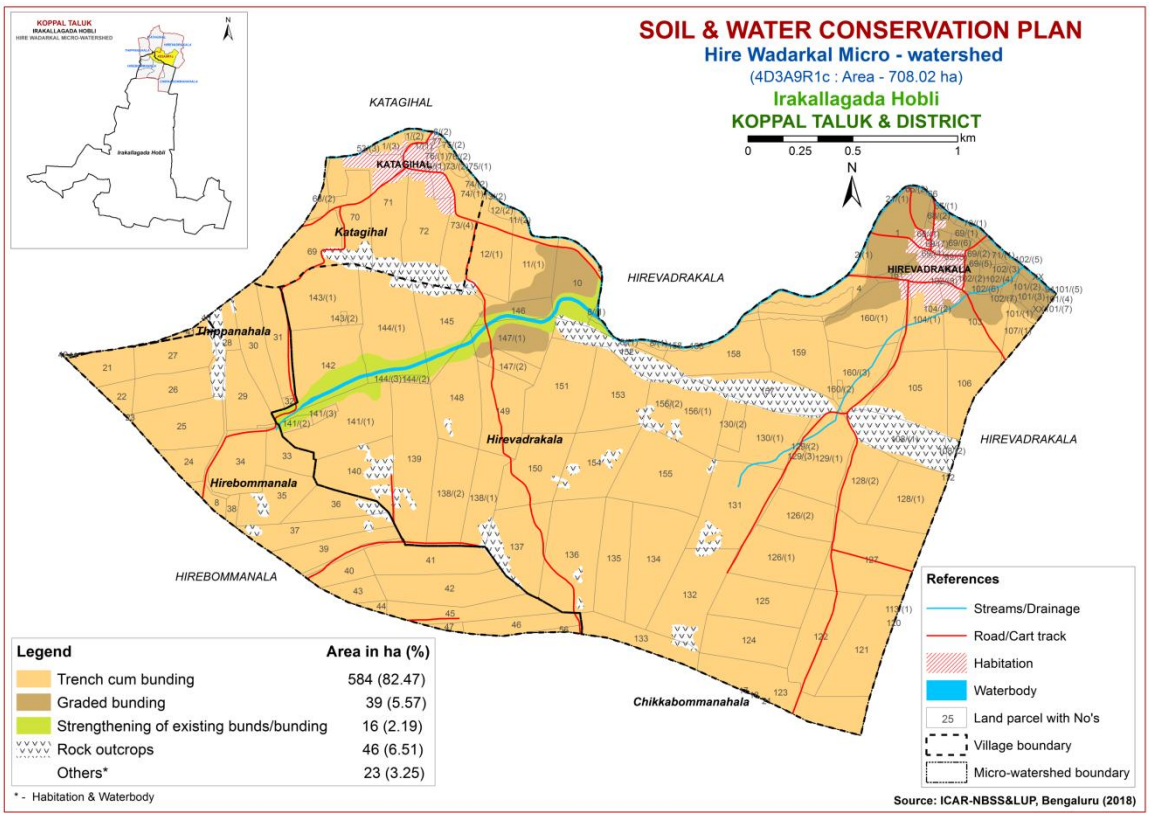


Fig. 9.1 Soil and Water Conservation Plan map of Hire Wadarkal Microwatershed

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 dug-out 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

Hire Wadrakal 9R1c Microwatershed

Soil Phase Information

Village	Survey Number	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
Hirevadrakala	1	8.27	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Habitation+Current fallow (Hb+Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	2/(1)	0.78	HDHcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	4	3.34	HDHcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	8/(1)	1.22	HDHcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadrakala	9	0.02	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	10	7.62	RNKiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Hirevadrakala	11/(1)	7	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	11/(2)	0.22	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadrakala	12/(1)	7.64	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	12/(2)	0.82	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadrakala	13/(2)	0.07	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	21/(1)	0.15	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	65/(2)	0.3	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	66	0.02	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	67/(1)	0.28	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	68/(1)	1.16	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	68/(2)	0.41	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	69/(1)	1.21	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	69/(2)	0.61	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	69/(3)	0.63	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	69/(4)	0.58	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	69/(5)	0.51	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadra	69/(6)	0.61	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly	Low (51-100	Very gently	Moderate	Not Available (NA)	Not	IIIes	Graded

Village	Survey Number	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
kala							(<15%)	mm/m)	sloping (1-3%)			Available		bunding
Hirevadrakala	69/(7)	0.6	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	70/(1)	0.66	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	70/(2)	0	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	71/(1)	0.81	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	71/(2)	0.29	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	94	0.09	Waterbody	Others	Others	Others	Others	Others	Others	Others	Current fallow (Cf)	Not Available	Others	Others
Hirevadrakala	101/(1)	0.49	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	101/(2)	0.68	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	101/(3)	0.73	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	101/(4)	0.32	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	101/(5)	0.11	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIIes	Graded bunding
Hirevadrakala	101/(7)	0.01	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(1)	0.52	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	102/(2)	0.93	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(3)	0.46	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(4)	0.79	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(5)	0.41	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(6)	0.49	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(7)	0.45	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Graded bunding
Hirevadrakala	102/(8)	0.6	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Hirevadrakala	103	8.47	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Paddy (Mz+Pd)	Not Available	IIes	Trench cum bunding
Hirevadrakala	104/(1)	5.12	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Paddy (Mz+Pd)	Not Available	IIes	Trench cum bunding
Hirevadrakala	104/(2)	0.26	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadra	105	10.8	HDHhB2g1	LMU-1	Moderately deep	Sandy clay	Gravelly (15-	Very Low (<50	Very gently	Moderate	Maize+Jowar (Mz+Jw)	Not	IIes	Trench cum

Village	Survey Number	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
kala		2			(75-100 cm)	loam	35%)	mm/m)	sloping (1-3%)			Available		bunding
Hirevadrakala	106	6.49	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	107/(1)	2.1	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadrakala	108/(1)	8.18	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Dyke (Dy)	Not Available	Ro	Ro
Hirevadrakala	108/(2)	0.7	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Dyke (Dy)	Not Available	Ro	Ro
Hirevadrakala	112	0.02	MKHiB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	113/(1)	0.04	GHTcB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	Trench cum bunding
Hirevadrakala	120	0.01	GHTcB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIs	Trench cum bunding
Hirevadrakala	121	10.53	GHTcB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Jowar (Mz+Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	122	10.06	GHTcB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow (Cf)	Not Available	IIs	Trench cum bunding
Hirevadrakala	123	11.9	GHTcB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	124	8.4	GHTcB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Jowar (Cf+Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	125	8.79	MNLiB2g1	LMU-2	Deep (100-150 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Trench cum bunding
Hirevadrakala	126/(1)	9.66	MNLcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Redgram (Jw+Rg)	Not Available	IIes	Trench cum bunding
Hirevadrakala	126/(2)	6.16	MNLcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	127	14.27	MNLcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Marigold+Current fallow+Maize+Jowar (Mg+Cf+Mz+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	128/(1)	8.62	MNLcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	128/(2)	7.11	MKHiB2g1	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Groundnut (Mz+Gn)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	129/(1)	10.13	MKHiB2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize +Paddy (Mz+Pd)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	129/(2)	0.08	MKHiB2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	129/(3)	0.11	MKHiB2	LMU-6	Moderately shallow (50-75 cm)	Sandy clay	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	130/(1)	8.03	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	130/(2)	2.38	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	131	12.58	MNLcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Jowar (Cf+Jw)	Not Available	IIes	Trench cum bunding

Village	Survey Number	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
Hirevadrakala	132	11.31	KTPcB1g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Jowar (Mz+Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	133	5.75	KTPcB1g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar (Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	134	12.62	KTPcB1g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Jowar (Mz+Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	135	8.13	KTPcB1g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize+Jowar (Mz+Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	136	13.59	HDHcC3g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Current fallow+Jowar (Cf+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	137	9.66	HDHcC3g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Gently sloping (3-5%)	Severe	Jowar+Current fallow+Scrub land (Jw+Cf+Sl)	Not Available	IIes	Trench cum bunding
Hirevadrakala	138/(1)	6.05	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	138/(2)	8.84	TDHcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	139	14.27	TDHcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Jowar (Mz+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	140	8.75	TDHcB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	141/(1)	11.32	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	141/(2)	0.89	HLPmA1	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Maize (Mz)	Not Available	IIsw	
Hirevadrakala	141/(3)	0.59	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	142	12.01	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	143/(1)	9.71	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Jowar (Mz+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	143/(2)	0.2	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadrakala	144/(1)	13.93	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	144/(2)	0.36	HLPmA1	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIsw	
Hirevadrakala	144/(3)	0.18	HLPmA1	LMU-3	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIsw	
Hirevadrakala	145	9.24	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Maize (Jw+Mz)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	146	3.59	RNKiB2g1	LMU-5	Moderately shallow (50-75 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Hirevadrakala	147/(1)	6.8	RNKmB2	LMU-5	Moderately shallow (50-75 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Hirevadrakala	147/(2)	2.1	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	148	9.4	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Jowar (Mz+Jw)	Not Available	IIes	Trench cum bunding

Village	Survey Number	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
Hirevadrakala	149	8.1	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Jowar (Gn+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	150	9.2	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Jowar (Cf+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	151	11.52	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	152	5.53	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Dyke (Dy)	Not Available	Ro	Ro
Hirevadrakala	153	9.36	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Current fallow (Jw+Cf)	Not Available	IIes	Trench cum bunding
Hirevadrakala	154	9.18	KTPcB1g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Jowar (Cf+Jw)	Not Available	IIs	Trench cum bunding
Hirevadrakala	155	13.65	KTPcB1g1	LMU-4	Moderately shallow (50-75 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Jowar+Pomegranate+Current fallow (Jw+Pg+Cf)	Not Available	IIs	Trench cum bunding
Hirevadrakala	156/(1)	10.49	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Jowar (Cf+Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	156/(2)	0.1	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Hirevadrakala	157	8.15	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Dyke (Dy)	Not Available	Ro	Ro
Hirevadrakala	158	8.02	HDHcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Hirevadrakala	159	9.15	HDHcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirevadrakala	160/(1)	8.62	CSRcB2g1	LMU-8	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	160/(2)	0.24	CSRcB2g1	LMU-8	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	160/(3)	7.12	CSRcB2g1	LMU-8	Shallow (25-50 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIIes	Trench cum bunding
Hirevadrakala	161	0.87	MTLiB2	LMU-7	Shallow (25-50 cm)	Sandy clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Graded bunding
Katagihal	1/(1)	0.18	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Katagihal	1/(2)	0.28	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	1/(3)	1.96	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	6/(2)	0	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Katagihal	53/(3)	0.03	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Katagihal	54/(2)	0.01	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Katagihal	68/(2)	1.07	GHTcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Katagihal	69	8.02	GHTcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding

Village	Survey Number	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
Katagihal	70	6.38	GHTcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Jowar (Mz+Jw)	Not Available	IIes	Trench cum bunding
Katagihal	71	11.45	GHTcB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Jowar (Mz+Jw)	Not Available	IIes	Trench cum bunding
Katagihal	72	9.39	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Katagihal	73/(1)	0.14	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	73/(2)	0.48	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	73/(4)	8.42	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Trench cum bunding
Katagihal	74/(1)	0.08	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	74/(2)	0.33	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	75/(1)	0.17	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	75/(2)	0.26	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	76/(1)	0.34	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Katagihal	76/(2)	0.34	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Trench cum bunding
Katagihal	77	0.23	Habitation	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Chikkabommanahalla	17	0.01	KTPhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IIes	Trench cum bunding
Chikkabommanahalla	18	0.05	KTPhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Maize (Gn+Mz)	Not Available	IIes	Trench cum bunding
Chikkabommanahalla	21	0	KTPhB2g1	LMU-4	Moderately shallow (50-75 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Bajra (Rg+Bj)	Not Available	IIes	Trench cum bunding
Hirebommanala	8	1.26	HDHhB2g2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Current fallow (Rg+Cf)	Not Available	IIes	Trench cum bunding
Hirebommanala	21	4.24	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Hirebommanala	22	1.8	BDGcB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	Trench cum bunding
Hirebommanala	23	0.07	BSRbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Hirebommanala	24	2.94	HDHhB2g2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Bengalgram (Rg+Bg)	Not Available	IIes	Trench cum bunding
Hirebommanala	25	8.23	BSRbB2g1	LMU-2	Moderately deep (75-100 cm)	Loamy sand	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	1 Borewell	IIes	Trench cum bunding
Hirebommanala	26	5.92	BDGcB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	Trench cum bunding

Village	Survey Number	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
Hirebommanala	27	6.06	BDGcB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Redgram (Rg)	Not Available	IIIs	Trench cum bunding
Hirebommanala	28	3.84	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Redgram (Rg)	Not Available	Ro	Ro
Hirebommanala	29	5.98	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIes	Trench cum bunding
Hirebommanala	30	6.68	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	1 Borewell	IIIes	Trench cum bunding
Hirebommanala	31	5.63	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	1 Borewell	IIIes	Trench cum bunding
Hirebommanala	32	0.31	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Hirebommanala	33	3.44	BSRhB2g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Trench cum bunding
Hirebommanala	34	7.18	HDHhB2g2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Very gravelly (35-60%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	1 Borewell	IIes	Trench cum bunding
Hirebommanala	35	6.57	NGPcC2g2R1	LMU-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Gently sloping (3-5%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Hirebommanala	36	5	BPRcB2g2	LMU-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Hirebommanala	37	6.55	BPRcB2g2	LMU-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Hirebommanala	38	0.76	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow (Cf)	Not Available	IIes	Trench cum bunding
Hirebommanala	39	5.14	BPRcB2g2	LMU-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Hirebommanala	40	3.05	BPRcB2g2	LMU-1	Deep (100-150 cm)	Sandy loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIIes	Trench cum bunding
Hirebommanala	41	8.19	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IIes	Trench cum bunding
Hirebommanala	42	8.96	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut+Redgram+Maize (Gn+Rg+Mz)	Not Available	IIes	Trench cum bunding
Hirebommanala	43	2.52	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Hirebommanala	44	0.55	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Hirebommanala	45	6.69	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Maize (Rg+Mz)	Not Available	IIes	Trench cum bunding
Hirebommanala	46	4.12	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Maize (Mz)	Not Available	IIes	Trench cum bunding
Hirebommanala	47	0.53	HDHcB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Hirebommanala	56	0.47	HDHhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Trench cum bunding
Thippanahala	40	0.001	BDGcB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	Trench cum bunding
Thippanahala	41	0.99	BDGcB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Slight	Not Available (NA)	Not Available	IIIs	Trench cum bunding

Village	Survey Number	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
Thippanahala	42	0.01	BDGhB2g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Gravelly (15-35%)	Very Low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIIes	Trench cum bunding

Appendix II

Hire Wadrakal 9R1c 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
Hirevadrakala	1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	2/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	4	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	8/(1)	Slightly alkaline (pH 7.3 – 7.8)	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)
Hirevadrakala	9	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	10	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	11/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	11/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	12/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	12/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	13/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	21/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	65/(2)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	66	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	67/(1)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	68/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	68/(2)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	69/(1)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	69/(2)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	69/(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	69/(4)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	69/(5)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	69/(6)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	69/(7)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 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
Hirevadrakala	70/(1)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	70/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	71/(1)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	71/(2)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	94	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	101/(1)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	101/(2)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	101/(3)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	101/(4)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	101/(5)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	101/(7)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	102/(2)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(3)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(4)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(5)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(6)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(7)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	102/(8)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	103	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	104/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	104/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	105	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	106	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	107/(1)	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 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
Hirevadrakala	108/(1)	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	108/(2)	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	112	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	113/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	120	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	121	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	122	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	123	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	124	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	125	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	126/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	126/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	127	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	128/(1)	Slightly alkaline (pH 7.3 – 7.8)	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)
Hirevadrakala	128/(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	129/(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	129/(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	129/(3)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	130/(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	130/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	131	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	132	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	133	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	134	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 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
Hirevadrakala	135	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	136	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	137	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	138/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	138/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	139	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	140	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirevadrakala	141/(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirevadrakala	141/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirevadrakala	141/(3)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirevadrakala	142	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	143/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	143/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	144/(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	144/(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	144/(3)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirevadrakala	145	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 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)
Hirevadrakala	146	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 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)
Hirevadrakala	147/(1)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 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)
Hirevadrakala	147/(2)	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 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)
Hirevadrakala	148	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 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)
Hirevadrakala	149	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	150	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	151	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 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
Hirevadrakala	152	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	153	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	154	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	155	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	156/(1)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	156/(2)	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	157	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	158	Slightly alkaline (pH 7.3 – 7.8)	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)
Hirevadrakala	159	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	160/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	160/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	160/(3)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirevadrakala	161	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	1/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	1/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	1/(3)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	6/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	53/(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	54/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	68/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	69	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Katagihal	70	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	71	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	72	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	73/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	73/(2)	Moderately alkaline	Non saline	Low (< 0.5	Low (< 23	Medium (145 –	High (> 20	Medium (0.5	Deficient (<	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey No	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		(pH 7.8 – 8.4)	(<2 dsm)	%)	kg/ha)	337 kg/ha)	ppm)	– 1.0 ppm)	4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Katagihal	73/(4)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	74/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	74/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	75/(1)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	75/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	76/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	76/(2)	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Katagihal	77	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Chikkabommanahala	17	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkabommanahala	18	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Chikkabommanahala	21	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	Low (<145 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	8	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	21	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	22	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	23	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	24	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	25	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	26	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	27	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	28	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirebommanala	29	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	30	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	31	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 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)
Hirebommanala	32	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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
Hirebommanala	33	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	34	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	35	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	36	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Hirebommanala	37	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	38	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	39	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	40	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	41	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	42	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	43	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	44	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	45	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	46	Neutral (pH 6.5 – 7.3)	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	47	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Hirebommanala	56	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Thippanahala	40	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Thippanahala	41	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Thippanahala	42	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)

Appendix III

Hire Wadrakal 9R1c 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
Hirevadrakala	1	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	2/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	4	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	8/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	9	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	10	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
Hirevadrakala	11/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	11/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	12/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	12/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	13/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	21/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	65/(2)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	66	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	67/(1)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	68/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	68/(2)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	69/(1)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	69/(2)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	69/(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

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
Hirevadrakala	69/(4)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	69/(5)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	69/(6)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	69/(7)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	70/(1)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	70/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	71/(1)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	71/(2)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	94	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	101/(1)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	101/(2)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	101/(3)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	101/(4)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	101/(5)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	101/(7)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	102/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	102/(2)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	102/(3)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	102/(4)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	102/(5)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	102/(6)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Hirevadrakala	102/(7)	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt

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
Hirevadrakala	102/(8)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Hirevadrakala	103	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	104/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	104/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	105	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	106	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	107/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	108/(1)	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	108/(2)	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	112	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Hirevadrakala	113/(1)	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S2rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Hirevadrakala	120	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S2rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Hirevadrakala	121	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S2rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Hirevadrakala	122	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S2rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Hirevadrakala	123	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S2rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Hirevadrakala	124	S3rg	S2g	S2rg	S2g	S2rg	S3g	S3rg	S2rg	S3g	S2rg	S3g	S2g	S2rg	S2g	S2rg	S3rg	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2g	S1	S1	S3g	S2rg	S2g	S1
Hirevadrakala	125	S2rg	S2g	S2g	S2g	S2g	S2g	S2rg	S2g	S2gt	S2g	S2g	S1	S2g	S1	N1z	S2rg	S2g	S1	S2g	S2g	S2g	S2g	S2g	S1	S2g	S2z	S2z	S2g	S2g	S1	S2z
Hirevadrakala	126/(1)	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Hirevadrakala	126/(2)	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Hirevadrakala	127	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Hirevadrakala	128/(1)	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Hirevadrakala	128/(2)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g

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
Hirevadrakala	129/(1)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Hirevadrakala	129/(2)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Hirevadrakala	129/(3)	N1r	S2rg	S3rg	S2rg	S3rg	S2rg	N1r	S3rg	S2rt	S3rg	S3rg	S2rg	S3rg	S2rg	S3rg	S3rg	S3rg	S2rg	S2rg	S2rg	S2rg	S2rg	S3rg	S2rg	S2rg	S3g	S3g	S2rg	S3rg	S3rg	S3g
Hirevadrakala	130/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	130/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	131	S2r	S1	S1	S1	S1	S2t	S2r	S1	S2t	S1	S1	S1	S1	S1	N1z	S2r	S1	S1	S1	S1	S1	S1	S1	S1	S1	S2z	S2z	S1	S1	S1	S2z
Hirevadrakala	132	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirevadrakala	133	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirevadrakala	134	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirevadrakala	135	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirevadrakala	136	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	137	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	138/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	138/(2)	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2rt	S2r	S2r	S3r	S3r	S2rt
Hirevadrakala	139	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2rt	S2r	S2r	S3r	S3r	S2rt
Hirevadrakala	140	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2rt	S2r	S2r	S3r	S3r	S2rt
Hirevadrakala	141/(1)	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirevadrakala	141/(2)	S3rw	S1	S2rw	S1	S2rw	S2w	S3rw	S2rw	S1	S2rw	S2rw	S2rw	S2rw	S2rw	N1tw	S3rw	S2rw	S2tw	S2w	S1	S2tw	S2tw	S2rw	S1	S2tw	S2rw	S2rw	S2tw	S2rw	S2rw	S2rw
Hirevadrakala	141/(3)	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirevadrakala	142	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	143/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	143/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g

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
Hirevadrakala	144/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	144/(2)	S3rw	S1	S2rw	S1	S2rw	S2w	S3rw	S2rw	S1	S2rw	S2rw	S2rw	S2rw	S2rw	N1tw	S3rw	S2rw	S2tw	S2w	S1	S2tw	S2tw	S2rw	S1	S2tw	S2rw	S2rw	S2tw	S2rw	S2rw	S2rw
Hirevadrakala	144/(3)	S3rw	S1	S2rw	S1	S2rw	S2w	S3rw	S2rw	S1	S2rw	S2rw	S2rw	S2rw	S2rw	N1tw	S3rw	S2rw	S2tw	S2w	S1	S2tw	S2tw	S2rw	S1	S2tw	S2rw	S2rw	S2tw	S2rw	S2rw	S2rw
Hirevadrakala	145	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirevadrakala	146	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
Hirevadrakala	147/(1)	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
Hirevadrakala	147/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	148	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	149	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	150	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	151	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	152	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	153	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	154	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirevadrakala	155	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirevadrakala	156/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	156/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	157	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirevadrakala	158	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	159	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirevadrakala	160/(1)	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Hirevadrakala	160/(2)	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r

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
Hirevadrakala	160/(3)	N1r	S3r	N1r	S3r	N1r	S3r	N1r	N1r	S3r	N1r	N1r	S3r	N1r	S3r	N1r	N1r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	S3r	S3r	S3r	S3r	S3r	N1r	N1r	S3r
Hirevadrakala	161	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3r	S3r	S3rz	N1rz	N1rz	S3rt
Katagihal	1/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	1/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	1/(3)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	6/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	53/(3)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	54/(2)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	68/(2)	S3r	S2g	S2r	S2g	S2r	S2rg	S3r	S2r	S2g	S2rg	S2rg	S1	S2r	S1	S2r	S2r	S2r	S1	S2g	S2g	S2g	S2g	S2r	S1	S2g	S1	S1	S2g	S2rg	S2r	S1
Katagihal	69	S3r	S2g	S2r	S2g	S2r	S2rg	S3r	S2r	S2g	S2rg	S2rg	S1	S2r	S1	S2r	S2r	S2r	S1	S2g	S2g	S2g	S2g	S2r	S1	S2g	S1	S1	S2g	S2rg	S2r	S1
Katagihal	70	S3r	S2g	S2r	S2g	S2r	S2rg	S3r	S2r	S2g	S2rg	S2rg	S1	S2r	S1	S2r	S2r	S2r	S1	S2g	S2g	S2g	S2g	S2r	S1	S2g	S1	S1	S2g	S2rg	S2r	S1
Katagihal	71	S3r	S2g	S2r	S2g	S2r	S2rg	S3r	S2r	S2g	S2rg	S2rg	S1	S2r	S1	S2r	S2r	S2r	S1	S2g	S2g	S2g	S2g	S2r	S1	S2g	S1	S1	S2g	S2rg	S2r	S1
Katagihal	72	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	73/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	73/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	73/(4)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	74/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	74/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	75/(1)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	75/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	76/(1)	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Katagihal	76/(2)	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Katagihal	77	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

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
Chikkabommanahala	17	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Chikkabommanahala	18	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Chikkabommanahala	21	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S3t	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S3r	S2r
Hirebommanala	8	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	21	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirebommanala	22	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirebommanala	23	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2gt	S2r	S2gt	S2t	S2rg	S1	S2rt	S2rg	S2rg	S2t	S2t	S2t	S2tg	S2tg	S2rg	S2t	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Hirebommanala	24	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	25	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2gt	S2r	S2gt	S2t	S2rg	S1	S2rt	S2rg	S2rg	S2t	S2t	S2t	S2tg	S2tg	S2rg	S2t	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Hirebommanala	26	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirebommanala	27	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirebommanala	28	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro	Ro
Hirebommanala	29	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	30	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirebommanala	31	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Hirebommanala	32	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	33	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2gt	S2r	S2gt	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S1	S1	S2tg	S2tg	S2rg	S1	S2tg	S2t	S1	S2gt	S2r	S2r	S2t
Hirebommanala	34	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	35	S3rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3rg	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hirebommanala	36	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g

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
Hirebommanala	37	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hirebommanala	38	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	39	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hirebommanala	40	S3rg	S3g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S3g	S3g	S3g	S2g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S2g	S3g	S2g	S2g	S2g
Hirebommanala	41	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	42	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	43	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	44	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	45	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	46	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	47	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Hirebommanala	56	S3rg	S3g	S2rg	S3g	S2rg	S3rg	S3rg	S2rg	S3g	S3rg	S3g	S2rg	S2rg	S2rg	S2rg	S2rg	S2rg	S2g	S3g	S3g	S3g	S3g	S2rg	S2g	S3g	S3g	S3g	S3g	S3g	S2g	S3g
Thippanahala	40	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Thippanahala	41	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg
Thippanahala	42	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2g	S3g	S2g	S2rg	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S3g	S2tg	S2tg	S3g	S3g	S2g	S2tg

Ro-Rock outcrops

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 Hire Wadarkal is located at North latitude 76^0 17' 36.021" and 76^0 16' 17.724" and East longitude 15^0 36' 59.965" and 15^0 36' 5.239" covering an area of about 118.69 ha coming under Hirebommanala village of Koppal taluk.*
- *Socio-economic analysis of Hire Wadarkal micro watersheds of Katagihalli sub-watershed, Koppala taluk & District indicated that, out of the total sample of 40 farmers were sampled in Hire Wadarkal micro-watershed among households surveyed 5 (12.50%) were marginal, 13 (32.50%) were small, 10 (25.00 %) were semi medium and 7 (17.50 %) were medium farmers. 5 landless farmers were also interviewed for the survey.*
- *The population characteristics of households indicated that, there were 116 (54.98%) men and 95 (45.02 %) were women. The average population of landless was 5.2, marginal farmers were 4.2, small farmers were 4.8, semi medium farmers were 5.7 and medium farmers were 6.4.*
- *Majority of the respondents (36.02%) were in the age group of 16-35 years.*
- *Education level of the sample households indicated that, there were 16.11 per cent illiterates, 84.83 per cent pre university education and 2.84 per cent attained graduation.*
- *About, 77.50 per cent of household heads practicing agriculture and 17.50 per cent of the household heads were engaged as agricultural labourers.*
- *Agriculture was the major occupation for 43.13 per cent of the household members.*
- *In the study area, 47.50 per cent of the households possess katcha house and 17.50 per cent possess pucca house.*
- *The durable assets owned by the households showed that, 87.50 per cent possess TV, 80.00 per cent possess mixer grinder, 87.50 per cent possess mobile phones and 15.00 per cent possess motor cycles.*
- *Farm implements owned by the households indicated that, 27.50 per cent of the households possess plough, 17.50 per cent possess bullock cart and 10.00 per cent possess sprayer.*
- *Regarding livestock possession by the households, 17.50 per cent possess local cow and 2.50 per cent possess buffalo.*
- *The average labour availability in the study area showed that, own labour men available in the micro watershed was 1.75, women available in the micro watershed was 1.98, hired labour (men) available was 7.58 and hired labour (women) available was 11.68.*
- *Further, 55.00 per cent of the households opined that hired labour was inadequate during the agricultural season.*

- *In the study area, about 0.47 per cent of the respondents migrated from the micro watershed in search of jobs with an average distance of 400.00 kms for about 2.00 months.*
- *Out of the total land holding of the sample respondents 65.25 per cent (63.50 ha) of the area is under dry condition and the remaining 34.75 per cent area is irrigated land.*
- *There were 20.00 live bore wells and 20.00 dry bore wells among the sampled households.*
- *Bore/open well was the major source of irrigation for 50.00 per cent of the households.*
- *The major crops grown by sample farmers are Maize, Bajra, Sunflower, Red gram and Groundut and cropping intensity was recorded as 100.00 per cent.*
- *Out of the sample households 90.00 percent possessed bank account and 50.00 per cent of them have savings in the account.*
- *About 90.00 per cent of the respondents borrowed credit from various sources.*
- *Among the credit borrowed by households, 31.58 per cent have borrowed loan from commercial banks and 47.37 per cent from co-operative/Grameena bank.*
- *Majority of the respondents (100.00%) have borrowed loan for agriculture purpose.*
- *Regarding the opinion on institutional sources of credit, 78.95 per cent of the households opined that credit helped to perform timely agricultural operations.*
- *The per hectare cost of cultivation for Maize, Bajra, Sunflower, Red gram and Groundut was Rs.33772.11, 24265.59, 35980.72, 59003.81 and 58133.96 with benefit cost ratio of 1:0.98, 1: 1.10, 1: 1.00, 1: 0.90 and 1:0.80 respectively.*
- *Further, 50.00 per cent of the households opined that dry fodder was adequate and 2.50 per cent of the households have opined that the green fodder was adequate.*
- *The average annual gross income of the farmers was Rs. 67232.50 in micro-watershed, of which Rs. 42770.00 comes from agriculture.*
- *Sampled households have grown 6 horticulture trees and 35 forestry trees together in the fields and back yards.*
- *About 60.00 per cent of the households shown interest to cultivate horticultural crops.*
- *Households have an average investment capacity of Rs. 5775.00 for land development and Rs. 3525.00 for irrigation facility.*
- *Source of funds for additional investment is concerned, 40.00 per cent depends on own funds.*
- *Regarding marketing channels, 80.00 per cent of the households have sold agricultural produce to the local/village merchants, while, 12.50 per cent have sold in regulated markets.*
- *Further, 40.00 per cent of the households have used tractor for the transport of agriculture commodity.*

- *Majority of the farmers (62.50%) have experienced soil and water erosion problems in the watershed and 72.50 per cent of the households were interested towards soil testing.*
- *Fire was the major source of fuel for domestic use for 82.50 per cent of the households and 17.50 per cent households has LPG connection.*
- *Piped supply was the major source for drinking water for 80.00 per cent of the households.*
- *Electricity was the major source of light for 100.00 per cent of the households.*
- *In the study area, 35.00 per cent of the households possess toilet facility.*
- *Regarding possession of PDS card, 100.00 per cent of the households possessed BPL card.*
- *Households opined that, the requirement of cereals (62.50%), pulses (57.50%) and oilseeds (47.50%) are adequate for consumption.*
- *Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (67.50%) wild animal menace on farm field (60.00%), frequent incidence of pest and diseases (47.50%), inadequacy of irrigation water (55.00%), high cost of fertilizers and plant protection chemicals (70.00%), high rate of interest on credit (70.00%), low price for the agricultural commodities (72.50%), lack of marketing facilities in the area (67.50%), inadequate extension services (15.00%), lack of transport for safe transport of the agricultural produce to the market (60.00%), Less rainfall (5.00%) and Source of Agri-technology information (Newspaper/ TV/Mobile) (5.00%).*

Chapter 2

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 km² 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 Hire Wadarkal micro-watershed (Katagihalli sub-watershed, Koppala taluk & District) is located at North latitude 76^0 17’ 36.021” and ^{760} 16’ 17.724” and East longitude 15^0 36’ 59.965” and 15^0 36’ 5.239”covering an area of about 118.69 ha bounded by under Hirebommanala Village.

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 40 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

Chapter 4

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 Hire Wadarkal Micro watershed is presented in Table 1 and it indicated that 40 farmers were sampled in Hire Wadarkal micro-watershed among households surveyed 5 (12.50%) were marginal, 13 (32.50%) were small, 10 (25.00 %) were semi medium and 7 (17.50 %) were medium farmers. 5 landless farmers were also interviewed for the survey.

Table 1. Households sampled for socio economic survey in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	12.5	5	12.5	13	32.5	10	25	7	17.5	40	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Hire Wadarkal Micro watershed is presented in Table 2. The data indicated that, there were 116 (54.98%) men and 95 (45.02%) were women. The average population of landless was 5.2, marginal farmers were 4.2, small farmers were 4.8, semi medium farmers were 5.7 and medium farmers were 6.4.

Table 2. Population characteristics in Hire Wadarkal micro-watershed

Sl.No.	Particulas	LL (26)		MF (21)		SF (62)		SMF (57)		MDF (45)		All (211)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	14	53.9	11	52	34	55	34	59.7	23	51.1	116	55
2	Women	12	46.2	10	48	28	45	23	40.4	22	48.9	95	45
Total		26	100	21	100	62	100	57	100	45	100	211	100
Average		5.2		4.2		4.8		5.7		6.4		5.3	

Age wise classification of population: The age wise classification of household members in Hire Wadarkal Micro watershed is presented in Table 3. The indicated that, 78 (36.97%) of population were 0-15 years of age, 76 (36.02%) were 16-35 years of age, 47(22.27%) were 36-60 years of age and 10 (4.74 %) were above 61 years of age.

Table 3: Age wise classification of members of the household in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (26)		MF (21)		SF (62)		SMF (57)		MDF (45)		All (211)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	11	42.3	9	42.9	20	32.3	23	40.35	15	33	78	36.97
2	16-35 years of age	8	30.8	10	47.6	26	41.9	18	31.58	14	31	76	36.02
3	36-60 years of age	7	26.9	2	9.52	12	19.4	15	26.32	11	24	47	22.27
4	> 61 years	0	0	0	0	4	6.45	1	1.75	5	11	10	4.74
Total		26	100	21	100	62	100	57	100	45	100	211	100

Education level of household members: Education level of household members in Hire Wadarkal Micro watershed is presented in Table 4. The results indicated that, there were 16.11 per cent of illiterates, 56.87 per cent of them had primary school education, 3.32 per cent middle school education, 17.06 per cent high school education, 3.79 per cent of them had PUC education, 2.84 per cent attained graduation.

Table 4. Education level of members of the household in Hire Wadarkal micro-watershed

Sl. No.	Particulars	LL (26)		MF (21)		SF (62)		SMF (57)		MDF (45)		All (211)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	2	7.69	0	0	9	14.5	12	21.1	11	24.44	34	16.1
2	Primary School	15	57.7	15	71.4	43	69.4	29	50.9	18	40	120	56.9
3	Middle School	0	0	1	4.76	0	0	3	5.26	3	6.67	7	3.32
4	High School	7	26.9	5	23.8	5	8.06	9	15.8	10	22.22	36	17.1
5	PUC	2	7.69	0	0	3	4.84	1	1.75	2	4.44	8	3.79
6	Degree	0	0	0	0	2	3.23	3	5.26	1	2.22	6	2.84
Total		26	100	21	100	62	100	57	100	45	100	211	100

Occupation of head of households: The data regarding the occupation of the household heads in Hire Wadarkal Micro watershed is presented in Table 5. The results indicate that, 77.50 per cent of households heads were practicing agriculture, 17.50 per cent of the household heads were agricultural Labour.

Table 5: Occupation of heads of households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	4	80	13	100	9	90	5	71.4	31	77.5
2	Agricultural Labour	5	100	0	0	0	0	0	0	2	28.6	7	17.5
3	Private Service	0	0	1	20	0	0	0	0	0	0	1	2.5
4	Student	0	0	0	0	1	7.69	1	10	0	0	2	5
Total		5	100	5	100	14	100	10	100	7	100	41	100

Table 6: Occupation of members of the household in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (26)		MF (21)		SF (62)		SMF (57)		MDF (45)		All (211)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0	10	47.6	32	51.61	26	45.61	23	51	91	43.1
2	Agricultural Labour	9	34.6	1	4.76	3	4.84	3	5.26	4	8.9	20	9.48
3	General Labour	4	15.4	0	0	0	0	0	0	0	0	4	1.9
4	Household industry	0	0	0	0	1	1.61	0	0	0	0	1	0.47
5	Private Service	0	0	1	4.76	0	0	0	0	1	2.2	2	0.95
6	Student	13	50	9	42.9	24	38.71	25	43.86	16	36	87	41.2
7	Housewife	0	0	0	0	2	3.23	3	5.26	1	2.2	6	2.84
Total		26	100	21	100	62	100	57	100	45	100	211	100

Occupation of the members of the household: The data regarding the occupation of the household members in Hire Wadarkal Micro watershed is presented in Table 6. The results indicate that, agriculture was the major occupation for 43.13 per cent of the household members, 9.48 per cent were agricultural labour, 1.90 per cent were general

labour, 41.23 per cent were working in pursuing education and 2.84 per cent were involved as housewife.

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

Table 7: Institutional Participation of household member in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (26)		MF (21)		SF (62)		SMF (57)		MDF (45)		All (211)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	26	100	21	100	62	100	57	100	45	100	211	100
Total		26	100	21	100	62	100	57	100	45	100	211	100

Type of house owned: The data regarding the type of house owned by the households in Hire Wadarkal Micro watershed is presented in Table 8. The results indicate that, 35.00 percent possess thatched house, 47.50 per cent of the households possess katcha house, 17.50 per cent possess pacca house.

Table 8. Type of house owned by households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	1	20	4	80	6	46.15	2	20	1	14	14	35
2	Katcha	4	80	1	20	5	38.46	5	50	4	57	19	47.5
3	Pucca/RCC	0	0	0	0	2	15.38	3	30	2	29	7	17.5
Total		5	100	5	100	13	100	10	100	7	100	40	100

Durable assets owned by the households: The data regarding the Durable Assets owned by the households in Hire Wadarkal Micro watershed is presented in Table 9. The result shows that, 87.50 per cent possess TV, 80.00 per cent possess mixer grinder, 12.50 per cent possess Bicycle, 15.00 per cent possess motor cycle, 87.50 per cent possess mobile phones.

Table 9. Durable assets owned by households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	3	60	5	100	11	84.6	9	90	7	100	35	87.5
2	Mixer/Grinder	3	60	3	60	11	84.6	8	80	7	100	32	80
3	Bicycle	0	0	0	0	2	15.4	1	10	2	28.6	5	12.5
4	Motor Cycle	0	0	0	0	2	15.4	3	30	1	14.3	6	15
5	Auto	0	0	1	20	0	0	0	0	0	0	1	2.5
6	Mobile Phone	4	80	4	80	12	92.3	9	90	6	85.7	35	87.5
7	Blank	1	20	0	0	1	7.69	0	0	0	0	2	5

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Hire Wadarkal Micro watershed is presented in Table 10. The result shows that, the average value of television was Rs.5714.00, mixer grinder was

Rs.1543.00, bicycle was Rs.3000.00, motor cycle was Rs. 43333.00, mobile phone was Rs.2386.00.

Table 10. Average value of durable assets owned in Hire Wadarkal micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
1	Television	6333	6200	5545	5444	5714	5714
2	Mixer/Grinder	1400	1500	1636	1500	1528	1543
3	Bicycle	0	0	3000	3000	3000	3000
4	Motor Cycle	0	0	50000	40000	40000	43333
5	Auto	0	100000	0	0	0	100000
6	Mobile Phone	2000	2300	2342	2384	2900	2386

Farm implements owned: The data regarding the farm implements owned by the households in Hire Wadarkal Micro watershed is presented in Table 11. About 17.50 per cent of the households possess Bullock Cart, 27.50 per cent possess plough, 10.00 per cent possess Sprayer, 45.00 per cent possess Weeder.

Table 11. Farm implements owned in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0	0	0	3	23.08	3	30	1	14.3	7	17.5
2	Plough	0	0	0	0	4	30.77	4	40	3	42.9	11	27.5
3	Sprayer	0	0	0	0	1	7.69	1	10	2	28.6	4	10
4	Weeder	0	0	3	60	8	61.54	3	30	4	57.1	18	45
5	Blank	5	100	2	40	4	30.77	3	30	3	42.9	17	42.5

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Hire Wadarkal Micro watershed is presented in Table 12. The results show that the average value of plough was Rs.3090.00, bullock Cart was Rs.15571.00, seed/fertilizer drill was Rs.4750.00 and weeder was Rs.125.00.

Table 12. Average value of farm implements in Hire Wadarkal micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
1	Bullock Cart	0	0	15333	15000	18000	15571
2	Plough	0	0	3375	3500	2166	3090
3	Sprayer	0	0	5000	5000	4500	4750
4	Weeder	0	116	132	130	114	125

Table 13. Livestock possession by households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	0	0	4	30.77	4	40	2	28.6	10	25
2	Local cow	0	0	0	0	3	23.08	2	20	2	28.6	7	17.5
3	Buffalo	0	0	0	0	1	7.69	0	0	0	0	1	2.5
4	Goat	0	0	0	0	1	7.69	0	0	0	0	1	2.5
5	Goat	0	0	0	0	1	7.69	0	0	0	0	1	2.5
6	blank	5	100	5	100	6	46.15	6	60	3	42.9	25	62.5

Livestock possession by the households: The data regarding the Livestock possession by the households in Hire Wadarkal Micro watershed is presented in Table 13. The results indicate that, 25.00 per cent of the households possess bullocks, 17.50 per cent possess local cow, 2.50 per cent possess buffalo, 2.50 per cent possess goat.

Average Labour availability: The data regarding the average labour availability in Hire Wadarkal Micro watershed is presented in Table 14. The indicated that, own labour men available in the micro watershed was 1.75, women available in the micro watershed was 1.98, hired labour (men) available was 7.58 and hired labour (women) available was 11.68.

Table 14. Average labour availability in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
		N	N	N	N	N	N
1	Hired labour Female	0	8.4	13.46	14	15.7	11.68
2	Own Labour Female	0	1.2	1.85	3.6	1.86	1.98
3	Own labour Male	0	1.4	1.69	2.8	1.86	1.75
4	Hired labour Male	0	4.6	8.08	10	10.7	7.58

Adequacy of hired labour: The data regarding the adequacy of hired labour in Hire Wadarkal Micro watershed is presented in Table 15. The results indicate that, 45.00 per cent of the household opined that hired labour was adequate, 55.00 per cent of the household opined that hired labour was Inadequate.

Table 15. Adequacy of hired labour in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	5	100	3	60	6	46.2	4	40	0	0	18	45
2	Inadequate	0	0	2	40	7	53.9	6	60	7	100	22	55

Migration among the households: The data regarding the migration (Table 16) indicate that, 0.47 percent of the population was being migrated from the micro watershed.

Table 16. Migration among the households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (26)		MF (21)		SF (62)		SMF (57)		MDF (45)		All (211)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Migration	0	0.00	0	0.00	0	0.00	1	1.75	0	0.00	1	0.47

Average distance and duration of migration: The data regarding the average distance and duration of migration (Table 17) indicate that, people migrated to a distance of 400 kms on an average for 2 months.

Table 17. Average distance and duration of migration in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)	MF (0)	SF (0)	SMF (1)	MDF (0)	All (1)
		N	N	N	N	N	N
1	Avg. Distance (kms)	0	0	0	400	0	400
2	Avg. Duration (months)	0	0	0	2	0	2

Purpose of migration: The data regarding the purpose of migration **(**Table 18) indicate that, 100.00 percent of them went for the purpose of job/wage/work.

Table 18. Purpose of migration by members of households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (0)		SMF (1)		MDF (0)		All (1)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Job/wage/work	0	0	0	0	0	0	1	100	0	0	1	100
Total		0	100	0	100	0	100	1	100	0	100	1	100

Distribution of land (ha): The data regarding the distribution of land (ha) in Hire Wadarkal Micro watershed is presented in Table 19. The results indicate that, 41.43 ha (65.25%) of dry land and 22.06 ha (34.75 %) of irrigated land.

Table 19. Distribution of land (ha) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Dry	0	0	3.4	100	12.94	79.35	10.93	58.7	14.16	56.3	41.43	65.25
2	Irrigated	0	0	0	0	3.37	20.65	7.69	41.3	11.01	43.7	22.06	34.75
Total		0	100	3.4	100	16.31	100	18.62	100	25.17	100	63.5	100

Average value of land (ha): The data regarding the average land value (Rs./ha) in Hire Wadarkal Micro watershed is presented in Table 20. The results show that the average value of dry land was Rs.323285.80 and the average value of irrigated land was Rs.616140.87.

Table 20. Average value of land (ha) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)	MF (0)	SF (0)	SMF (2)	MDF (0)	All (2)
		N	N	N	N	N	N
1	Dry	0	882142.9	308943.1	311037	211714.3	323285.8
2	Irrigated	0	0	890625	520000	599338.2	616140.9

Status of bore wells: The data regarding the status of bore wells in Hire Wadarkal Micro watershed is presented in Table 21. The results indicate that, there were 20 De-functioning bore wells and 20 functioning bore wells among the sampled households in micro watershed.

Table 21. Status of bore wells in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
		N	N	N	N	N	N
1	De-functioning	0	0	5	7	8	20
2	Functioning	0	0	5	7	8	20

Table 22. Source of irrigation in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	0	0	5	38.46	7	70	8	114.29	20	50

Source of irrigation: The data regarding the source of irrigation in Hire Wadarkal Micro watershed is presented in Table 22. The results that bore well were major source of irrigation for 50.00 per cent of the households.

Depth of water (Avg. In meters): The data regarding the depth of water in Hire Wadarkal Micro watershed is presented in Table 23. The results revealed that, the depth of bore well was 146.54 meter.

Table 23. Depth of water (Avg. In meters) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
		N	N	N	N	N	N
1	Bore Well	0	0	27.67	48.77	70.1	146.54

Irrigated Area (ha): The results (Table 24) indicate that, the availability of irrigation water was used for kharif crops was 19.98 ha and 3.24 ha for rabi crop.

Table 24. Irrigated Area (ha) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
1	Kharif	0	0	3.38	5.67	10.93	19.98
2	Rabi	0	0	0	0.81	2.43	3.24
Total		0	0	3.38	6.48	13.36	23.22

Cropping pattern: The data regarding the cropping pattern in Hire Wadarkal Micro watershed is presented in Table 25. The results indicate that, farmers have grown Maize (36.09 ha), Bajra (11.04 ha), Sunflower (4.45 ha), Groundnut (2.43 ha), Maize (2.02 ha), Sunflower (1.21 ha) and Red gram (0.45 ha).

Table 25. Cropping pattern in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
1	Kharif - Maize	0	1.34	9.24	16.19	9.31	36.09
2	Kharif - Bajra	0	0.81	5.77	0	4.45	11.04
3	Kharif - Sunflower	0	0	0	1.21	3.24	4.45
4	Kharif - Groundnut	0	0	0.81	0	1.62	2.43
5	Rabi - Maize	0	0.81	0	0	1.21	2.02
6	Rabi - Sunflower	0	0	0	0	1.21	1.21
7	Kharif - Red gram (togari)	0	0.45	0	0	0	0.45

Cropping intensity: The data regarding the cropping intensity in Hire Wadarkal Micro watershed is presented in Table 26. The results indicate that, the cropping intensity was 100.00 per cent.

Table 26. Cropping intensity (%) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
1	Cropping Intensity	0	100	100	100	100	100

Table 27. Possession of Bank account and savings in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	2	40	5	100	13	100	9	90	7	100	36	90
2	Savings	0	0	1	20	8	61.54	6	60	5	71.43	20	50

Possession of bank account and savings: The data regarding the possession of bank account and saving in Hire Wadarkal micro-watershed is presented in Table 27. The

results indicate that, 90.00 cent of the households posses bank account and 50.00 per cent of them have savings.

Borrowing status: The data regarding the borrowing status in Hire Wadarkal micro-watershed is presented in Table 28. The results indicate that, 90.00 percent of the sample farmers have borrowed credit from different sources.

Table 28. Borrowing status in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	5	100	4	80	11	84.6	9	90	7	100	36	90

Source of credit: The results (Table 29) shows that, 31.58 per cent have borrowed loan from commercial banks and 21.05 per cent have borrowed loan from Cooperative bank and 5.26 per cent have borrowed loan from Friends/Relatives, 47.37 per cent have borrowed loan from Grameena Bank, 5.26 per cent have borrowed loan from input dealers / suppliers, 31.58 per cent have borrowed loan from SHGs/CBOs.

Table 29. Source of credit borrowed by households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	MF (3)		SF (7)		SMF (3)		MDF (6)		All (19)	
		N	%	N	%	N	%	N	%	N	%
1	Commercial Bank	0	0	1	14.3	2	67	3	50	6	31.58
2	Cooperative Bank	1	33.3	2	28.6	0	0	1	16.67	4	21.05
3	Friends/Relatives	0	0	0	0	1	33	0	0	1	5.263
4	Grameena Bank	2	66.7	4	57.1	1	33	2	33.33	9	47.37
5	Input Dealers/ Suppliers	0	0	1	14.3	0	0	0	0	1	5.263
6	SHGs/CBOs	0	0	1	14.3	3	100	2	33.33	6	31.58

Avg. Credit amount: The data regarding the avg. Credit amount in Hire Wadarkal micro-watershed is presented in Table 30. The results show that, farmers have borrowed Avg. Credit of Rs.183625.00 from different sources.

Table 30. Avg. Credit amount in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)	MF (3)	SF (3)	SMF (7)	MDF (6)	All (19)
		N	N	N	N	N	N
1	Average Credit	0	105000	320000	285000	24500	183625

Table 31. Purpose of credit borrowed (institutional Source) by households in Hire Wadarkal micro-watershed

SN	Particulars	LL (0)		MF (3)		SF (7)		SMF (3)		MDF (6)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0	3	100	7	100	3	100	6	100	19	100

Purpose of credit borrowed (institutional Source): The data regarding the purpose of credit borrowed - Institutional Credit in Hire Wadarkal micro-watershed is presented in Table 31. The results indicate that, 100.00 per cent of the households have borrowed loan for agriculture.

Purpose of credit borrowed (Private Source): The data regarding the purpose of credit borrowed – Private Source in Hire Wadarkal micro-watershed is presented in Table 32.

The results indicate that, 100.00 per cent of the households have borrowed loan for agriculture.

Table 32. Purpose of credit borrowed (Private Source) by households in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (2)		SMF (4)		MDF (2)		All (8)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture production	0	0	0	0	2	100	4	100	2	100	8	100

Repayment status of household (institutional Source): The data regarding the repayment status of credit borrowed from institutional Source by households in Hire Wadarkal micro watershed is presented in Table 33. The results indicate that, 100.00 per cent have unpaid.

Table 33. Repayment status of household (institutional Source) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)		MF (3)		SF (7)		SMF (3)		MDF (6)		All (19)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Un paid	0	0	3	100	7	100	3	100	6	100	19	100

Repayment status of household (Private Source): The results (Table 34) indicate that, 100 per cent of the households have unpaid.

Table 34. Repayment status of household (Private Source) in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (0)		MF (0)		SF (2)		SMF (4)		MDF (2)		All (8)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Un paid	0	0	0	0	2	100	4	100	2	100	8	100

Table 35. Opinion regarding institutional sources of credit in Hire Wadarkal micro-watershed

Sl. No.	Particulars	MF (3)		SF (7)		SMF (3)		MDF (6)		All (19)	
		N	%	N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	3	100	7	100	1	33	4	67	15	79
2	Easy accessibility of credit	0	0	0	0	0	0	0	0	0	0
3	Higher rate of interest	0	0	0	0	2	67	2	33	4	21.1

Opinion regarding institutional sources of credit: The results (Table 35) indicate that, 78.95 per cent of the households opined that credit helped to perform timely agricultural operations, 21.05 per cent higher rate of interest.

Opinion regarding Non- institutional sources of credit: The results (Table 36) indicate that, 78.95 per cent of the households opined that credit helped to perform timely agricultural operations.

Table 36. Opinion regarding Non- institutional sources of credit in Hire Wadarkal micro-watershed

Sl.No.	Particulars	SF (2)		SMF (4)		MDF (2)		All (8)	
		N	%	N	%	N	%	N	%
1	Helped to perform timely agricultural operations	2	100	4	100	2	100	8	100

Cost of Cultivation of Maize: The data regarding the cost of cultivation (Rs/ha) of Maize in Hire Wadarkal micro watershed is presented in Table 37.a. The results indicate that, the total cost of cultivation (Rs/ha) for Maize was Rs. 33772.11. The gross income realized by the farmers was Rs. 32375.83. The net income from Maize cultivation was Rs.-1396.28, thus the benefit cost ratio was found to be 1:0.98.

Table 37(a). Cost of Cultivation of Maize in Hire Wadarkal micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	45.09	9568.18	28.33
2	Bullock		Pairs/day	0.3	202.09	0.6
3	Tractor		Hours	2.69	2065.06	6.11
4	Machinery		Hours	0.06	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	13.01	2039.44	6.04
7	FYM		Quintal	1.85	4631.25	13.71
8	Fertilizer + micronutrients		Quintal	5.38	4232.7	12.53
9	Pesticides (PPC)		Kgs / liters	1.73	1682.21	4.98
11	Repairs			0	59.09	0.17
12	Msc. Charges (Marketing costs etc)			0	477.27	1.41
13	Depreciation charges			0	41.38	0.12
II	**Cost B1**					
16	Interest on working capital				1510.82	4.47
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				26512.11	78.5
III	**Cost B2**					
18	Rental Value of Land				283.33	0.84
19	**Cost B2 = (Cost B1 + Rental value)**				26795.44	79.34
IV	**Cost C1**					
20	Family Human Labour			16.63	3901.92	11.55
21	**Cost C1 = (Cost B2 + Family Labour)**				30697.37	90.9
V	**Cost C2**					
22	Risk Premium				4.55	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**				30701.91	90.91
VI	**Cost C3**					
24	Managerial Cost				3070.19	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				33772.11	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		25.31	30890.71	
		b) Main Crop Sales Price (Rs.)			1220.45	
	By Product	e) Main Product (q)		3	1485.12	
		f) Main Crop Sales Price (Rs.)			495.45	
b.	Gross Income (Rs.)				32375.83	
c.	Net Income (Rs.)				-1396.28	
d.	Cost per Quintal (Rs./q.)				1334.3	
e.	Benefit Cost Ratio (BC Ratio)				1:0.98	

Cost of Cultivation of Bajra: The data regarding the cost of cultivation (Rs/ha) of Bajra in Hire Wadarkal micro watershed is presented in Table 37.b. The results indicate that, the total cost of cultivation (Rs/ha) for Bajra was Rs. 24265.59. The gross income realized by the farmers was Rs. 25779.31. The net income from Bajra cultivation was Rs.1513.72, thus the benefit cost ratio was found to be 1:1.10.

Table 37(b). Cost of Cultivation of Bajra in Hire Wadarkal micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	43.03	8281.38	34.13
2	Bullock		Pairs/day	0.52	219.56	0.9
3	Tractor		Hours	3.02	2840.09	11.7
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	9.29	1390.32	5.73
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	4.29	3447.11	14.21
9	Pesticides (PPC)		Kgs / liters	2.2	2075.98	8.56
10	Irrigation		Number	0	0	0
13	Depreciation charges			0	59.16	0.24
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				829.95	3.42
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				19143.55	78.89
III	**Cost B2**					
18	Rental Value of Land				209.57	0.86
19	**Cost B2 = (Cost B1 + Rental value)**				19353.12	79.76
IV	**Cost C1**					
20	Family Human Labour			15.01	2703.64	11.14
21	**Cost C1 = (Cost B2 + Family Labour)**				22056.77	90.9
V	**Cost C2**					
22	Risk Premium				2.86	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**				22059.62	90.91
VI	**Cost C3**					
24	Managerial Cost				2205.96	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				24265.59	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.87	21765.92	
		b) Main Crop Sales Price (Rs.)			1371.43	
	By Product	e) Main Product (q)		8.26	4013.39	
		f) Main Crop Sales Price (Rs.)			485.71	
b.	Gross Income (Rs.)				25779.31	
c.	Net Income (Rs.)				1513.72	
d.	Cost per Quintal (Rs./q.)				1528.93	
e.	Benefit Cost Ratio (BC Ratio)				1:1.1	

Cost of Cultivation of Sunflower: The data regarding the cost of cultivation (Rs/ha) of Sunflower in Hire Wadarkal micro watershed is presented in Table 37.c. The results indicate, the total cost of cultivation (Rs/ha) for Sunflower was Rs.35980.72. The gross income realized by the farmers was Rs. 36200.94. The net income from Sunflower cultivation was Rs. 220.22, thus the benefit cost ratio was found to be 1:1.00.

Table 37(c). Cost of Cultivation of Sunflower in Hire Wadarkal micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	45.61	10145.53	28.2
2	Bullock		Pairs/day	0.41	288.17	0.8
3	Tractor		Hours	2.55	2041.87	5.67
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	6.63	1567.22	4.36
7	FYM		Quintal	0.99	2470	6.86
8	Fertilizer + micronutrients		Quintal	5.31	4454.23	12.38
9	Pesticides (PPC)		Kgs / liters	2.14	2140.67	5.95
10	Irrigation		Number	2.92	0	0
11	Repairs			0	150	0.42
12	Msc. Charges (Marketing costs etc)			0	750	2.08
13	Depreciation charges			0	114.86	0.32
14	Land revenue and Taxes			0	6.18	0.02
II	**Cost B1**					
16	Interest on working capital				1288.45	3.58
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				25417.16	70.64
III	**Cost B2**					
18	Rental Value of Land				333.33	0.93
19	**Cost B2 = (Cost B1 + Rental value)**				25750.49	71.57
IV	**Cost C1**					
20	Family Human Labour			28.16	6854.25	19.05
21	**Cost C1 = (Cost B2 + Family Labour)**				32604.74	90.62
V	**Cost C2**					
22	Risk Premium				105	0.29
23	**Cost C2 = (Cost C1 + Risk Premium)**				32709.74	90.91
VI	**Cost C3**					
24	Managerial Cost				3270.97	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				35980.72	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.06	36185.5	
		b) Main Crop Sales Price (Rs.)			3000	
	By Product	e) Main Product (q)		0.12	15.44	
		f) Main Crop Sales Price (Rs.)			125	
b.	Gross Income (Rs.)				36200.94	
c.	Net Income (Rs.)				220.22	
d.	Cost per Quintal (Rs./q.)				2983.02	
e.	Benefit Cost Ratio (BC Ratio)				1:1	

Cost of Cultivation of Red gram: The data regarding the cost of cultivation (Rs/ha) of Red gram in Hire Wadarkal micro watershed is presented in Table 37.d. The results indicate that, the total cost of cultivation (Rs/ha) for Red gram was Rs. 59003.81. The gross income realized by the farmers was Rs.52768.18. The net income from Red gram cultivation was Rs. -6235.62, thus the benefit cost ratio was found to be 1:0.90.

Table 37(d). Cost of Cultivation of Red gram in Hire Wadarkal micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	119.01	24587.73	41.67
2	Bullock		Pairs/day	0	0	0
3	Tractor		Hours	6.74	5389.09	9.13
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	11.23	1347.27	2.28
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	0	0	0
8	Fertilizer + micronutrients		Quintal	11.23	8981.82	15.22
9	Pesticides (PPC)		Kgs / liters	0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	22.45	0.04
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				1239.49	2.1
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				41567.85	70.45
III	**Cost B2**					
18	Rental Value of Land				283.33	0.48
19	**Cost B2 = (Cost B1 + Rental value)**				41851.19	70.93
IV	**Cost C1**					
20	Family Human Labour			51.65	11788.64	19.98
21	**Cost C1 = (Cost B2 + Family Labour)**				53639.82	90.91
V	**Cost C2**					
22	Risk Premium				0	0
23	**Cost C2 = (Cost C1 + Risk Premium)**				53639.82	90.91
VI	**Cost C3**					
24	Managerial Cost				5363.98	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				59003.81	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		33.68	50522.73	
		b) Main Crop Sales Price (Rs.)			1500	
	By Product	e) Main Product (q)		4.49	2245.45	
		f) Main Crop Sales Price (Rs.)			500	
b.	Gross Income (Rs.)				52768.18	
c.	Net Income (Rs.)				-6235.62	
d.	Cost per Quintal (Rs./q.)				1751.8	
e.	Benefit Cost Ratio (BC Ratio)				1:0.9	

Cost of Cultivation of Groundut: The data regarding the cost of cultivation (Rs/ha) of Groundut in Hire Wadarkal micro watershed is presented in Table 37.e. The results indicate that, the total cost of cultivation (Rs/ha) for Groundut was Rs.58133.96. The gross income realized by the farmers was Rs. 45664.13. The net income from Groundut cultivation was Rs. -12469.83, thus the benefit cost ratio was found to be 1:0.80.

Table 37(e). Cost of Cultivation of Groundut in Hire Wadarkal micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	65.76	14264.25	24.54
2	Bullock		Pairs/day	1.85	1173.25	2.02
3	Tractor		Hours	2.16	1605.5	2.76
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	123.5	16055	27.62
8	Fertilizer + micronutrients		Quintal	7.72	6283.06	10.81
9	Pesticides (PPC)		Kgs /liters	2.16	1945.13	3.35
10	Irrigation		Number	3.09	0	0
11	Repairs			0	250	0.43
12	Msc. Charges (Marketing costs etc)			0	3000	5.16
13	Depreciation charges			0	461.89	0.79
14	Land revenue and Taxes			0	8.23	0.01
II	**Cost B1**					
16	Interest on working capital				2915.78	5.02
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				47962.09	82.5
III	**Cost B2**					
18	Rental Value of Land				333.33	0.57
19	**Cost B2 = (Cost B1 + Rental value)**				48295.43	83.08
IV	**Cost C1**					
20	Family Human Labour			19.76	4538.63	7.81
21	**Cost C1 = (Cost B2 + Family Labour)**				52834.05	90.88
V	**Cost C2**					
22	Risk Premium				15	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				52849.05	90.91
VI	**Cost C3**					
24	Managerial Cost				5284.91	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				58133.96	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		15.44	42453.13	
		b) Main Crop Sales Price (Rs.)			2750	
	By Product	e) Main Product (q)		4.01	3211	
		f) Main Crop Sales Price (Rs.)			800	
b.	Gross Income (Rs.)				45664.13	
c.	Net Income (Rs.)				-12469.83	
d.	Cost per Quintal (Rs./q.)				3765.76	
e.	Benefit Cost Ratio (BC Ratio)				1:0.8	

Adequacy of fodder: The data regarding the adequacy of fodder in Hire Wadarkal Micro watershed is presented in Table 38. The results indicate that, 50.00 per cent of the households opined that dry fodder was adequate. With respect to green fodder availability, 2.50 percent of them opined it was sufficient.

Table 38. Adequacy of fodder in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	1	20	9	69.23	6	60	4	57.1	20	50
2	Adequate-Green Fodder	0	0	0	0	1	7.69	0	0	0	0	1	2.5

Average annual gross income: The data regarding the annual gross income in Hire Wadarkal Micro watershed is presented in Table 39. The results indicate that, the farmers have annual gross income of Rs. 67232.50 in micro-watershed, of which Rs. 42770.00 is from agriculture itself.

Table 39. Average annual gross income in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	10000	0	0	0	1250
2	Wage	66000	13800	16153.9	14800	19285.7	22300
3	Agriculture	0	21400	40953.9	51000	80200	42770
4	Dairy Farm	0	0	692.31	1350	857.14	712.5
5	Goat Farming	0	0	615.38	0	0	200
	Income(Rs.)	66000	45200	58415.4	67150	100343	67232.5

Average annual Expenditure: The data regarding the average annual expenditure in Hire Wadarkal Micro watershed is presented in Table 40. The results indicate that, the farmers have annual gross expenditure of Rs. 168744.87 in micro-watershed, of which Rs. 20900.00 is from agriculture itself.

Table 40. Average annual Expenditure in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Service/salary	0	35000	0	0	0	875
2	Wage	31000	0	5461.54	4285.71	833.33	6525
3	Agriculture	0	12200	20357.1	26000	32857.1	20900
4	Dairy Farm	0	0	0	750	0	37.5
	Total	31000	47200	25818.7	31035.7	33690.5	168745

Table 41. Horticulture species grown in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Mango	0	0	0	0	6	0	0	0	0	0	6	0

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

Horticulture species grown: The data regarding horticulture species grown in Hire Wadarkal Micro watershed is presented in Table 41. The results indicate that, the total

number of horticultural trees grown (both field and backyard) by the sampled households were Mango (6).

Interest towards cultivation of horticulture crops: The data regarding Table (42) indicates that, 60.00 per cent of the households shown interest to cultivate horticultural crops.

Table 42. Interest towards cultivation of horticulture crops in Hire Wadarkal micro-watershed

Sl. No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interested towards cultivation of horticulture crops	0	0	5	100	8	62	6	60	5	71	24	60

Forest species grown: The data regarding forest species grown in Hire Wadarkal Micro watershed is presented in Table 43. The results indicate that, households have planted 5 Eucalyptus trees, 10 teak trees, 20 neem trees together in both field and backyard.

Table 43. Forest species grown in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Eucalyptus	0	0	0	0	0	0	5	0	0	0	5	0
2	Teak	0	0	0	0	0	0	10	0	0	0	10	0
3	Neem	0	0	0	0	2	0	18	0	0	0	20	0

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

Average additional investment capacity: The data regarding average additional investment capacity in Hire Wadarkal Micro watershed is presented in Table 44. The results indicate that, households have an average investment capacity of Rs. 5775.00 for land development, Rs. 3525.00 for creation of irrigation facility, Rs.3837.50 for adoption of improved livestock breeds, Rs.500.00 for adoption of improved crop production activities.

Table 44. Average additional investment capacity of households in Hire Wadarkal micro-watershed

Sl. No.	Particulars	LL (5)	MF (5)	SF (13)	SMF (10)	MDF (7)	All (40)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Land development	0	5600	5230.77	7600	8428.57	5775
2	Irrigation facility	0	0	461.54	1100	17714.3	3525
3	Improved crop production	0	3700	3307.69	4400	6857.14	3837.5
4	Improved livestock management	0	1000	384.62	500	714.29	500

Source of funds for additional investment: The data regarding source of funds for additional investment in Hire Wadarkal Micro watershed is presented in Table 45. The results indicate that, the sources of finance raised from bank as a loan and from own sources for irrigation facility were 2.50.

Table 45. Source of funds for additional investment in Hire Wadarkal micro-watershed

Sl. No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Government subsidy	0	0	1	2.5	0	0	0	0
2	Loan from bank	16	40	1	2.5	12	30	4	10
3	Own funds	9	22.5	4	10	10	25	1	2.5

Marketing of agricultural produce: The data regarding marketing of the agricultural produce in Hire Wadarkal Micro watershed is presented in Table 46. The results indicated that, 56.55 percent of output of Bajra was sold in the market with average price of Rs. 1585.71; 88.57 percent of output of Groundnut was sold in the market with average price of Rs. 2750.00; 88.43 percent of output of Maize was sold in the market with average price of Rs. 1246.00; 100.00 percent of output of Red gram was sold in the market with average price of Rs. 1500.00 and 100.00 percent of output of Sunflower was sold in the market with average price of Rs. 3000.00.

Table 46. Marketing of agricultural produce in Hire Wadarkal micro-watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	168	73	95	57	1586
2	Groundnut	35	4	31	89	2750
3	Maize	942	109	833	88	1246
4	Red gram	15	0	15	100	1500
5	Sunflower	61	0	61	100	3000

Marketing channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Hire Wadarkal Micro watershed is presented in Table 47. The results indicated that, 80.00 cent of the households have sold agricultural produce to the local/village merchants, 12.50 per cent of regulated market, 2.50 per cent of cooperative marketing society.

Table 47. Marketing channels used for sale of agricultural produce in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	5	100	10	76.9	6	60	11	157	32	80
2	Regulated Market	0	0	0	0	2	15.4	3	30	0	0	5	12.5
3	Cooperative marketing Society	0	0	0	0	1	7.69	0	0	0	0	1	2.5

Table 48. Mode of transport of agricultural produce in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cart	0	0	4	80	1	7.69	1	10	8	114	14	35
2	Tractor	0	0	1	20	8	61.5	6	60	1	14.3	16	40
3	Truck	0	0	0	0	4	30.8	3	30	2	28.6	9	22.5

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Hire Wadarkal Micro watershed is presented in Table 48. The results indicated that, 40.00 cent of the households have used tractor, 35.00 per cent have used Cart for the transport of agriculture commodity.

Incidence of soil and water erosion problems: The data regarding incidence of incidence of soil and water erosion problems in Hire Wadarkal Micro watershed is presented in Table 49. The results indicate that, 62.50 per cent of the households have experienced soil and water erosion problems.

Table 49. Incidence of soil and water erosion problems in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	5	100	10	76.9	6	60	4	57.1	25	62.5

Interest towards soil testing: The data regarding Interest shown towards soil testing in Hire Wadarkal Micro watershed is presented in Table 50. The results indicated that, 72.50 per cent of the households were interested towards soil testing.

Table 50. Interest regarding soil testing in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	4	80	11	84.6	9	90	5	71.4	29	72.5

Soil and water conservation practices and structures adopted: The data regarding soil and water conservation practices and structures adopted in Hire Wadarkal Micro watershed is presented in Table 51. The results indicated that 100 per cent of farmers practicing summer ploughing as soil and water conservation practice.

Table 51. Soil and water conservation practices and structures adopted in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Field Bunding	0	0	2	40	7	54	7	70	4	57.1	20	50

Table 52. Status of soil and water conservation structures in Hire Wadarkal micro-watershed

Sl.No	Item	Good		Slightly Damaged		Severely Damaged		Full Replacement Required	
		N	%	N	%	N	%	N	%
1	Field Bunding	18	90	2	10	0	0	0	0

Status of soil and water conservation structures: The data regarding status soil and water conservation structures adopted in Hire Wadarkal Micro watershed is presented in Table 52. The results indicated that, the households have adopted field bunding as a soil

and water conservation structures out of which 90.00 per cent was in good condition, 10.00 per cent was slightly damaged.

Agencies involved in the soil and water conservation structures: The data regarding Agencies involved in the soil and water conservation structures adopted in Hire Wadarkal Micro watershed is presented in Table 53. The results indicated that, 5.00 per cent of the households have adopted by their own, 5.00 per cent were done by NGO, 35.00 per cent were done by Govt. and 5.00 per cent were done by farmer organization.

Table 53. Agencies involved in the soil and water conservation structures in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Own	0	0	0	0	0	0	2	20	0	0	2	5
2	NGO	0	0	0	0	1	7.69	1	10	0	0	2	5
3	Govt.	0	0	2	40	5	38.46	3	30	4	57.1	14	35
4	Farmer organization	0	0	0	0	1	7.69	1	10	0	0	2	5
5	Other	0	0	0	0	0	0	0	0	0	0	0	0

Usage pattern of fuel for domestic use: The data on usage pattern of fuel for domestic use in Hire Wadarkal Micro watershed is presented in Table 54. The results indicated that, firewood was the major source of fuel for domestic use for 82.50 per cent of the households followed by LPG (17.50%).

Table 54. Usage pattern of fuel for domestic use in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	4	80	4	80	10	76.9	9	90	6	85.7	33	82.5
2	LPG	1	20	1	20	3	23.1	1	10	1	14.3	7	17.5

Source of drinking water: The data on source of drinking water in Hire Wadarkal Micro watershed is presented in Table 55. The results indicated that, piped waters supply was the major source for drinking water for 80.00 per cent of the households followed by bore well water (20.00%).

Table 55. Source of drinking water in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100	4	80	9	69.23	9	90	5	71.4	32	80
2	Bore Well	0	0	1	20	4	30.77	1	10	2	28.6	8	20

Source of light: The data on source of light in Hire Wadarkal Micro watershed is presented in Table 56. The results indicated that, electricity was the major source of light for 100.00 per cent of the households.

Table 56. Source of light in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100	5	100	13	100	10	100	7	100	40	100

Existence of sanitary toilet facility: The data on availability of toilet facility in Hire Wadarkal Micro watershed is presented in Table 57. The results indicated that, 35.00 per cent of the households possess toilets.

Table 57. Existence of sanitary toilet facility in Hire Wadarkal micro-watershed

Sl. No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	1	20	2	40	3	23.08	5	50	3	42.9	14	35

Possession of PDS card: The data regarding possession of PDS card in Hire Wadarkal Micro watershed is presented in Table 58. The results indicated that, 100.00 per cent of the households possessed BPL card.

Table 58. Possession of PDS card in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100	5	100	13	100	10	100	7	100	40	100

Participation in NREGA programme: The data regarding Participation in NREGA programme in Hire Wadarkal Micro watershed is presented in Table 59. The results indicated that, only 37.50 per cent of the households have participated in NREGA programme.

Table 59. Participation in NREGA programme in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	3	60	1	20	3	23.1	5	50	3	43	15	37.5

Adequacy of food items: The data regarding adequacy of food items in Hire Wadarkal Micro watershed is presented in Table 60. The results indicated that, the extent of adequacy of food items for cereals, pulses, Oilseeds and vegetables were 62.50, 57.50, 47.50, 60.00 per cent respectively, similarly for Fruits (12.50%), milk (12.50%), Egg (5.00%).

Table 60. Adequacy of food items in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	2	40	3	60	9	69.23	6	60	5	71.43	25	62.5
2	Pulses	1	20	4	80	7	53.85	7	70	4	57.14	23	57.5
3	Oilseed	1	20	3	60	8	61.54	2	20	5	71.43	19	47.5
4	Vegetables	1	20	2	40	9	69.23	7	70	5	71.43	24	60
5	Fruits	2	40	1	20	1	7.69	1	10	0	0	5	12.5
6	Milk	1	20	0	0	2	15.38	1	10	1	14.29	5	12.5
7	Egg	0	0	0	0	1	7.69	1	10	0	0	2	5

Inadequacy of food items: The data regarding in adequacy of food items in Hire Wadarkal Micro watershed is presented in Table 61. The results indicated that, the extent of in adequacy of food items for cereals, pulses, Oilseeds and vegetables were 27.50,

32.50, 42.50, 22.50 and 87.50 per cent respectively, similarly for fruits (72.50%), milk (60.00%), egg (85.00%) and meat (87.50%).

Table 61. Inadequacy of food items in Hire Wadarkal micro-watershed

Sl.No.	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	0	0	1	20	4	30.77	4	40	2	28.57	11	27.5
2	Pulses	1	20	0	0	6	46.15	3	30	3	42.86	13	32.5
3	Oilseed	1	20	1	20	5	38.46	8	80	2	28.57	17	42.5
4	Vegetables	1	20	2	40	2	15.38	2	20	2	28.57	9	22.5
5	Fruits	0	0	3	60	11	84.62	8	80	7	100	29	72.5
6	Milk	1	20	3	60	9	69.23	6	60	5	71.43	24	60
7	Egg	2	40	4	80	12	92.31	9	90	7	100	34	85
8	Meat	2	40	4	80	13	100	9	90	7	100	35	87.5

Farming constraints: The data regarding farming constraints experienced by households in Hire Wadarkal Micro watershed is presented in Table 62. The results indicated that, lower fertility status of the soil was the constraint experienced by (67.50 %) per cent of the households, wild animal menace on farm field (60.00%), frequent incidence of pest and diseases (47.50%), inadequacy of irrigation water (55.00%), high cost of fertilizers and plant protection chemicals (70.00%), high rate of interest on credit (70.00%), low price for the agricultural commodities (72.50 %), lack of marketing facilities in the area (67.50%), inadequate extension services (15.00 %), lack of transport for safe transport of the agricultural produce to the market (60.00%), less rainfall (5.00%), source of agri-technology information (Newspaper/Tv/Mobile) (5.00%).

Table 62. Farming constraints experienced in Hire Wadarkal micro-watershed

SN	Particulars	LL (5)		MF (5)		SF (13)		SMF (10)		MDF (7)		All (40)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	0	0	4	80	10	76.92	7	70	6	85.71	27	67.5
2	Wild animal menace on farm field	0	0	3	60	10	76.92	7	70	4	57.14	24	60
3	Frequent incidence of pest and diseases	0	0	4	80	6	46.15	6	60	3	42.86	19	47.5
4	Inadequacy of irrigation water	0	0	3	60	8	61.54	7	70	4	57.14	22	55
5	High cost of Fertilizers and plant protection chemicals	0	0	4	80	11	84.62	6	60	7	100	28	70
6	High rate of interest on credit	0	0	4	80	11	84.62	7	70	6	85.71	28	70
7	Low price for the agricultural commodities	0	0	4	80	11	84.62	8	80	6	85.71	29	72.5
8	Lack of marketing facilities in the area	0	0	2	40	10	76.92	8	80	7	100	27	67.5
9	Inadequate extension services	0	0	1	20	1	7.69	4	40	0	0	6	15
10	Lack of transport for safe transport of the Agril produce to the market.	0	0	3	60	7	53.85	7	70	7	100	24	60
11	Less rainfall	0	0	0	0	1	7.69	1	10	0	0	2	5
12	Source of Agri-technology information	0	0	0	0	1	7.69	1	10	0	0	2	5

Chapter 5

SUMMARY AND IMPLICATIONS

In order to assess the socio-economic condition of the farmers in the watershed 40 households located in the micro watershed were interviewed for the survey. The study was conducted in Hire Wadarkal micro-watershed (Katagihalli sub-watershed, Koppala taluk & District) is located at North latitude 76^0 17' 36.021" and 76^0 16' 17.724" and East longitude 15^0 36' 59.965" and 15^0 36' 5.239"covering an area of about 118.69 ha bounded by under Hirebommanala Village.

Socio-economic analysis of Hire Wadarkal micro watersheds of Katagihalli sub-watershed, Koppala taluk & District indicated that, out of the total sample of 40 farmers were sampled in Hire Wadarkal micro-watershed among households surveyed 5 (12.50%) were marginal, 13 (32.50%) were small, 10 (25.00 %) were semi medium and 7 (17.50 %) were medium farmers. 5 landless farmers were also interviewed for the survey. The population characteristics of households indicated that, there were 116 (54.98%) men and 95 (45.02 %) were women. The average population of landless was 5.2, marginal farmers were 4.2, small farmers were 4.8, semi medium farmers were 5.7 and medium farmers were 6.4. Majority of the respondents (36.02%) were in the age group of 16-35 years.

Education level of the sample households indicated that, there were 16.11 per cent illiterates, 84.83 per cent pre university education and 2.84 per cent attained graduation. About, 77.50 per cent of household heads practicing agriculture and 17.50 per cent of the household heads were engaged as agricultural labourers.

Agriculture was the major occupation for 43.13 per cent of the household members. In the study area, 47.50 per cent of the households possess katcha house and 17.50 per cent possess pucca house. The durable assets owned by the households showed that, 87.50 per cent possess TV, 80.00 per cent possess mixer grinder, 87.50 per cent possess mobile phones and 15.00 per cent possess motor cycles.

Farm implements owned by the households indicated that, 27.50 per cent of the households possess plough, 17.50 per cent possess bullock cart and 10.00 per cent possess sprayer. Regarding livestock possession by the households, 17.50 per cent possess local cow and 2.50 per cent possess buffalo.

The average labour availability in the study area showed that**,** own labour men available in the micro watershed was 1.75, women available in the micro watershed was 1.98, hired labour (men) available was 7.58 and hired labour (women) available was 11.68. Further, 55.00 per cent of the households opined that hired labour was inadequate during the agricultural season.

In the study area, about 0.47 per cent of the respondents migrated from the micro watershed in search of jobs with an average distance of 400.00 kms for about 2.00 months. Out of the total land holding of the sample respondents 65.25 per cent (63.50 ha)

of the area is under dry condition and the remaining 34.75 per cent area is irrigated land. There were 20.00 live bore wells and 20.00 dry bore wells among the sampled households.

Bore well was the major source of irrigation for 50.00 per cent of the households. The major crops grown by sample farmers are Maize, Bajra, Sunflower, Red gram and Groundut and cropping intensity was recorded as 100.00 per cent. Out of the sample households 90.00 percent possessed bank account and 50.00 per cent of them have savings in the account.

About 90.00 per cent of the respondents borrowed credit from various sources. Among the credit borrowed by households, 31.58 per cent have borrowed loan from commercial banks and 47.37 per cent from co-operative/Grameena bank. Majority of the respondents (100.00%) have borrowed loan for agriculture purpose.

Regarding the opinion on institutional sources of credit, 78.95 per cent of the households opined that credit helped to perform timely agricultural operations. The per hectare cost of cultivation for Maize, Bajra, Sunflower, Red gram and Groundut was Rs.33772.11, 24265.59, 35980.72, 59003.81 and 58133.96 with benefit cost ratio of 1:0.98, 1: 1.10, 1: 1.00, 1: 0.90 and 1:0.80 respectively.

Further, 50.00 per cent of the households opined that dry fodder was adequate and 2.50 per cent of the households have opined that the green fodder was adequate. The average annual gross income of the farmers was Rs. 67232.50 in micro-watershed, of which Rs. 42770.00 comes from agriculture.

Sampled households have grown 6 horticulture trees and 35 forestry trees together in the fields and back yards. About 60.00 per cent of the households shown interest to cultivate horticultural crops.

Households have an average investment capacity of Rs. 5775.00 for land development and Rs. 3525.00 for irrigation facility. Source of funds for additional investment is concerned, 40.00 per cent depends on own funds.

Regarding marketing channels, 80.00 per cent of the households have sold agricultural produce to the local/village merchants, while, 12.50 per cent have sold in regulated markets.

Further, 40.00 per cent of the households have used tractor for the transport of agriculture commodity. Majority of the farmers (62.50%) have experienced soil and water erosion problems in the watershed and 72.50 per cent of the households were interested towards soil testing.

Fire was the major source of fuel for domestic use for 82.50 per cent of the households and 17.50 per cent households has LPG connection. Piped supply was the

major source for drinking water for 80.00 per cent of the households. Electricity was the major source of light for 100.00 per cent of the households.

In the study area, 35.00 per cent of the households possess toilet facility. Regarding possession of PDS card, 100.00 per cent of the households possessed BPL card. Households opined that, the requirement of cereals (62.50%), pulses (57.50%) and oilseeds (47.50%) are adequate for consumption.

Farming constraints experienced by households in the micro watersheds were lower fertility status of the soil (67.50%) wild animal menace on farm field (60.00%), frequent incidence of pest and diseases (47.50%), inadequacy of irrigation water (55.00%), high cost of fertilizers and plant protection chemicals (70.00%), high rate of interest on credit (70.00%), low price for the agricultural commodities (72.50%), lack of marketing facilities in the area (67.50%), inadequate extension services (15.00%), lack of transport for safe transport of the agricultural produce to the market (60.00%), Less rainfall (5.00%) and Source of Agri-technology information (Newspaper/ TV/Mobile) (5.00%).

Implications of the survey

- ✓ Result indicated that, there were 16.11 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, 47.50 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.

- ✓ The data indicate that, job/work was the reason for all the migrants hence, farmers may be trained on profitable agriculture or self employment such has animal husbandry, plate making, sheep rearing, goat rearing, rabbit rearing with suitable information on sources of financial support.
- ✓ The 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 41.43ha (65.25 %) of dry land and 22.06ha (34.75 %) of irrigated land hence, the availability of the dry land 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 50.00 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 cropping intensity in the micro watershed was found to be (100.00 %) 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.42770.00 from agriculture and Rs. 22300.00 from wages. 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, 62.50 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, 72.50 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 (67.50%), wild animal menace on farm field (60.00%), frequent incidence of pest and diseases (47.50%), high cost of fertilizers and plant protection chemicals (70.00%), high rate of interest on credit (70.00%), low price for the agricultural commodities (72.50%), lack of marketing facilities in the area (67.50%), inadequate extension services (15.00%), lack of transport for safe transport of the agricultural produce to the market (60.00%) 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.