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

YADGIR RF-4 (4D5B2H2b) MICROWATERSHED

Yadgir 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 Yadgir Rf-4 microwatershed in Yadgir 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
Date: 04-12-2019

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Yadgir Rf4Microwatershed 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 the 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 689 ha in Yadgir taluk & district, Karnataka. The climate is semiarid and categorized as drought-prone with an average annual rainfall of 866 mm, of which about 652 mm is received during south-west monsoon, 138 mm during north-east and the remaining 76 mm during the rest of the year. An area of 506 ha in the microwatershed is covered by soils, 168 ha area is covered by rock outcrops and 16 ha by others (habitation and water body). The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 8 soil series and 11 soil phases (management units) and 4 land management units.*
- *The length of crop growing period is about 120-150 days starting from 1st week of June to 4th week of October.*
- *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 29 major agricultural and horticultural crops was assessed and maps showing the degree of suitability along with constraints were generated.*
- *About 506 ha area in the microwatershed is suitable for agriculture.*
- *About 26 per cent of area is very shallow (<25 cm), 27 per cent area is moderately deep (75-100 cm), 15 per cent of area is deep (100 - 150 cm) and 6 per cent of area is very deep (>150 cm).*
- *About 35 per cent loamy soils and 39 per cent clayey soils at the surface.*
- *Non gravelly (<15%) soils cover an entire cultivated area of the microwatershed.*
- *About 12 per cent area of the microwatershed is very high (>200 mm/m) in available water capacity, 27 per cent is medium (101-150 mm/m), 8 per cent is low (51-100 mm/m) and 26 per cent area is very low (<50 mm/m).*
- *Entire cultivated area is under very gently sloping (1-3% slope) lands in the microwatershed.*
- *Maximum area of about 69 per cent is moderately (e2) eroded and 4 per cent area is severely eroded (e3).*

- *Entire cultivated area in the microwatershed is alkaline (pH 7.3-9.0) in soil reaction.*
- *Electrical Conductivity is non saline (<2 dsm^{-1}) in the entire cultivated area of the microwatershed.*
- *About 15 per cent area is medium (0.5-0.75%) and 58 per cent area is high (>0.75%) in organic carbon content of the soil.*
- *About 72 per cent of area is medium (23-57 kg/ha) in available phosphorus content of the soil and 1 per cent of area is high (>57 kg/ha) in the microwatershed.*
- *Available potassium content is high (>337 kg/ha) in 48 per cent area and medium (23-57 kg/ha) in 25 per cent area in the microwatershed.*
- *Available sulphur is low (<10 ppm) in 13 per cent, medium (10-20 ppm) in 50 per cent and high (>20 ppm) in 10 per cent area in the microwatershed.*
- *Available boron is low (<0.5 ppm) in an area of 8 per cent and medium (0.5-0.1 ppm) in 66 per cent of area in the microwatershed.*
- *Available iron is sufficient (>4.5 ppm) in the entire cultivated area of the microwatershed.*
- *Available manganese and copper are sufficient in all the soils of the microwatershed.*
- *Available zinc is deficient (<0.6 ppm) in an area of 64 per cent and sufficient (>0.6 ppm) in 9 per cent of area in the microwatershed.*
- *The land suitability for 29 major crops grown in the microwatershed were 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	*34 (5)*	*67 (10)*		*Guava*	-	*34 (5)*
Maize	*34 (5)*	*67 (10)*		*Sapota*	-	*34 (5)*
Bajra	*34 (5)*	*67 (10)*		*Pomegranate*	-	*93 (13)*
Groundnut	-	*34 (5)*		*Musambi*	-	*93 (13)*
Sunflower	-	*93 (13)*		*Lime*	-	*93 (13)*
Redgram	-	*101 (15)*		*Amla*	*34 (5)*	-
Bengal gram	-	*59 (9)*		*Cashew*	-	-
Cotton	-	*93 (13)*		*Jackfruit*	-	*34 (5)*
Chilli	*34 (5)*	*59 (9)*		*Jamun*	-	-
Tomato	*34 (5)*	-		*Custard apple*	-	*93 (13)*
Brinjal	*34 (5)*	-		*Tamarind*	-	-
Onion	*34 (5)*	-		*Mulberry*	-	*34 (5)*
Bhendi	*34 (5)*	*59 (9)*		*Marigold*	*34 (5)*	*59 (9)*
Drumstick	*34 (5)*	-		*Chrysanthemum*	*34 (5)*	*59 (9)*
Mango	-	-				

- *Apart from the individual crop suitability, a proposed crop plan has been prepared for the 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. This would help in not only supplementing the farm income but also provide fodder and fuel and generate lot of biomass which would help in maintaining an ecological balance and also contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

Soil being a vital natural resource on whose proper use depends the life supporting systems of a country and the socioeconomic development of its people. Soils provide food, fodder, fibre and fuel for meeting the basic human and animal needs. With the ever increasing growth in human and animal population, the demand on soil for more food and fodder production is on the increase. 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. The soils have been degrading at an estimated rate of one million hectares per year and ground water levels have been receding at an alarming rate resulting in decline in the ground water resource. Further, land degradation has emerged as a serious problem which has already affected about 38 lakh ha of cultivated area in the State. Soil erosion alone has degraded about 35 lakh ha. Almost all the uncultivated areas are facing various degrees of degradation, particularly soil erosion; salinity and alkalinity has emerged as a major problem in more than 3.5 lakh ha in the irrigated areas of the State. Nutrient depletion and declining factor productivity is common in both rainfed and irrigated areas. The degradation is continuing at an alarming rate and there appears to be no systematic effort among the stakeholders to contain this process. In recent times, an aberration of weather due to climate change phenomenon has added another dimension leading to unpredictable situation 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 use 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 has already been made to upscale the soil resource information from 1:250000 and 1:50000 scale to the LEU map in Goa and in some other states.

The land resource inventory aims to provide site-specific database for Yadgir Rf4 microwatershed in Yadgir Taluk and Yadgir District, Karnataka State for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

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

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Yadgir Rf4 microwatershed is located in the northern part of Karnataka in Yadgir Taluk & District, Karnataka State (Fig.2.1). It comprises parts of Yargola and Bapu Nagara villages. It lies between 16^0 53' and 16^0 55' North latitudes and 77^0 3' and 77^0 5' East longitudes covering an area of about 689 ha. It is about 28 km southeast of Yadgir town and is surrounded by Yargola on the south, east and northeast and Bapu Nagara on the west and northwestern side.

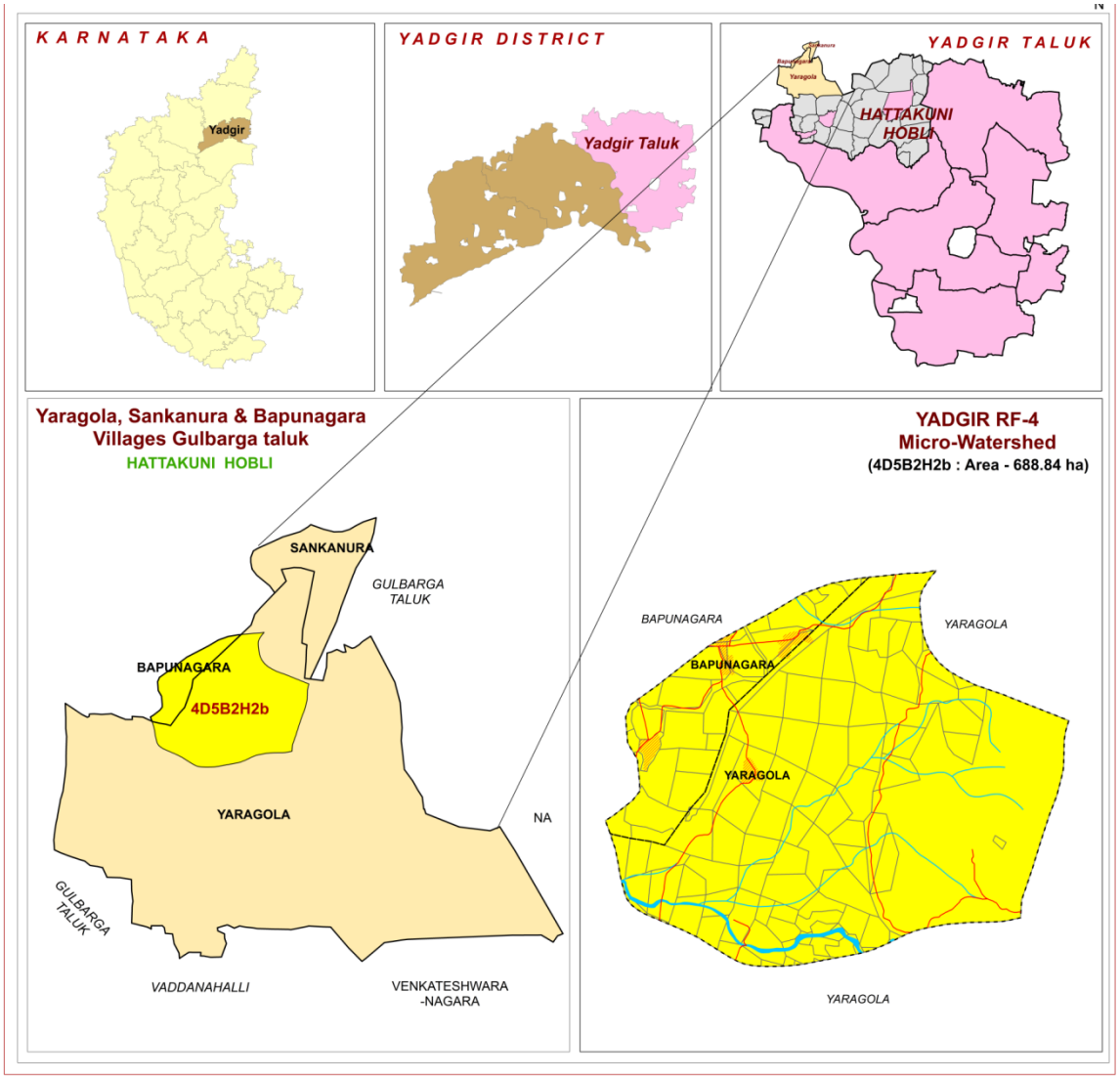


Fig.2.1 Location map of Yadgir Rf4 Microwatershed

2.2 Geology

Major rock formations observed in the microwatershed are granite gneiss (Figs.2.2). They 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 Yadgir Rf4 microwatershed.

Fig.2.2 Granite and granite gneiss rocks

2.3 Physiography

Physiographically, the area has been identified as granite gneiss landscape based on geology. The area has been further subdivided into five landforms, *viz;* mounds/ridges, summits, side slopes and very gently sloping uplands, plains and valleys based on slope and its relief features. The elevation ranges from 395-548 m above MSL. The mounds and ridges are mostly covered by rock outcrops.

2.4 Drainage

The area is drained by several parallel streams like Bori, Amerja and Kanga which finally join the river Bhima along its course. Though, they are not perennial, during rainy season they carry large quantities of rain water. The microwatershed has only few small tanks which are not capable of storing the water that flows during the rainy season. Due to this, the ground water recharge is very much affected. This is reflected in the failure of many bore wells in the villages. If the available rain water is properly harnessed by constructing new 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 parallel to sub parallel and dendritic.

2.5 Climate

The Yadgir district lies in the northern plains of Karnataka and falls under semiarid tract of the state and is categorized as drought- prone with total annual rainfall of 866 mm (Table 2.1). Of the total rainfall, maximum of 652 mm is received during the south–west monsoon period from June to September, the north-east monsoon from October to early December contributes about 138 mm and the remaining 76 mm during

the rest of the year. The summer season starts during the middle of February and continues up to the first week of June. The period from December to the middle of February is the coldest season. December is the coldest month with mean daily maximum and minimum temperatures being 29.5^{0}C and 10^{0}C respectively. During peak summer, temperature shoots up to 45^{0}C. Relative humidity varies from 26% in summer to 62% in winter. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo-Transpiration (PET) is 141 mm and varies from a low of 81 mm in December to 199 mm in the month of May. The PET is always higher than precipitation in all the months except July, August and September. Generally, the Length of crop Growing Period (LGP) is 120-150 days and starts from 1st week of June to 4th week of October.

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

Sl. No.	Months	Rainfall	PET	1/2 PET
1	January	4.30	86.0	43.0
2	February	2.30	125.5	62.7
3	March	15.10	166.0	83.0
4	April	18.50	179.8	89.9
5	May	36.0	198.8	97.9
6	June	118.0	175.1	87.5
7	July	171.80	156.3	78.1
8	August	182.9	150.3	75.1
9	September	179.7	142.0	71.0
10	October	105.3	138.5	69.2
11	November	26.4	97.60	48.6
12	December	6.0	80.90	40.4
Total		**866.3**		

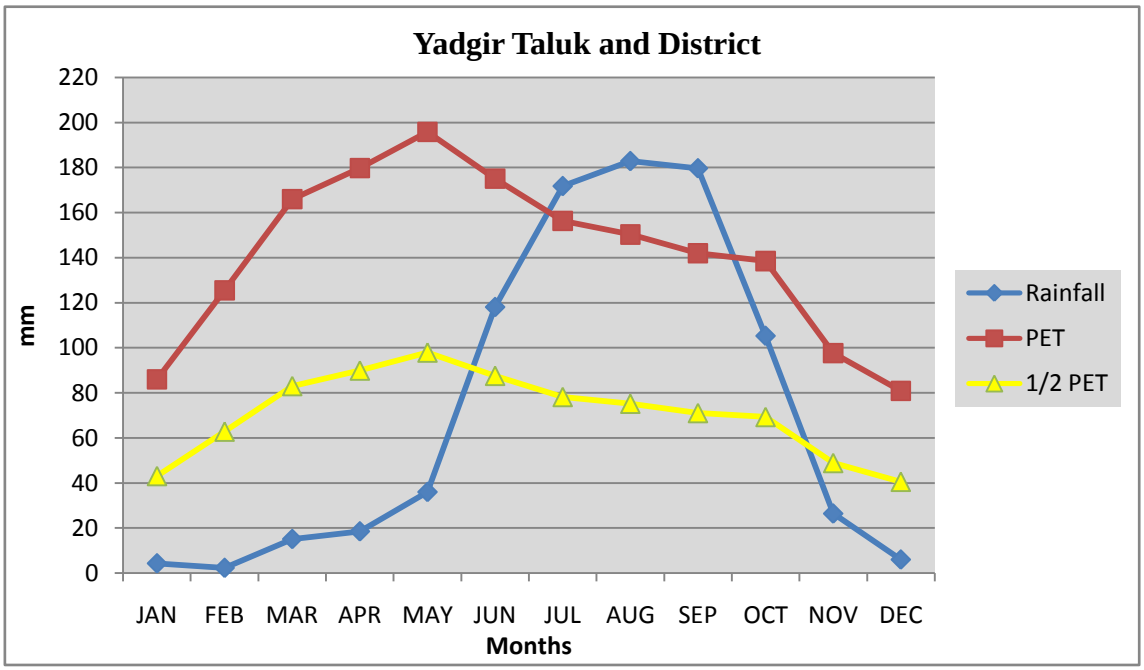


Fig 2.3 Rainfall distribution in Yadgir Taluk, Yadgir District

2.6 Natural Vegetation

The natural vegetation is sparse comprising few tree species, shrubs and herbs. The mounds, ridges and boulders occupy very sizeable area which is 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 that eventually result in the heavy siltation of tanks and reservoirs in the microwatershed.

Fig 2.4 Natural vegetation of Yadgir Rf4 microwatershed

2.7 Land Utilization

About 72 per cent area (Table 2.2) in Yadgir district is cultivated at present. An area of about 2 per cent is permanently under pasture, 20 per cent under current fallows and 6 per cent under non-agricultural land, and 5 per cent under currently barren. Forests occupy an area of about 7 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, cotton, sunflower, groundnut, Bengal gram, red gram and paddy. The cropping intensity is 120 per cent in the taluk. 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 Yadgir Rf4 microwatershed is presented in Fig.2.5. The different crops and cropping systems adopted in the

microwatershed is presented in the Figures 2.6. Location of wells in Yadgir Rf4 microwatershed is presented in the figure 2.7.

Table 2.2 Land Utilization in Yadgir District

Sl. No.	Agricultural land use	Area (ha)	Per cent
1.	Total geographical area	516088	-
2.	Total cultivated area	373617	72.4
3.	Area sown more than once	74081	14.3
4.	Cropping intensity	-	119.8
5.	Trees and grooves	737	0.14
6.	Forest	33773	6.54
7.	Cultivable wasteland	2385	0.46
8.	Permanent Pasture land	11755	2.28
9.	Barren land	27954	5.41
10.	Non- Agriculture land	29623	5.73
11.	Current Fallows	105212	20.4

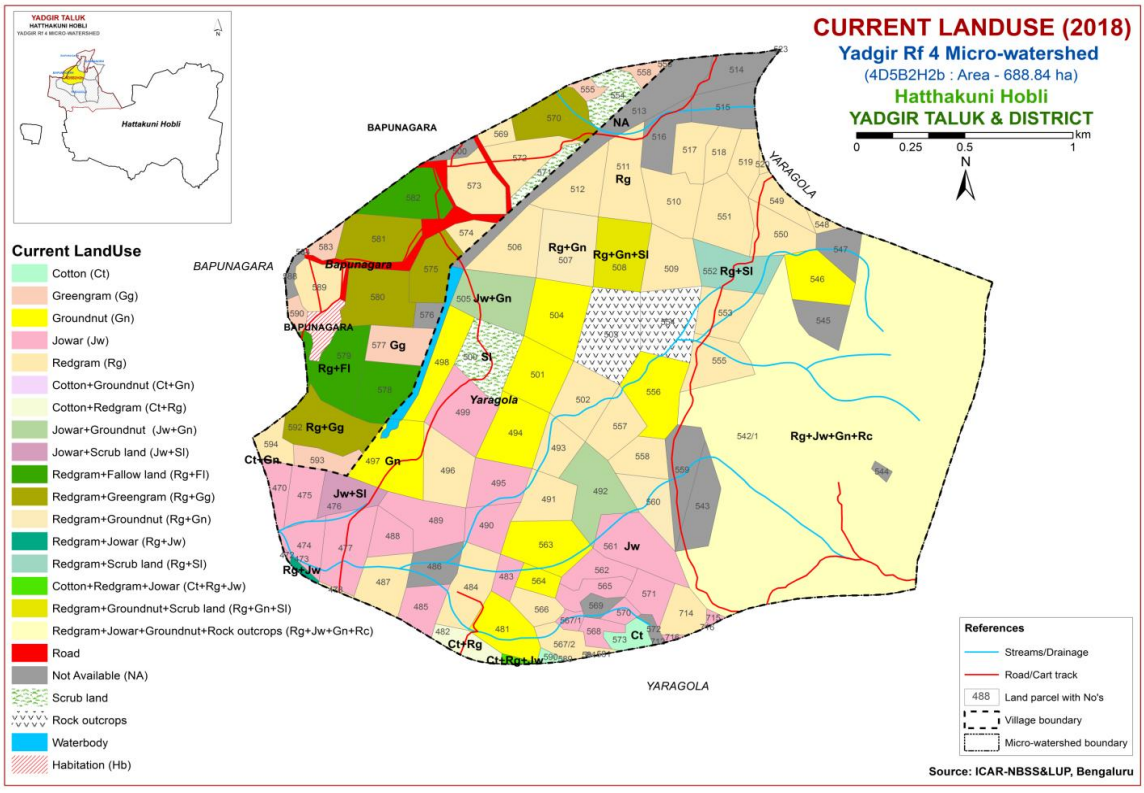


Fig.2.5 Current Land Use map of Yadgir Rf4 Microwatershed

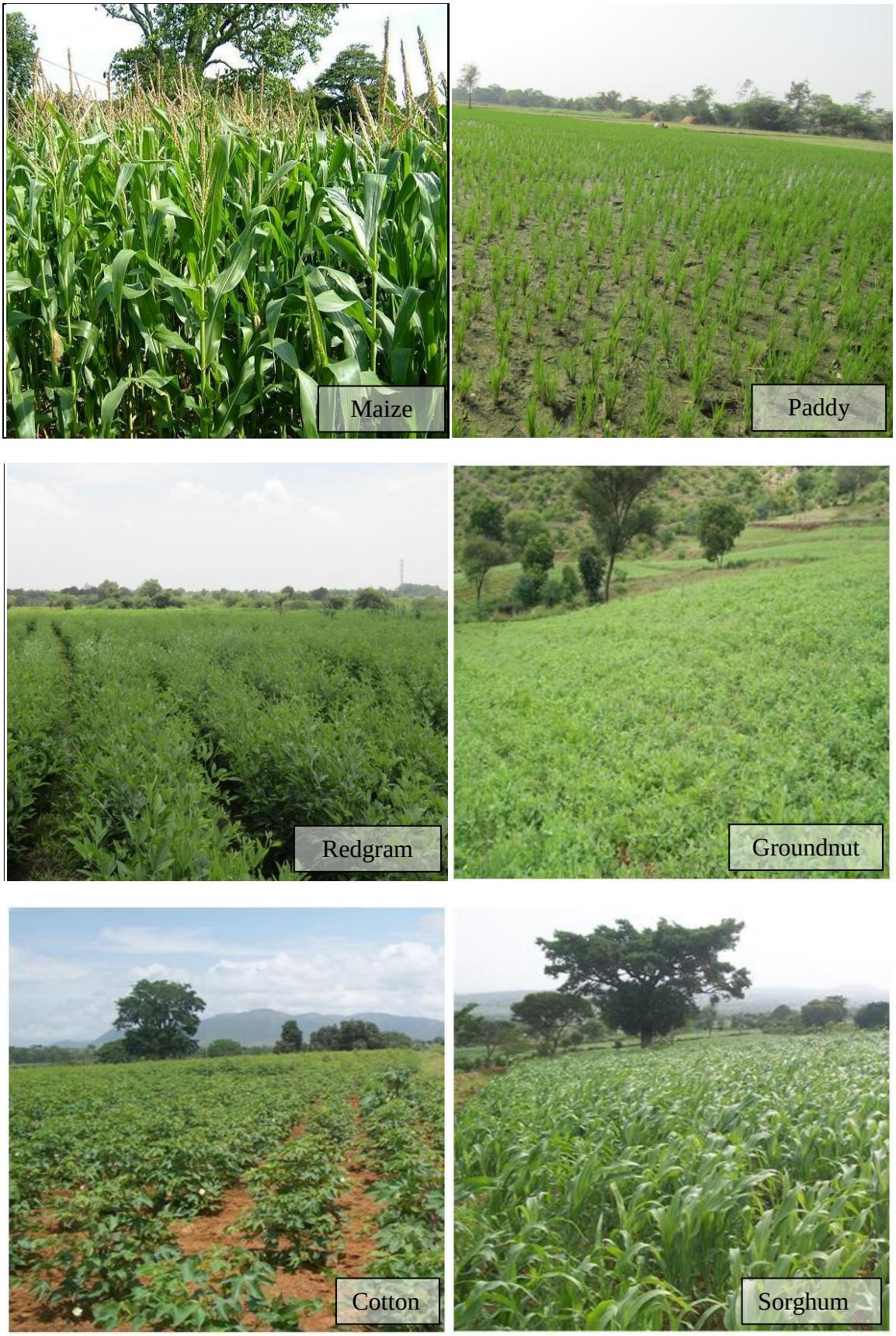


Fig 2.6 Different Crops and Cropping Systems in Yadgir Rf4 Microwatershed

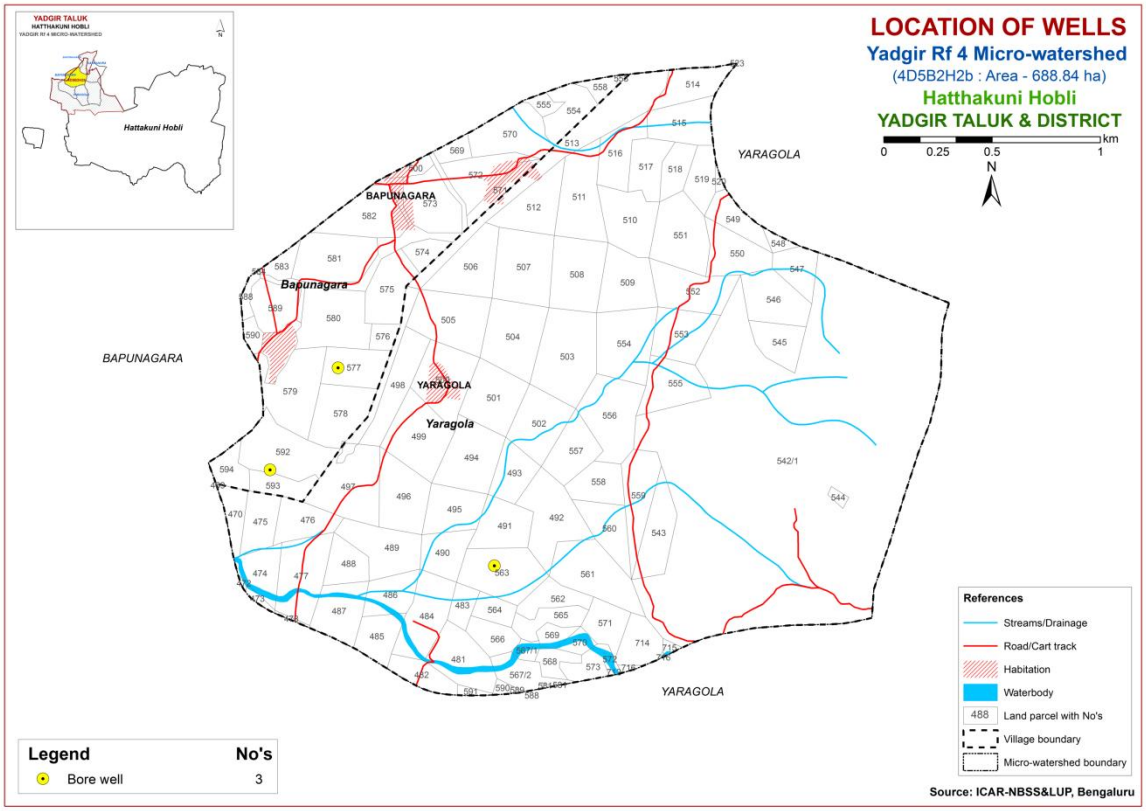


Fig 2.7 Location of wells in Yadgir Rf4 Microwatershed

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 Yadgir Rf4 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 of the land, 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 the area extent and their geographic distribution on the microwatershed cadastral map. The detailed survey at 1:7920 scale was carried out in an area of 689 ha. 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 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 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 also used for initial traversing, identification of geology 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 (FCCs) of Cartosat-I and LISS-IV merged satellite data covering 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 landscape. It was divided into five landforms, *viz;* ridges and mounds, gently and very gently sloping uplands and lowlands based on slope and image characteristics. 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)
	G24		Valleys/ lowlands
		G241	Valleys, pink tones
		G242	Valleys gray mixed with pink tones

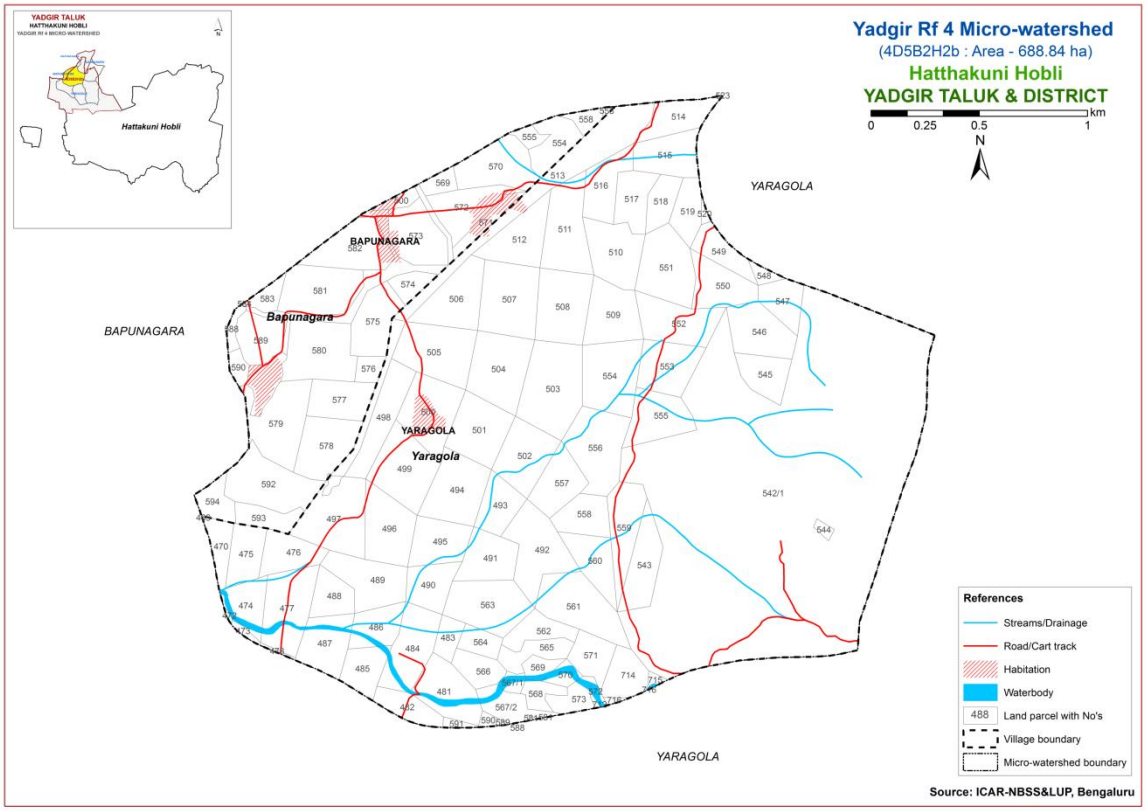


Fig 3.1 Scanned and Digitized Cadastral map of Yadgir Rf4 Microwatershed

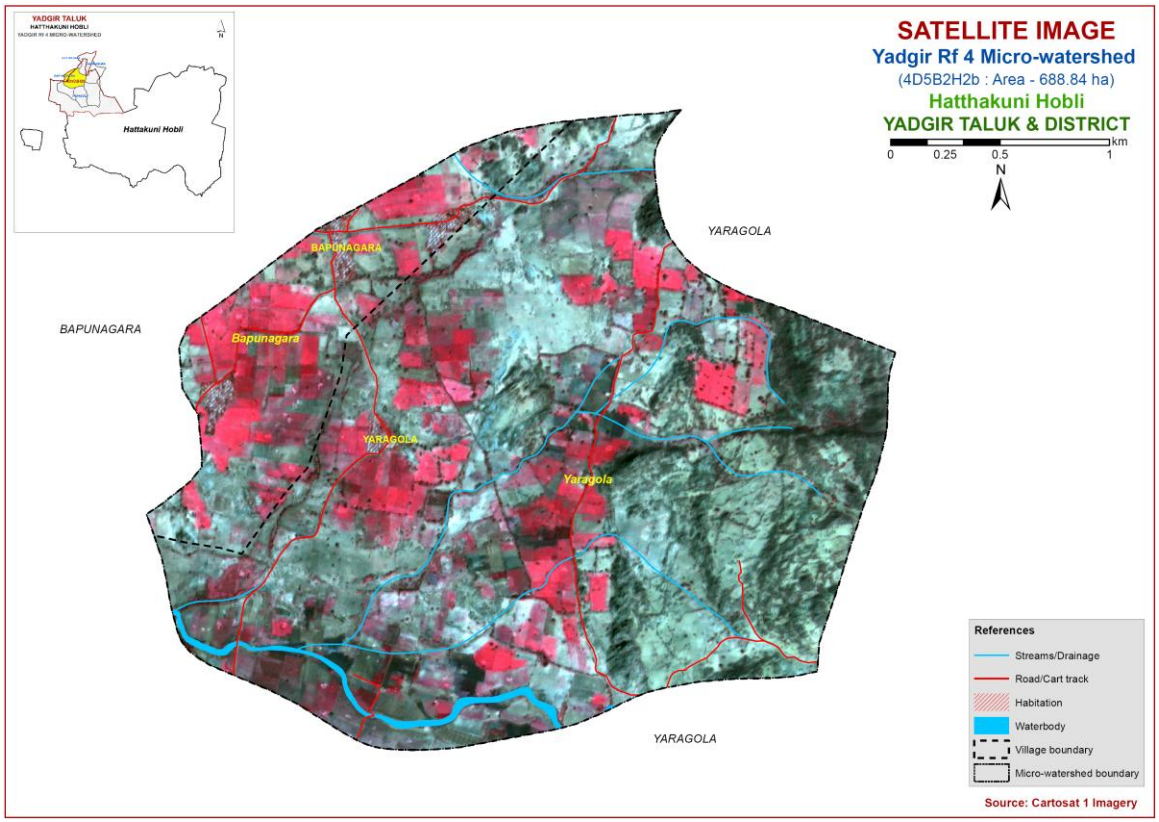


Fig.3.2 Satellite Image of Yadgir Rf4 Microwatershed

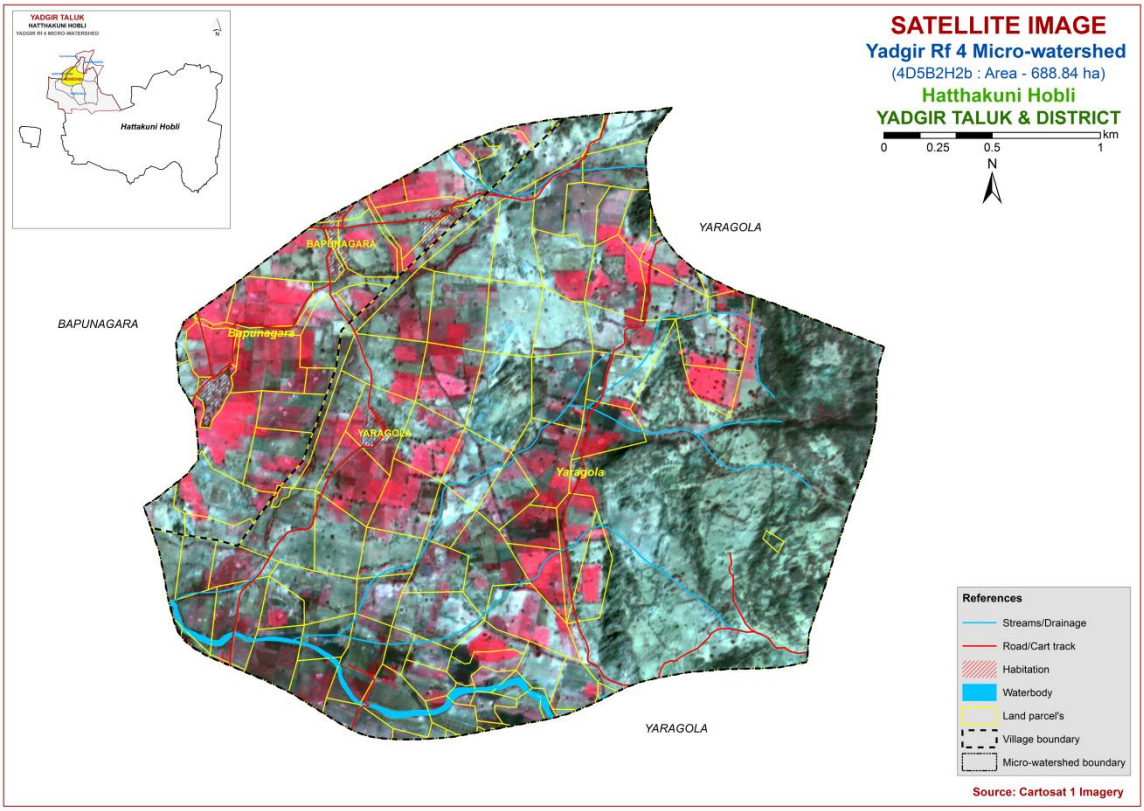


Fig.3.3 Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Yadgir Rf4 Microwatershed

3.3 Field Investigation

The field boundaries and survey numbers given on the cadastral sheet were located on the ground by following permanent features like roads, cart tracks, *nallas*, streams, tanks etc., and wherever changes were noticed, they were incorporated on the microwatershed cadastral map. Preliminary traverse of the microwatershed was carried out with the help of cadastral map, imagery and toposheets. While traversing, landforms and physiographic units identified were checked and preliminary soil legend was prepared by studying soils at few selected places. Then, intensive traversing of each physiographic unit like hills, ridges, uplands and valleys 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).

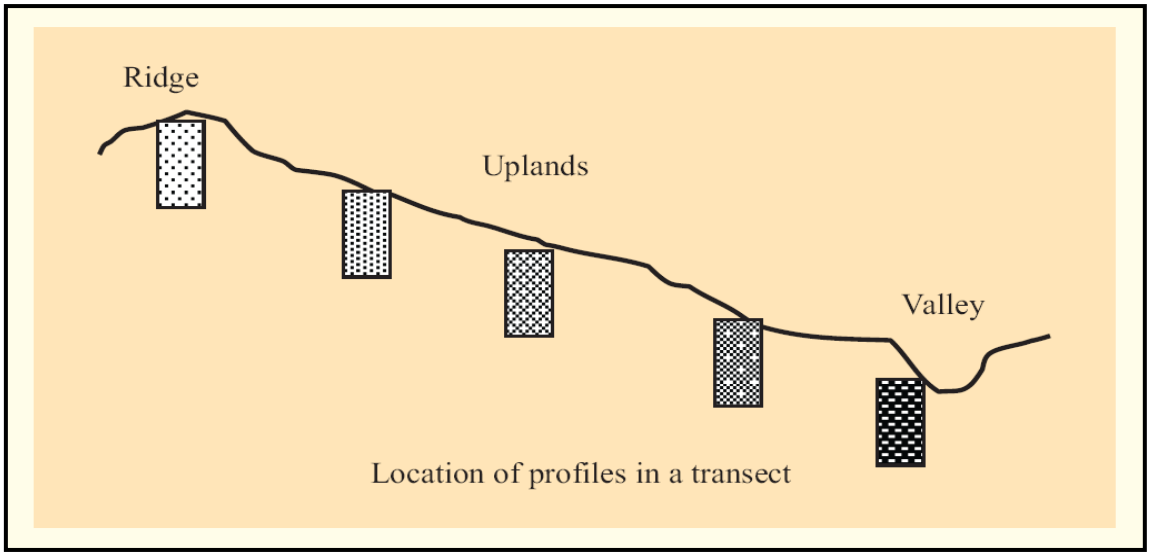


Fig: 3.4. Location of profiles in a transect

In the selected transect, soil profiles were located (Fig. 3.4) 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, soil profiles (vertical cut showing the soil layers from surface to the rock) were opened upto 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, profiles were also studied at random, almost like in a grid pattern, outside the transect areas.

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, calcareousness, amount and nature of gravel present, 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, 8 soil series were identified in the Yadgir Rf4 microwatershed.

Table 3.1 Differentiating Characteristics used for identifying Soil Series

(Characteristics are of Series Control Section)

Soils of Granite gneiss Landscape							
Sl. no	**Soil Series**	**Depth (cm)**	**Colour (moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcare-ousness**
1	BDP (Baddeppalli)	<25	7.5YR 3/2,3/4 5YR 3/4	scl	-	Ap-Ac	es
2	GWD (Gowdagera)	75-100	10YR 3/1,3/2,4/2	scl	-	Ap-Bw	es
3	HSL	75-100	10YR 5/4,4/4,4/6	sc	-	Ap-Bw	e

	(Hosalli)						
4	MDG (Mundargi)	100-150	10YR 4/4,3/3 7.5YR4/4	scl	-	Ap-Bw	-
5	NGP (Nagalapur)	100-150	10YR3/2,3/1,2/1	c	-	Ap-Bss	es
6	SGR (Sangwar)	>150	10YR3/1,4/1	c	-	Ap-Bss	es
7	YDR (Yadgir)	100-150	10YR4/3,4/4 2.5YR4/3,5/3	sl	-	Ap-A2-Bw	-
8	BMN (Bhimanahalli)	>150	10YR 3/1	c	-	Ap-Bss	es

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 of 11 mapping units representing 8 soil series occurring in the microwatershed. The soil map unit (soil legend) description is presented in Table 3.2. The soil phase map (management units) shows the distribution of 11 soil phases mapped in the microwatershed. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one soil phase will have similar management needs and have to be treated accordingly.

3.5 Land Management Units (LMU's)

The 11 soil phases identified and mapped in the microwatershed were grouped into 4 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatershed. The database (soil phases) generated under LRI was utilized for identifying Land Management Units (LMU's) based on the management needs. One or more than one soil site characteristic having influence on the management have been chosen for identification and delineation of LMUs. For Yadgir Rf4 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.

3.6 Laboratory Characterization

Soil samples for each soil 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 from farmer's fields for fertility status (major and micronutrients) at 320 m grid interval in the year 2018 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 by using Kriging method for the microwatershed.

Table 3.2 Soil map unit description of Yadgir Rf4 Microwatershed

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha(%)
Soils of Granite and Granite Gneiss Landscape				
	BDP	Baddeppalli soils are very shallow (<25 cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils occurring on very gently sloping uplands under cultivation		**181 (26.24)**
120		BDPhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	150 (21.81)
119		BDPiB3	Sandy clay surface, slope 1-3%, severe erosion	31 (4.43)
	HSL	Hosalli soils are moderately deep (75-100 cm), moderately well drained, have yellowish brown to dark yellowish brown, slightly calcareous sandy clay soils occurring on very gently sloping uplands under cultivation		**33 (4.88)**
32		HSLcB2	Sandy loam surface, slope 1-3%, moderate erosion	32 (4.69)
126		HSLhB2	Sandy clay loam surface, slope 1-3%, moderate erosion	1 (0.19)
	GWD	Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown, calcareous, sodic sandy clay loam soils occurring on very gently sloping uplands under cultivation		**152 (22.01)**
35		GWDiB2	Sandy clay surface, slope 1-3%, moderate erosion	152 (22.01)
	MDG	Mundargi soils are deep (100-150 cm), well drained, have brown to dark yellowish brown, sandy clay loam soils occurring on very gently sloping uplands under cultivation		**8 (1.15)**
58		MDGiB2	Sandy clay surface, slope 1-3%, moderate erosion	8 (1.15)
	NGP	Nagalapur soils are deep (100-150 cm), moderately well drained, have very dark gray to very dark grayish brown, black calcareous cracking clay soils occurring on very gently sloping uplands under cultivation		**37 (5.33)**

*Soil map unit No.	Soil Series	Soil Phase	Mapping Unit Description	Area in ha(%)
48		NGPiB2	Sandy clay surface, slope 1-3%, moderate erosion	23 (3.28)
49		NGPmB2	Clay surface, slope 1-3%, moderate erosion	14 (2.05)
	SGR	Sangwar soils are very deep (>150 cm), moderately well drained, have dark gray to very dark gray, calcareous sodic cracking clay soils occurring on nearly level to very gently sloping lowlands under cultivation		**17 (2.47)**
143		SGRiB2	Sandy clay surface, slope 1-3%, moderate erosion	17 (2.47)
	YDR	Yadgir soils are deep (100-150 cm), well drained, have brown to dark yellowish brown and olive brown, sodic sandy loam soils occurring on very gently sloping uplands under cultivation		**56 (8.07)**
42		YDRcB2	Sandy loam surface, slope 1-3%, moderate erosion	56 (8.07)
	BMN	Bhimanahalli soils are very deep (>150 cm), moderately well drained, have very dark gray, calcareous cracking clay black soils occurring on very gently sloping uplands under cultivation		**22 (3.25)**
62		BMNmB2	Clay surface, slope 1-3%, moderate erosion	22 (3.25)
999		Rock outcrops	Rock lands, both massive and bouldery with little or no soil	**168 (24.33)**
1000		Others	Habitation and water body	**16 (2.26)**

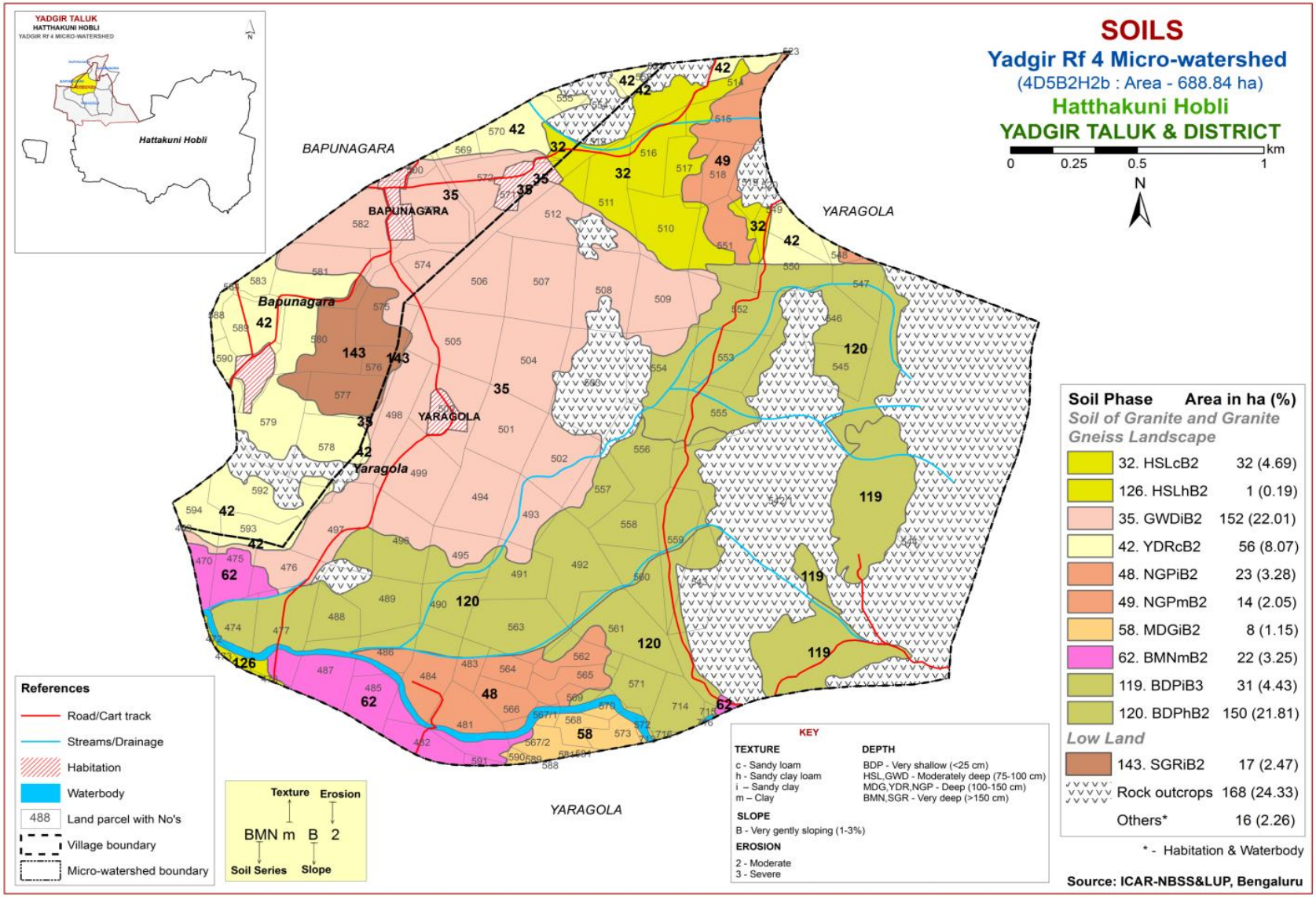


Fig 3.5 Soil Phase or Management Units - Yadgir Rf4 Microwatershed

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and their distribution of different kinds of soils occurring in Yadgir Rf4 microwatershed is provided in this chapter. The microwatershed area has been identified as granite gneiss landscape based on geology. In all, 8 soil series are identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. In the granite gneiss landscape, it is by parent material, relief and climate.

A brief description of each of the 8 soil series identified followed by 11 soil phases (management units) mapped are furnished below. The physical and chemical characteristics of soil series identified in Yadgir Rf4 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, 8 soil series are identified and mapped. Of these, BDP series occupies a maximum area of 181 ha (26%) followed by SGR 168 ha (24%), GWD 152 ha (22%), YDR 56 ha (8%), NGP 37 ha (5%), HSL 33 ha (5%), BMN 22 ha (3%) and MDG 8 ha (1%).

Brief description of each series identified and number of soil phases mapped is given below.

4.1.1 Baddeppalli (BDP) Series: Baddeppalli soils are very shallow (<25cm), well drained, have dark brown to dark reddish brown, calcareous sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Baddepalli series has been classified as a member of the loamy, mixed (calcareous), isohyperthermic family of Lithic Ustorthents.

The thickness of the soil is less than 25 cm. Its colour is in 7.5 YR and 5 YR hue with value 3 and chroma 2 to 4. The texture varies from sandy clay loam to sandy clay and is calcareous. The available water capacity is very low (<50 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Baddeppalli (BDP) Series

4.1.2 Hosalli (HSL) Series: Hosalli soils are moderately deep (75-100 cm), moderately well drained, have dark yellowish brown to yellowish brown, slightly calcareous sandy clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Hosalli series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 76 to 100 cm. The thickness of A horizon ranges from 6 to 15 cm. Its colour is in hue 10 YR and 7.5 YR with value 3 to 5 and chroma 2 to 4. Its texture varies from loamy sand to sandy loam and sandy clay loam. The thickness of B horizon ranges from 62 to 93 cm. Its colour is in hue 10 YR with value 3 to 4 and chroma 2 to 4. Its texture varies from sandy clay loam to sandy clay and clay and is slightly calcareous. The available water capacity is medium (101-150 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Hosalli (HSL) Series

4.1.3 Gowdagera (GWD) Series: Gowdagera soils are moderately deep (75-100 cm), moderately well drained, have very dark gray to dark grayish brown, calcareous, sodic sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation. The Gowdagera series has been classified as a member of the fine-loamy, mixed (calcareous), isohyperthermic family of Typic Haplustepts.

The thickness of the solum ranges from 76 to 100 cm. The thickness of A horizon ranges from 8 to 16 cm. Its colour is in hue 10 YR with value 3 to 4 and chroma 2 to 4. Its texture varies from sandy loam to sandy clay loam. The thickness of B horizon ranges from 61 to 91 cm. Its colour is in hue 10 YR with value 2 to 4 and chroma 1 to 4. Its texture is sandy clay loam to sandy clay and is calcareous sodic soils. The available water capacity is medium (101-150 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Gowdagera (GWD) Series

4.1.4 Mundargi (MDG) Series: Mundargi soils are deep (100-150 cm), well drained, have dark brown to dark yellowish brown, sandy clay loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Mundargi series has been classified as a member of the fine-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the solum ranges from 100 to 149 cm. The thickness of A horizon ranges from 8 to 20 cm. Its colour is in 10 YR hue with value 3 and chroma 1 to 4. The texture ranges from sandy loam to sandy clay loam and sandy clay. The thickness of B horizon ranges from 105 to 140 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture varies from sandy loam to sandy clay loam and sandy clay. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Mundargi (MDG) Series

4.1.5 Naglapur (NGP) Series: Naglapur soils are deep (100-150 cm), moderately well drained, have black to very dark grayish brown, calcareous cracking clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Naglapur series has been classified as a member of the very fine, smectitic (calcareous), isohyperthermic family of Typic Haplusterts.

The thickness of the solum ranges from 110 to 150 cm. The thickness of A horizon ranges from 6 to 25 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. The texture varies from sandy loam to sandy clay and clay. The thickness of B horizon ranges from 110 to 141 cm. Its colour is in 10 YR hue with value 2 to 3 and chroma 1 to 2. Texture is clay and is calcareous. The available water capacity is very high (>200 mm/m). Two phases were identified and mapped.

Landscape and Soil Profile characteristics of Naglapur (NGP) Series

4.1.6 Sangwar (SGR) Series: Sangwar soils are very deep (>150 cm), moderately well drained, have very dark gray to dark gray, sodic, calcareous cracking clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping lowlands under cultivation. The Sangwar series has been classified as a member of the fine, mixed (calcareous), isohyperthermic family of Sodic Haplusterts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 9 to 20 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 2 with sandy clay loam to sandy clay and clay texture. The thickness of B horizon ranges from 157 to 174 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2. Its texture varies from sandy clay to clay and is calcareous sodic soils. They are sodic with ESP ranging from 29 - 65%. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Sangwar (SGR) Series

4.1.7 Yadgir (YDR) Series: Yadgir soils are deep (100-150 cm), well drained, have very dark yellowish brown to light olive brown, sodic sandy loam soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Yadgir series has been classified as a member of the coarse-loamy, mixed, isohyperthermic family of Fluventic Haplustepts.

The thickness of the soil ranges from 105 to 145 cm. The thickness of A horizon ranges from 6 to 10 cm. Its colour is in 10 YR hue with value 4 and chroma 3. The texture is loamy sand. The thickness of subsurface horizons ranges from 95 to 130 cm. Its colour is in 10 YR and 2.5 Y hue with value 4 to 5 and chroma 3 to 4. Textures are loamy sand to sandy loam and sandy clay loam and are sodic soils. The available water capacity is low (51-100 mm/m). Only one phase was identified and mapped. Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Yadgir (YDR) Series

4.1.8 Bhimanahalli (BMN) Series: Bhimanahalli soils are very deep (>150 cm), moderately well drained, have very dark gray calcareous cracking clay soils. They are developed from weathered granite gneiss and occur on very gently to gently sloping uplands under cultivation. The Bhimanahalli series has been classified as a member of the fine, smectitic (calcareous), isohyperthermic family of Typic Haplusterts.

The thickness of the solum is more than 150 cm. The thickness of A horizon ranges from 6 to 13 cm. Its colour is in 10 YR hue with value 3 to 4 and chroma 1 to 2 with clay texture. The thickness of B horizon ranges from 163 to 176 cm. Its colour is in 10 YR hue with value 2 to 4 and chroma 1. Its texture is clay and is calcareous. The available water capacity is very high (>200 mm/m). Only one phase was identified and mapped.

Landscape and Soil Profile characteristics of Bhimanahalli (BMN) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Yadgir Rf4 microwatershed

Soil Series: Baddeppalli **(**BDP) **Pedon:** R-11

Location: $16^0$43'84.4"N $77^0$14'06.4"E, Halagera village, Yadgir hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Loamy, mixed (calcareous), isohyperthermic Lithic Ustorthents

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	58.67	17.02	24.31	19.03	13.74	9.62	10.57	5.71	<15	scl	16.19	8.18

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}							%	%
0-16	8.58	-	-	0.262	1.60	7.67	-	-	0.24	0.06	-	18.10	0.74	100	0.35

Contd...

Soil Series: Hosalli (HSL) **Pedon:** R-3

Location: $16^0$46'60.3"N $77^0$05'47.6"E, Mudhanala village, Yadgir hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed, 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
0-10	Ap	88.43	5.15	6.42	5.69	6.40	36.04	27.31	12.99	-	s	7.40	2.74
10-30	Bw1	58.47	7.24	34.29	4.26	9.37	19.91	19.28	5.64	-	scl	19.07	11.57
30-50	Bw2	51.43	12.67	35.90	3.49	8.89	16.72	15.87	6.46	<15	sc	21.64	12.44
50-90	Bw3	49.89	13.64	36.47	2.43	2.96	20.61	16.17	7.72	<15	sc	21.12	12.95

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}							%	%
0-10	7.16	-	-	0.117	0.48	0.00	2.83	1.50	0.15	0.29	4.76	4.90	0.76	97	5.94
10-30	6.91	-	-	0.040	0.36	0.00	10.64	5.43	0.10	0.26	16.43	17.80	0.52	92	1.47
30-50	8.17	-	-	0.182	0.24	1.43	-	-	0.12	0.22	-	19.90	0.55	100	1.08
50-90	8.60	-	-	0.148	0.20	4.29	-	-	0.13	0.16	-	19.70	0.54	100	0.81

Contd...

Soil Series: Gowdagera (GWD) **Pedon:** R-13

Location: $16^0$38'24.4"N $77^0$21'24.0"E, Madhawara village, Balichakara hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed (calcareous), 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
0-18	Ap	79.61	13.94	6.45	14.17	17.53	23.65	17.02	7.24	-	ls	11.36	3.86
18-42	BW1	69.09	10.58	21.06	10.54	16.58	22.01	14.43	5.53	-	scl	31.62	12.30
42-81	Bw2	51.37	13.51	35.60	7.59	10.55	16.24	11.60	5.38	-	sc	67.57	26.89

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-18	9.89	-	-	0.74	0.66	1.20	-	-	0.18	3.63	-	8.35	1.29	100	17.40
18-42	10.82	-	-	1.60	0.27	5.76	-	-	0.19	19.23	-	15.84	0.75	100	40.17
42-81	10.83	-	-	2.30	0.27	7.80	-	-	0.40	26.71	-	26.54	0.75	100	40.27

Contd...

Soil Series: Mundargi **(**MDG) **Pedon:** R-2

Location: $16^0$46'82.4"N $77^0$04'85.2"E, Thumakura village, Yadgir hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine-loamy, mixed, isohyperthermic Fluventic 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
0-9	Ap	81.23	12.97	5.80	4.84	10.19	14.83	37.94	13.42	<15	ls	11.75	3.31
9-20	A2	76.82	16.19	6.98	4.96	10.12	20.75	27.53	13.46	-	ls	14.52	3.99
20-46	Bw1	42.43	17.43	40.15	2.26	5.59	11.49	14.93	8.16	-	c	34.90	21.14
46-90	Bw2	54.51	16.56	28.93	4.72	5.03	19.92	16.67	8.18	-	scl	36.73	18.88
90-110	Bw3	53.69	11.00	35.30	9.57	9.89	16.23	13.01	4.99	-	sc	38.72	20.53

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}							%	%
0-9	8.2	-	-	0.399	0.44	0.78	-	-	0.16	0.38	-	4.90	0.84	100	3.08
9-20	8.44	-	-	0.075	0.29	1.82	-	-	0.05	0.35	-	4.90	0.70	100	2.88
20-46	9.39	-	-	0.451	0.32	2.73	-	-	0.12	5.22	-	20.77	0.52	100	10.06
46-90	9.75	-	-	0.616	0.24	3.25	-	-	0.12	5.72	-	16.56	0.57	100	13.82
90-110	9.72	-	-	0.725	0.24	3.64	-	-	0.14	6.84	-	19.76	0.56	100	13.836

Contd...

Soil Series: Naglapur (NGP) **Pedon:** R-8

Location: $16^0$52'84.1"N $77^0$22'99.4"E, Gurumitkal village, Gurumitkal hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Very fine, smectitic (calcareous), isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-10	Ap	7.53	19.88	72.59	1.00	0.78	0.89	2.10	2.77	-	c	44.31	32.79
10-35	Bss1	6.55	18.76	74.68	0.80	0.92	0.80	1.72	2.30	-	c	43.09	31.62
35-60	Bss2	6.58	21.05	72.37	0.69	0.46	1.04	1.50	2.89	-	c	46.52	32.52
60-102	Bss3	7.48	19.74	72.78	1.61	1.38	0.69	1.61	2.19	-	c	51.12	35.62

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}							%	%
0-10	7.42	-	-	0.24	0.84	1.30	-	-	0.84	0.15	-	67.10	0.92	100	0.22
10-35	8.52	-	-	0.291	0.64	2.86	-	-	0.17	0.29	-	65.20	0.87	100	0.45
35-60	7.89	-	-	0.134	0.62	4.55	-	-	0.15	0.20	-	65.00	0.90	100	0.30
60-102	8.68	-	-	0.213	0.54	8.32	-	-	0.17	0.15	-	64.10	0.88	100	0.24

Contd...

Soil Series: Sangwar **(**SGR) **Pedon:** R-4

Location: $16^0$32'25.9"N $77^0$12'52.6"E, Bheemanahalli village, Sydhapura hobli, Yadgir taluka and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed, (calcareous), isohyperthermic Sodic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-8	Ap	37.30	18.18	44.52	4.91	6.76	12.10	4.80	8.72	-	c	32.36	23.18
8-30	BA	42.04	17.77	40.19	8.28	16.34	7.42	6.13	3.87	-	c	29.89	20.87
30-70	Bss1	33.77	18.63	47.60	5.45	11.66	6.21	6.75	3.70	-	c	37.04	26.13
70-100	Bss2	26.95	18.65	54.40	5.39	9.79	4.95	4.07	2.75	-	c	43.07	32.05
100-150	Bss3	14.35	17.32	68.33	2.69	4.15	2.35	2.69	2.47	-	c	55.74	38.19

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}							%	%
0-8	8.3	-	-	6.49	1.48	6.69	-	-	1.32	10.09	-	34.77	0.78	100	11.61
8-30	9.09	-	-	2.54	0.64	6.76	-	-	0.75	10.00	-	33.76	0.84	100	11.85
30-70	9.23	-	-	2.6	0.28	6.63	-	-	0.42	11.55	-	38.98	0.82	100	11.86
70-100	9.39	-	-	3.01	0.36	6.89	-	-	0.73	27.73	-	42.46	0.78	100	26.132
100-150	9.28	-	-	4	0.24	7.15	-	-	0.80	27.78	-	47.67	0.70	100	23.308

Contd...

Soil Series: Yadgir **(**YDR) **Pedon:** R-5

Location: $16^0$35'43.6"N $77^0$17'06.4"E, Kanikal village, Balichakra hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Coarse-loamy, mixed, isohyperthermic Fluventic 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
0-14	Ap	86.59	8.77	4.64	23.19	26.92	14.11	15.22	7.16	-	ls	6.97	2.68
14-43	A2	80.41	3.75	15.84	8.06	13.47	36.73	15.71	6.43	-	sl	22.84	10.18
43-89	Bw1	73.39	11.31	15.30	6.76	20.27	24.87	15.66	5.83	-	sl	12.14	7.22
89-110	Bw2	63.55	5.40	31.05	8.10	23.05	19.00	9.87	3.53	15-35	scl	38.46	17.70

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	9.47	-	-	0.371	0.32	1.30	14.71	4.28	0.38	1.54	20.91	12.70	0.83	165	4.86
14-43	7.25	-	-	0.114	0.56	0.00	2.29	0.86	0.07	0.03	3.25	3.40	0.73	96	0.31
43-89	10.30	-	-	0.820	0.16	0.52	1.70	0.98	0.15	6.62	9.45	8.61	0.54	110	30.77
89-110	10.80	-	-	1.440	0.12	0.91	1.02	2.00	0.29	14.43	17.74	16.17	0.52	110	35.688

Contd…

Soil Series: Bhimanahalli (BMN) **Pedon:** R-3

Location: $16^0$31'82.4"N $77^0$12'70.8"E, Bheemanahalli village, Sydhapura hobli, Yadgir taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, smectitic (calcareous), isohyperthermic Typic Haplusterts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-8	Ap	20.34	19.94	59.72	2.68	5.03	3.75	5.25	3.64	-	c	50.19	33.49
8-40	Bss1	19.61	22.76	57.62	1.94	2.59	5.28	4.96	4.85	-	c	43.22	29.05
40-70	Bss2	21.25	17.65	61.10	3.02	5.26	3.91	5.48	3.58	-	c	44.30	30.25
70-120	Bss3	19.08	22.29	58.63	1.75	5.04	3.84	5.15	3.29	-	c	43.26	30.31
120-170	Bss4	11.11	20.44	68.45	2.04	1.93	1.70	2.83	2.61	-	c	51.33	33.51

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}							%	%
0-8	8.2	-	-	0.284	0.72	4.94	-	-	1.20	0.34	-	52.70	0.88	100	0.65
8-40	8.44	-	-	0.139	0.40	7.28	-	-	0.30	0.48	-	52.06	0.90	100	0.93
40-70	8.32	-	-	0.202	0.40	6.37	-	-	0.18	0.40	-	52.52	0.86	100	0.77
70-120	9.3	-	-	0.282	0.36	6.89	-	-	0.27	0.38	-	50.97	0.87	100	0.75
120-170	8.47	-	-	0.305	0.37	8.19	-	-	0.28	0.91	-	58.19	0.85	100	1.57

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 interpretative and 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: Depth, texture, gravelliness, calcareousness.

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

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

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

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

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

Class III: They are moderately good lands that have moderate 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/alkalinity or gravelliness and "c" indicates limitation due to climate.

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

The 11 soil map units identified in Yadgir Rf4 microwatershed are grouped under 2 land capability classes and 2 land capability subclasses. An area of about 506 ha (73%) in the microwatershed is suitable for agriculture. About 168 ha (24%) area is covered by rock outcrops and 16 ha (2%) area is covered by others (water body & habitation (Fig. 5.1).

Good lands (Class II) cover an area of about 15 per cent and are distributed in the northern, southern and southwestern part of the microwatershed with minor problems of soil and erosion. Fairly good (Class IV) lands occur in an area of about 59 per cent of the microwatershed and are distributed in the major part of the microwatershed with very severe problems of soil and erosion.

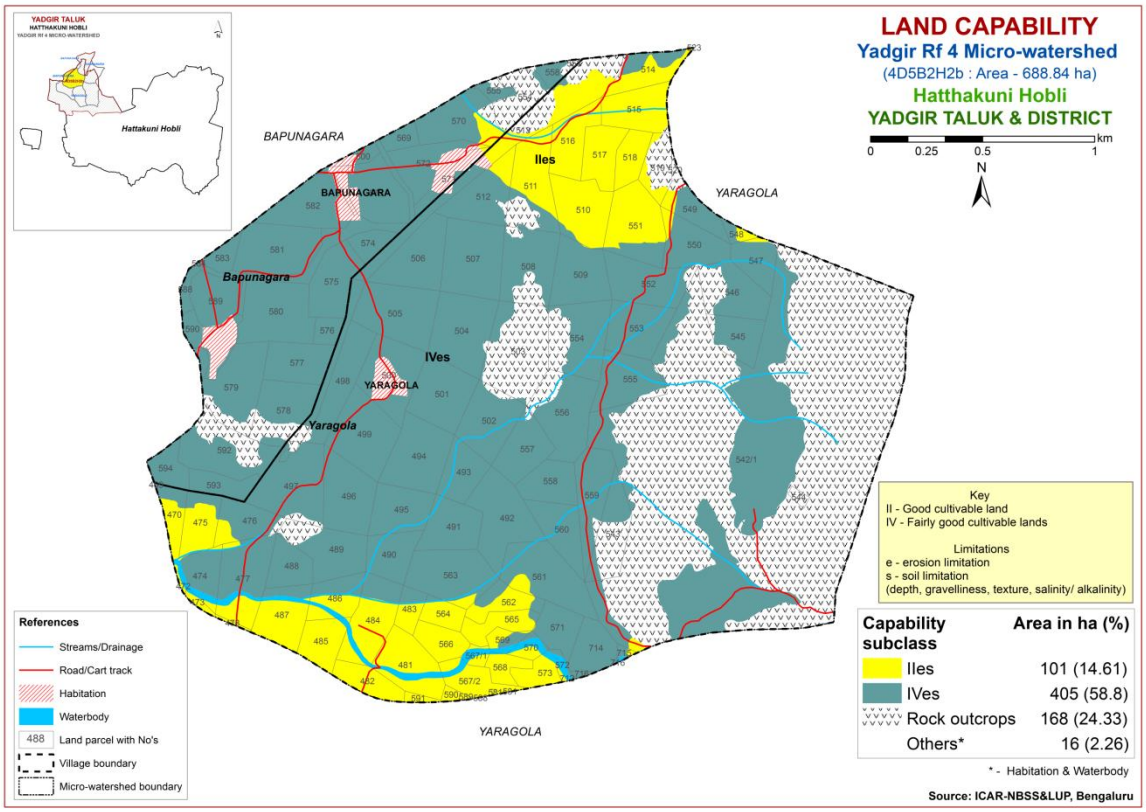


Fig. 5.1 Land Capability map of Yadgir Rf4 Microwatershed

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. The area extent and their geographical distribution in the microwatershed is given in Fig. 5.2.

Very shallow (<25 cm) soils occur in an area of 181 ha (26%) and are distributed in the central, eastern, southwestern and southern part of the microwatershed. Moderately deep (75-100 cm) soils occur in an area of 185 ha (27%) and are distributed in the western, central, northern, northwestern and southern part of the microwatershed. Deep (100-150 cm) soils cover an area of 100 ha (15%) and are distributed in the northern, western and southern part of the microwatershed. Very deep (>150 cm) soils cover an area of 39 ha (6%) and are distributed in the western, southern and southwestern part of the microwatershed.

The most productive lands covering 139 ha (20%) with respect to soil rooting depth where all climatically adapted annual and perennial crops can be grown are deep to

very deep (100- >150 cm depth) soils. The problem soils occupy an area of 181 ha (26%) where only short duration crops can be grown occasionally and the probability of crop failure is very high.

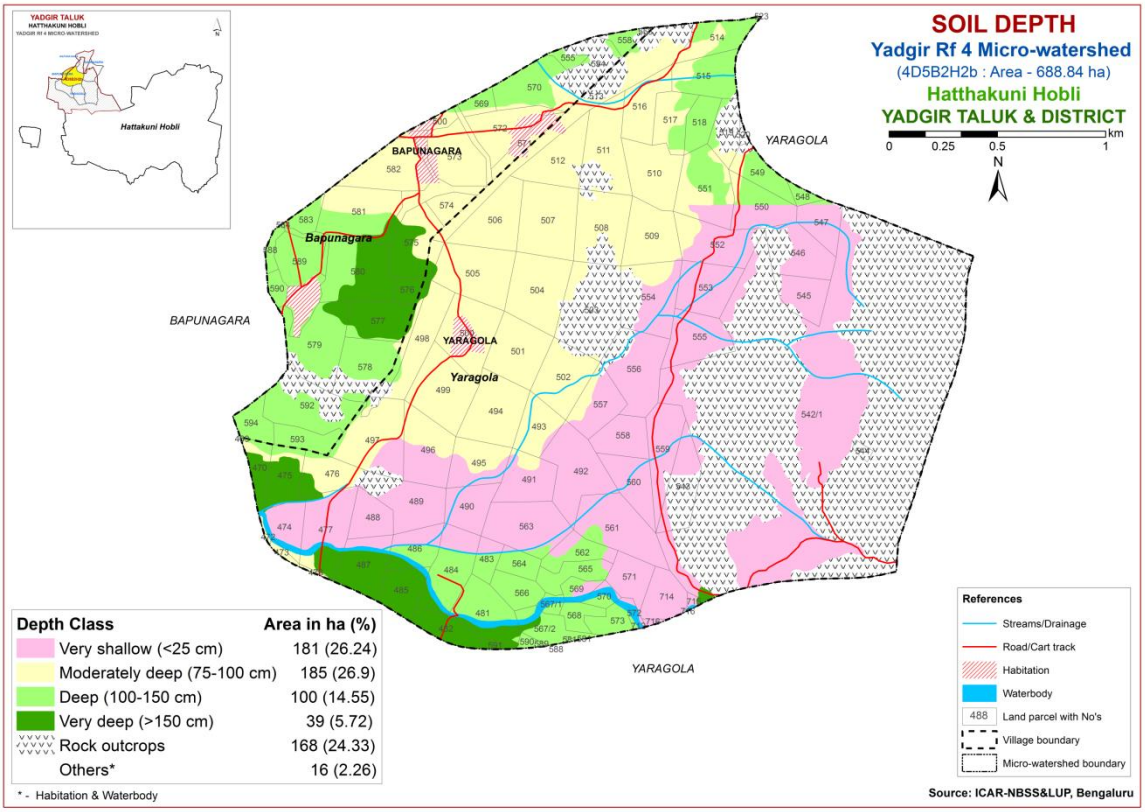


Fig. 5.2 Soil Depth map of Yadgir Rf4 Microwatershed

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 was generated. The area extent and their geographical distribution in the microwatershed is shown in Figure 5.3.

An area of 240 ha (35%) of the microwatershed has loamy soils at the surface and are distributed in the central, western, northern, eastern and southern part. An area of about 266 ha (39%) of the microwatershed has soils that are clayey and are distributed in the central, southeastern, northern, northwestern and southwestern part. Both loamy and clay soils have high potential for soil-water retention and availability, and nutrient retention and availability, but clayey soils have more problems of drainage, infiltration, workability and other physical problems.

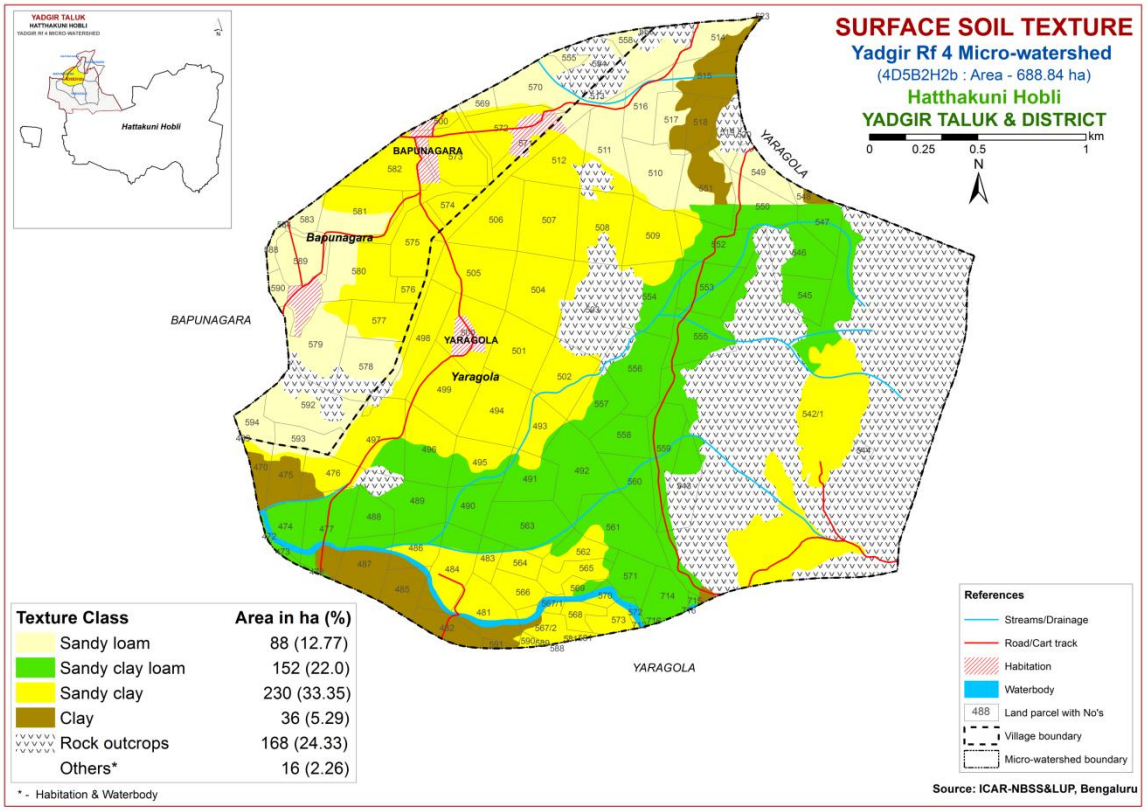


Fig. 5.3 Surface Soil Texture map of Yadgir Rf4 Microwatershed

5.4 Soil Gravelliness

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

Non gravelly (<15%) soils cover an entire cultivated area of the microwatershed. These are the most productive soils, where all climatically adapted short and long duration crops can be grown.

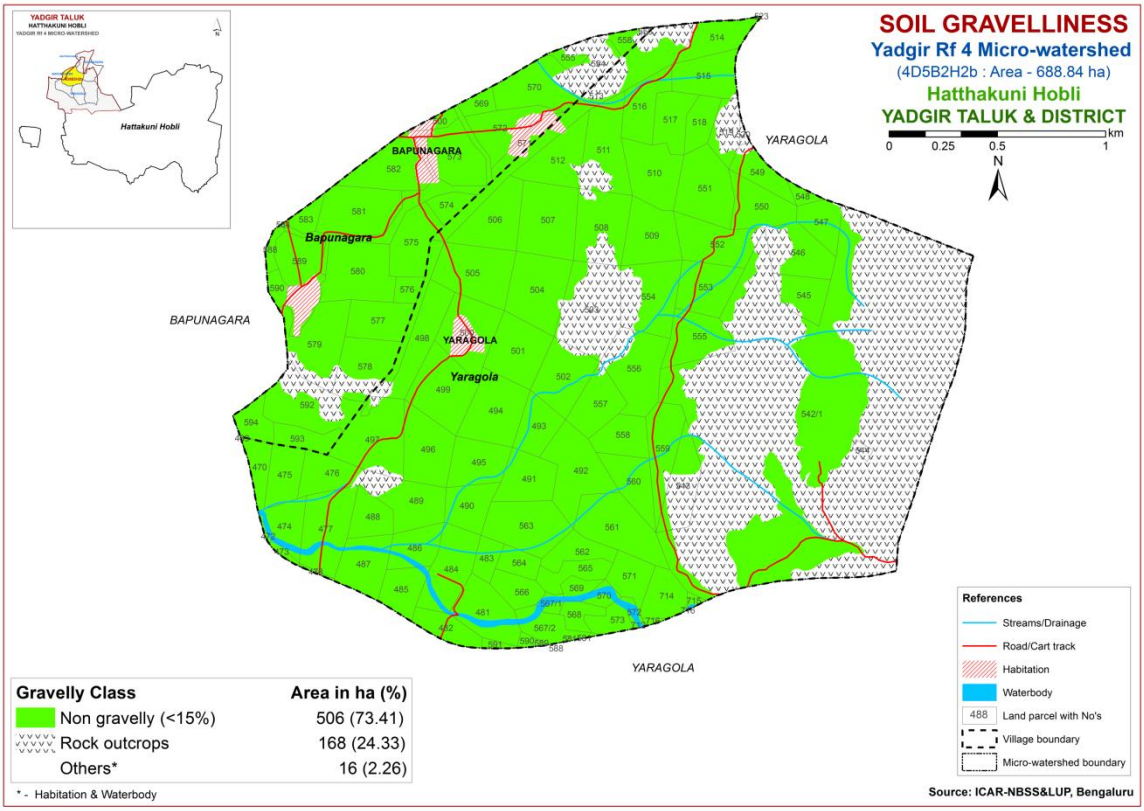


Fig. 5.4 Soil Gravelliness map of Yadgir Rf4 Microwatershed

5.5 Available Water Capacity

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

An area of about 181 ha (26%) in the microwatershed has soils that are very low (<50 mm/m) in available water capacity and is distributed in the southwestern, northern, central and southern part of the microwatershed. An area of about 56 ha (8%) is low (51-100 mm/m) in available water capacity and are distributed in the western and northern part of the microwatershed. An area of about 185 ha (27%) is medium (101-150 mm/m) in available water capacity and are distributed in the western, northern and central part of the microwatershed Very high (>200 mm/m) in 84 ha (12%) and are distributed in the southern, southwestern, western and northern part of the microwatershed.

An area of about 237 ha (34%) in the microwatershed has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and probability of the crop failure is very high. These areas are best put to other

alternative uses. An area of 84 ha (12%) are potential areas with regard to AWC where all climatically adapted annual and perennial crops can be grown.

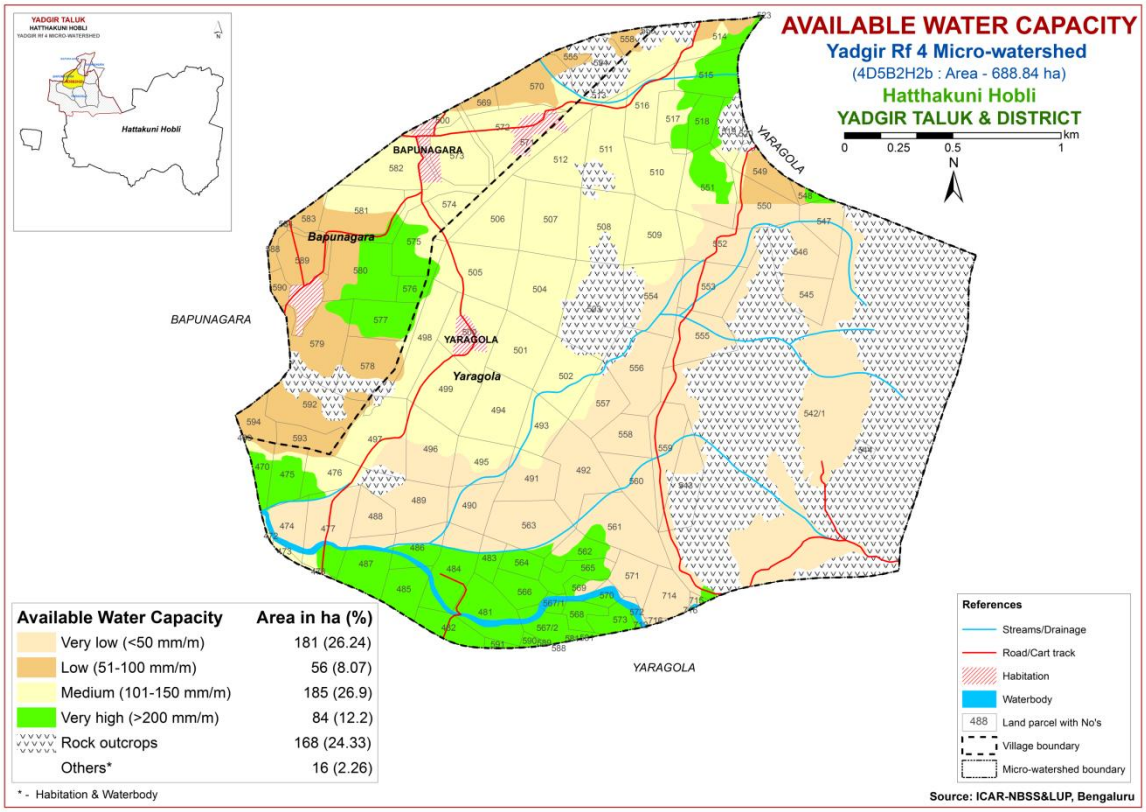


Fig. 5.5 Soil Available Water Capacity map of Yadgir Rf4 Microwatershed

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 single slope class and a slope map was generated showing the area extent and their geographic distribution in the microwatershed (Fig. 5.6).

Entire cultivated area is under very gently sloping (1-3% slope) lands in the microwatershed. In these areas, all climatically adapted annual and perennial crops can be grown without much soil and water conservation and other land development measures.

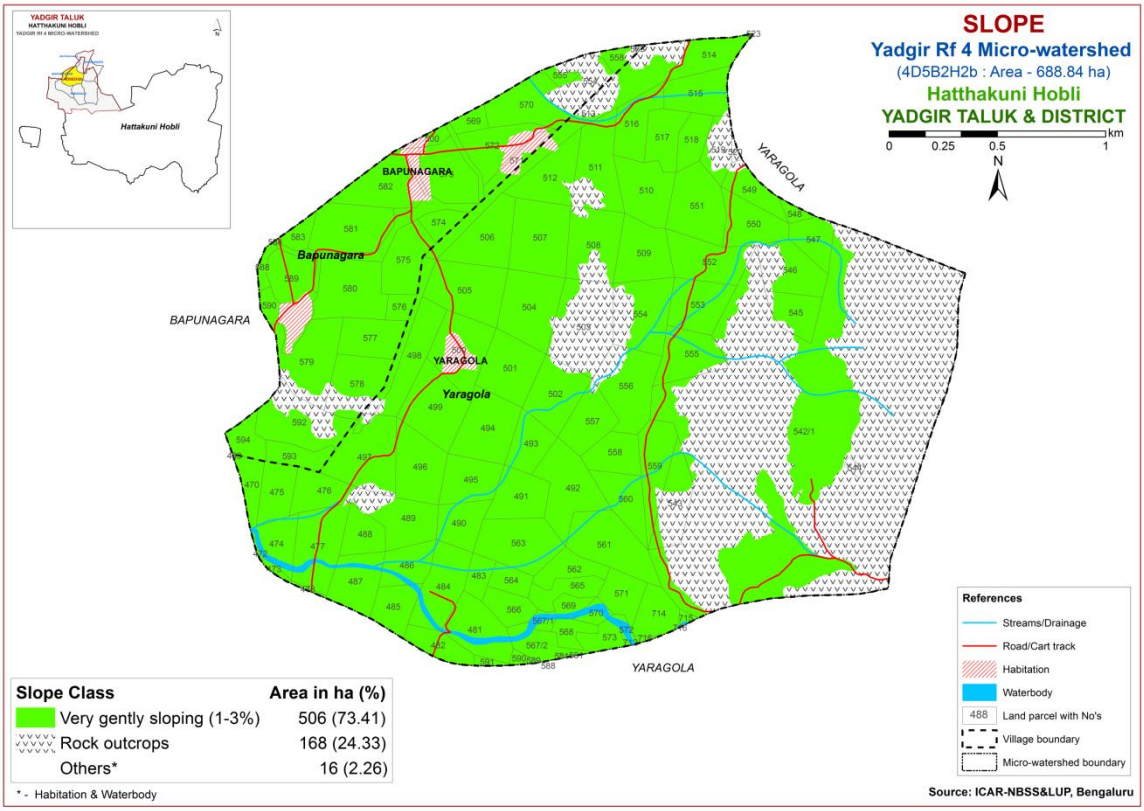


Fig. 5.6 Soil Slope map of Yadgir Rf4 Microwatershed

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.

Moderately eroded (e2 class) soils cover a maximum area of 475 ha (69%) and are distributed in the major part of the microwatershed and severely eroded (e3) soils cover an area of 31 ha (4%) and are distributed in the southeastern and eastern part of the microwatershed

Entire cultivated area of the microwatershed is problematic because of moderate and severe erosion. For these areas, taking up of soil and water conservation and other land development measures are needed.

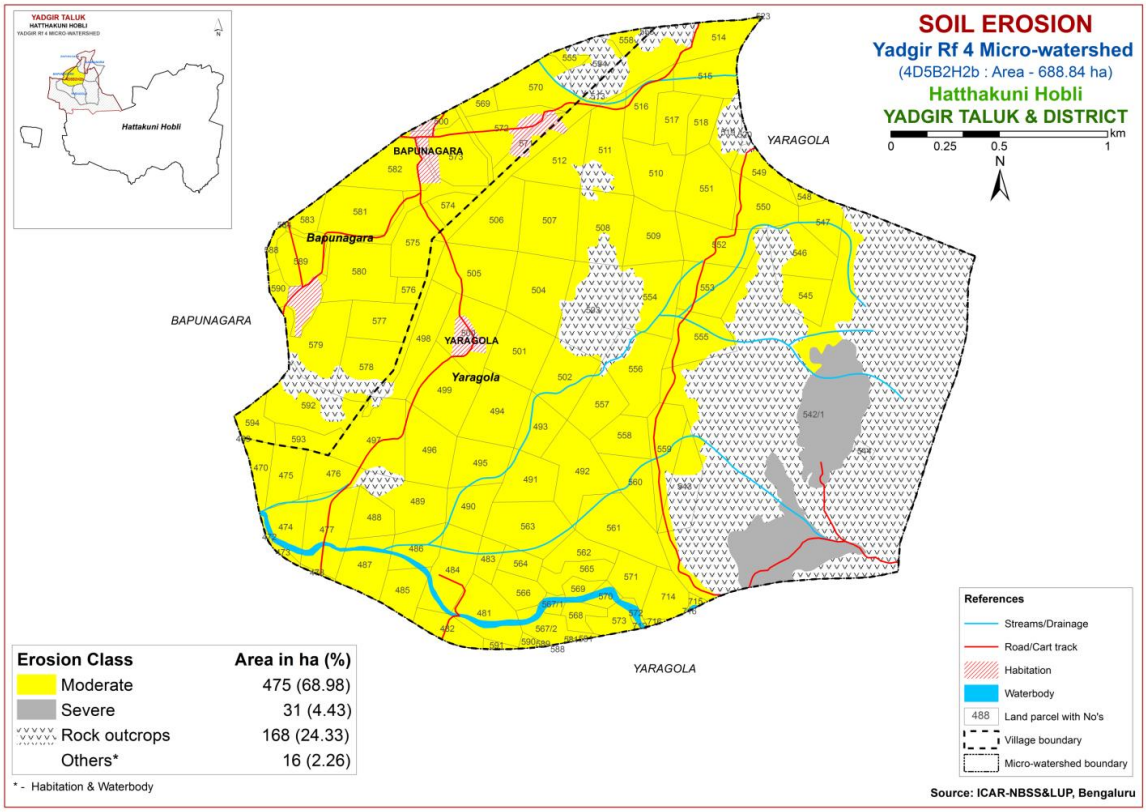


Fig. 5.7 Soil Erosion map of Yadgir Rf4 Microwatershed

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 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 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 Yadgir Rf4 microwatershed for soil reaction (pH) showed that an entire cultivated area in the microwatershed is alkaline (pH 7.3-9.0) (Fig. 6.1)

6.2 Electrical Conductivity (EC)

The Electrical Conductivity is non saline (<2 dsm^{-1}) in the entire cultivated area of the microwatershed (Fig. 6.2)

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen) in an area of about 107 ha (15%) is medium (0.5-0.75%) and are distributed in the western, northern and northwestern part of the microwatershed and high (>0.75%) in an area of 399 ha (58%) and are distributed in the major part of the microwatershed (Fig. 6.3).

6.4 Available Phosphorus

Available phosphorus content is medium (23-57 kg/ha) in an area of 495 ha (72%) and distributed in the major part of the microwatershed. High (>57 kg/ha) in a small area of 10 ha (1%) and are distributed in the western part of the microwatershed (Fig. 6.4).

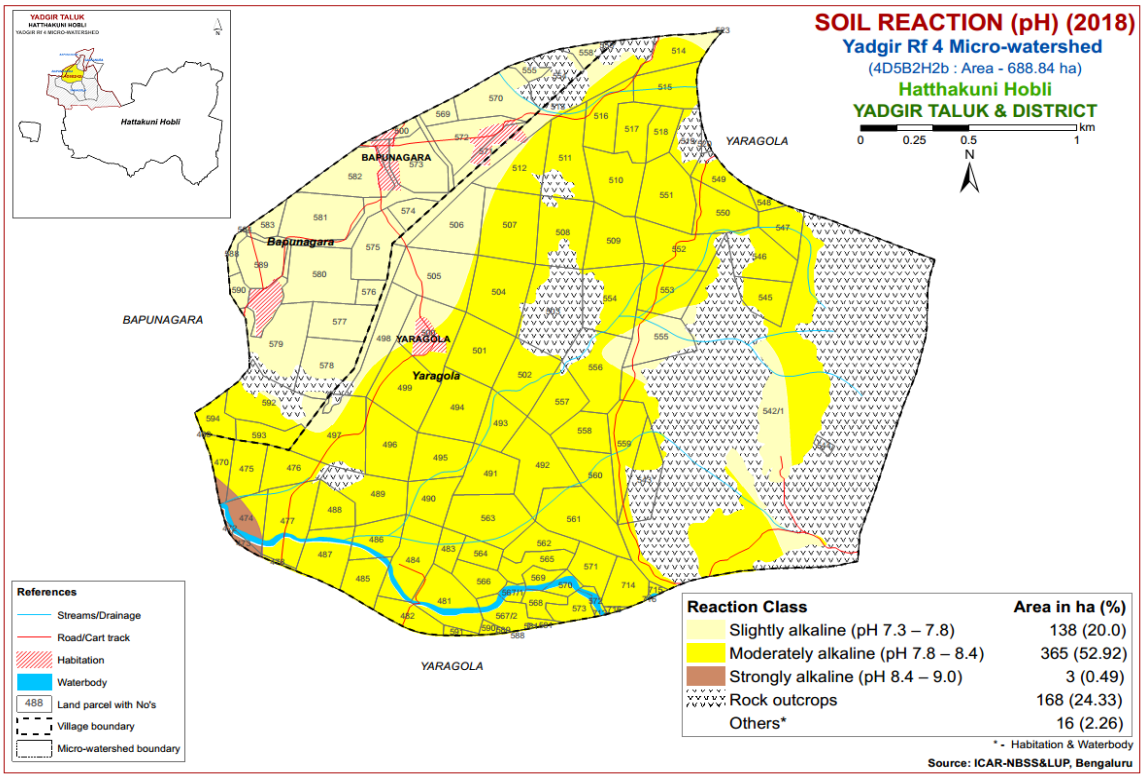


Fig.6.1 Soil Reaction (pH) map of Yadgir Rf4 Microwatershed

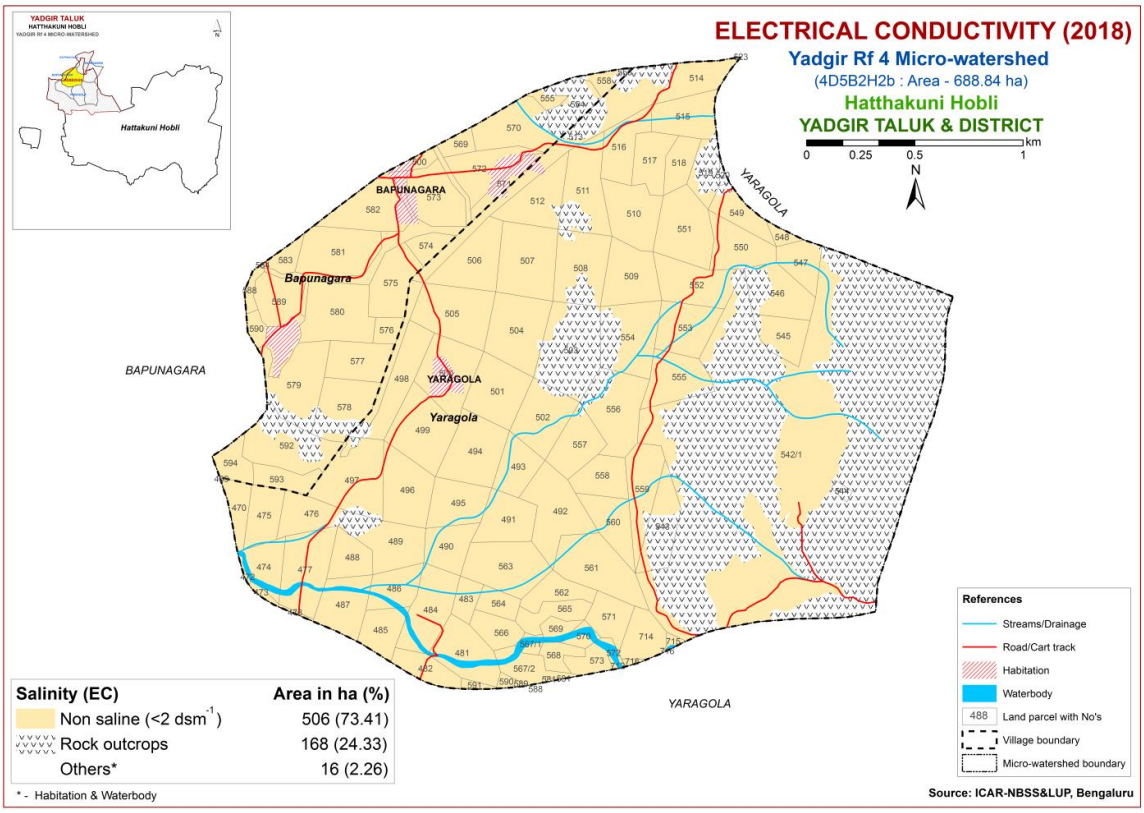


Fig.6.2 Electrical Conductivity (EC) map of Yadgir Rf4 Microwatershed

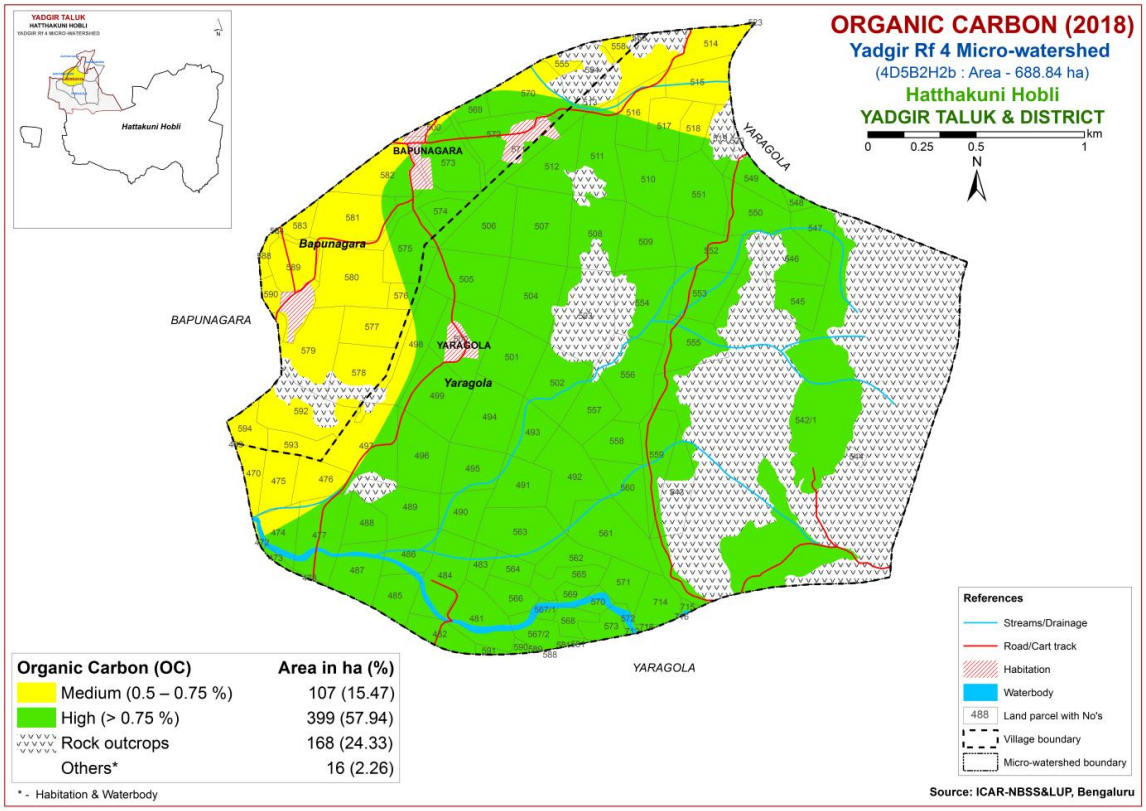


Fig.6.3 Soil Organic Carbon map of Yadgir Rf4 Microwatershed

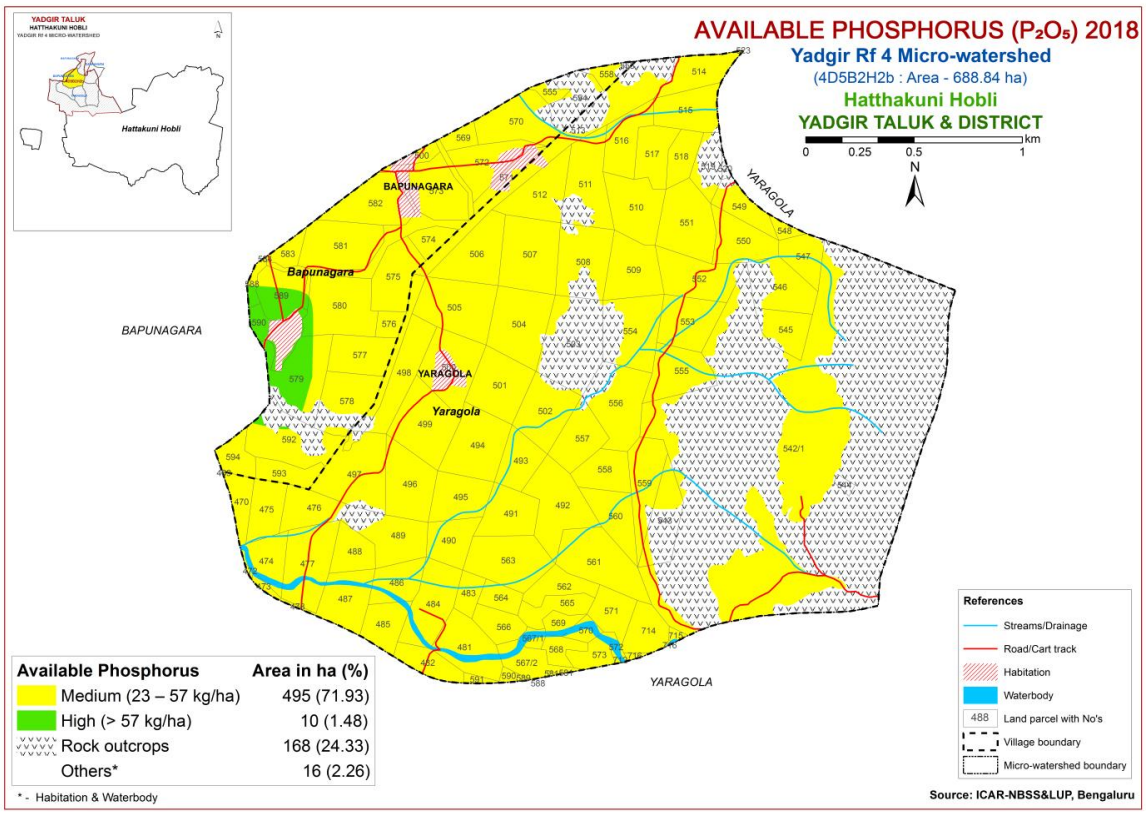


Fig.6.4 Soil Available Phosphorus map of Yadgir Rf4 Microwatershed

6.5 Available Potassium

Available potassium content is medium (145-337 kg/ha) in an area of 175 ha (25%) and are distributed in the southern, central, northern and northwestern part and high (>337 kg/ha) in an area of 330 ha (48%) and are distributed in the major cultivated area of the microwatershed (Fig. 6.5)

6.6 Available Sulphur

Available sulphur content is low (<10 ppm) in an area of 91 ha (13%) and are distributed in the northern and southeastern part. Medium (10-20 ppm) in an area of 344 ha (50%) and are distributed in the major part and high (>20 ppm) in an area of 71 ha (10%) and are distributed in the southern, western and southwestern part of the microwatershed (Fig. 6.6).

6.7 Available Boron

Available boron content is low (<0.5 ppm) in an area of 52 ha (8%) and are distributed in the southern and western part of the microwatershed. Medium (0.5-1.0 ppm) in an area of 454 ha (66%) and are distributed in the major part of the microwatershed (Fig. 6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) in the entire cultivated area of the microwatershed (Fig 6.8).

6.9 Available Manganese

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

6.10 Available Copper

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

6.11 Available Zinc

Available zinc content is deficient (<0.6 ppm) in an area of 443 ha (64%) and are distributed in the major part and sufficient (>0.6 ppm) in an area of 63 ha (9%) and are distributed in the eastern, southern and southeastern part of the microwatershed (Fig 6.11).

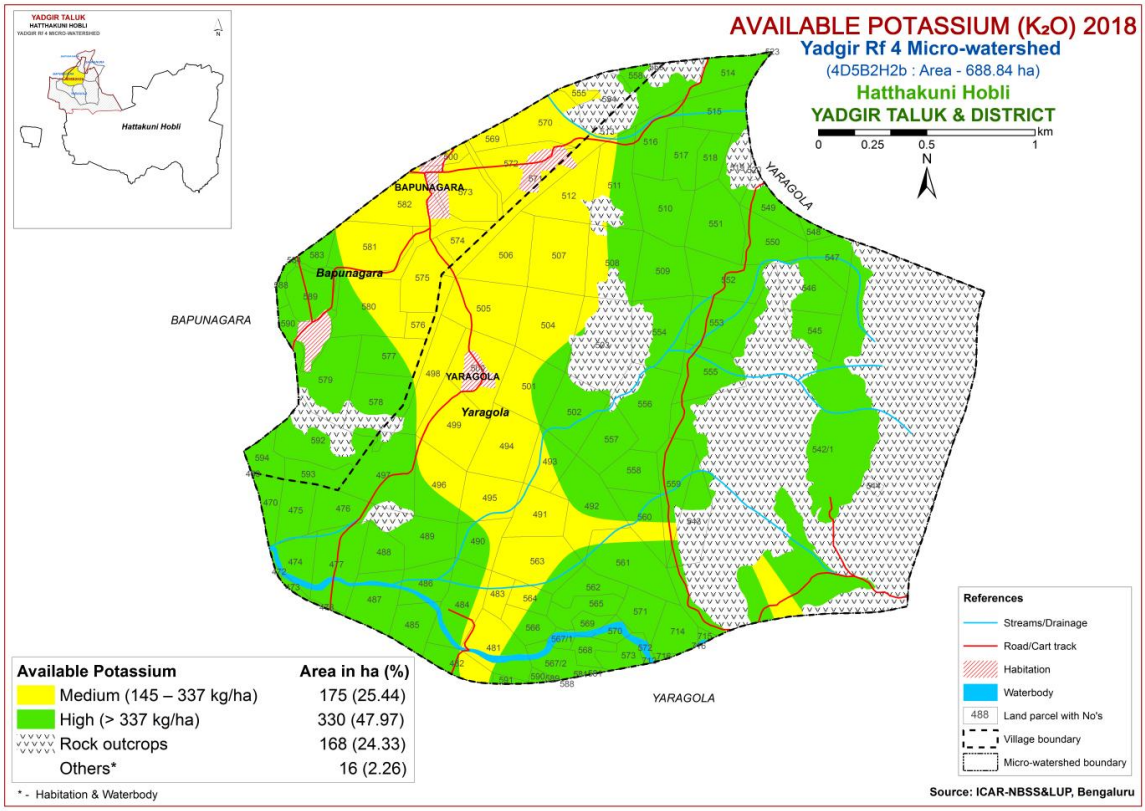


Fig.6.5 Soil Available Potassium map of Yadgir Rf4 Microwatershed

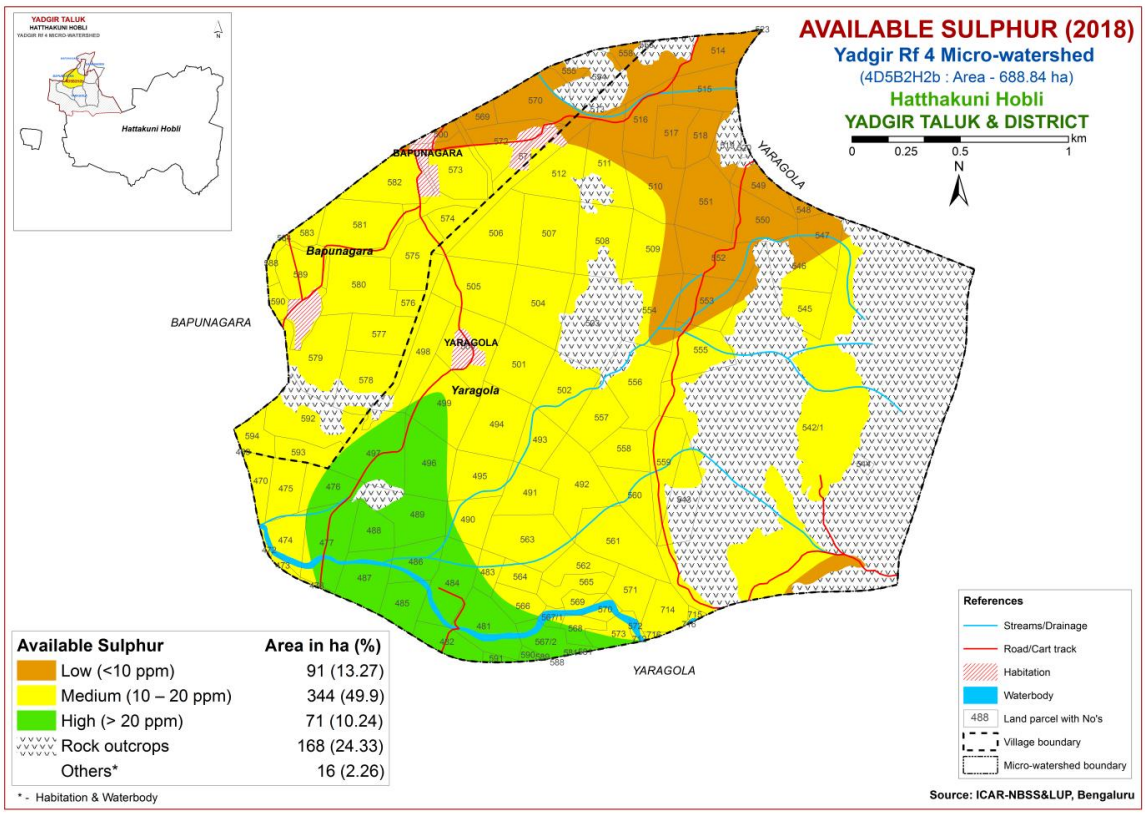


Fig.6.6 Soil Available Sulphur map of Yadgir Rf4 Microwatershed

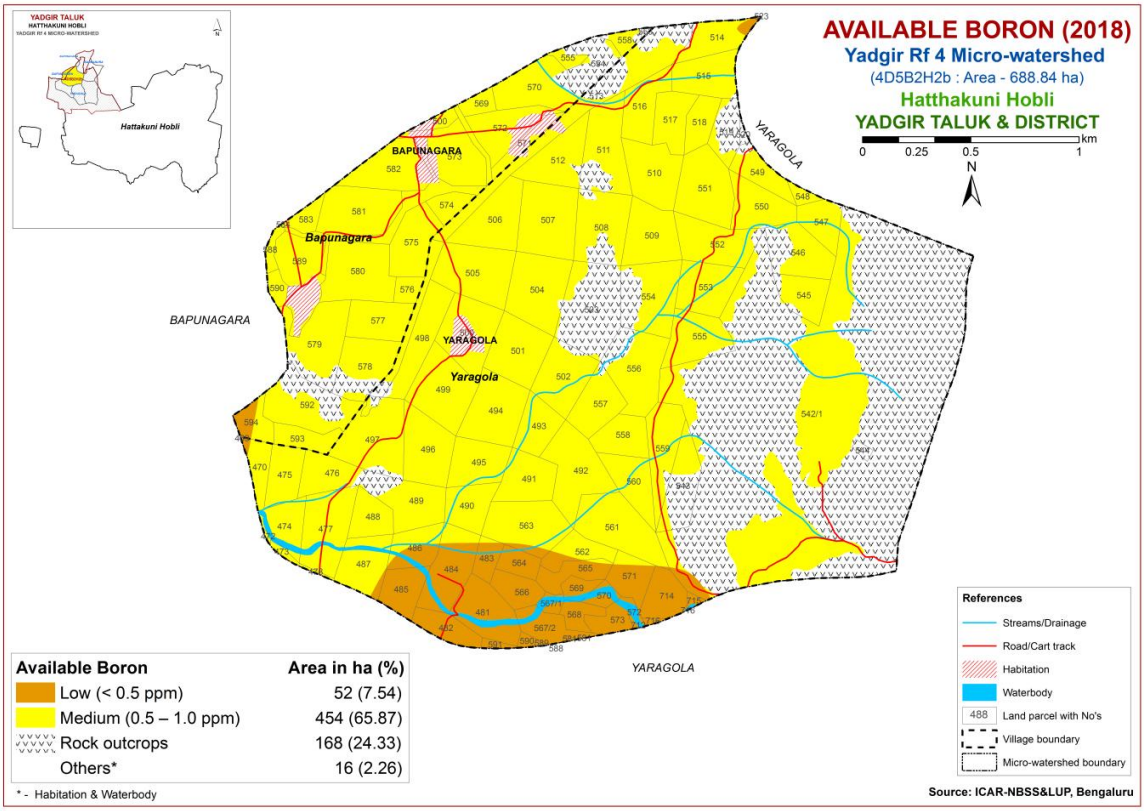


Fig.6.7 Soil Available Boron map of Yadgir Rf4 Microwatershed

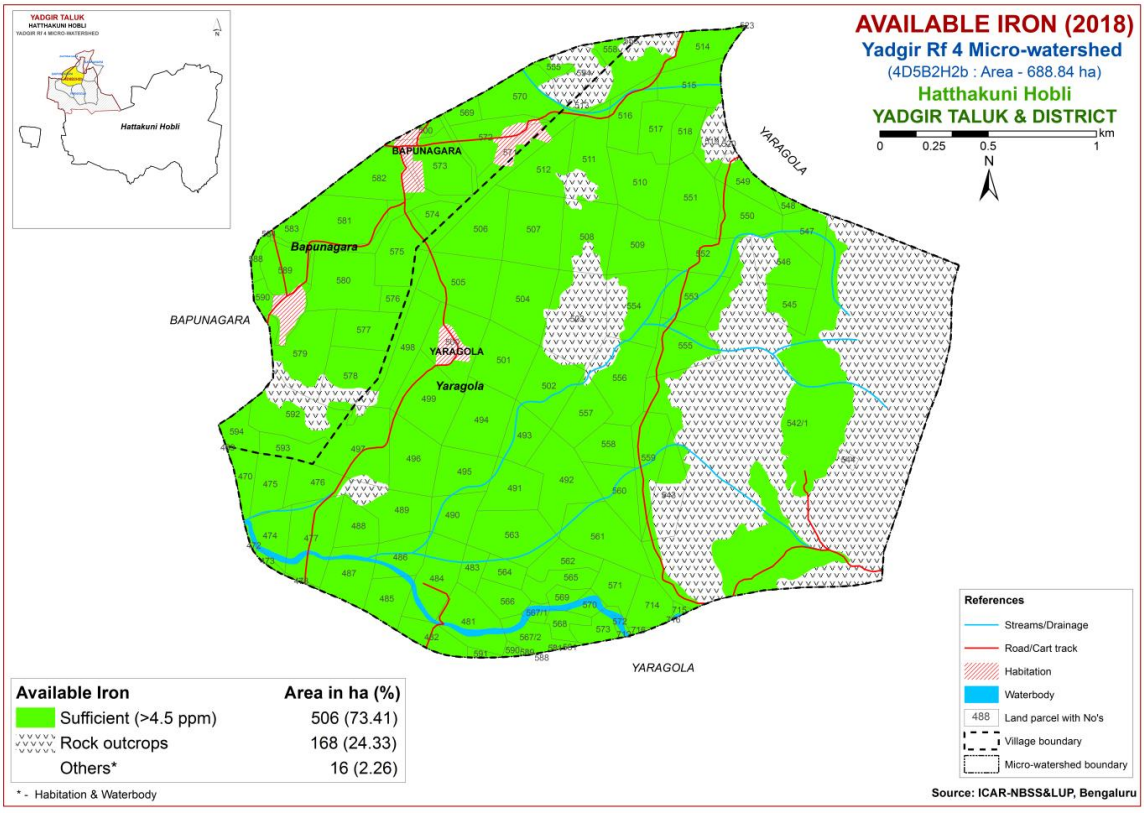


Fig.6.8 Soil Available Iron map of Yadgir Rf4 Microwatershed

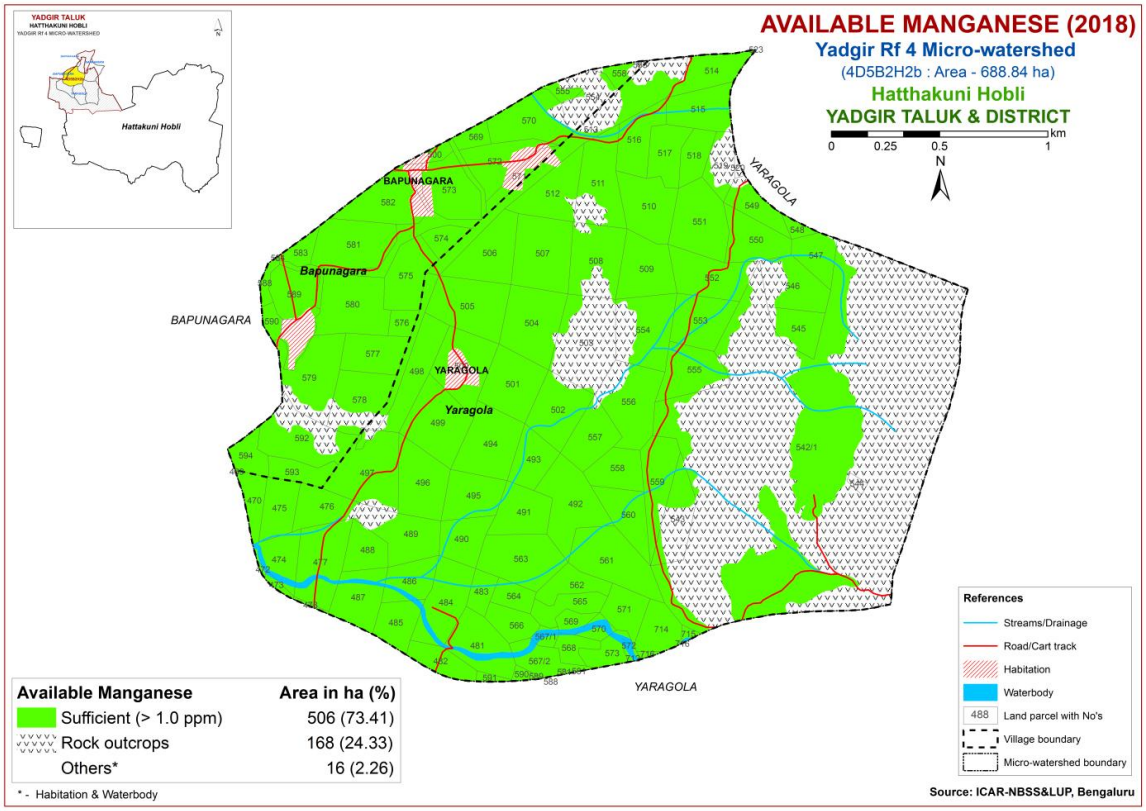


Fig.6.9 Soil Available Manganese map of Yadgir Rf4 Microwatershed

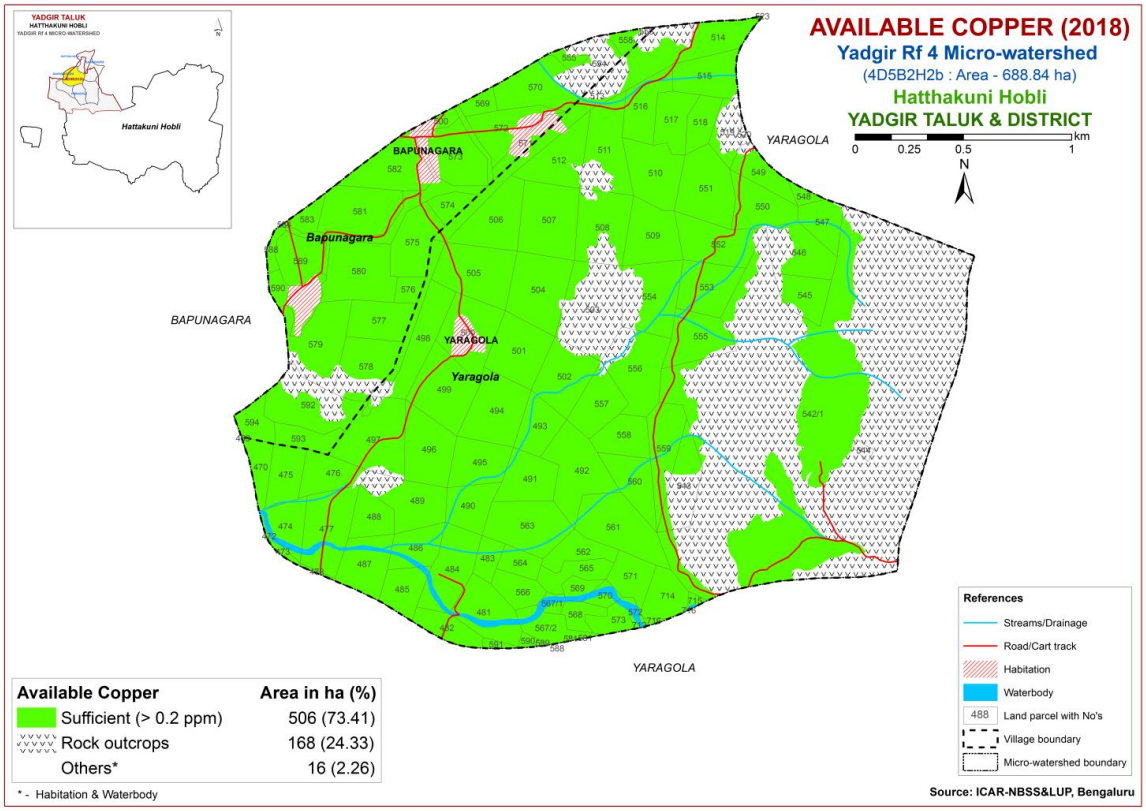


Fig.6.10 Soil Available Copper map of Yadgir Rf4 Microwatershed

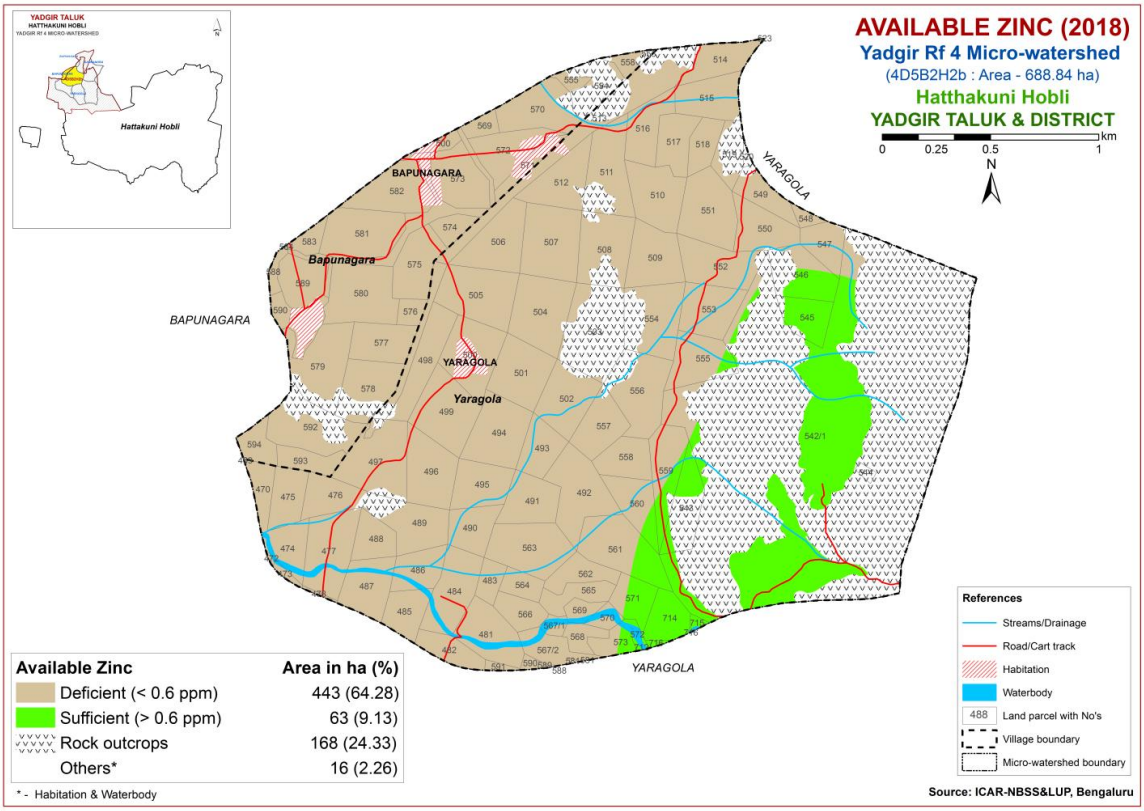


Fig.6.11 Soil Available Zinc map of Yadgir Rf4 Microwatershed

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Yadgir Rf4 microwatershed were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The soil and land characteristics were matched with the crop requirement to arrive at the crop suitability. The soil and land characteristics (Table 7.1) table and crop requirement tables (Tables 7.2 to 7.30) 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, 'w' for drainage, 's' for sodium and 'z' for calcareousness. 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 29 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 Tumakuru districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatershed and a land suitability map for growing sorghum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershed are given in Figure 7.1.

Highly suitable (Class S1) lands for growing sorghum occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An

area of about 67 ha (10%) is moderately suitable (Class S2) for growing sorghum and is distributed in the northern, southwestern and southern part of the microwatershed with minor limitations of nutrient availability, calcareousness and texture. An area of about 225 ha (33%) is marginally suitable (Class S3) for growing sorghum and are distributed in the central, western, northwestern and northern part of the microwatershed with moderate limitations texture, calcareousness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 181 ha (26%) and are distributed in the eastern, southern, southwestern and southeastern part of the microwatershed with severe limitation of rooting depth.

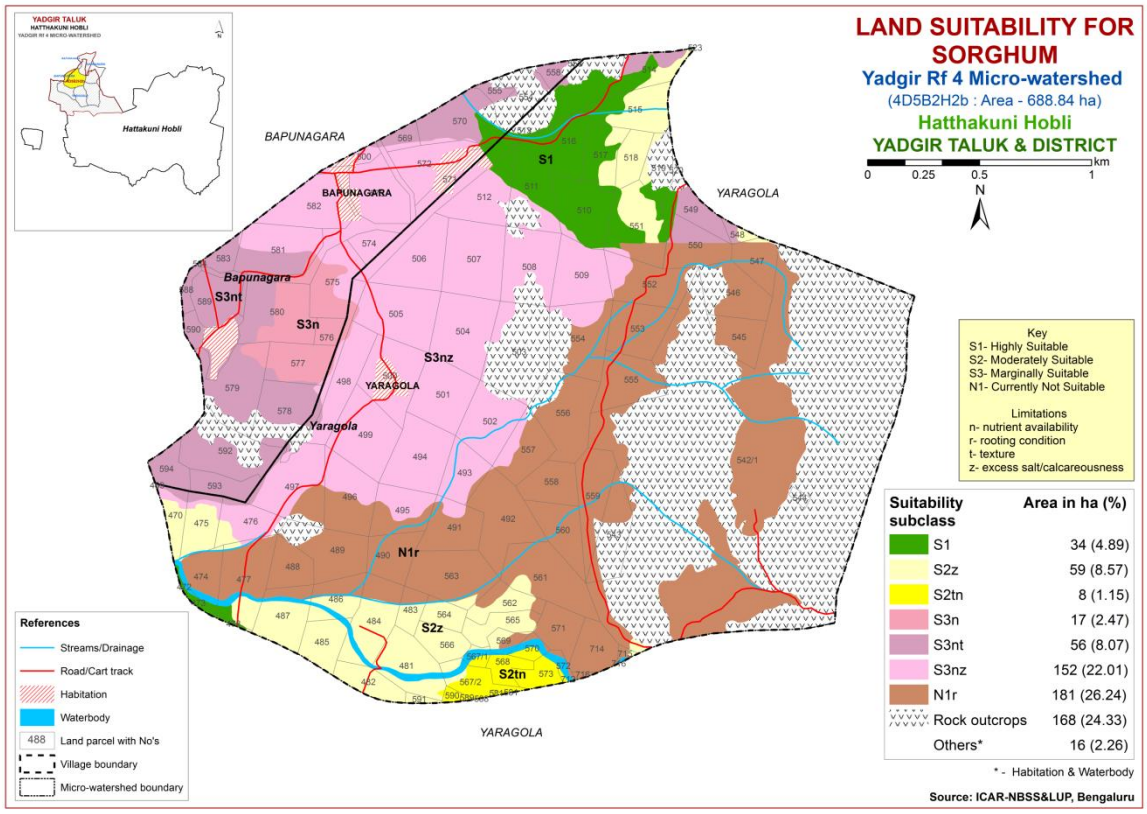


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

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

Highly suitable (Class S1) lands for growing maize occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 67 ha (10%) is moderately suitable (Class S2) for growing maize and is distributed in the northern, southwestern and southern part of the microwatershed with

minor limitations of nutrient availability, calcareousness and texture. An area of about 225 ha (33%) is marginally suitable (Class S3) for growing maize and are distributed in the central, western, northwestern and northern part of the microwatershed with moderate limitations texture, calcareousness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 181 ha (26%) and are distributed in the eastern, southern, southwestern and southeastern part of the microwatershed with severe limitation of rooting depth.

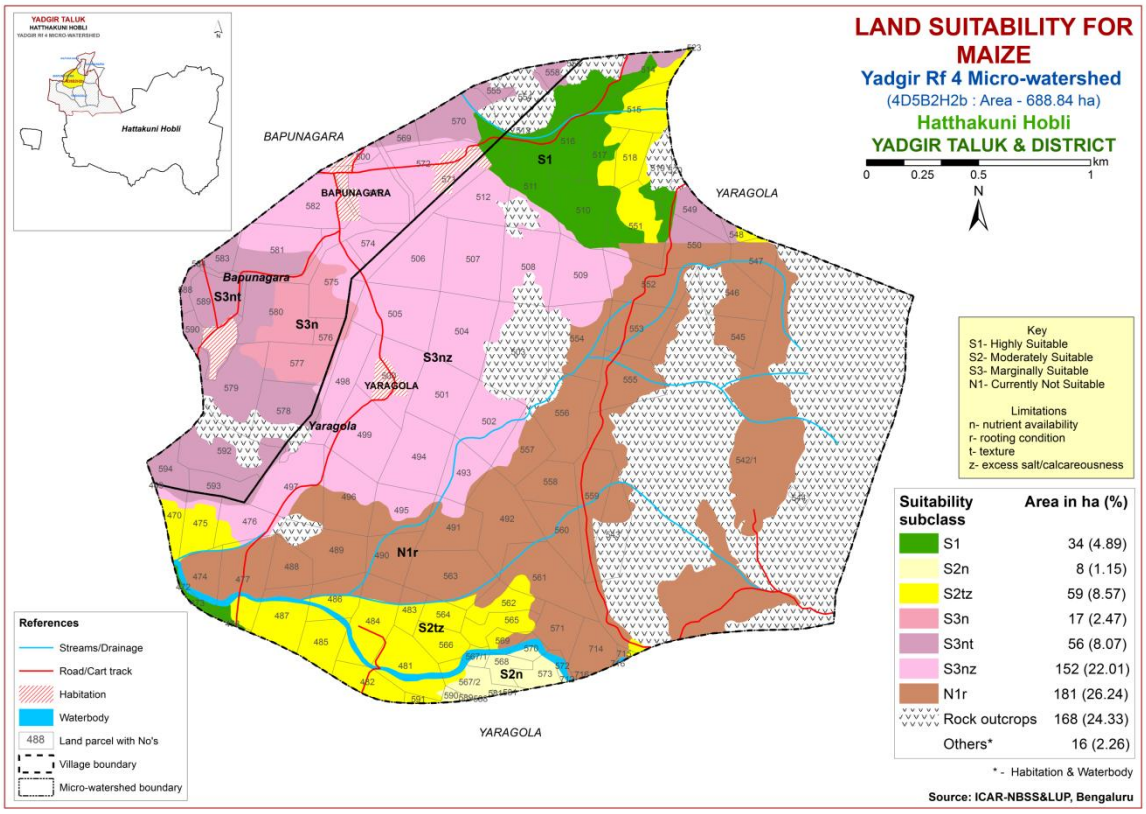


Fig. 7.2 Land Suitability map of Maize

7.3 Land Suitability for Bajra (*Pennisetum glaucum)*

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

Highly suitable (Class S1) lands for growing bajra occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 67 ha (10%) is moderately suitable (Class S2) for growing bajra and is distributed in the northern, southwestern and southern part of the microwatershed with minor limitations of nutrient availability, calcareousness and texture. An area of about 225 ha (33%) is marginally suitable (Class S3) for growing bajra and are distributed in the central, western, northwestern and northern part of the microwatershed with moderate

limitations texture, calcareousness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 181 ha (26%) and are distributed in the eastern, southern, southwestern and southeastern part of the microwatershed with severe limitation of rooting depth.

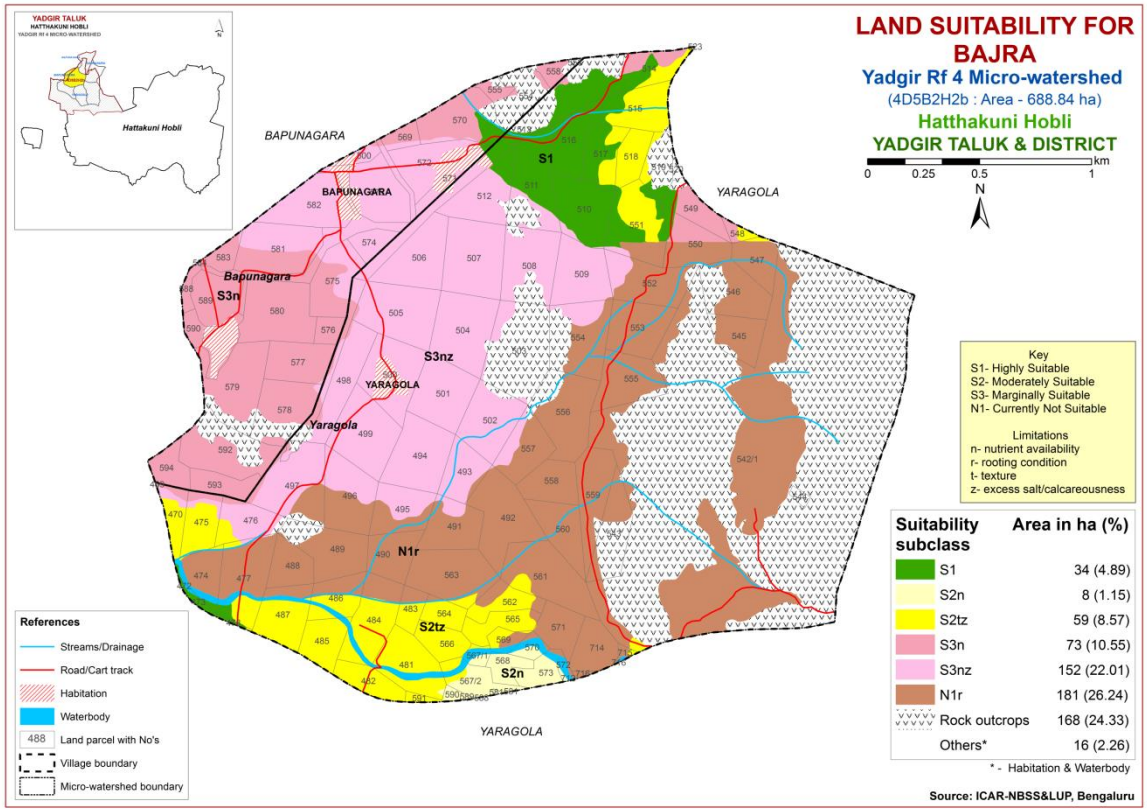


Fig. 7.3 Land Suitability map of Bajra

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

An area of about 34 ha (5%) is moderately suitable (Class S2) for growing groundnut and is distributed in the southwestern and northern part of the microwatershed with minor limitation of texture. An area of about 67 ha (10%) is marginally suitable (Class S3) for growing groundnut and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of calcareousness and texture. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

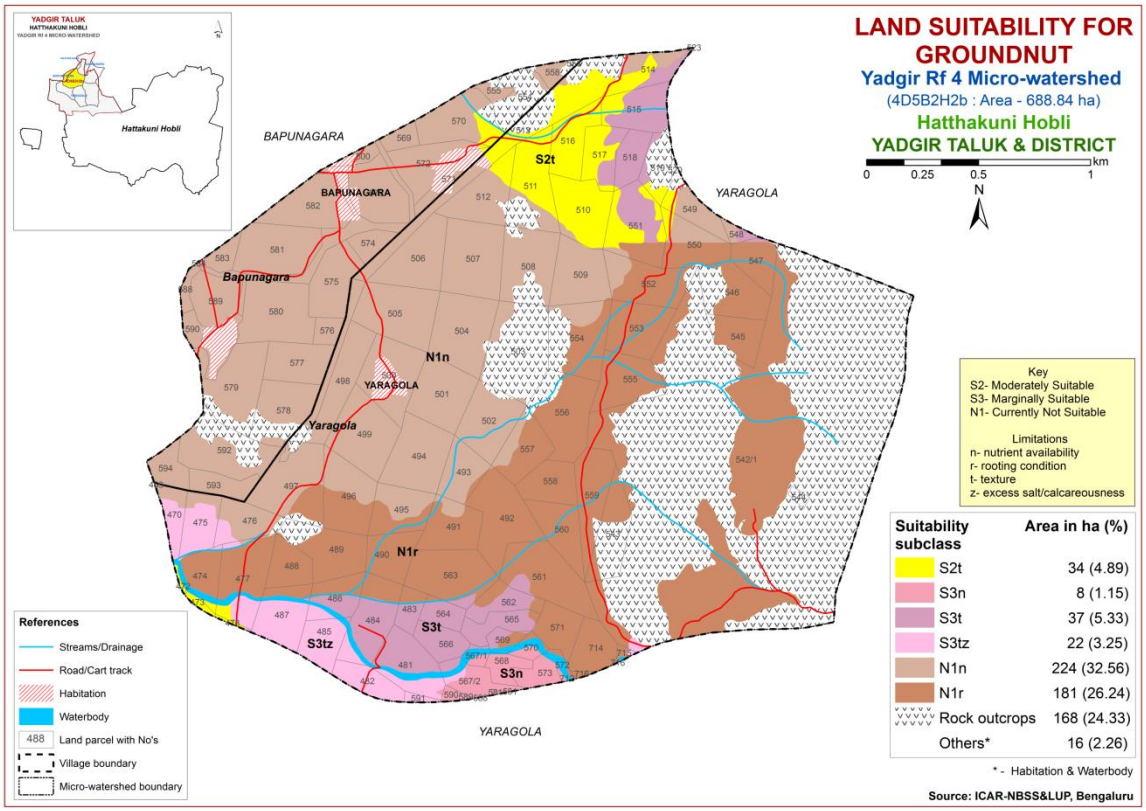


Fig. 7.4 Land Suitability map of Groundnut

7.5 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 4.1 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 93 ha (13%) is moderately suitable (Class S2) for growing sunflower and is distributed in the southern, southwestern and northern part of the microwatershed with minor limitations of calcareousness and rooting depth. An area of about 8 ha (1%) is marginally suitable (Class S3) and is distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

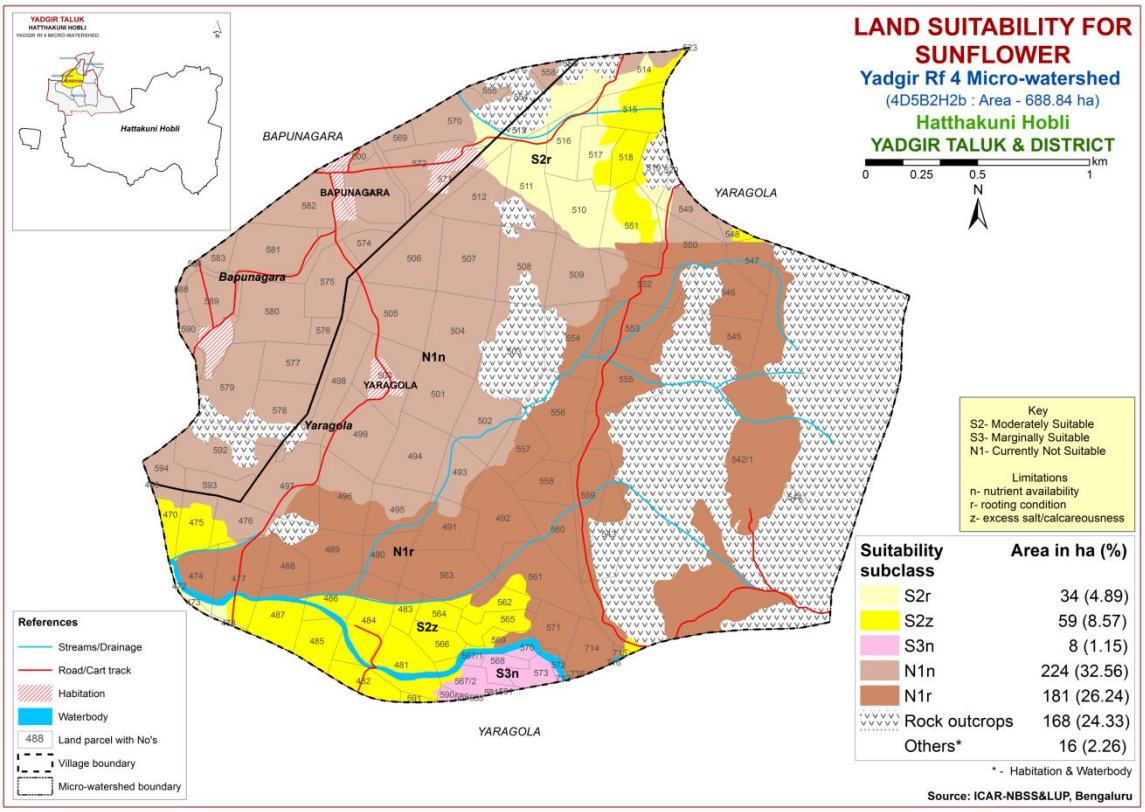


Fig. 7.5 Land Suitability map of Sunflower

7.6 Land Suitability for Red gram (*Cajanus Cajan)*

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

An area of about 101 ha (15%) is moderately suitable (Class S2) for growing redgram and is distributed in the southwestern, southern and northern part of the microwatershed with minor limitations of calcareousness, rooting depth, nutrient availability and texture. An area of about 225 ha (33%) is marginally suitable (Class S3) and is distributed in the southern, southwestern, northern, western, central and northwestern part of the microwatershed with moderate limitations of calcareousness and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 181 ha (26%) and are distributed in the eastern, southern, southwestern and southeastern part of the microwatershed with severe limitation of rooting depth.

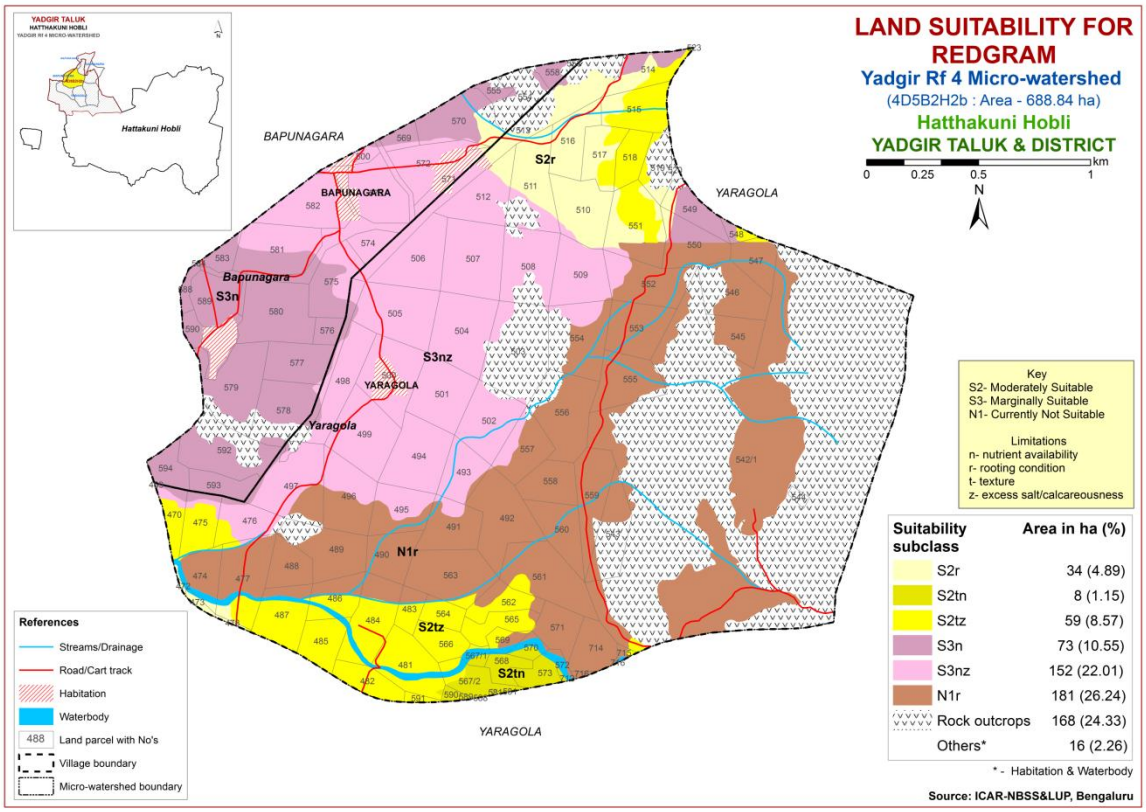


Fig. 7.6 Land Suitability map of Redgram

7.7 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, Kalaburgi, Dharwad, Belgaum and Bellary districts. The crop requirements for growing Bengal gram (Table 7.8) 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 7.7.

An area of about 59 ha (9%) is moderately suitable (Class S2) for growing bengalgram and is distributed in the northern, southern and southwestern part of the microwatershed with minor limitation of calcareousness. An area of about 211 ha (31%) is marginally suitable (Class S3) and is distributed in the southern, southwestern, northern, western, central and northwestern part of the microwatershed with moderate limitations of rooting depth, calcareousness, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 237 ha (34%) and are distributed in the central, southern, eastern, southeastern and northern and western part of the microwatershed with severe limitations of texture and rooting depth.

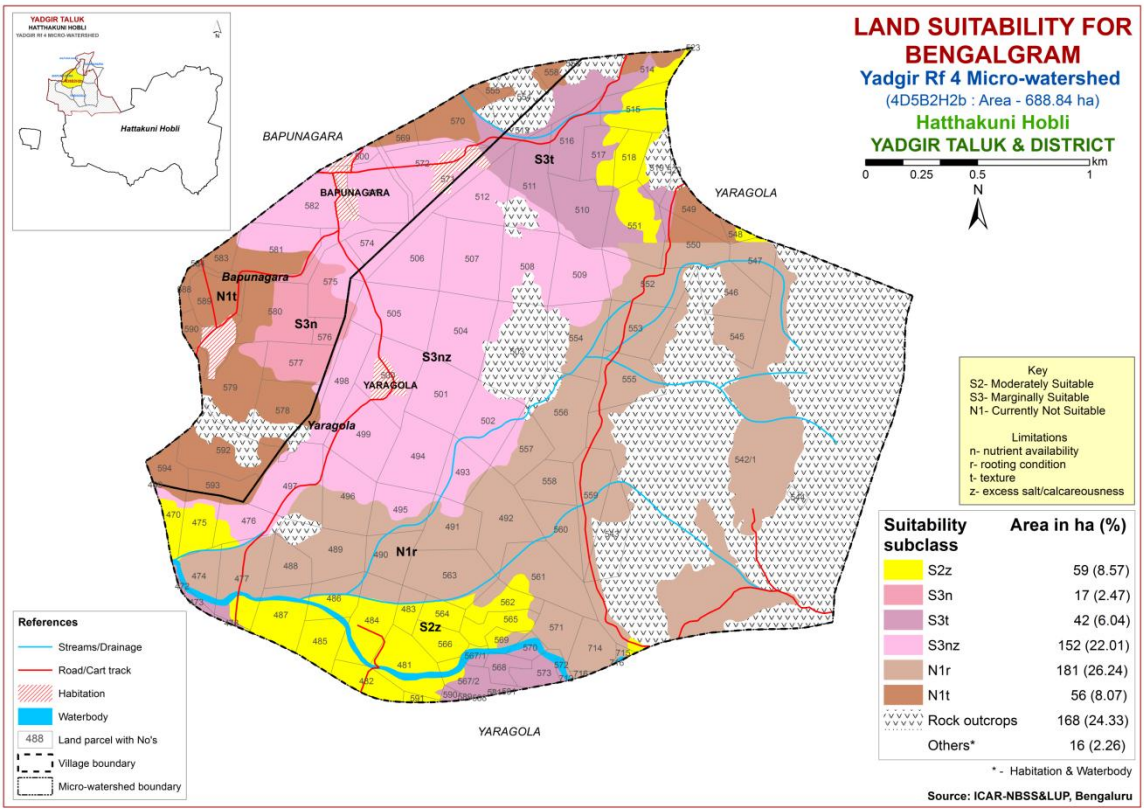


Fig. 7.7 Land Suitability map of Bengal gram

7.8 Land Suitability for Cotton (*Gossypium hirsutum*)

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

An area of about 93 ha (13%) is moderately suitable (Class S2) for growing cotton and is distributed in the southern, northern and southwestern part of the microwatershed with minor limitations of calcareousness and rooting depth. An area of about 177 ha (26%) is marginally suitable (Class S3) and is distributed in the southern, southwestern, northern, western, central and northwestern part of the microwatershed with moderate limitations of calcareousness, texture and nutrient availability. Currently not suitable (Class N1) lands occur in an area of 237 ha (34%) and are distributed in the central, southern, eastern, southeastern and northern and western part of the microwatershed with severe limitations of texture and rooting depth.

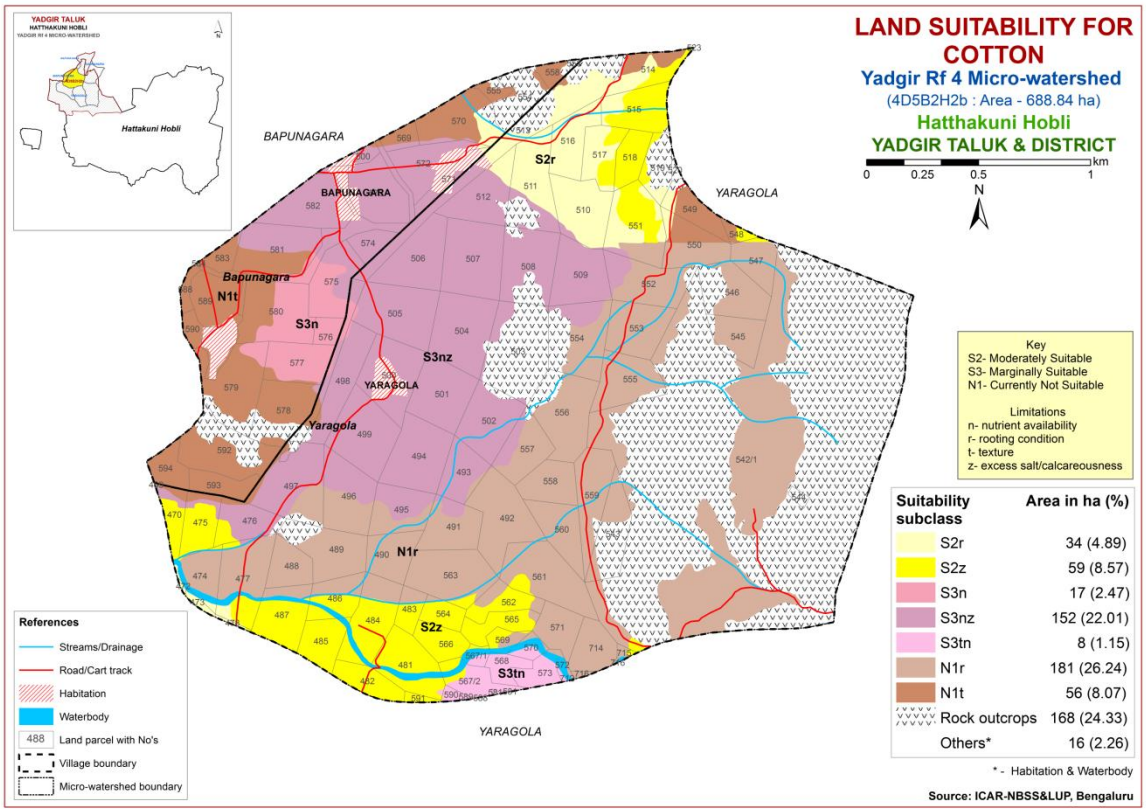


Fig. 7.8 Land Suitability map of Cotton

7.9 Land Suitability for Chilli (*Capsicum annuum)*

Chilli is one of the most important spice crop grown in about 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) and a land suitability map for growing chilli was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.9.

Highly suitable (Class S1) lands for growing chilli occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing chilli and is distributed in the northern, southern and southwestern part of the microwatershed with minor limitations of calcareousness and texture. Marginally suitable lands (Class S3) for growing chilli occupy an area of about 8 ha (1%) and are distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of nutrient availability and rooting depth.

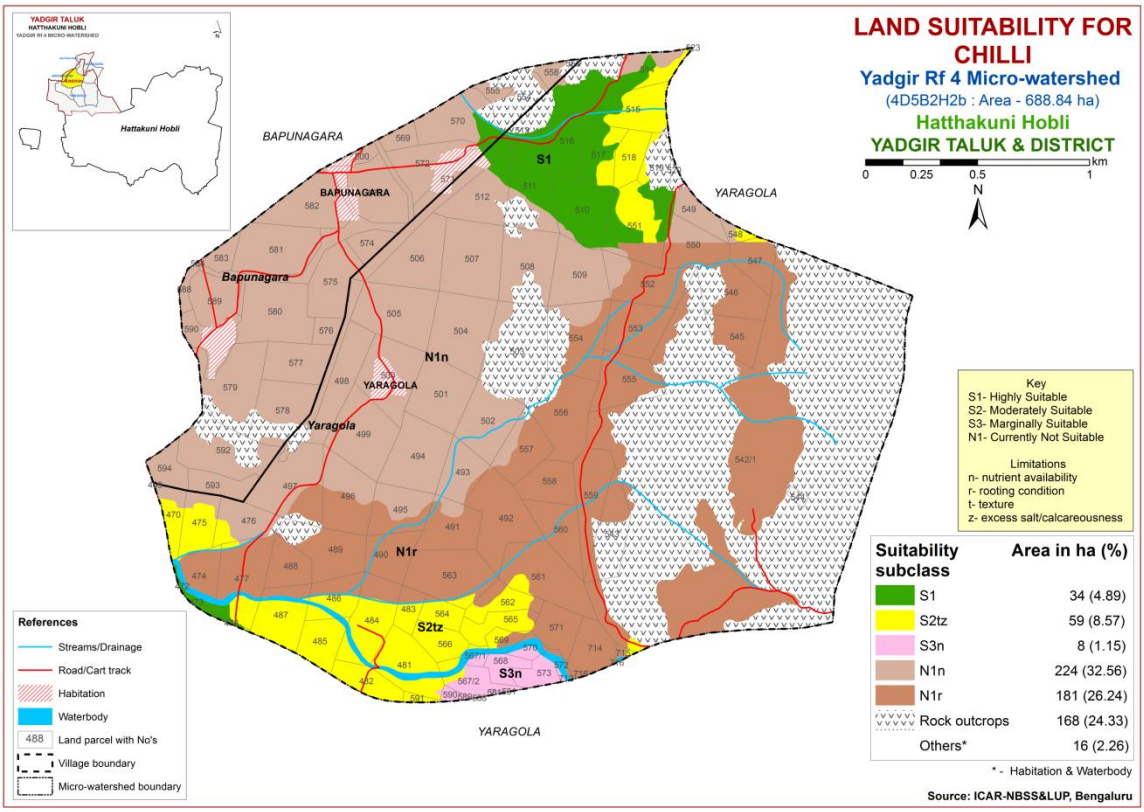


Fig 7.9 Land Suitability map of Chilli

7.10 Land Suitability for Tomato *(Lycopersicon esculentum)*

Tomato is one of the most important vegetable crop grown in about 0.61 lakh ha covering almost all the district of the state. The crop requirements for growing tomato (Table 7.11) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.10.

Highly suitable (Class S1) lands for growing tomato occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 67 ha (10%) is marginally suitable (Class S3) for growing tomato and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of calcareousness and texture. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

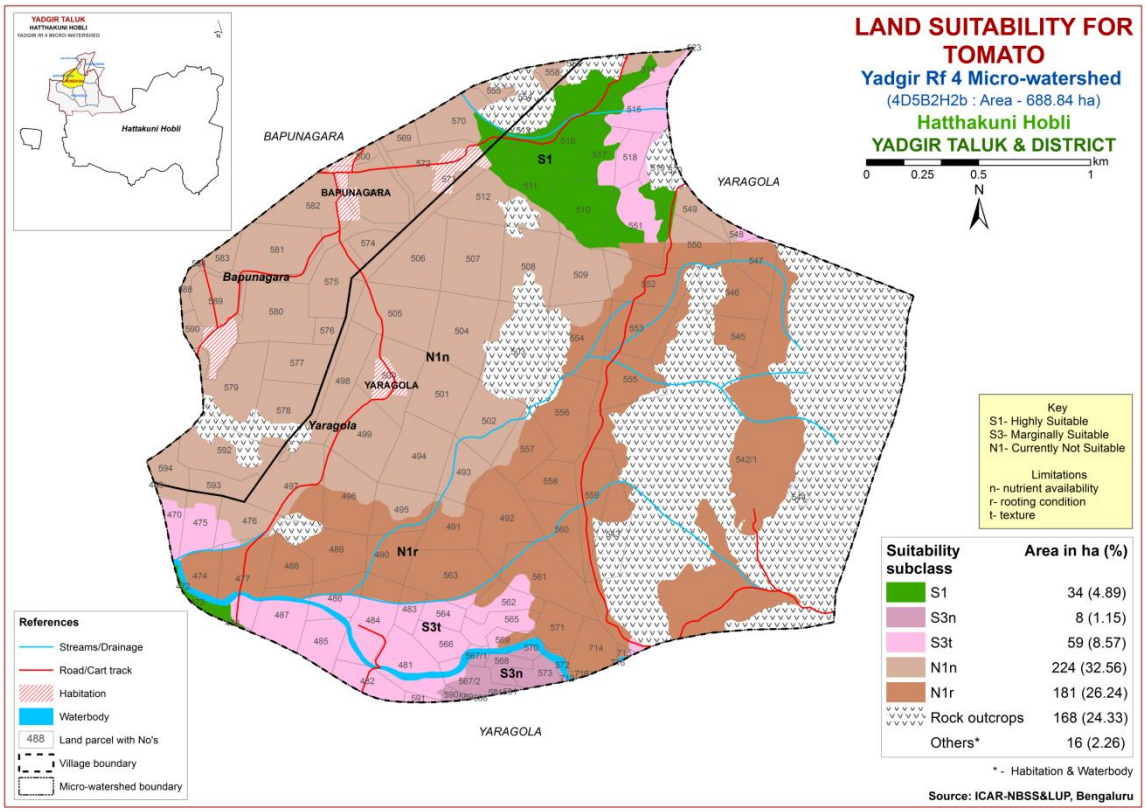


Fig 7.10 Land Suitability map of Tomato

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 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 67 ha (10%) is marginally suitable (Class S3) for growing brinjal and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations nutrient availability and texture. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

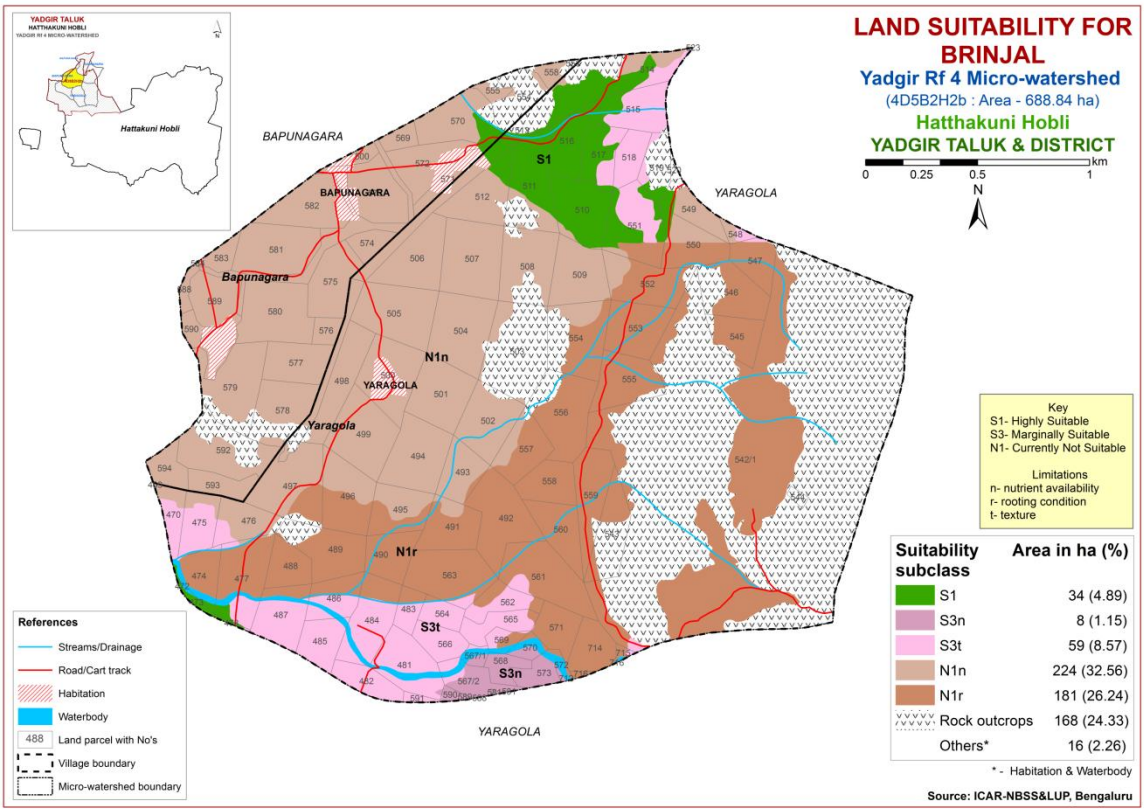


Fig 7.11 Land Suitability map of Brinjal

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 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing onion and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of calcareousness and texture. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitation of rooting depth and nutrient availability.

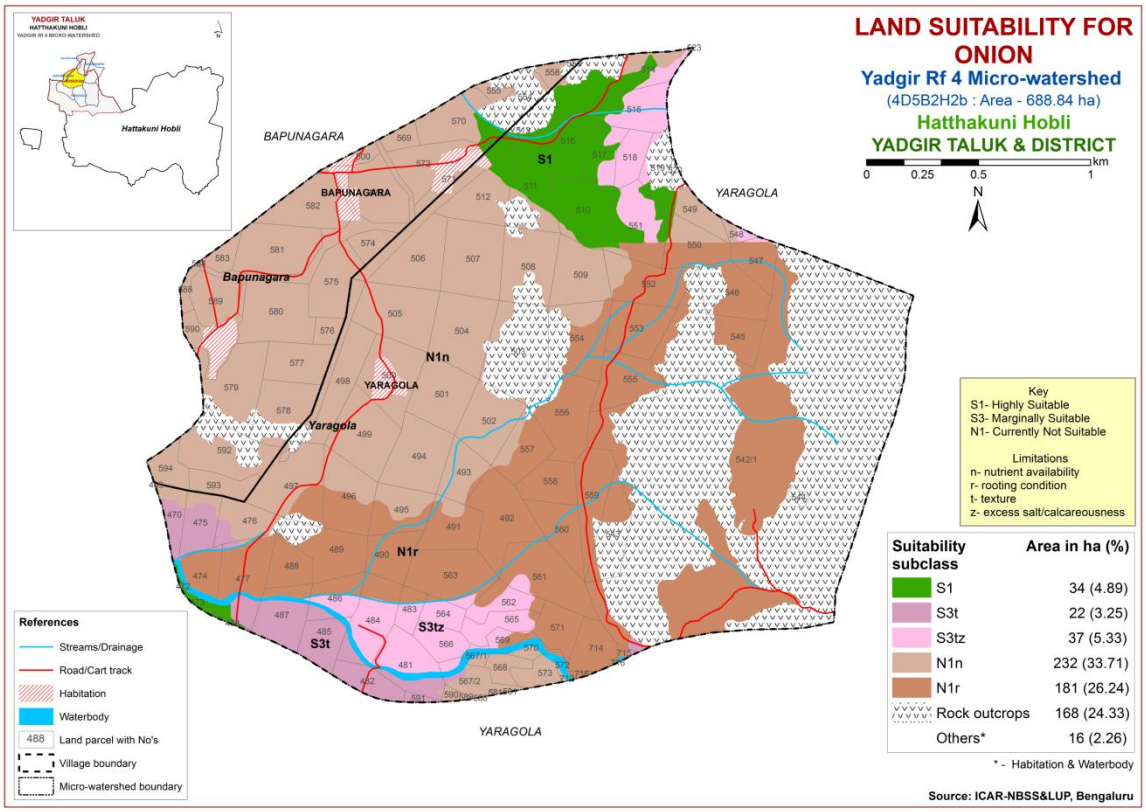


Fig 7.12 Land Suitability map of Onion

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 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing bhendi and is distributed in the northern, southern and southwestern part of the microwatershed with minor limitations of calcareousness and texture. Marginally suitable lands (Class S3) for growing bhendi occupy an area of about 8 ha (1%) and are distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of nutrient availability and rooting depth.

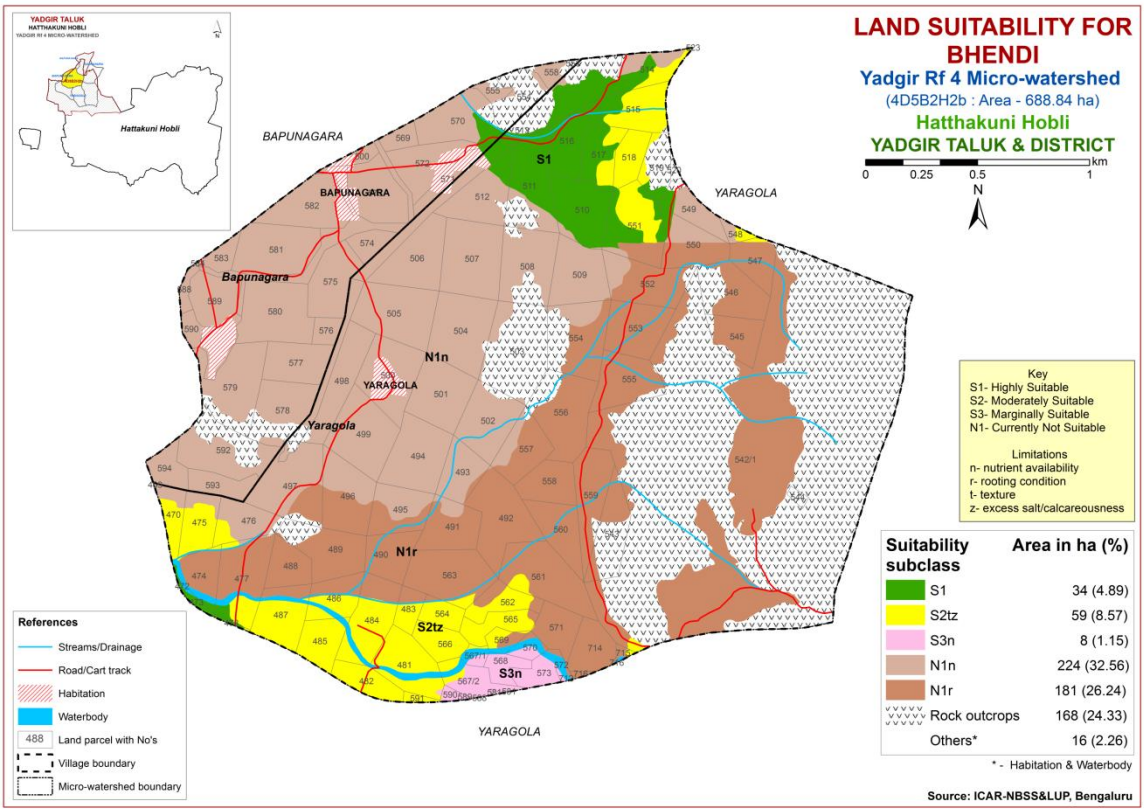


Fig 7.13 Land Suitability map of Bhendi

7.14 Land Suitability for Drumstick (*Moringa oleifera*)

Drumstick is one of the most important vegetable crop grown in about 2403 ha 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 34 ha (5%) is moderately suitable (Class S2) for growing drumstick and is distributed in the southwestern and northern part of the microwatershed with minor limitation of rooting depth. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing drumstick and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitation of calcareousness. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

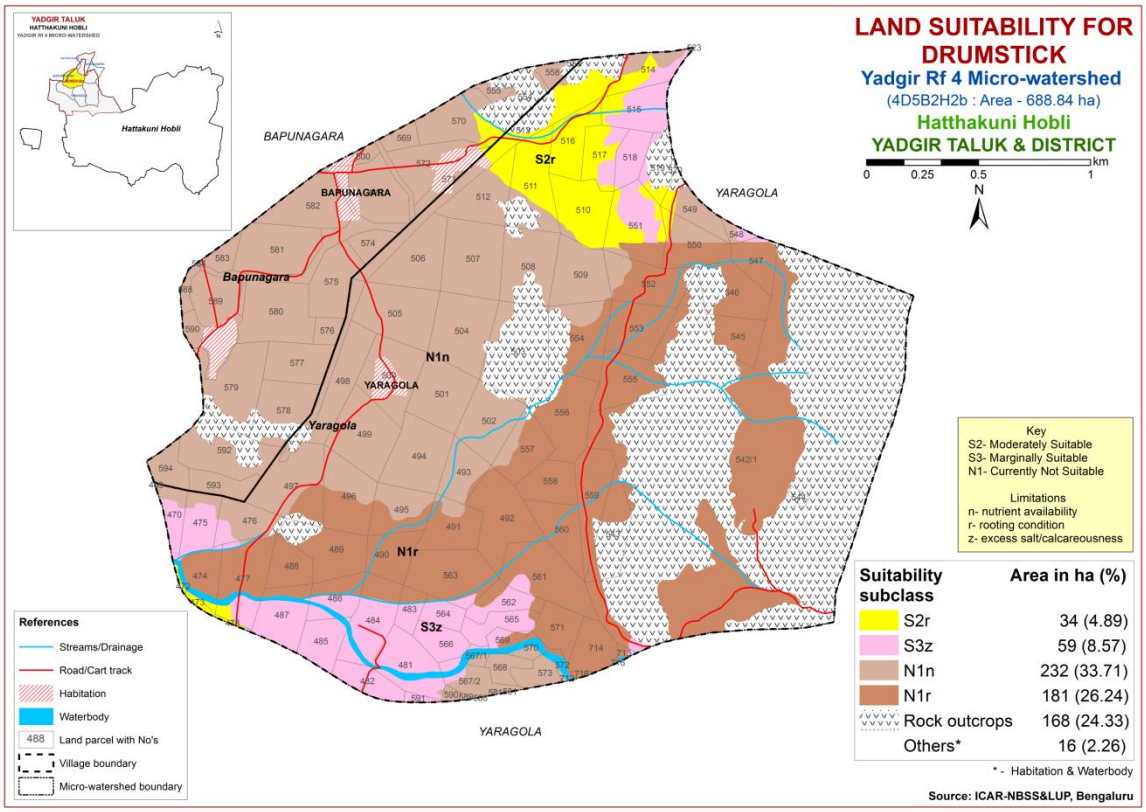


Fig 7.14 Land Suitability map of Drumstick

7.15 Land Suitability for Mango (*Mangifera indica*)

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

An area of about 101 ha (15%) is marginally suitable (Class S3) and is distributed in the northern, southern and western part of the microwatershed with moderate limitations of nutrient availability, rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

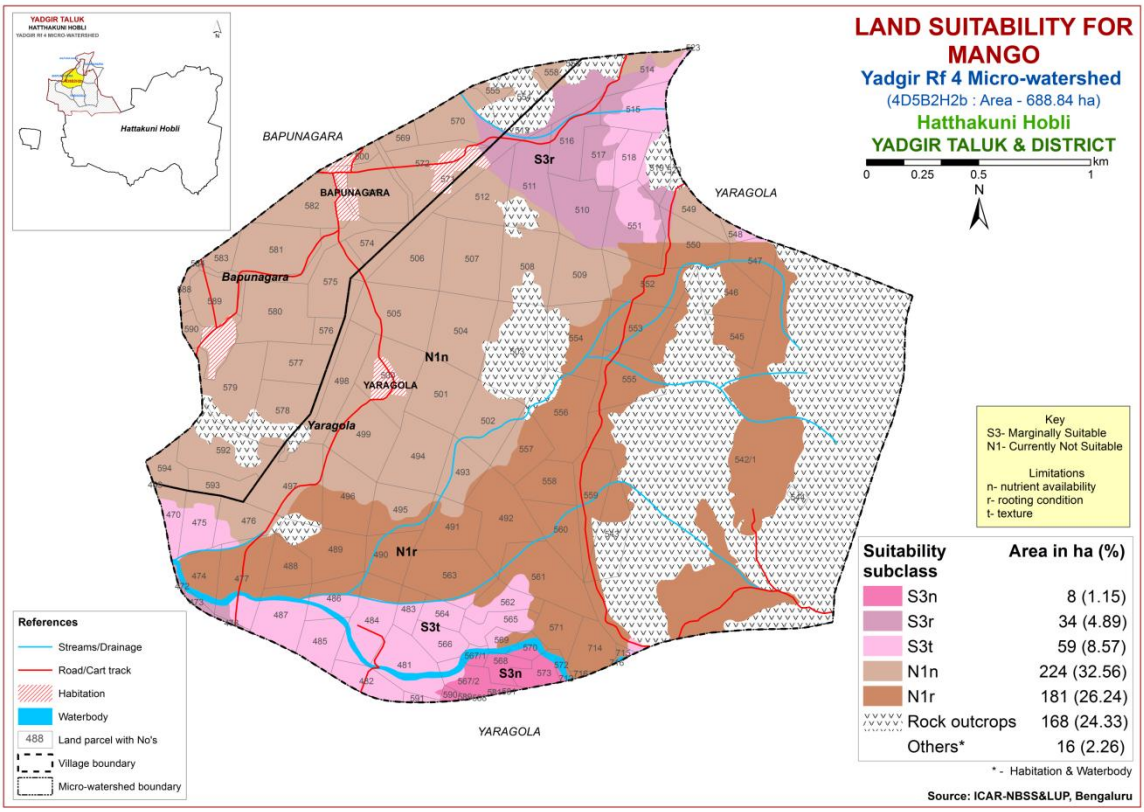


Fig. 7.15 Land Suitability map of Mango

7.16 Land Suitability for Guava (*Psidium guajava*)

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

An area of about 34 ha (5%) is moderately suitable (Class S2) for growing guava and is distributed in the southwestern and northern part of the microwatershed with minor limitation of rooting depth. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing guava and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of texture and calcareousness. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

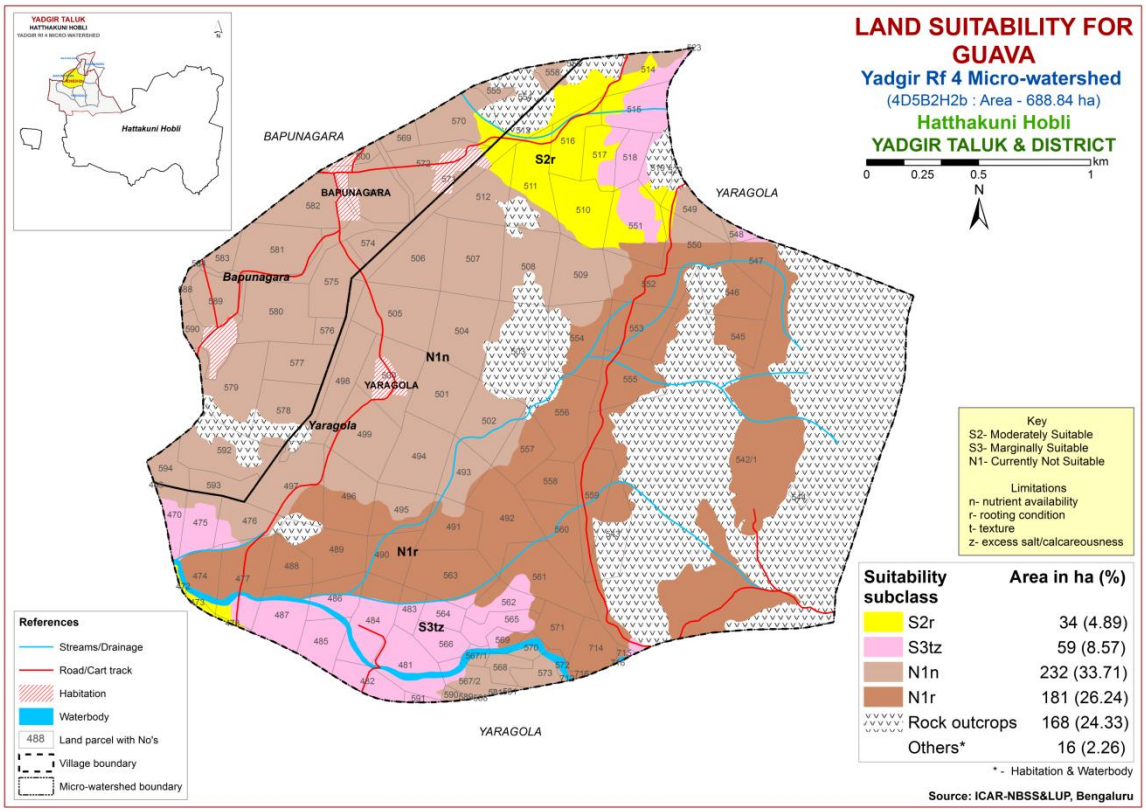


Fig. 7.16 Land Suitability map of Guava

7.17 Land Suitability for Sapota (*Manilkara zapota*)

Sapota is one of the most important fruit crop grown in an area of 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 geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.17.

An area of about 34 ha (5%) is moderately suitable (Class S2) for growing sapota and is distributed in the southwestern and northern part of the microwatershed with minor limitation of rooting depth. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing sapota and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of nutrient availability and texture. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

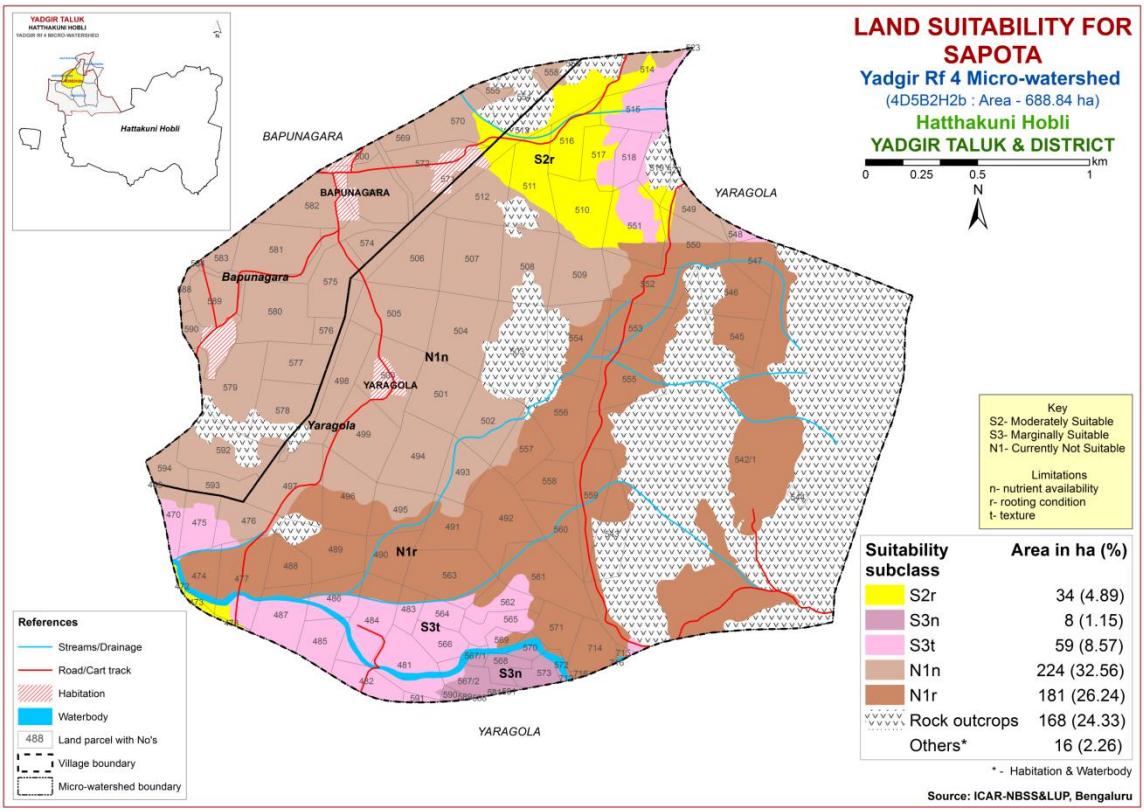


Fig. 7.17 Land Suitability map of Sapota

7.18 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the most important fruit crop commercially grown 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) and a land suitability map for growing pomegranate was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.18.

An area of about 93 ha (13%) is moderately suitable (Class S2) for growing pomegranate and is distributed in the southern, southwestern and northern part of the microwatershed with minor limitations of calcareousness, texture and rooting depth. An area of about 8 ha (1%) is marginally suitable (Class S3) and is distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

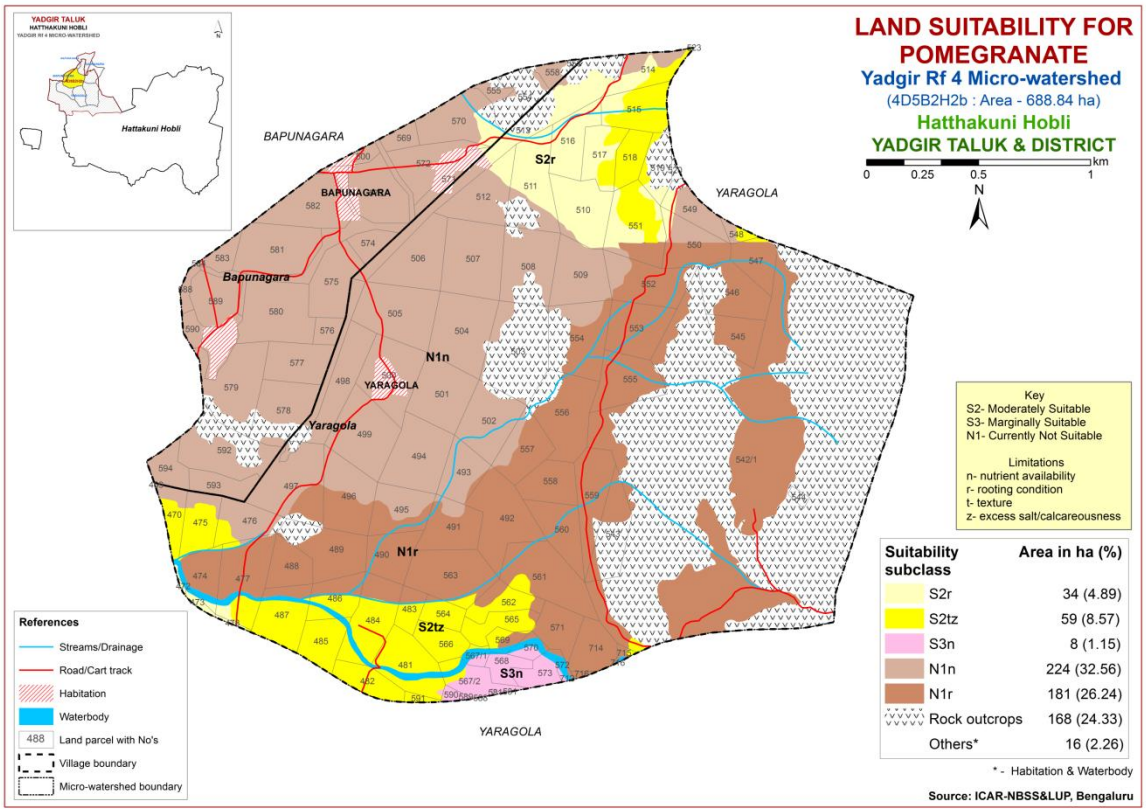


Fig 7.18 Land Suitability map of Pomegranate

7.19 Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the important fruit crop grown in an area of 3446 ha in almost all the districts of the State. The crop requirements for growing musambi (Table 7.20) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.19.

An area of about 93 ha (13%) is moderately suitable (Class S2) for growing musambi and is distributed in the southern, southwestern and northern part of the microwatershed with minor limitations of calcareousness and rooting depth. An area of about 8 ha (1%) is marginally suitable (Class S3) and is distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

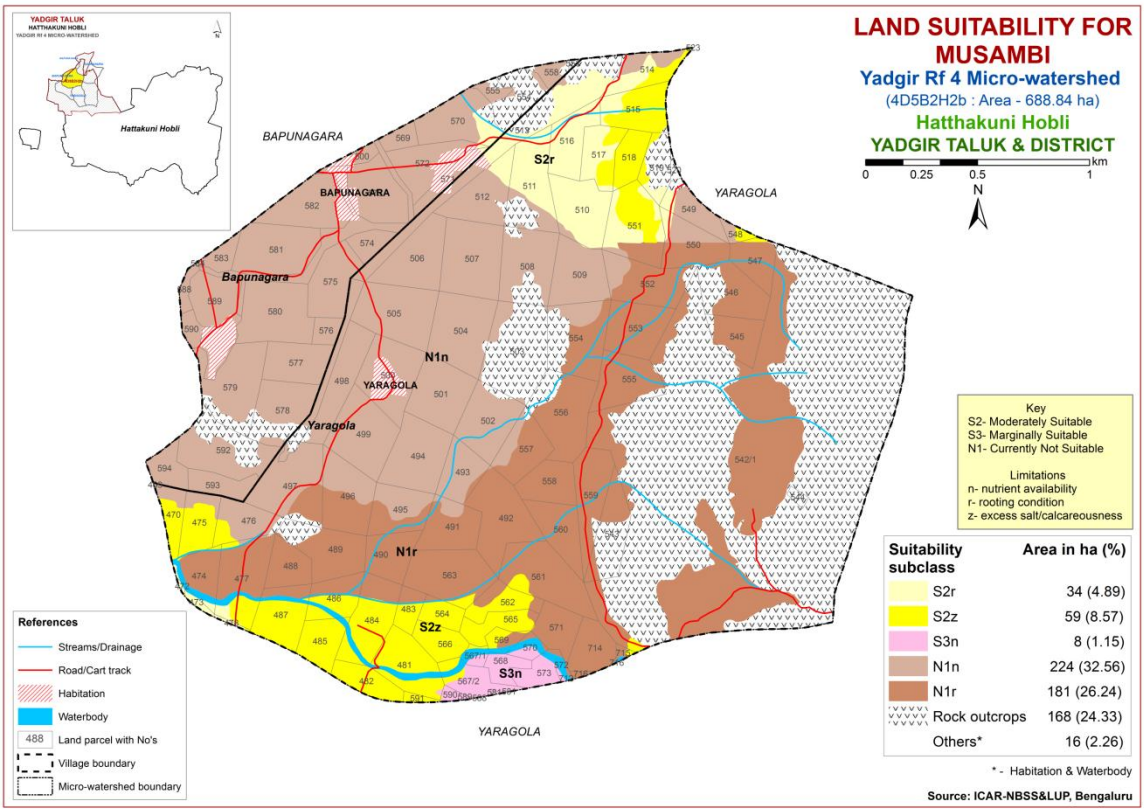


Fig. 7.19 Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 0.11 lakh ha in almost all the districts of the State. The crop requirements for growing lime (Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7. 20.

An area of about 93 ha (13%) is moderately suitable (Class S2) for growing lime and is distributed in the southern, southwestern and northern part of the microwatershed with minor limitations of calcareousness and rooting depth. An area of about 8 ha (1%) is marginally suitable (Class S3) and is distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

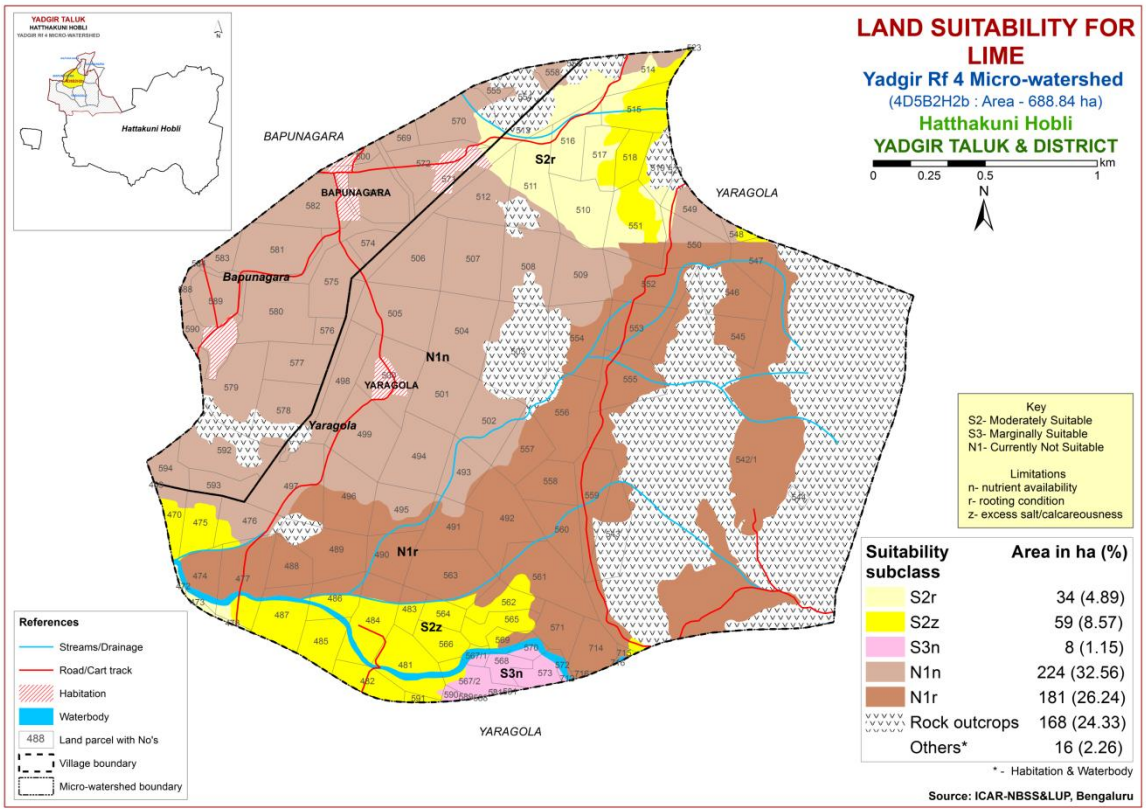


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the medicinal fruit crop grown in almost all the districts of the State. The crop requirements for growing amla (Table 7.22) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.21.

Highly suitable (Class S1) lands for growing amla occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing amla and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitation calcareousness. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitation of rooting depth and nutrient availability.

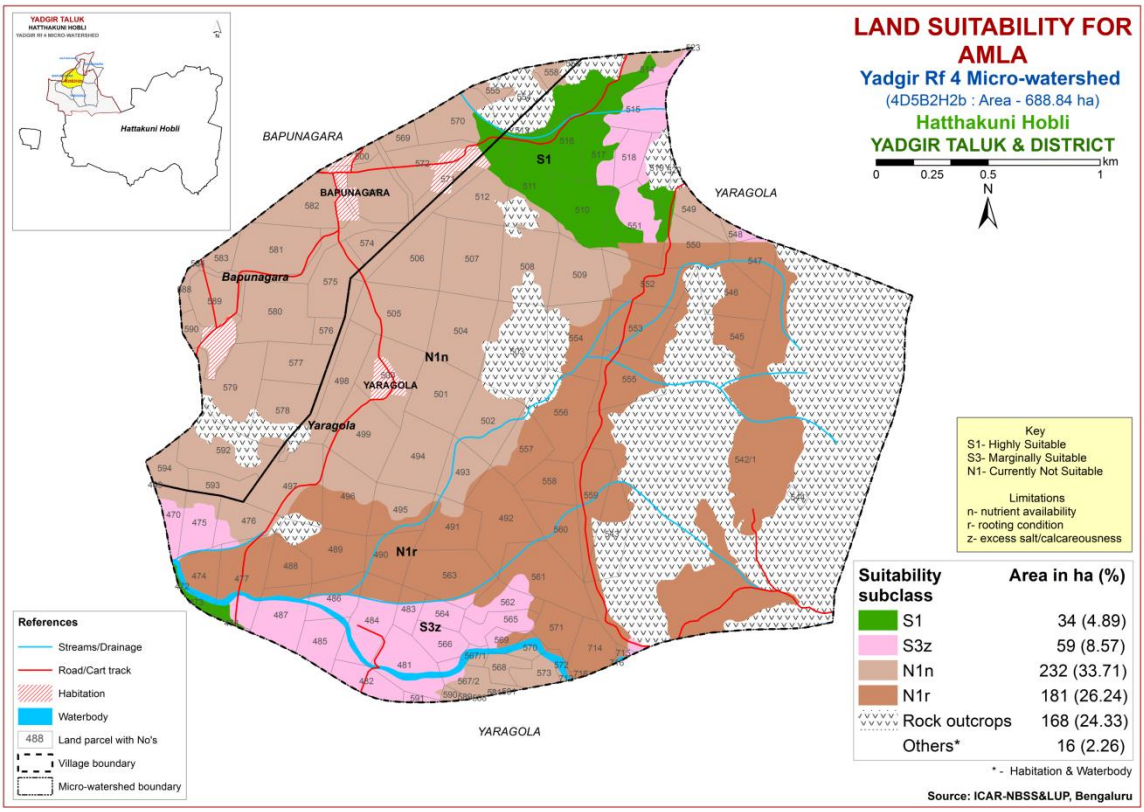


Fig. 7.21 Land Suitability map of Amla

7.22 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important plantation nut crop grown in an area of 0.7 lakh ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.23) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.22.

An area of about 34 ha (5%) is marginally suitable (Class S3) for growing cashew and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitation nutrient availability. Currently not suitable (Class N1) lands occur in an area of 472 ha (69%) and are distributed in the major part of the microwatershed with severe limitation of rooting depth, texture and nutrient availability.

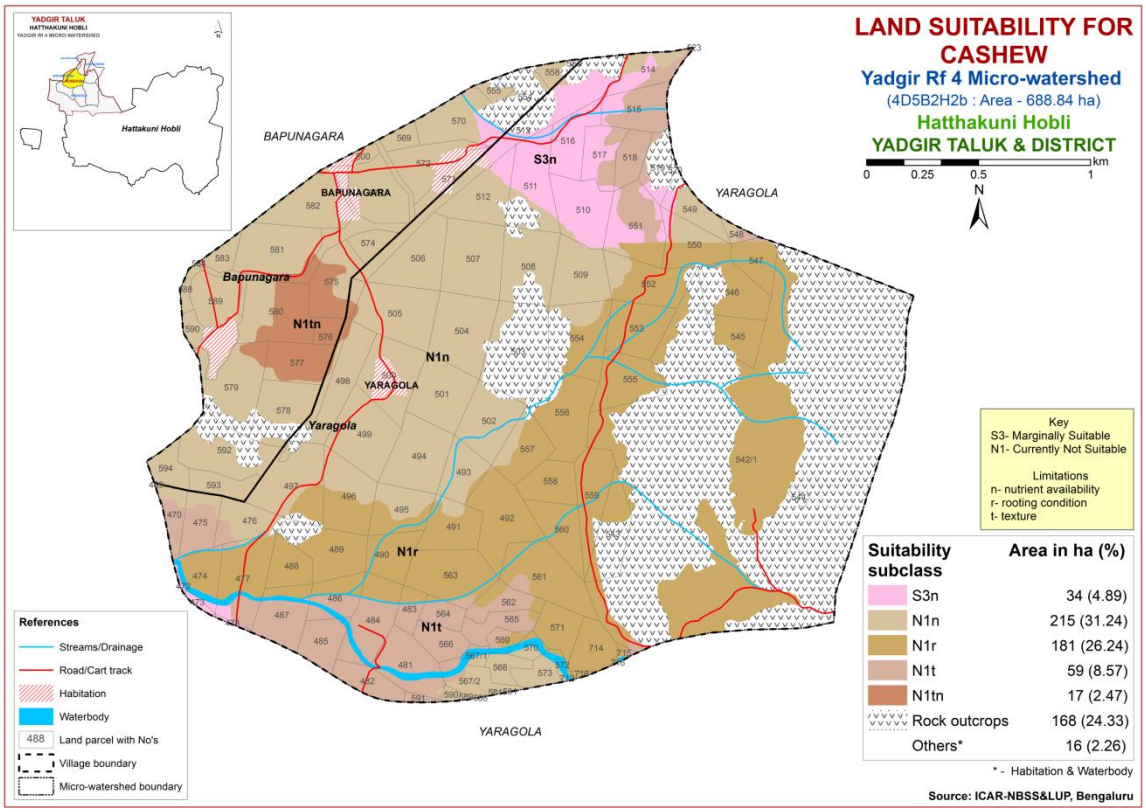


Fig. 7.22 Land Suitability map of Cashew

7. 23 Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is one of the most important fruit crop grown in an area of 5368 ha in almost all the districts of the State. The crop requirements for growing jackfruit (Table 7.24) 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 geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.23.

An area of about 34 ha (5%) is moderately suitable (Class S2) for growing jackfruit and is distributed in the southwestern and northern part of the microwatershed with minor limitation of rooting depth. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing jackfruit and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of calcareousness and texture. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitation of rooting depth and nutrient availability.

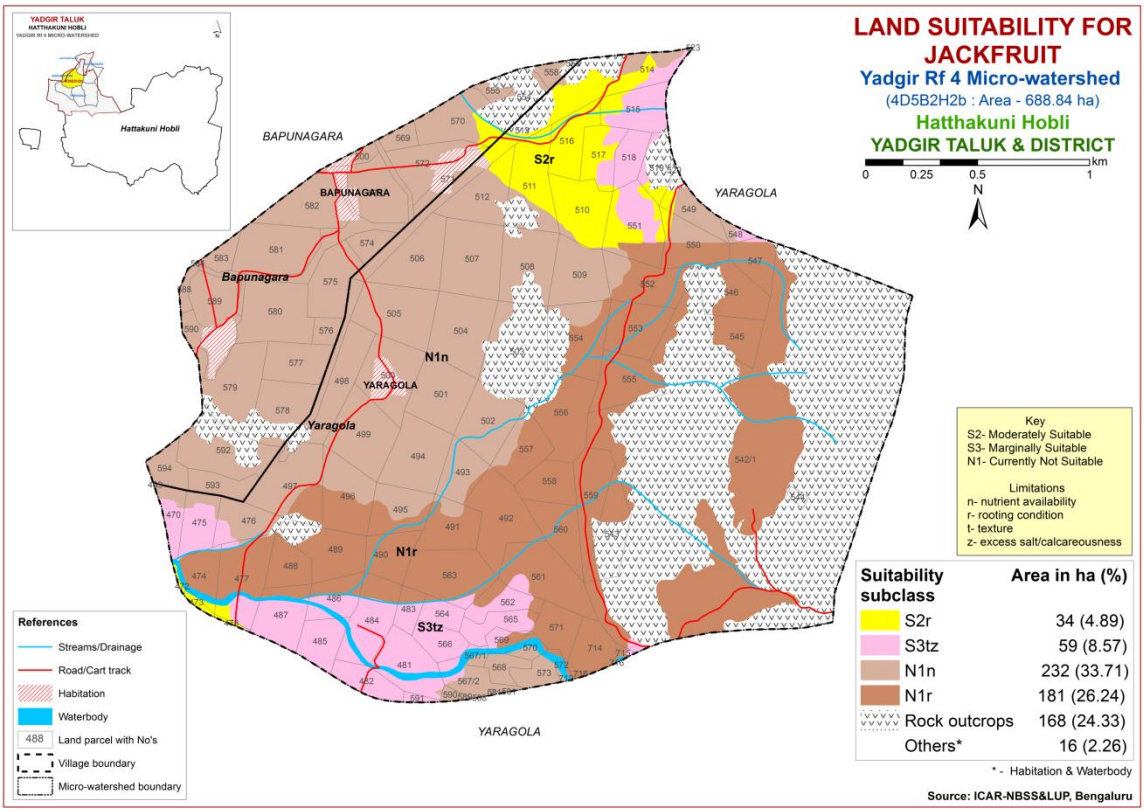


Fig. 7.23 Land Suitability map of Jackfruit

7.24 Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun (Table 25) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.24.

An area of about 93 ha (14%) is marginally suitable (Class S3) and is distributed in the northern, southern and western part of the microwatershed with moderate limitations of nutrient availability, rooting depth and texture. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

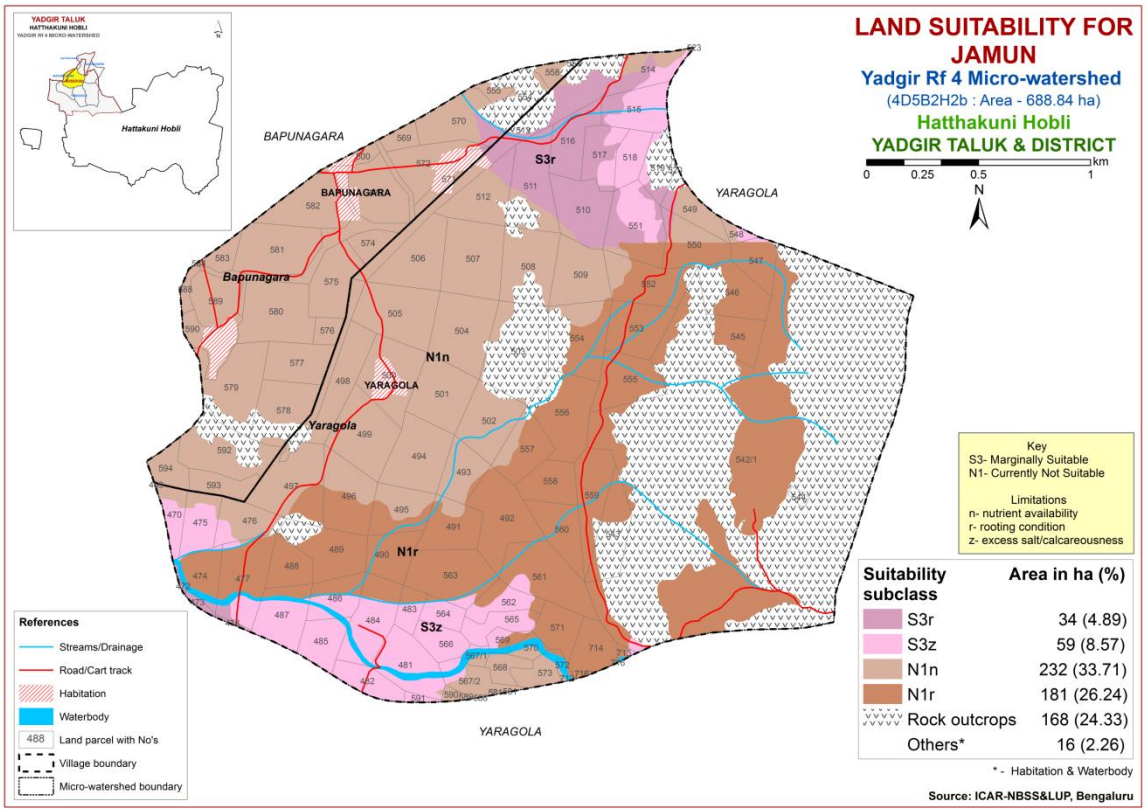


Fig. 7.24 Land Suitability map of Jamun

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

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple (Table7.26) 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 geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.25.

An area of about 93 ha (13%) is moderately suitable (Class S2) for growing custard apple and is distributed in the southern, southwestern and northern part of the microwatershed with minor limitations of calcareousness and rooting depth. An area of about 8 ha (1%) is marginally suitable (Class S3) and is distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

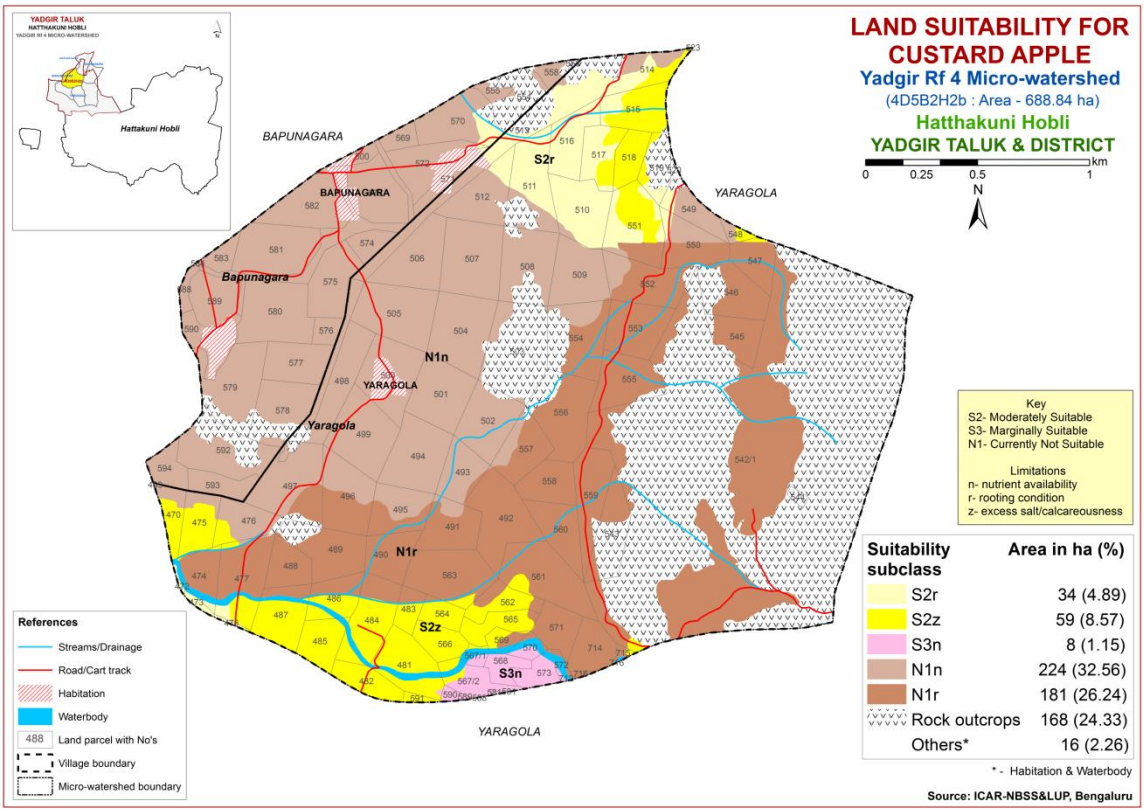


Fig. 7.25 Land Suitability map of Custard Apple

7.26 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in almost all the districts of the state. The crop requirements for growing tamarind (Table 7.27) 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 7.26.

An area of about 93 ha (14%) is marginally suitable (Class S3) and is distributed in the northern, southern and western part of the microwatershed with moderate limitations of nutrient availability and rooting depth. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

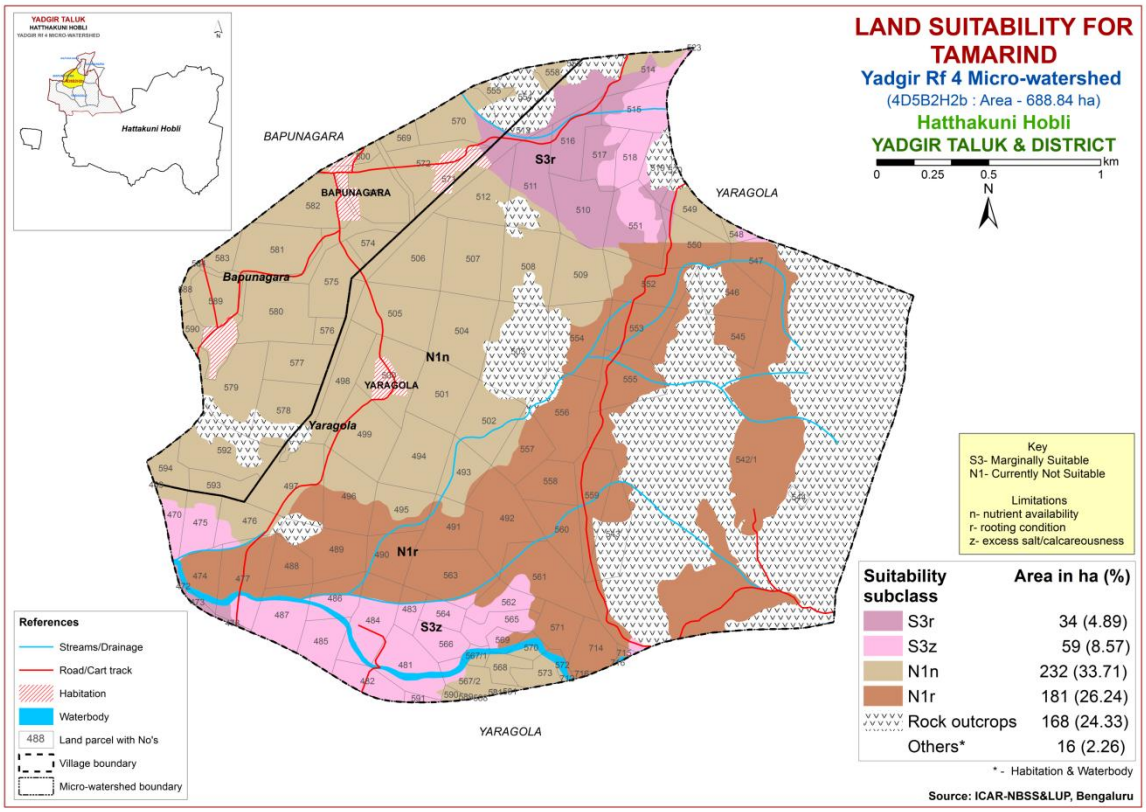


Fig. 7.26 Land Suitability map of Tamarind

7.27 Land Suitability for Mulberry (*Morus nigra*)

Mulberry is one of the important leaf crop grown for rearing silk worms in about 1.6 lakh ha area in all the districts of the state. The crop requirements for growing mulberry (Table 7.28) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershed is given in Figure 7.27.

An area of about 34 ha (5%) is moderately suitable (Class S2) for growing mulberry and is distributed in the southwestern and northern part of the microwatershed with minor limitation of rooting depth. An area of about 59 ha (9%) is marginally suitable (Class S3) for growing guava and is distributed in the southwestern, southern and northern part of the microwatershed with moderate limitations of texture calcareousness. Currently not suitable (Class N1) lands occur in an area of 413 ha (60%) and are distributed in the major part of the microwatershed with severe limitations of rooting depth and nutrient availability.

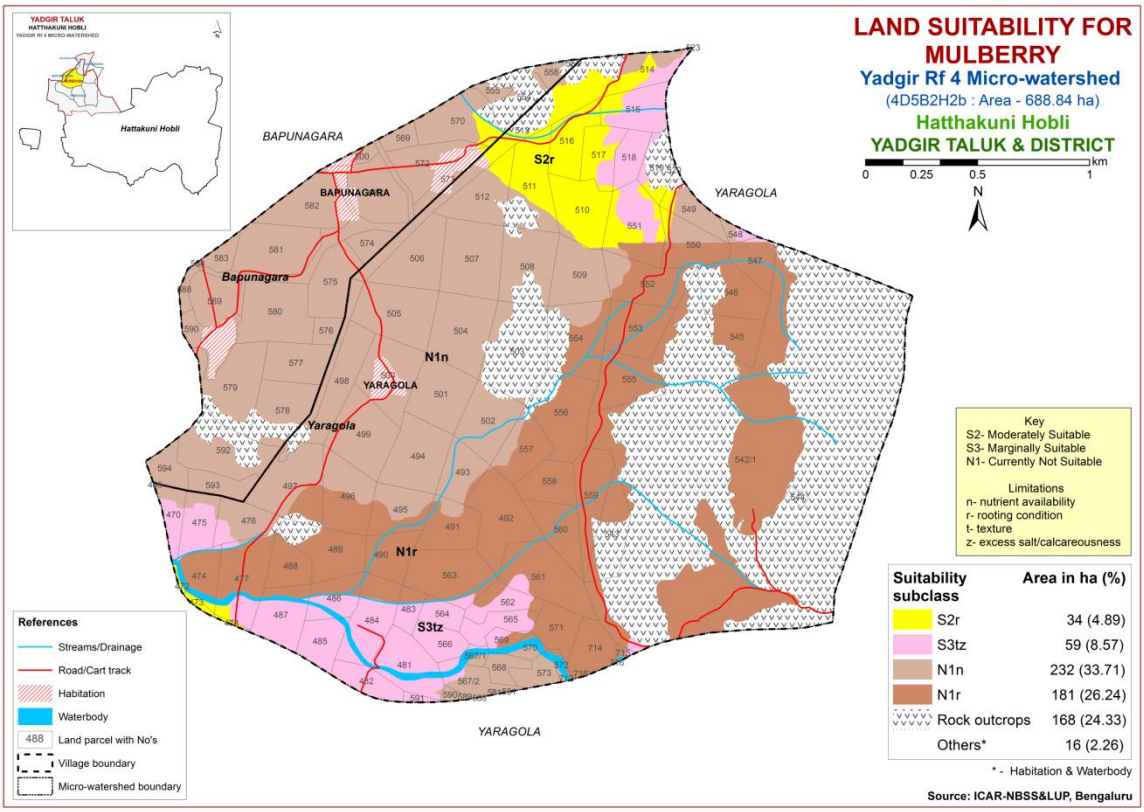


Fig 7.27 Land Suitability map of Mulberry

7.28 Land Suitability for Marigold (*Tagetes sps*.)

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 are given in Figure 7.28.

Highly suitable (Class S1) lands for growing marigold occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing marigold and is distributed in the northern, southern and southwestern part of the microwatershed with minor limitations of calcareousness and texture. Marginally suitable lands (Class S3) for growing marigold occupy an area of about 8 ha (1%) and are distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of nutrient availability and rooting depth.

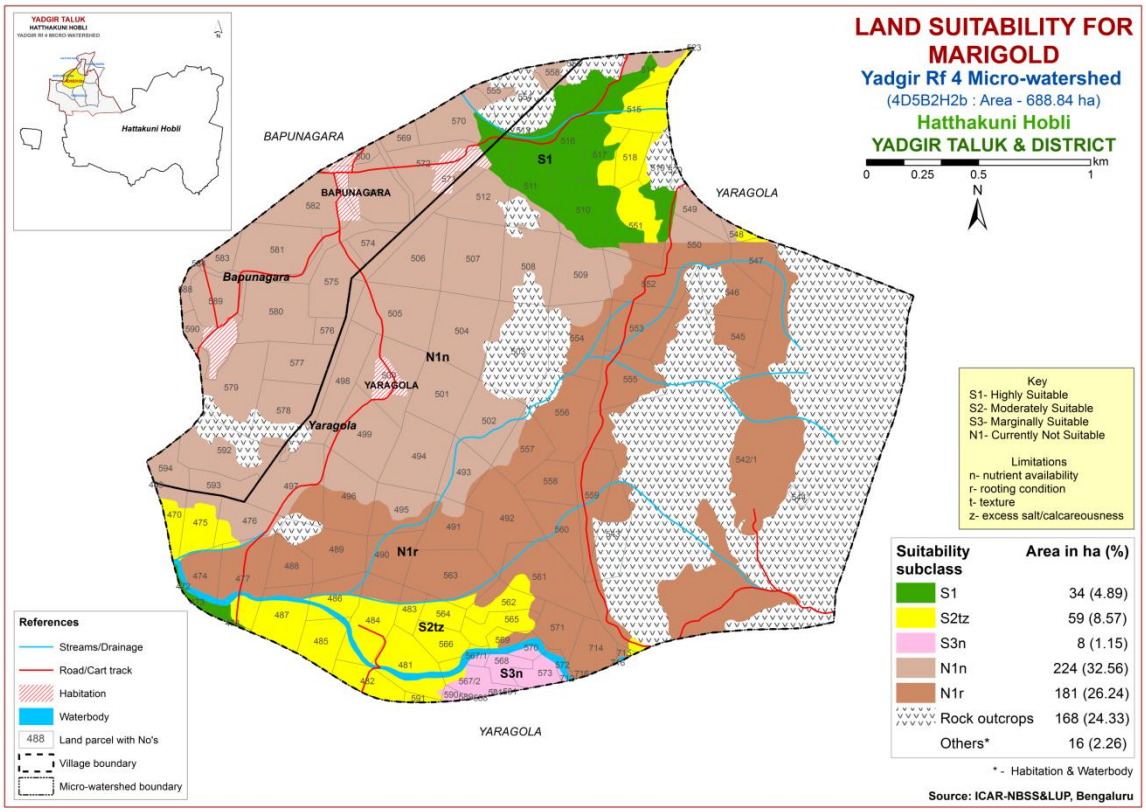


Fig. 7.28 Land Suitability map of Marigold

7.29 Land Suitability for Chrysanthemum (*Dendranthema grandiflora*)

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 geographical distribution of different suitability subclasses in the microwatershed are given in Figure 7.29.

Highly suitable (Class S1) lands for growing chrysanthemum occur in an area of 34 ha (5%) and are distributed in the northern and southwestern part of the microwatershed. An area of about 59 ha (9%) is moderately suitable (Class S2) for growing chrysanthemum and is distributed in the northern, southern and southwestern part of the microwatershed with minor limitations of calcareousness and texture. Marginally suitable lands (Class S3) for growing chrysanthemum occupy an area of about 8 ha (1%) and are distributed in the southern part of the microwatershed with moderate limitation of nutrient availability. Currently not suitable (Class N1) lands occur in an area of 405 ha (59%) and are distributed in the major part of the microwatershed with severe limitations of nutrient availability and rooting depth.

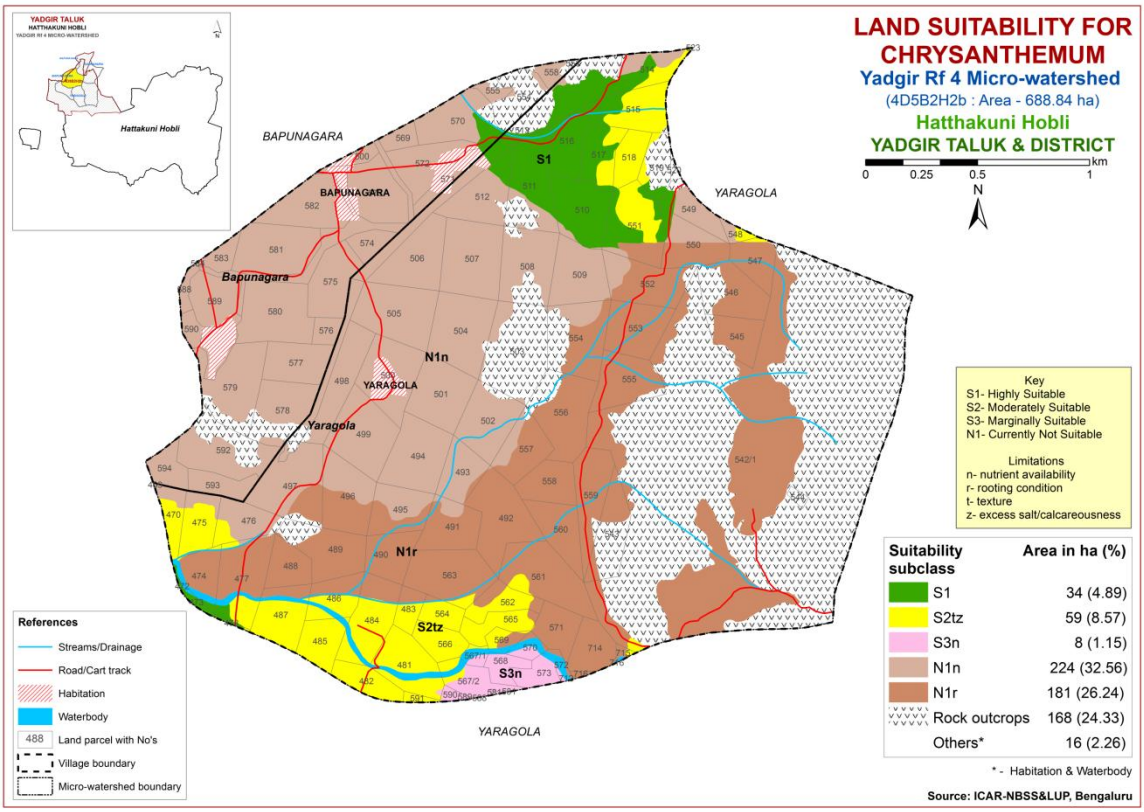


Fig. 7.29 Land Suitability map of Chrysanthemum

Table 7.1 Soil-Site Characteristics of Yadgir Rf4 Microwatershed

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drain-age Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC (dSm^{-1})	ESP (%)	CEC [Cmol (p^{+})kg^{-1}]	BS (%)
					Sur-face	Sub-surface	Surface (%)	Sub-surface (%)								
BDPiB3	866	150	WD	<25	sc	scl	<15	<15	<50	1-3	severe	8.58	0.262	0.35	18.10	100
BDPhB2	866	150	WD	<25	scl	scl	<15	<15	<50	1-3	moderate	8.58	0.262	0.35	18.10	100
HSLcB2	866	150	MW	75-100	sl	sc	<15	<15	101-150	1-3	moderate	7.16	0.117	5.94	4.90	97
HSLhB2	866	150	MW	75-100	scl	sc	<15	<15	101-150	1-3	moderate	7.16	0.117	5.94	4.90	97
GWDiB2	866	150	MW	75-100	sc	scl	<15	<15	101-150	1-3	moderate	9.89	0.74	17.40	8.35	100
MDGiB2	866	150	WD	100-150	sc	scl	<15	<15	>200	1-3	moderate	8.2	0.399	3.08	4.90	100
NGPiB2	866	150	MW	100-150	sc	c	<15	<15	>200	1-3	moderate	7.42	0.24	0.22	67.10	100
NGPmB2	866	150	MW	100-150	c	c	<15	<15	>200	1-3	moderate	7.42	0.24	0.22	67.10	100
SGRiB2	866	150	mw	>150	sc	c	-	-	>200	1-3	moderate	8.3	6.49	11.61	34.77	100
YDRcB2	866	150	WD	100-150	sl	sl	<15	<15	51-100	1-3	moderate	7.25	0.114	0.31	3.40	96
BMNmB2	866	150	MW	>150	c	c	<15	<15	>200	1-3	moderate	8.2	0.284	0.65	52.70	100

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

Table 7.2 Land suitability criteria for Sorghum

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

Table 7.3 Land suitability criteria for Maize

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

Table 7.4 Land suitability criteria for Bajra

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

Table 7.5 Land suitability criteria for Groundnut

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

Table 7.6 Land suitability criteria for Sunflower

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

Table 7.7 Land suitability criteria for Redgram

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

Table 7.8 Land suitability criteria for Bengal gram

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

Table 7.9 Land suitability criteria for Cotton

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

Table 7.10 Land suitability criteria for Chilli

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

Table 7.11 Land suitability criteria for Tomato

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

Table 7.12 Land suitability criteria for Brinjal

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

Table 7.13 Land suitability criteria for Onion

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

Table 7.14 Land suitability criteria for Bhendi

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

Table 7.15 Land suitability criteria for Drumstick

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

Table 7.16 Land suitability criteria for Mango

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

Table 7.17 Land suitability criteria for Guava

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

Table 7.18 Land suitability criteria for Sapota

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

Table 7.19 Land suitability criteria for Pomegranate

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

Table 7.20 Land suitability criteria for Musambi

Land use requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable (N1)**
Climatic regime	Mean temperature in growing season	°C	28-30	31-35 24-27	36-40 20-23	>40 <20
	Mean max. temp. in growing season	°C				
	Mean min. tempt. in growing season	°C				
	Mean RH in growing season	%				
	Total rainfall	mm				
	Rainfall in growing season	mm				
Land quality	Soil-site characteristic					
Moisture availability	Length of growing period for short duration	Days				
	Length of growing period for long duration					
	AWC	mm/m				
Oxygen availability to roots	Soil drainage	Class	Well drained	Moderately drained	poorly	Very poorly
	Water logging in growing season	Days				
Nutrient availability	Texture	Class	scl, cl, sc, c	sl	ls	-
	pH	1:2.5	6.0-7.8	5.5-6.0 7.8-8.4	5.0-5.5 8.4-9.0	>9.0
	CEC	C mol (p+)/ Kg				
	BS	%				
	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 Lime

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

Table 7.22 Land suitability criteria for Amla

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

Table 7.23 Land suitability criteria for Cashew

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

Table 7.24 Land suitability criteria for Jackfruit

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

Table 7.25 Land suitability criteria for Jamun

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

Table 7.26 Land suitability criteria for Custard apple

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

Table 7.27 Land suitability criteria for Tamarind

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

Table 7.28 Land suitability criteria for Mulberry

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

Table 7.29 Land suitability criteria for Marigold

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

Table 7.30 Land suitability criteria for Chrysanthemum

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

7.30 Land Management Units (LMUs)

The 11 soil map units identified in Yadgir Rf4 microwatershed have been grouped into 4 Land Management Units (LMU's) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units map (Fig. 7.30) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The 11 map units that have been grouped into 4 Land Management Units along with brief description of soil and site characteristics are given below.

LMU	Soil map units	Soil and site characteristics
1	62.BMNmB2 48.NGPiB2 49.NGPmB2 32.HSLcB2 126.HSLhB2	Moderately deep to very deep (75 to >150), black clay soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
2	143.SGRiB2 35.GWDiB2 42.YDRcB2	Deep (100-150), sodic soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
3	58.MDGiB2	Deep (100-150), sandy clay loam soils, 1-3% slopes, non gravelly (<15%), moderate erosion.
4	120.BDPhB2 119.BDPiB3	Very shallow (>25), sandy clay loam soils, 1-3% slopes, non gravelly (<15%), moderate to severe erosion.

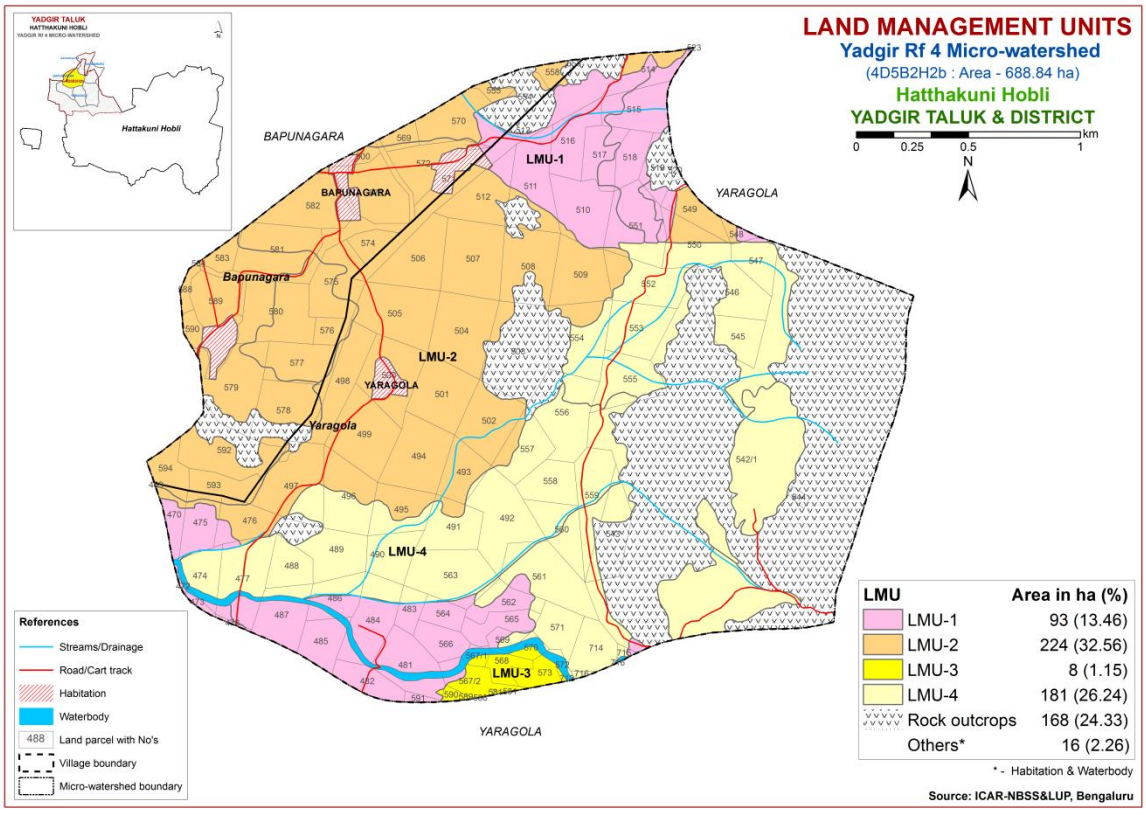


Fig. 7.30 Land Management Units Map- Yadgir Rf4 Microwatershed

7.31 Proposed Crop Plan for Yadgir Rf4 Microwatershed

After assessing the land suitability for the 29 crops, the Proposed Crop Plan has been prepared for the 4 identified LMUs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 29 crops. The resultant proposed crop plan is presented below in Table 7.31.

Table 7.31 Proposed Crop Plan for Yadgir Rf4 Microwatershed

LMU	Soil Map Units	Survey Number	Field Crops/ Commercial crops	Horticulture Crops (Rainfed/Irrigated)	Suitable Interventions
1	62.BMNmB2 48.NGPiB2 49.NGPmB2 32.HSLcB2 126.HSLhB2 (Moderately deep to very deep, black clay soils)	**Yaragola:**470,472,473,475,478,481,482,483,484,485,487,510,511,513,515,516,517,518,523,551,562,564,565,566,569, 591	Maize, Sorghum, Sunflower, Cotton, Red gram, Bengalgram, Bajra	**Fruit crops:** Lime, Musambi, Custard apple, Pomegranate **Vegetables:** Chilli, Bhendi **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
2	143.SGRiB2 35.GWDiB2 42.YDRcB2 (Deep, sodic soils)	**Bapunagara:**500,555,558,569,570,572,573,574,575,576,577,578,579,580,581,582,583,584,588,589,590,592,593,594 **Yaragola:**469,476,493,494,495,497,498,499,500,501,502,504,505,506,507,508,509,512,514,548, 549	-	**Agri-Silvi-Pasture** Ber, Aonla, Acacia sp. Dhaincha, Rhodes grass, Para grass, Bermuda grass	Application of gypsum, iron pyrites and elemental sulphur. Addition of farm yard manure, green manure and providing subsurface drainage
3	58.MDGiB2 (Deep, sandy clay loam soils)	**Yaragola :**567/2,568,573,581, 588,589, 590	Sunflower, Sorghum, Maize, Groundnut, Red gram, Bajra	**Fruit crops:** Mango, Musambi, Sapota, Tamarind, Pomegranate, Amla, Custard apple, Guava, Jackfruit, Jamun, Lime **Vegetables:** Tomato, Onion**,** Bhendi, Chilli, Brinjal, Drumstick, Coriander **Flowers:** Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
4	120.BDPhB2 119.BDPiB3 (Very shallow, sandy clay loam soils)	**Yaragola :** 474,477,486,488,489, 490,491,492,496,545,546,547,550,552, 553, 554,555,556,557,558, 559,560,561,563,571,712,714,715,716	-	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata, Styloxanthes scabra*	Use of short duration varieties, sowing across the slope, drip irrigation is recommended

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 Yadgir Rf4 Microwatershed

- The soil phases identified in the microwatershed belonged to the soil series of BDP series occupies a maximum area of 181 ha (26%) followed by SGR 168 ha (24%), GWD 152 ha (22%), YDR 56 ha (8%), NGP 37 ha (5%), HSL 33 ha (5%), BMN 22 ha (3%) and MDG 8 ha (1%).
- As per land capability classification entire area of the microwatershed falls under arable land category (Class II & IV). The major limitations identified in the arable lands were soil and erosion.

❖ On the basis of soil reaction, an entire cultivated area in the microwatershed is alkaline (pH 7.3-9.0)

Soil Health Management

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

Acid soils

Acid soils do not occur in the microwatershed.

1. Growing of crops suitable for a particular soil pH.
2. Amelioration of soils through the application of amendments (liming materials).

Liming materials:

1. $CaCO_3$ (Calcium Carbonate).
2. Dolomite [Ca Mg $(Co_3)_2$]
3. Quick lime (Cao)
4. Slaked lime [Ca $(OH)_2$]

For normal pH and pH 4.8 (35 t/ha) and pH 6 .0-7.0 (4 t/ha) lime is required.

Alkaline soils

Alkaline soils occur in entire area of 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, Azatobacter, Rhizobium).
3. Application of 25% extra N and P (125 % RDN&P).
4. Application of $ZnSO_4$ – 12.5 kg/ha (once in three years).
5. Application of Boron – 5kg/ha (once in three years).

Neutral soils

Neutral soils do not occur 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.

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. Out of total 689 ha area in the microwatershed, an area of about 31 ha (4%) is under severe erosion and about 475 ha (69%) is suffering from moderate erosion. In areas of moderate and severe erosion immediate soil and water conservation and, other land development and land husbandry practices are required 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 (Saturation Plan) in IWMP is focusing on preparation of

1. Soil and Water Conservation Plan 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 (Saturation Plan) are briefly presented below.

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet

erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Yadgir Rf4 microwatershed.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in an area of 107 ha (15%) and high (>0.75%) in an area of 399 ha (58%) of the microwatershed. The areas that are medium in OC needs to be further improved by applying farmyard manure and crop rotation with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuring crops costs Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level where OC is 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**: Available Phosphorus is medium (23-57 kg/ha) in an area of 495 ha (72%) in the microwatershed and high (>57 kg/ha) in an area of 10 ha (1%). In medium and low areas, for all the crops 25% additional P needs to be applied.
- **Available Potassium:** Available potassium is high (>337 kg/ha) in 330 ha (48%) and medium (145-337 kg/ha) in 175 ha (25%) area in the microwatershed. An additional 25% potassium has to be applied in areas where it is medium or low.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. It is low in an area of 91 ha (13%). Medium in an area of 344 ha (50%) and high in an area of 71 ha (10%) of the microwatershed. Low and medium areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.
- **Available Boron:** An area of 52 ha (8%) is low (<0.5 ppm) in available boron and medium (0.5-1.0 ppm) in an area of 454 ha (66%). Application of sodium tetra borate @ 10 kg/ha as soil application or 0.2 % borax as foliar spray is recommended for low and medium areas. It is high (> 1.0 ppm) in 16 ha (3%) area.

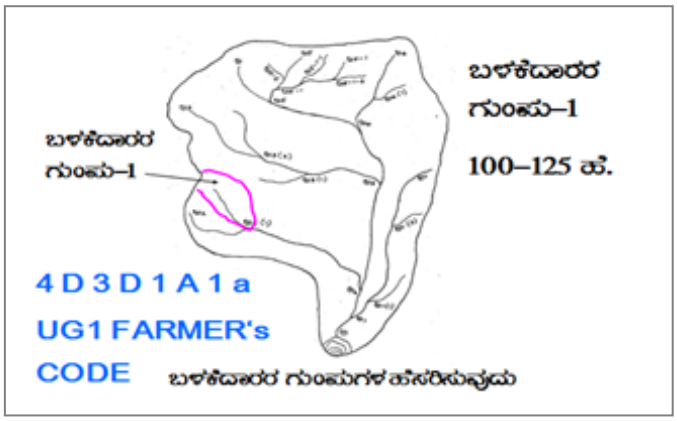
- **Available Iron:** Entire cultivated area is sufficient (>4.5 ppm) in available iron content of the microwatershed. Deficient areas need to be applied with iron sulphate @ 25 kg/ha for 2-3 years.
- **Available Manganese:** All the soils in the microwatershed are sufficient (>1.0 ppm) in available manganese.
- **Available Copper:** All the soils in the microwatershed are sufficient (>0.2 ppm) in available copper.
- **Available Zinc:** Maximum area of 443 ha (64%) is deficient (<0.6 ppm) in available zinc content of the microwatershed and 63 ha (9%) area is sufficient (>0.6 ppm). Application of zinc sulphate @25 kg/ha is recommended for zinc deficient areas.
- **Soil Alkalinity**: Alkaline soils occur in entire cultivated area of the microwatershed. Alkaline soils 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, Acacia, 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 the 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 Yadgir Rf4 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
- Rainfall
- Hydrology
- Water Resources
- Socio-economic data



- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)

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

Steps for Survey and Preparation of Treatment Plan

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

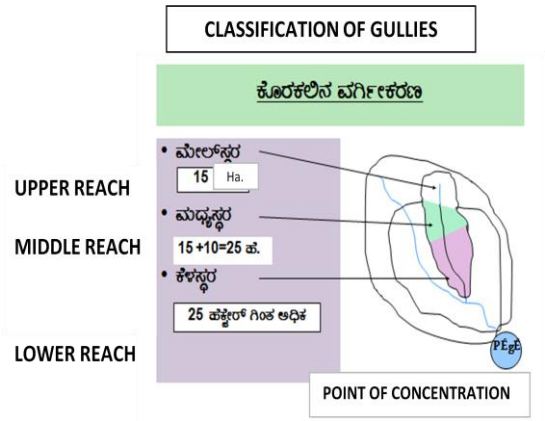
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge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

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below

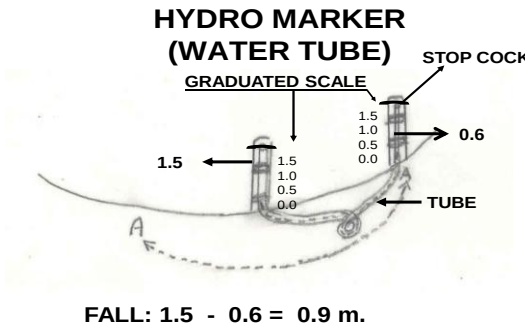
9.1.1 Arable Land Treatment

A. BUNDING

Steps for Survey and Preparation of Treatment Plan		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 ($bg_{0...}$ b=loamy sand, g_0 = <15% gravel). The recommended Sections for different soils are given below.

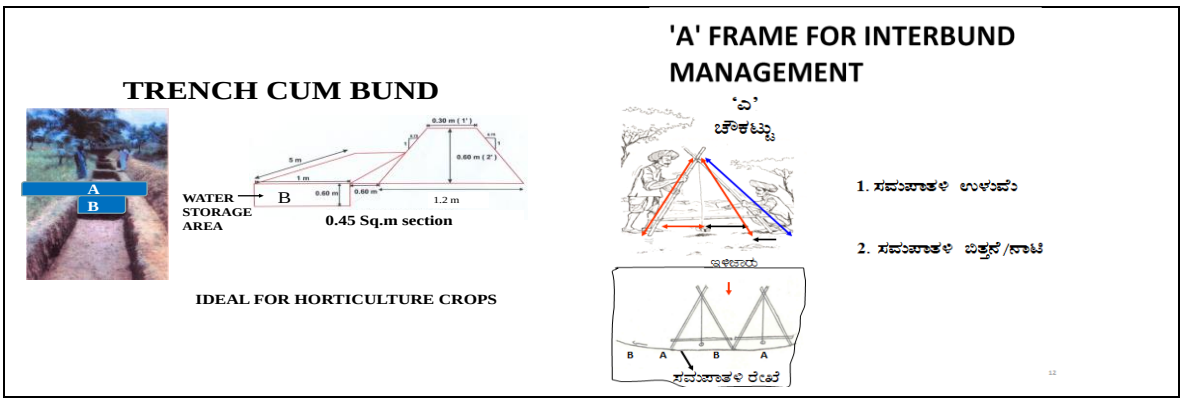
Recommended Bund Section

Top width (m)	Base width (m)	Height (m)	Side slope (Z:1;H:V)	Cross section (sq m)	Soil Texture	Remarks
0.3	0.9	0.3	01:01	0.18	Sandy loam	Vegetative bund
0.3	1.2	0.3	1.5:1	0.225	Sandy clay	
0.3	1.2	0.5	0.9:1	0.375	Red gravelly soils	
0.3	1.2	0.6	0.75:1	0.45		
0.3	1.5	0.6	01:01	0.54	Red sandy loam	
0.3	2.1	0.6	1.5:1	0.72	Very shallow 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
m^2	m	m^3	L(m)	W(m)	D(m)	Quantity (m^3)	m	
0.375	6	2.25	5.85	0.85	0.45	2.24	0.15	Shallow
0.45	6	2.7	5.4	1.2	0.43	2.79	0.6	Shallow
0.45	6	2.7	5	0.85	0.65	2.76	1	Moderately Shallow
0.54	5.6	3.02	5.5	0.85	0.7	3.27	0.1	Moderately shallow
0.54	5.5	2.97	5	1.2	0.5	3	0.5	Shallow
0.72	6.2	4.46	6	1.2	0.7	5.04	0.2	Moderately shallow
0.72	5.2	3.74	5.1	0.85	0.9	3.9	0.1	Moderately deep

B. Water Ways

1. Existing waterways are marked on the cadastral map (1:7920 scale) and their dimensions are recorded.
2. Considering the contour plan of the MWS, additional waterways/ modernization of the existing ones can be thought of.
3. 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 from 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 earthen 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. An area of about 325 ha (47%) needs Graded Bunding and 181 ha (26%) needs Trench cum Bunding in the microwatershed.

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.

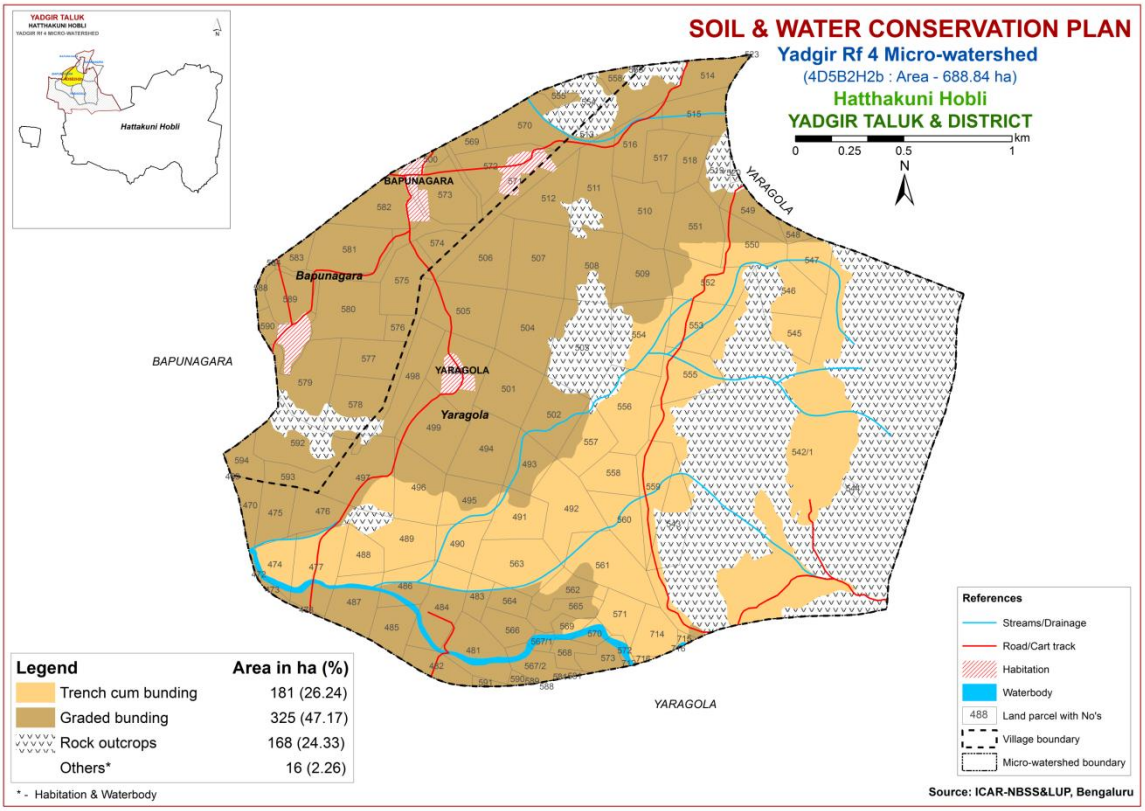


Fig. 9.1 Soil and Water Conservation Plan map of Yadgir Rf4 Microwatershed

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 and field bunds for growing annual and perennial crops. The method of planting these trees is given below.

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

The tree species suitable for the area considering rainfall, temperature and adaptability is listed below; waterlogged areas are recommended to be planted with species like Nerale (*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

Yadgir-4 (2H2b) Microwatershed

Soil Phase Information

Village	Survey No	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
Bapunagara	500	1.08	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding
Bapunagara	553	0.14	RO	RO	RO	RO	RO	RO	RO	RO	Greengram (Gg)	Not Available	RO	RO
Bapunagara	554	4	RO	RO	RO	RO	RO	RO	RO	RO	Grassland	Not Available	RO	RO
Bapunagara	555	1.04	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IVes	Graded bunding
Bapunagara	558	1.26	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IVes	Graded bunding
Bapunagara	569	1.45	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Bapunagara	570	6.75	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Greengram (Rg+Gg)	Not Available	IVes	Graded bunding
Bapunagara	571	2.07	Habitation	Others	Others	Others	Others	Others	Others	Others	Grassland	Not Available	Others	Others
Bapunagara	572	5.55	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Bapunagara	573	6.15	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Bapunagara	574	1.92	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Bapunagara	575	5.65	SGRiB2	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Greengram (Rg+Gg)	Not Available	IVes	Graded bunding
Bapunagara	576	1.43	SGRiB2	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding
Bapunagara	577	4.95	SGRiB2	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	1 Bore well	IVes	Graded bunding
Bapunagara	578	6.45	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Fallow land (Rg+Fl)	Not Available	IVes	Graded bunding
Bapunagara	579	8.4	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Fallow land (Rg+Fl)	Not Available	IVes	Graded bunding
Bapunagara	580	8.34	SGRiB2	LMU-2	Very deep (>150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Greengram (Rg+Gg)	Not Available	IVes	Graded bunding
Bapunagara	581	7.67	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Greengram (Rg+Gg)	Not Available	IVes	Graded bunding
Bapunagara	582	6.67	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Fallow land (Rg+Fl)	Not Available	IVes	Graded bunding
Bapunagara	583	1.63	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IVes	Graded bunding
Bapunagara	584	0.02	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding
Bapunagara	588	0.91	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding

Village	Survey No	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
Bapunagara	589	4.52	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Bapunagara	590	1.15	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IVes	Graded bunding
Bapunagara	592	8.35	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Greengram (Rg+Gg)	1 Bore well	IVes	Graded bunding
Bapunagara	593	2.82	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram (Gg)	Not Available	IVes	Graded bunding
Bapunagara	594	2.59	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	469	0.02	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Groundnut (Ct+Gn)	Not Available	IVes	Graded bunding
Yaragola	470	2.6	BMNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	472	0.12	HSLhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	473	0.49	HSLhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Jowar (Rg+Jw)	Not Available	IIes	Graded bunding
Yaragola	474	3.84	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	475	4.05	BMNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	476	4.34	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Scrub land (Jw+Sl)	Not Available	IVes	Graded bunding
Yaragola	477	7.81	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	478	0.2	HSLhB2	LMU-1	Moderately deep (75-100 cm)	Sandy clay loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	481	6.29	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Yaragola	482	3.21	BMNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram (Ct+Rg)	Not Available	IIes	Graded bunding
Yaragola	483	1.97	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	484	6.95	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	485	3.79	BMNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	486	4.03	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Trench cum bunding
Yaragola	487	5.57	BMNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	488	3.47	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	489	6.67	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	490	4.21	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding

Village	Survey No	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
Yaragola	491	5.25	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	492	8.2	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Groundnut (Jw+Gn)	Not Available	IVes	Trench cum bunding
Yaragola	493	4.07	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	494	7.57	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Yaragola	495	5.2	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Graded bunding
Yaragola	496	6.91	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	497	8.76	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Yaragola	498	5.97	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Yaragola	499	8	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Graded bunding
Yaragola	500	7.43	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Scrub land (Sl)	Not Available	IVes	Graded bunding
Yaragola	501	6.9	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Yaragola	502	6.54	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	503	10.57	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Yaragola	504	8.32	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Graded bunding
Yaragola	505	8.29	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar+Groundnut (Jw+Gn)	Not Available	IVes	Graded bunding
Yaragola	506	6.84	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	507	8.68	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IVes	Graded bunding
Yaragola	508	7.83	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut+Scrub land (Rg+Gn+Sl)	Not Available	IVes	Graded bunding
Yaragola	509	6.36	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	510	6.57	HSLcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	511	7.91	HSLcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	512	6.1	GWDiB2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	513	12.24	HSLcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yaragola	514	4.37	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Graded bunding

Village	Survey No	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
Yaragola	515	5.33	NGPmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yaragola	516	4.8	HSLcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yaragola	517	4.17	HSLcB2	LMU-1	Moderately deep (75-100 cm)	Sandy loam	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	518	2.94	NGPmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	519	3.31	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Yaragola	520	0.31	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Yaragola	523	0.0004	NGPmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yaragola	542/1	168.06	RO	RO	RO	RO	RO	RO	RO	RO	Redgram+Jowar+Groundnut+RO (Rg+Jw+Gn+Rc)	Not Available	RO	RO
Yaragola	543	5.54	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Yaragola	544	0.46	RO	RO	RO	RO	RO	RO	RO	RO	RO	Not Available	RO	RO
Yaragola	545	3.96	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Trench cum bunding
Yaragola	546	6.12	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Trench cum bunding
Yaragola	547	3.48	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Trench cum bunding
Yaragola	548	0.83	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	549	3.42	YDRcB2	LMU-2	Deep (100-150 cm)	Sandy loam	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Graded bunding
Yaragola	550	5.29	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	551	7.71	NGPmB2	LMU-1	Deep (100-150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	552	6.68	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Scrub land (Rg+Sl)	Not Available	IVes	Trench cum bunding
Yaragola	553	5.92	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	554	8.28	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	RO	Not Available	IVes	Trench cum bunding
Yaragola	555	5.88	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	556	8.46	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IVes	Trench cum bunding
Yaragola	557	5.01	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	558	4.15	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding

Village	Survey No	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
Yaragola	559	5.9	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IVes	Trench cum bunding
Yaragola	560	4.68	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram+Groundnut (Rg+Gn)	Not Available	IVes	Trench cum bunding
Yaragola	561	8.43	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	562	3.31	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	563	7.83	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	1 Bore well	IVes	Trench cum bunding
Yaragola	564	2.15	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Groundnut (Gn)	Not Available	IIes	Graded bunding
Yaragola	565	3.07	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	566	2.92	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	567/1	0.93	Waterbody	Others	Others	Others	Others	Others	Others	Others	Jowar (Jw)	Not Available	Others	Others
Yaragola	567/2	3.36	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IIes	Graded bunding
Yaragola	568	1.88	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IIes	Graded bunding
Yaragola	569	1.43	NGPiB2	LMU-1	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yaragola	570	1.28	Waterbody	Others	Others	Others	Others	Others	Others	Others	Jowar (Jw)	Not Available	Others	Others
Yaragola	571	3.53	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	572	0.75	Waterbody	Others	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Yaragola	573	2.2	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Yaragola	581	0.07	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	Graded bunding
Yaragola	588	0.02	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Yaragola	589	0.11	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Yaragola	590	0.44	MDGiB2	LMU-3	Deep (100-150 cm)	Sandy clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton (Ct)	Not Available	IIes	Graded bunding
Yaragola	591	0.48	BMNmB2	LMU-1	Very deep (>150 cm)	Clay	Non gravelly (<15%)	Very high (>200 mm/m)	Very gently sloping (1-3%)	Moderate	Cotton+Redgram+Jowar (Ct+Rg+Jw)	Not Available	IIes	Graded bunding
Yaragola	712	0.01	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding
Yaragola	714	3.78	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Redgram (Rg)	Not Available	IVes	Trench cum bunding
Yaragola	715	0.38	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding

Village	Survey No	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
Yaragola	716	0.27	BDPhB2	LMU-4	Very shallow (<25 cm)	Sandy clay loam	Non gravelly (<15%)	Very low (<50 mm/m)	Very gently sloping (1-3%)	Moderate	Jowar (Jw)	Not Available	IVes	Trench cum bunding

Appendix II

Yadgir-4 (2H2b) Microwatershed

Soil Fertility Information

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bapunagara	500	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)	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)
Bapunagara	553	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Bapunagara	554	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Bapunagara	555	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)	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)
Bapunagara	558	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Bapunagara	569	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)
Bapunagara	570	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)
Bapunagara	571	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Bapunagara	572	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)
Bapunagara	573	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Bapunagara	574	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Bapunagara	575	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Bapunagara	576	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	577	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	578	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	579	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	580	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	581	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	582	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	583	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	584	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	588	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	589	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Bapunagara	590	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	High (> 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	592	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	593	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Bapunagara	594	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	469	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	470	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	472	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	473	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	474	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	475	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	476	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	477	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	478	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	481	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	482	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	483	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	484	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	485	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	486	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	487	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	488	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	489	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	490	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	491	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Survey Number	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Yaragola	492	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	493	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	494	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	495	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	496	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Yaragola	497	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	498	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Yaragola	499	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	500	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	501	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	502	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	503	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yaragola	504	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	505	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Yaragola	506	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 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)
Yaragola	507	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	508	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	509	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	510	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	511	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	512	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	513	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)
Yaragola	514	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	515	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	516	Moderately alkaline	Non saline	Medium (0.5	Medium (23 –	High (> 337	Low (<10	Medium (0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	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)	– 0.75 %)	57 kg/ha)	kg/ha)	ppm)	– 1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yaragola	517	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	518	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	519	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yaragola	520	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yaragola	523	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	542/1	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yaragola	543	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yaragola	544	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO	RO
Yaragola	545	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yaragola	546	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yaragola	547	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	548	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	549	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	550	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	551	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	552	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	553	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	554	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	555	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	556	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	557	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	558	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	559	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	560	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	561	Moderately alkaline	Non saline	High (> 0.75	Medium (23 –	High (> 337	Medium (10	Medium (0.5	Sufficient	Sufficient (>	Sufficient (>	Deficient (<

Village	Survey Number	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)	%)	57 kg/ha)	kg/ha)	– 20 ppm)	– 1.0 ppm)	(>4.5 ppm)	1.0 ppm)	0.2 ppm)	0.6 ppm)
Yaragola	562	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	563	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)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	564	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)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	565	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	566	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	567/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Yaragola	567/2	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	568	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	569	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	570	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Yaragola	571	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yaragola	572	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Yaragola	573	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 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)
Yaragola	581	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	588	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	589	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	590	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	591	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Yaragola	712	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yaragola	714	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yaragola	715	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Yaragola	716	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	High (> 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Low (< 0.5 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)

Appendix III

Yadgir-4 (2H2b) 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	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Bapunagara	500	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bapunagara	553	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
Bapunagara	554	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
Bapunagara	555	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	558	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	569	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	570	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	571	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
Bapunagara	572	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bapunagara	573	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bapunagara	574	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bapunagara	575	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	576	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	577	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	578	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	579	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	580	N1n	S3n	N1n	S3n	N1n	S3n	N1n	N1n	S3n	N1n	S3n	N1n	N1n	N1n	N1tn	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	581	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bapunagara	582	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Bapunagara	583	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	584	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	588	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	589	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Bapunagara	590	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	592	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	593	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Bapunagara	594	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Yaragola	469	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Yaragola	470	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	472	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	473	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	474	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	475	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	476	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	477	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	478	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	481	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	482	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	483	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	484	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	485	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	486	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	487	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	488	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	489	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	490	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	491	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	492	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	493	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Yaragola	494	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	495	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	496	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	497	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	498	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	499	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	500	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	501	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	502	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	503	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
Yaragola	504	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	505	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	506	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	507	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	508	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	509	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	510	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	511	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	512	N1n	S3nz	N1n	S3nz	N1n	S3nz	N1n	N1n	S3nz	N1n	S3nz	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3nz	N1n	N1n	N1n	N1n
Yaragola	513	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	514	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Yaragola	515	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	516	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	517	S3r	S1	S2r	S1	S2r	S2r	S3r	S2r	S3t	S2r	S2r	S1	S2r	S2r	S3n	S3r	S2r	S2t	S1	S1	S1	S1	S1	S2r	S1	S1	S1	S2r	S2r
Yaragola	518	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	519	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

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Yaragola	520	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
Yaragola	523	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	542/1	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
Yaragola	543	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
Yaragola	544	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
Yaragola	545	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	546	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	547	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	548	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Yaragola	549	N1n	S3nt	N1n	S3nt	N1n	N1t	N1n	N1n	N1t	N1n	S3n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	N1n	S3n	N1n	N1n	N1n	N1n
Yaragola	550	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	551	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	552	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	553	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	554	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	555	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	556	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	557	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	558	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	559	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	560	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	561	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	562	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	563	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	564	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	565	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz

Village	Survey Number	Mango	Maize	Sapota	Sorghum	Guava	Cotton	Tamarind	Lime	Bengal gram	Sunflower	Red gram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Onion	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Brinjal	Bhendi	Drumstick	Mulberry
Yaragola	566	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	567/1	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
Yaragola	567/2	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	568	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	569	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3t	S3tz	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	570	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
Yaragola	571	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	572	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
Yaragola	573	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	581	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	588	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	589	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	590	S3n	S2n	S3n	S2tn	N1n	S3tn	N1n	S3n	S3t	S3n	S2tn	N1n	N1n	S3n	N1n	N1n	S3n	S3n	N1n	S3n	S3n	S3n	S3n	S3n	S2n	S3n	S3n	N1n	N1n
Yaragola	591	S3t	S2tz	S3t	S2z	S3tz	S2z	S3z	S2z	S2z	S2z	S2tz	S3z	S3tz	S2z	N1t	S3z	S2z	S3tz	S3t	S2tz	S3t	S2tz	S2tz	S2tz	S2tz	S3t	S2tz	S3z	S3tz
Yaragola	712	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	714	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	715	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r
Yaragola	716	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r	N1r

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

SALIENT FINDINGS OF THE SURVEY

- *The data indicated that there were 94 (55.62%) men and 75 (44.38%) women among the sampled households.*
- *The average family size of landless farmers' was 3.6, marginal farmers' was 4.8, small farmers' was 4.8, semi medium farmers' was 5.3 and medium farmers were 7.*
- *The data indicated that, 29 (17.16%) people were in 0-15 years of age, 83 (49.11%) were in 16-35 years of age, 43 (25.44%) were in 36-60 years of age and 14 (8.28%) were above 61 years of age.*
- *The results indicated that Yadgir Rf-4 had 56.83 per cent illiterates, 14.79 per cent of them had primary school, 11.83 per cent of them had Middle school education, 11.83 per cent of them had high school, 4.73 per cent of them had PUC, 4.14 per cent of them had diploma, 1.18 per cent of them had ITI and 0.59 per cent of them had degree education.*
- *The results indicate that, 68.57 per cent of household heads were practicing agriculture and 22.86 per cent of the household heads were agricultural labourers.*
- *The results indicate that agriculture was the major occupation for 44.97 per cent of the household members, 24.85 per cent were agricultural labourers, 0.59 per cent were government and private service, 18.34 per cent student, 4.73per cent were housewives and 5.92 per cent were children.*
- *The results show that, 100 per cent of the population in the micro watershed has not participated in any local institutions.*
- *The results indicate that 8.57 per cent of the households possess thatched, 85.71 per cent of the households possess katcha house and 5.71 per cent of the households possess pucca/RCC house.*
- *The results show that 68.57 per cent of the households possess TV, 8.57 per cent of the households possess mixer/grinder, 14.29 per cent of the households possess bicycle, 5.71 per cent of the households possess motor cycle and 91.43 per cent of the households possess mobile phones.*
- *The results show that the average value of television was Rs. 3,812, mixer/grinder was Rs. 1,000, bicycle was Rs. 1,240, motor cycle was Rs. 47,500 and mobile phone was Rs. 2,682.*
- *About 37.14 per cent each of the households possess plough, 8.57 per cent each of the households possess seed/fertilizer drill and sprayer, 2.86 per cent of the households possess sprinkler and 28.57 per cent of the households possess weeder.*
- *The results show that the average value of plough was Rs.2,750, seed/fertilizer drill was Rs. 7,500, sprayer was Rs. 2,866, sprinkler was Rs. 5,000 and the average value of weeder was Rs. 89.*
- *The results indicate that, 37.14 per cent of the households possess bullocks, 14.29 per cent of the households possess local cow, 2.86 per cent of the households possess buffalo and sheep, 11.43 per cent of the households possess goat.*

- *The results indicate that, average own labour men available in the micro watershed was 1.6, average own labour (women) available was 1.4, average hired labour (men) available was 9.1 and average hired labour (women) available was 6.67.*
- *The results indicate that, 82.86 per cent of the households opined that the hired labour was adequate and 2.86 per cent of the households opined that the hired labour was inadequate.*
- *The results show that, 2.96 per cent of the population in the micro watershed has migrated.*
- *The results show that, average distance of migration was 1950 kms and average duration of migration was 12 months.*
- *The results show that, 100 per cent of the population has migrated for the purpose of job/wage/work and business.*
- *The results indicate that, households of the Yadgir Rf-4 micro-watershed possess 34.42 ha (81.17%) of dry land and 7.98 ha (18.83%) of irrigated land. Marginal farmers possess 5.43 ha (100%) of dry land. Small farmers possess 21.08 ha (96.3%) of dry land and 0.81 ha (3.7%) of irrigated land. Semi medium farmers possess 7.91 ha (60.55%) of dry land and 5.15 ha (39.45%) of irrigated land. Medium farmers possess 2.02 ha (100%) of irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 364,516.70 and the average value of irrigated land was Rs. 400,608.21.*
- *The results indicate that, there were 4 functioning and de-functioning bore wells in the micro watershed.*
- *The results indicate that, there were 1 functioning and de-functioning bore wells in the micro watershed.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 11.43 per cent and open well was the source in the micro watershed for 2.86 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 8.80 meters and depth of open well was found to be 2.35 meters.*
- *The results indicate that, small, semi medium and medium farmers had an irrigated area of 0.81 ha, 3.38 ha and 2.02 ha respectively.*
- *The results indicate that, farmers have grown cotton (6.27%), green gram (0.81 ha), groundnut (5.96 ha) and red gram (21.08 ha). Marginal farmers have grown cotton and red gram. Small farmers have grown cotton, green gram, groundnut and red gram. Semi medium farmers have grown groundnut and red gram.*
- *The results indicate that, the cropping intensity in Yadgir Rf-4 micro-watershed was found to be 95.76 per cent.*
- *The results indicate that, 88.57 per cent of the households have bank account and 17.14 per cent have savings.*

- *The results indicate that, 97.14 per cent of the households have availed credit from different sources.*
- *The results indicate that, the total cost of cultivation for Cotton was Rs. 30741.14. The gross income realized by the farmers was Rs. 49327.74. The net income from Cotton cultivation was Rs. 18586.60. Thus the benefit cost ratio was found to be 1:1.6.*
- *The total cost of cultivation for green gram was Rs. 21020.94. The gross income realized by the farmers was Rs. 20254. The net income from green gram cultivation was Rs. -766.94. Thus the benefit cost ratio was found to be 1:0.96.*
- *The total cost of cultivation for Red gram was Rs. 45728.81. The gross income realized by the farmers was Rs. 35678.40. The net income from Red gram cultivation was Rs. -10050.41. Thus the benefit cost ratio was found to be 1:0.78.*
- *The total cost of cultivation for groundnut was Rs. 47989.68. The gross income realized by the farmers was Rs. 104205.14. The net income from groundnut cultivation was Rs. 56215.46. Thus the benefit cost ratio was found to be 1:2.17.*
- *The results indicate that, 25.71 per cent of the households opined that dry fodder was adequate and 11.43 per cent of the households opined that dry fodder was inadequate.*
- *The results indicate that the annual gross income was Rs. 153,000 for landless farmers, for marginal farmers it was Rs. 69,662.50, for small farmers it was Rs. 109,186.67, semi medium farmers it was Rs. 201,000 and for medium farmers it was Rs. 332,000.*
- *The results indicate that the average annual expenditure is Rs. 14,292.50. For landless farmers it was Rs. 31,000, marginal farmers it was Rs. 3,678.57, for small farmers it was Rs. 3,998.38, for semi medium farmers it was Rs. 17,138.89 and for medium farmers it was Rs. 153,000.*
- *The results indicate that, households have planted 4 coconut and 3 lemon trees in their field.*
- *The results indicate that, households have planted 4 teak and 49 neem trees in their field and also 6 neem trees in their backyard.*
- *The results indicated that, households have an average investment capacity of Rs. 13,314.29 for land development, Rs.285.71 for irrigation facility, Rs.1,914.29 for improved crop production and Rs.200 for improved livestock management.*
- *The results indicated that loan from bank was the source of additional investment for 8.57 per cent for land development and 2.86 per cent for irrigation facility. Own funds was the source of additional investment for 45.71 per cent for land development, 37.14 per cent for improved crop production and 8.57 per cent for improved livestock management.*
- *The results indicated that, cotton, groundnut and maize was sold to the extent of 100 per cent, green gram was sold to the extent of 87.5 per cent, paddy was sold to extent of 61.4 per cent and red gram was sold to the extent of 91.29 per cent.*

- *The results indicated that, about 94.29 per cent of the farmers sold their produce to local/village merchant.*
- *The results indicated that, 94.29 per cent of the households have used tractor as a mode of transportation.*
- *The results indicated that, 62.86 per cent of the households have experienced soil and water erosion problems in the farm.*
- *The results indicated that, 85.71 per cent have shown interest in soil test.*
- *The results indicated that, 51.43 per cent of the households used fire wood, 2.86 per cent of the households used kerosene and 48.57 per cent of the households used LPG as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 71.43 per cent, 22.86 per cent of the households used bore well, 5.71 per cent of the households used lake/tank in the micro watershed.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*
- *The results indicated that, 97.14 per cent of the sampled households possessed BPL cards and 2.86 per cent of the households does not possessed PDS cards.*
- *The results indicated that, 88.57 per cent of the households participated in NREGA Programme.*
- *The results indicated that, cereals were adequate for 91.43 per cent of the households, pulses were adequate for 77.14 per cent, oilseed were adequate for 48.57 per cent, vegetables were adequate for 34.29 per cent, fruits and milk were adequate for 14.29 per cent.*
- *The results indicated that, cereals were inadequate for 14.29 per cent of the households, pulses were inadequate for 20 per cent, oilseed were inadequate for 57.14 per cent, vegetables were inadequate for 68.57 per cent, fruits were inadequate for 51.43 per cent, milk were inadequate for 85.71 per cent and egg were inadequate for 65.71 per cent of the households.*
- *The results indicated that, lower fertility status of the soil and wild animal menace on farm field in the area was the constraint experienced by 82.86 per cent of the households, frequent incidence of pest and diseases, high cost of fertilizer and plant protection chemicals and high rate of interest on credit (85.71%), Inadequacy of irrigation water (74.29%), low price for the agricultural commodities (51.43%), lack of marketing facilities in the area (40%), inadequate extension service (31.43%) and Lack of transport for safe transport of the Agril produce to the market (48.57%).*

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.

Description of the study area

Yadgir District is one of the 30 districts of Karnataka state in southern India. This district was carved out from the erstwhile Gulbarga district as the 30th district of Karnataka on 10 April 2010. Yadgir town is the administrative headquarters of the district. The district comprises of 3 taluks namely, Shahapur, Yadgiri and Shorapur (There are 16 hoblies, 117 Gram Panchayats, 4 Municipalities,8 Towns/ Urban agglomeration and 487 inhabited & 32 un-inhabited villages The district occupies an area of 5,160.88 km².

Yadgir district is the second smallest district in the state, area wise is very rich in cultural traditions. The vast stretch of fertile black soil of the district is known for bumper red gram and jowar crops. The district is a "Daal bowl" of the state. The district is also known for cluster of cement industries and a distinct stone popularly known as "Malakheda Stone". Two main rivers, Krishna and Bhima, and a few tributaries flow in this region. Krishna and Bhima Rivers drain the district. They constitute the two major river basins of the district. Kagna and Amarja are the two sub - basins of Bhima River, which occur within the geographical area of the district

According to the 2011 census Yadgir district has a population of 1, 172,985, roughly equal to the nation of Timor-Lesteor the US state of Rhode Island. This gives it a ranking of 404th in India (out of a total of 640). The district has a population density of 224 inhabitants per square kilometre (580/sq mi). Its population growth rate over the decade 2001-2011 was 22.67%. Yadgir has a sex ratio of 984 females for every 1000 males, and a literacy rate of 52.36%.

Description of the micro watershed

Yadgir Rf-4 micro-watershed in Haligeri sub-watershed (Yadgir taluk and district) is located in between $16^0$56’31.361’’ to 16^0 54’57.289’’North latitudes and 77^0 4’8.455’’ to $77^0$2’15.879’’East longitudes, covering an area of about 554.38 ha, bounded by Nalwar and Yargola villages.

Methodology followed in assessing socio-economic status of households

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 35 households located in the micro-watershed were interviewed for the survey.

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Yadgir Rf-4 micro-watershed is presented in Table 1 and it indicated that 35 farmers were sampled in Yadgir Rf-4 micro-watershed among them 5 (14.29%) were landless, 8 (22.86%) were marginal, 15 (42.86%) were small farmers, 6 (17.14%) were semi medium farmers and medium farmers were 1 (2.86%).

Table 1: Households sampled for socio economic survey in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	5	14.29	8	22.86	15	42.86	6	17.14	1	2.86	35	100

Population characteristics: The population characteristics of households sampled for socio-economic survey in Yadgir Rf-4 micro-watershed is presented in Table 2. The data indicated that there were 94 (55.62%) men and 75 (44.38%) women among the sampled households. The average family size of landless farmers' was 3.6, marginal farmers' was 4.8, small farmers' was 4.8, semi medium farmers' was 5.3 and medium farmers were 7.

Table 2: Population characteristics of Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (18)		MF (39)		SF (73)		SMF (32)		MDF (7)		All (169)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	10	55.56	21	53.85	41	56.16	17	53.13	5	71.43	94	55.62
2	Women	8	44.44	18	46.15	32	43.84	15	46.88	2	28.57	75	44.38
Total		18	100	39	100	73	100	32	100	7	100	169	100
Average		3.6		4.8		4.8		5.3		7		4.8	

Age wise classification of population: The age wise classification of household members in Yadgir Rf-4 micro-watershed is presented in Table 3. The data indicated that, 29 (17.16%) people were in 0-15 years of age, 83 (49.11%) were in 16-35 years of age, 43 (25.44%) were in 36-60 years of age and 14 (8.28%) were above 61 years of age.

Table 3: Age wise classification of household members in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (18)		MF (39)		SF (73)		SMF (32)		MDF (7)		All (169)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	4	22.22	10	25.64	9	12.33	5	15.63	1	14.29	29	17.16
2	16-35 years of age	8	44.44	20	51.28	35	47.95	16	50	4	57.14	83	49.11
3	36-60 years of age	4	22.22	5	12.82	25	34.25	7	21.88	2	28.57	43	25.44
4	> 61 years	2	11.11	4	10.26	4	5.48	4	12.50	0	0	14	8.28
Total		18	100	39	100	73	100	32	100	7	100	169	100

Education level of household members: Education level of household members in Yadgir Rf-4 micro-watershed is presented in Table 4. The results indicated that Yadgir Rf-4 had 56.83 per cent illiterates, 14.79 per cent of them had primary school, 11.83 per cent of them had Middle school education, 11.83 per cent of them had high school, 4.73

per cent of them had PUC, 4.14 per cent of them had diploma, 1.18 per cent of them had ITI and 0.59 per cent of them had degree education.

Table 4. Education level of household members in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (18)		MF (39)		SF (73)		SMF (32)		MDF (7)		All (169)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	12	66.67	16	41.03	38	52.05	25	78.13	5	71.43	96	56.80
2	Primary School	2	11.11	8	20.51	14	19.18	1	3.13	0	0	25	14.79
3	High School	2	11.11	5	12.82	10	13.70	3	9.38	0	0	20	11.83
4	PUC	0	0	2	5.13	5	6.85	0	0	1	14.29	8	4.73
5	Diploma	0	0	4	10.26	3	4.11	0	0	0	0	7	4.14
6	ITI	0	0	0	0	1	1.37	1	3.13	0	0	2	1.18
7	Degree	0	0	1	2.56	0	0	0	0	0	0	1	0.59
8	Others	2	11.11	3	7.69	2	2.74	2	6.25	1	14.29	10	5.92
Total		18	100	39	100	73	100	32	100	7	100	169	100

Occupation of household heads: The data regarding the occupation of the household heads in Yadgir Rf-4 micro-watershed is presented in Table 5. The results indicate that, 68.57 per cent of household heads were practicing agriculture and 22.86 per cent of the household heads were agricultural labourers.

Table 5: Occupation of household heads in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	3	60	5	62.50	11	73.33	4	66.67	1	100	24	68.57
2	Agricultural Labour	1	20	2	25	3	20	2	33.33	0	0	8	22.86
Total		4	100	7	100	14	100	6	100	1	100	32	100

Occupation of the household members: The data regarding the occupation of the household members in Yadgir Rf-4 micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 44.97 per cent of the household members, 24.85 per cent were agricultural labourers, 0.59 per cent were government and private service, 18.34 per cent student, 4.73per cent were housewives and 5.92 per cent were children.

Table 6: Occupation of family members in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (18)		MF (39)		SF (73)		SMF (32)		MDF (7)		All (169)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	7	38.89	9	23.08	36	49.32	19	59.38	5	71.43	76	44.97
2	Agricultural Labour	3	16.67	14	35.90	19	26.03	6	18.75	0	0	42	24.85
3	Government Service	0	0	1	2.56	0	0	0	0	0	0	1	0.59
4	Private Service	0	0	1	2.56	0	0	0	0	0	0	1	0.59
5	Student	2	11.11	10	25.64	14	19.18	4	12.50	1	14.29	31	18.34
6	Housewife	4	22.22	1	2.56	2	2.74	1	3.13	0	0	8	4.73
7	Children	2	11.11	3	7.69	2	2.74	2	6.25	1	14.29	10	5.92
Total		18	100	39	100	73	100	32	100	7	100	169	100

Institutional participation of the household members: The data regarding the institutional participation of the household members in Yadgir Rf-4 micro-watershed is

presented in Table 7. The results show that, 100 per cent of the population in the micro watershed has not participated in any local institutions. .

Table 7. Institutional Participation of household members in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (18)		MF (39)		SF (73)		SMF (32)		MDF (7)		All (169)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	18	100	39	100	73	100	32	100	7	100	169	100
Total		18	100	39	100	73	100	32	100	7	100	169	100

Type of house owned: The data regarding the type of house owned by the households in Yadgir Rf-4 micro-watershed is presented in Table 8. The results indicate that 8.57 per cent of the households possess thatched, 85.71 per cent of the households possess katcha house and 5.71 per cent of the households possess pucca/RCC house.

Table 8. Type of house owned by households in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	0	0	0	0	1	6.67	1	16.67	1	100	3	8.57
2	Katcha	5	100	6	75	14	93.33	5	83.33	0	0	30	85.71
3	Pucca/RCC	0	0	2	25	0	0	0	0	0	0	2	5.71
Total		5	100	8	100	15	100	6	100	1	100	35	100

Durable Assets owned by the households: The data regarding the Durable Assets owned by the households in Yadgir Rf-4 micro-watershed is presented in Table 9. The results show that 68.57 per cent of the households possess TV, 8.57 per cent of the households possess mixer/grinder, 14.29 per cent of the households possess bicycle, 5.71 per cent of the households possess motor cycle and 91.43 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by households in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	0	0	6	75	13	86.67	4	66.67	1	100	24	68.57
2	Mixer/Grinder	0	0	1	12.50	2	13.33	0	0	0	0	3	8.57
3	Bicycle	0	0	3	37.50	2	13.33	0	0	0	0	5	14.29
4	Motor Cycle	0	0	0	0	1	6.67	1	16.67	0	0	2	5.71
5	Mobile Phone	4	80	8	100	13	86.67	6	100	1	100	32	91.43
6	Blank	1	20	0	0	0	0	0	0	0	0	1	2.86

Table 10. Average value of durable assets owned by households in Yadgir Rf-4 micro-watershed **Average value (Rs.)**

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Television	0	3,000	3,192	5,750	9,000	3,812
2	Mixer/Grinder	0	1,000	1,000	0	0	1,000
3	Bicycle	0	1,333	1,100	0	0	1,240
4	Motor Cycle	0	0	45,000	50,000	0	47,500
5	Mobile Phone	1,820	1,777	3,277	2,416	6,000	2,682

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Yadgir Rf-4 micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 3,812, mixer/grinder was Rs. 1,000, bicycle was Rs. 1,240, motor cycle was Rs. 47,500 and mobile phone was Rs. 2,682.

Farm Implements owned: The data regarding the farm implements owned by the households in Yadgir Rf-4 micro-watershed is presented in Table 11. About 37.14 per cent each of the households possess plough, 8.57 per cent each of the households possess seed/fertilizer drill and sprayer, 2.86 per cent of the households possess sprinkler and 28.57 per cent of the households possess weeder.

Table 11. Farm Implements owned by households in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Plough	0	0	3	37.50	4	26.67	5	83.33	1	100	13	37.14
2	Seed/Fertilizer Drill	0	0	2	25	0	0	0	0	1	100	3	8.57
3	Sprayer	0	0	1	12.50	0	0	1	16.67	1	100	3	8.57
4	Sprinkler	0	0	0	0	1	6.67	0	0	0	0	1	2.86
5	Weeder	2	40	1	12.50	2	13.33	5	83.33	0	0	10	28.57
6	Blank	3	60	5	62.50	11	73.33	1	16.67	0	0	20	57.14

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Yadgir Rf-4 micro-watershed is presented in Table 12. The results show that the average value of plough was Rs.2,750, seed/fertilizer drill was Rs. 7,500, sprayer was Rs. 2,866, sprinkler was Rs. 5,000 and the average value of weeder was Rs. 89.

Table 12. Average value of farm implements owned by households in Yadgir Rf-4 micro-watershed **Average Value (Rs.)**

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Plough	0	6,166	2,125	1,666	1,500	2,750
2	Seed/Fertilizer Drill	0	10,000	0	0	2,500	7,500
3	Sprayer	0	4,000	0	2,300	2,300	2,866
4	Sprinkler	0	0	5,000	0	0	5,000
5	Weeder	100	100	125	77	0	89

Table 13. Livestock possession by households in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0	3	37.50	4	26.67	5	83.33	1	100	13	37.14
2	Local cow	0	0	0	0	1	6.67	3	50	1	100	5	14.29
3	Buffalo	0	0	0	0	0	0	0	0	1	100	1	2.86
4	Sheep	0	0	0	0	0	0	1	16.67	0	0	1	2.86
5	Goat	1	20	0	0	1	6.67	2	33.33	0	0	4	11.43
6	blank	4	80	5	62.50	10	66.67	1	16.67	0	0	20	57.14

Livestock possession by the households: The data regarding the Livestock possession by the households in Yadgir Rf-4 micro-watershed is presented in Table 13. The results indicate that, 37.14 per cent of the households possess bullocks, 14.29 per cent of the households possess local cow, 2.86 per cent of the households possess buffalo and sheep, 11.43 per cent of the households possess goat.

Average Labour availability: The data regarding the average labour availability in Yadgir Rf-4 micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.6, average own labour (women) available was 1.4, average hired labour (men) available was 9.1 and average hired labour (women) available was 6.67.

In case of marginal farmers, average own labour men available was 1.38, average own labour (women) was 1.13, average hired labour (men) was 10 and average hired labour (women) available was 6.88. In case of small farmers, average own labour men available was 1.67, average own labour (women) was 1.53, average hired labour (men) was 10 and average hired labour (women) available was 7.47. In case of semi medium farmers, average own labour men available was 1.5, average own labour (women) was 1.33, average hired labour (men) was 6.33 and average hired labour (women) available was 4.67. In case of medium farmers, average own labour men available was 3, average own labour (women) was 2, average hired labour (men) and average hired labour (women) available was 5.

Table 14. Average Labour availability in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Hired labour Female	0	6.88	7.47	4.67	5	6.67
2	Own Labour Female	0	1.13	1.53	1.33	2	1.40
3	Own labour Male	0	1.38	1.67	1.50	3	1.60
4	Hired labour Male	0	10	10	6.33	5	9.10

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Yadgir Rf-4 micro-watershed is presented in Table 15. The results indicate that, 82.86 per cent of the households opined that the hired labour was adequate and 2.86 per cent of the households opined that the hired labour was inadequate.

Table 15. Adequacy of Hired Labour in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	0	0	8	100	15	100	5	83.33	1	100	29	82.86
2	Inadequate	0	0	0	0	0	0	1	16.67	0	0	1	2.86

Table 16. Migration among the households in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (18)		MF (39)		SF (73)		SMF (32)		MDF (7)		All (169)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Migration	0	0	1	2.56	0	0	4	12.50	0	0	5	2.96

Migration among the households: The data regarding the migration among the household members in Yadgir Rf-4 micro-watershed is presented in Table 16. The results show that, 2.96 per cent of the population in the micro watershed has migrated.

Average distance and duration of migration: The data regarding the average distance and duration of migration of household members in Yadgir Rf-4 micro-watershed is presented in Table 17. The results show that, average distance of migration was 1950 kms and average duration of migration was 12 months.

Table 17. Average distance and duration of migration of households in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (0)	MF (1)	SF (0)	SMF (4)	All (5)
1	Avg. Distance (kms)	0	1,500	0	2,400	1,950
2	Avg. Duration (months)	0	12	0	12	12

Purpose of migration by household members: The data regarding the average distance and duration of migration of household members in Yadgir Rf-4 micro-watershed is presented in Table 18. The results show that, 100 per cent of the population has migrated for the purpose of job/wage/work and business.

Table 18. Purpose of migration of households in Yadgiri Rf-4 micro-watershed

Sl.No.	Particulars	LL (0)		MF (1)		SF (0)		SMF (4)		All (5)	
		N	%	N	%	N	%	N	%	N	%
1	Job/wage/work	0	0	1	100	0	0	4	100	5	100
Total		0	100	1	100	0	100	4	100	5	100

Distribution of land (ha): The data regarding the distribution of land (ha) in Yadgir Rf-4 micro-watershed is presented in Table 19. The results indicate that, households of the Yadgir Rf-4 micro-watershed possess 34.42 ha (81.17%) of dry land and 7.98 ha (18.83%) of irrigated land. Marginal farmers possess 5.43 ha (100%) of dry land. Small farmers possess 21.08 ha (96.3%) of dry land and 0.81 ha (3.7%) of irrigated land. Semi medium farmers possess 7.91 ha (60.55%) of dry land and 5.15 ha (39.45%) of irrigated land. Medium farmers possess 2.02 ha (100%) of irrigated land.

Table 19. Distribution of land (Ha) in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	0	0	5.43	100	21.08	96.30	7.91	60.55	0	0	34.42	81.17
2	Irrigated	0	0	0	0	0.81	3.70	5.15	39.45	2.02	100	7.98	18.83
Total		0	100	5.43	100	21.89	100	13.06	100	2.02	100	42.40	100

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Yadgir Rf-4 micro-watershed is presented in Table 20. The results indicate that, the average value of dry land was Rs. 364,516.70 and the average value of irrigated land was Rs. 400,608.21. In case of marginal famers, the average land value was Rs. 736,214.61 for dry land. In case of small famers, the average land value was Rs. 322,503.85 for dry land and the average land value was Rs. 988,000 for irrigated land. In case of semi

medium famers, the average land value was Rs. 221,212.90 for dry land and the average land value was Rs. 349,253.73 for irrigated. In case of medium famers, the average land value was Rs. 296,400 for irrigated land.

Table 20. Average land value (Rs./ha) in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Dry	0	736,214.61	322,503.85	221,212.90	0	364,516.70
2	Irrigated	0	0	988,000	349,253.73	296,400	400,608.21

Status of bore wells: The data regarding the status of bore wells in Yadgir Rf-4 micro-watershed is presented in Table 21. The results indicate that, there were 4 functioning and de-functioning bore wells in the micro watershed.

Table 21. Status of bore wells in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	De-functioning	0	0	0	3	1	4
2	Functioning	0	0	0	3	1	4

Status of open wells: The data regarding the status of open wells in Yadgir Rf-4 micro-watershed is presented in Table 22. The results indicate that, there were 1 functioning and de-functioning bore wells in the micro watershed.

Table 22. Status of open wells in Yadgir Rf-4 micro-watershed

	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	De-functioning	0	0	1	0	0	1
2	Functioning	0	0	1	0	0	1

Source of irrigation: The data regarding the source of irrigation in Yadgir Rf-4 micro-watershed is presented in Table 23. The results indicate that, bore well was the major irrigation source in the micro water shed for 11.43 per cent and open well was the source in the micro watershed for 2.86 per cent of the farmers .

Table 23. Source of irrigation in Yadgir Rf-4 micro-watershed

	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bore Well	0	0	0	0	0	0	3	50	1	100	4	11.43
2	Open Well	0	0	0	0	1	6.67	0	0	0	0	1	2.86

Depth of Water (Avg. in meters): The data regarding the depth of water in Yadgir Rf-4 micro-watershed is presented in Table 24. The results indicate that, the depth of bore well was found to be 8.80 meters and depth of open well was found to be 2.35 meters.

Table 24. Depth of water (Avg in meters) in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Bore Well	0	0	0	38.61	76.20	8.80
2	Open Well	0	0	5.49	0	0	2.35

Irrigated Area (ha): The data regarding the irrigated area (ha) in Yadgir Rf-4 micro-watershed is presented in Table 25. The results indicate that, small, semi medium and medium farmers had an irrigated area of 0.81 ha, 3.38 ha and 2.02 ha respectively.

Table 25. Irrigated Area (ha) in Yadgir Rf-4micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Kharif	0	0	0.81	3.38	0.81	5
2	Rabi	0	0	0	0	1.21	1.21
Total		0	0	0.81	3.38	2.02	6.22

Cropping pattern: The data regarding the cropping pattern in Yadgir Rf-4 micro-watershed is presented in Table 26. The results indicate that, farmers have grown cotton (6.27%), green gram (0.81 ha), groundnut (5.96 ha) and red gram (21.08 ha). Marginal farmers have grown cotton and red gram. Small farmers have grown cotton, green gram, groundnut and red gram. Semi medium farmers have grown groundnut and red gram.

Table 26. Cropping pattern in Yadgir Rf-4 micro-watershed (Area in ha)

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF(1)	All (35)
1	Kharif Cotton	0	0.81	5.46	0	0	6.27
2	Kharif - Greengram	0	0	0.81	0	0	0.81
3	Kharif - Groundnut	0	0	1.21	4.74	0	5.96
4	Kharif - Red gram	0	3.35	13.19	4.53	0	21.08
5	Rabi - Groundnut	0	0	0.81	0.96	0	1.77
Total		0	4.16	21.48	10.23	0	35.89

Cropping intensity: The data regarding the cropping intensity in Yadgir Rf-4 micro-watershed is presented in Table 27. The results indicate that, the cropping intensity in Yadgir Rf-4 micro-watershed was found to be 95.76 per cent.

Table 27. Cropping intensity (%) in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Cropping Intensity	0	100	100	85.26	100	95.76

Possession of Bank account and savings: The data regarding the possession of bank account and saving in Yadgiri Rf-4 micro-watershed is presented in Table 28. The results indicate that, 88.57 per cent of the households have bank account and 17.14 per cent have savings.

Table 28. Possession of bank account and savings in Yadgiri Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Account	5	100	6	75	13	86.67	6	100	1	100	31	88.57
2	Savings	2	40	2	25	2	13.33	0	0	0	0	6	17.14

Borrowing status: The data regarding the borrowing status in Yadgiri Rf-4 micro-watershed is presented in Table 29. The results indicate that, 97.14 per cent of the households have availed credit from different sources.

Table 29. Borrowing status in Yadgiri Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	5	100	8	100	14	93.33	6	100	1	100	34	97.14

Cost of cultivation of Cotton: The data regarding the cost of cultivation of Cotton in Yadgir Rf-4 micro-watershed is presented in Table 30. The results indicate that, the total cost of cultivation for Cotton was Rs. 30741.14. The gross income realized by the farmers was Rs. 49327.74. The net income from Cotton cultivation was Rs. 18586.60. Thus the benefit cost ratio was found to be 1:1.6.

Table 30. Cost of Cultivation of Cotton in Yadgir Rf-4 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	26.46	4944.97	16.09
2	Bullock		Pairs/day	1.39	1033.08	3.36
3	Tractor		Hours	1.84	1128.93	3.67
4	Machinery		Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	5.22	5448.33	17.72
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	1.95	2919.64	9.50
8	Fertilizer + micronutrients		Quintal	5.41	4299.76	13.99
9	Pesticides (PPC)		Kgs / liters	1.46	1287.27	4.19
10	Irrigation		Number	0	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	22.57	0.07
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				1675.80	5.45
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				22760.35	74.04
III	**Cost B2**					
18	Rental Value of Land				166.67	0.54
19	**Cost B2 = (Cost B1 + Rental value)**				22927.02	74.58
IV	**Cost C1**					
20	Family Human Labour			21.29	5009.47	16.30
21	**Cost C1 = (Cost B2 + Family Labour)**				27936.49	90.88
V	**Cost C2**					
22	Risk Premium				10	0.03
23	**Cost C2 = (Cost C1 + Risk Premium)**				27946.49	90.91
VI	**Cost C3**					
24	Managerial Cost				2794.65	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				30741.14	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		12.33	49327.74	
		b) Main Crop Sales Price (Rs.)			4000	
b.	Gross Income (Rs.)				49327.74	
c.	Net Income (Rs.)				18586.60	
d.	Cost per Quintal (Rs./q.)				2492.81	
e.	Benefit Cost Ratio (BC Ratio)				1:1.6	

Cost of Cultivation of Green gram: The data regarding the cost of cultivation of green gram in Yadgir Rf-4 micro-watershed is presented in Table 31. The results indicate that, the total cost of cultivation for green gram was Rs. 21020.94. The gross income realized by the farmers was Rs. 20254. The net income from green gram cultivation was Rs. -766.94. Thus the benefit cost ratio was found to be 1:0.96.

Table 31. Cost of Cultivation of green gram in Yadgir Rf-4 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	8.65	1605.50	7.64
2	Bullock	Pairs/day	4.94	4940	23.50
3	Tractor	Hours	0	0	0
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	4.94	395.20	1.88
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	0	0	0
8	Fertilizer + micronutrients	Quintal	2.47	2111.85	10.05
9	Pesticides (PPC)	Kgs / liters	2.47	1605.50	7.64
10	Irrigation	Number	1.24	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	0.02	0
14	Land revenue and Taxes		0	0	0
II	**Cost B1**				
16	Interest on working capital			494.71	2.35
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			11152.78	53.06
III	**Cost B2**				
18	Rental Value of Land			166.67	0.79
19	**Cost B2 = (Cost B1 + Rental value)**			11319.45	53.85
IV	**Cost C1**				
20	Family Human Labour		35.82	7780.50	37.01
21	**Cost C1 = (Cost B2 + Family Labour)**			19099.95	90.86
V	**Cost C2**				
22	Risk Premium			10	0.05
23	**Cost C2 = (Cost C1 + Risk Premium)**			19109.95	90.91
VI	**Cost C3**				
24	Managerial Cost			1910.99	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			21020.94	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	4.94	20254	
		b) Main Crop Sales Price (Rs.)		4100	
b.	Gross Income (Rs.)			20254	
c.	Net Income (Rs.)			-766.94	
d.	Cost per Quintal (Rs./q.)			4255.25	
e.	Benefit Cost Ratio (BC Ratio)			1:0.96	

Cost of cultivation of Red gram: The data regarding the cost of cultivation of Red gram in Yadgir Rf-4 micro-watershed is presented in Table 32. The results indicate that, the total cost of cultivation for Red gram was Rs. 45728.81. The gross income realized by the farmers was Rs. 35678.40. The net income from Red gram cultivation was Rs. -10050.41. Thus the benefit cost ratio was found to be 1:0.78.

Table 32. Cost of Cultivation of Red gram in Yadgir Rf-4 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	34.83	5979.35	13.08
2	Bullock		Pairs/day	3.33	2348.56	5.14
3	Tractor		Hours	3.01	2056.60	4.50
4	Machinery		Hours	1.48	889.20	1.94
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	11.79	939.99	2.06
6	Seed Inter Crop		Kgs.	0	0	0
7	FYM		Quintal	1.88	3126.79	6.84
8	Fertilizer + micronutrients		Quintal	22.41	17882.28	39.11
9	Pesticides (PPC)		Kgs / liters	1.66	1216.77	2.66
10	Irrigation		Number	1.24	0	0
11	Repairs			0	0	0
12	Msc. Charges (Marketing costs etc)			0	0	0
13	Depreciation charges			0	89.74	0.20
14	Land revenue and Taxes			0	0	0
II	**Cost B1**					
16	Interest on working capital				2781.10	6.08
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				37310.38	81.59
III	**Cost B2**					
18	Rental Value of Land				187.50	0.41
19	**Cost B2 = (Cost B1 + Rental value)**				37497.88	82
IV	**Cost C1**					
20	Family Human Labour			17.16	4063.77	8.89
21	**Cost C1 = (Cost B2 + Family Labour)**				41561.65	90.89
V	**Cost C2**					
22	Risk Premium				10	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**				41571.65	90.91
VI	**Cost C3**					
24	Managerial Cost				4157.16	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				45728.81	100
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		7.25	35678.40	
		b) Main Crop Sales Price (Rs.)			4918.75	
b.	Gross Income (Rs.)				35678.40	
c.	Net Income (Rs.)				-10050.41	
d.	Cost per Quintal (Rs./q.)				6304.33	
e.	Benefit Cost Ratio (BC Ratio)				1:0.78	

Cost of cultivation of Groundnut: The data regarding the cost of cultivation of groundnut in Yadgir Rf-4 micro-watershed is presented in Table 33. The results indicate that, the total cost of cultivation for groundnut was Rs. 47989.68. The gross income realized by the farmers was Rs. 104205.14. The net income from groundnut cultivation was Rs. 56215.46. Thus the benefit cost ratio was found to be 1:2.17.

Table 33. Cost of Cultivation of groundnut in Yadgir Rf-4 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	33.75	5411.49	11.28
2	Bullock	Pairs/day	3.30	2679.82	5.58
3	Tractor	Hours	1.48	1120.87	2.34
4	Machinery	Hours	0	0	0
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	189.55	16733.71	34.87
6	Seed Inter Crop	Kgs.	0	0	0
7	FYM	Quintal	1.08	1749.65	3.65
8	Fertilizer + micronutrients	Quintal	13.62	7774.91	16.20
9	Pesticides (PPC)	Kgs / liters	1.18	883.89	1.84
10	Irrigation	Number	1.14	0	0
11	Repairs		0	0	0
12	Msc. Charges (Marketing costs etc)		0	0	0
13	Depreciation charges		0	23.94	0.05
14	Land revenue and Taxes		0	0	0
II	**Cost B1**				
16	Interest on working capital			3258.26	6.79
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			39636.53	82.59
III	**Cost B2**				
18	Rental Value of Land			138.89	0.29
19	**Cost B2 = (Cost B1 + Rental value)**			39775.42	82.88
IV	**Cost C1**				
20	Family Human Labour		16.43	3841.57	8
21	**Cost C1 = (Cost B2 + Family Labour)**			43616.98	90.89
V	**Cost C2**				
22	Risk Premium			10	0.02
23	**Cost C2 = (Cost C1 + Risk Premium)**			43626.98	90.91
VI	**Cost C3**				
24	Managerial Cost			4362.70	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			47989.68	100
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	21.56	104205.14	
		b) Main Crop Sales Price (Rs.)		4833.33	
b.	Gross Income (Rs.)			104205.14	
c.	Net Income (Rs.)			56215.46	
d.	Cost per Quintal (Rs./q.)			2225.90	
e.	Benefit Cost Ratio (BC Ratio)			1:2.17	

Adequacy of fodder: The data regarding the adequacy of fodder in Yadgir Rf-4 micro-watershed is presented in Table 34. The results indicate that, 25.71 per cent of the households opined that dry fodder was adequate and 11.43 per cent of the households opined that dry fodder was inadequate.

Table 34. Adequacy of fodder in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL(5)		MF (8)		SF (15)		SMF (6)		MDF(1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	0	0	1	12.50	3	20	5	83.33	0	0	9	25.71
2	Inadequate-Dry Fodder	0	0	2	25	1	6.67	0	0	1	100	4	11.43

Annual gross income: The data regarding the annual gross income in Yadgir Rf-4 micro-watershed is presented in Table 35 The results indicate that the annual gross income was Rs. 153,000 for landless farmers, for marginal farmers it was Rs. 69,662.50, for small farmers it was Rs. 109,186.67, semi medium farmers it was Rs. 201,000 and for medium farmers it was Rs. 332,000.

Table 35. Annual gross income in Yadgir Rf-4 micro-watershed (Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Service/salary	24,000	0	0	0	0	3,428.57
2	Business	4,000	0	1,666.67	0	0	1,285.71
3	Wage	105,000	48,500	49,000	95,500	140,000	67,457.14
4	Agriculture	0	21,162.50	58,520	97,166.67	192,000	52,060
5	Goat Farming	20,000	0	0	8,333.33	0	4,285.71
Income(Rs.)		153,000	69,662.50	109,186.67	201,000	332,000	128,517.14

Average annual expenditure: The data regarding the average annual expenditure in Yadgir Rf-4 micro-watershed is presented in Table 36. The results indicate that the average annual expenditure is Rs. 14,292.50. For landless farmers it was Rs. 31,000, marginal farmers it was Rs. 3,678.57, for small farmers it was Rs. 3,998.38, for semi medium farmers it was Rs. 17,138.89 and for medium farmers it was Rs. 153,000.

Table 36. Average annual expenditure in Yadgir Rf-4 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Service/salary	60,000	0	0	0	0	1,714.29
2	Business	10,000	0	5,000	0	0	428.57
3	Wage	55,000	19,000	30,909.09	45,833.33	65,000	32,171.43
4	Agriculture	0	10,428.57	24,066.67	42,000	88,000	20,914.29
5	Goat Farming	30,000	0	0	15,000	0	1,285.71
Total		155,000	29,428.57	59,975.76	102,833.33	153,000	500,237.66
Average		31,000	3,678.57	3,998.38	17,138.89	153,000	14,292.50

Table 37: Horticulture species grown in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Coconut	0	0	0	0	0	0	4	0	0	0	4	0
2	Lemon	0	0	3	0	0	0	0	0	0	0	3	0

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

Horticulture species grown: The data regarding horticulture species grown in Yadgir Rf-4 micro-watershed is presented in Table 37. The results indicate that, households have planted 4 coconut and 3 lemon trees in their field.

Forest species grown: The data regarding forest species grown in Yadgir Rf-4 micro-watershed is presented in Table 38. The results indicate that, households have planted 4 teak and 49 neem trees in their field and also 6 neem trees in their backyard.

Table 38: Forest species grown in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		F	B	F	B	F	B	F	B	F	B	F	B
1	Teak	0	0	0	0	4	0	0	0	0	0	4	0
2	Neem	0	0	9	2	13	0	25	4	2	0	49	6

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

Average Additional investment capacity: The data regarding average additional investment capacity in Yadgir Rf-4 micro-watershed is presented in Table 39. The results indicated that, households have an average investment capacity of Rs. 13,314.29 for land development, Rs.285.71 for irrigation facility, Rs.1,914.29 for improved crop production and Rs.200 for improved livestock management.

Table 39: Average additional investment capacity in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)	MF (8)	SF (15)	SMF (6)	MDF (1)	All (35)
1	Land development	0	7,750	15,600	28,333.33	0	13,314.29
2	Irrigation facility	0	1,250	0	0	0	285.71
3	Improved crop production	0	1,000	3,400	1,333.33	0	1,914.29
4	Improved livestock management	0	250	333.33	0	0	200

Source of additional investment: The data regarding source of funds for additional investment in Yadgir Rf-4 micro-watershed is presented in Table 40. The results indicated that loan from bank was the source of additional investment for 8.57 per cent for land development and 2.86 per cent for irrigation facility. Own funds was the source of additional investment for 45.71 per cent for land development, 37.14 per cent for improved crop production and 8.57 per cent for improved livestock management.

Table 40: Source of funds for additional investment capacity in Yadgir Rf-4 micro – watershed

Sl.No	Item	Land development		Irrigation facility		Improved crop production		Improved livestock management	
		N	%	N	%	N	%	N	%
1	Loan from bank	3	8.57	1	2.86	0	0.0	0	0.0
2	Own funds	16	45.71	0	0.0	13	37.14	3	8.57

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Yadgir Rf-4 micro-watershed is presented in Table 41. The results indicated that, cotton, groundnut and maize was sold to the extent of 100 per cent, green

gram was sold to the extent of 87.5 per cent, paddy was sold to extent of 61.4 per cent and red gram was sold to the extent of 91.29 per cent.

Table 41. Marketing of the agricultural produce in Yadgir Rf-4 micro-watershed

Sl.No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Cotton	79.0	0.0	79.0	100	4000.0
2	Greengram	4.0	0.5	3.5	87.5	4100.0
3	Groundnut	150.0	-4.0	154.0	100	4833.33
4	Maize	6.0	0.0	6.0	100	2300.0
5	Paddy	27.0	-13.9	16	61.4	1600.0
6	Redgram	155.0	13.5	141.5	91.29	4629.41

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Yadgir Rf-4 micro-watershed is presented in Table 42. The results indicated that, about 94.29 per cent of the farmers sold their produce to local/village merchant.

Table 42. Marketing Channels used for sale of agricultural produce in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	0	0	7	87.50	18	120	7	116.67	1	100	33	94.29

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Yadgir Rf-4 micro-watershed is presented in Table 43. The results indicated that, 94.29 per cent of the households have used tractor as a mode of transportation.

Table 43. Mode of transport of agricultural produce in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Tractor	0	0	7	87.50	18	120	7	116.67	1	100	33	94.29

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Yadgir Rf-4 micro-watershed is presented in Table 44. The results indicated that, 62.86 per cent of the households have experienced soil and water erosion problems in the farm.

Table 44. Incidence of soil and water erosion problems in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL(5)		MF(8)		SF (15)		SMF(6)		MDF(1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	0	0	6	75	11	73.33	5	83.33	0	0	22	62.86

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Yadgir Rf-4 micro-watershed is presented in Table 45. The results indicated that, 85.71 per cent have shown interest in soil test.

Table 45. Interest shown towards soil testing in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	0	0	8	100	15	100	6	100	1	100	30	85.71

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Yadgir Rf-4 micro-watershed is presented in Table 46. The results indicated that, 51.43 per cent of the households used fire wood, 2.86 per cent of the households used kerosene and 48.57 per cent of the households used LPG as a source of fuel.

Table 46. Usage pattern of fuel for domestic use in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	2	40	5	62.50	9	60	2	33.33	0	0	18	51.43
2	Kerosene	1	20	0	0	0	0	0	0	0	0	1	2.86
3	LPG	3	60	3	37.50	6	40	4	66.67	1	100	17	48.57

Source of drinking water: The data regarding source of drinking water in Yadgir Rf-4 micro-watershed is presented in Table 47. The results indicated that, piped supply was the major source of drinking water for 71.43 per cent, 22.86 per cent of the households used bore well, 5.71 per cent of the households used lake/tank in the micro watershed.

Table 47. Source of drinking water in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	5	100	6	75	11	73.33	3	50	0	0	25	71.43
2	Bore Well	0	0	2	25	2	13.33	3	50	1	100	8	22.86
3	Lake/ Tank	0	0	0	0	2	13.33	0	0	0	0	2	5.71

Source of light: The data regarding source of light in Yadgir Rf-4 micro-watershed is presented in Table 48. The results indicated that, Electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 48. Source of light in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	5	100	8	100	15	100	6	100	1	100	35	100

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facilit**y** in Yadgir Rf-4 micro-watershed is presented in Table 49. The results indicated that, 65.71 per cent of the households possess sanitary toilet facility.

Table 49. Existence of Sanitary toilet facility in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	3	60	6	75	10	66.67	3	50	1	100	23	65.71

Possession of PDS card: The data regarding possession of PDS card in Yadgir Rf-4 micro-watershed is presented in Table 50. The results indicated that, 97.14 per cent of the

sampled households possessed BPL cards and 2.86 per cent of the households does not possessed PDS cards.

Table 50. Possession of PDS card in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	5	100	8	100	14	93.33	6	100	1	100	34	97.14
2	Not Possessed	0	0	0	0	1	6.67	0	0	0	0	1	2.86

Participation in NREGA program: The data regarding participation in NREGA programme in Yadgir Rf-4 micro-watershed is presented in Table 51. The results indicated that, 88.57 per cent of the households participated in NREGA programme.

Table 51 Participation in NREGA programme in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL(5)		MF(8)		SF (15)		SMF(6)		MDF(1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	5	100	6	75	13	86.67	6	100	1	100	31	88.57

Adequacy of food items: The data regarding adequacy of food items in Yadgir Rf-4 micro-watershed is presented in Table 52. The results indicated that, cereals were adequate for 91.43 per cent of the households, pulses were adequate for 77.14 per cent, oilseed were adequate for 48.57 per cent, vegetables were adequate for 34.29 per cent, fruits and milk were adequate for 14.29 per cent.

Table 52. Adequacy of food items in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	0	0	9	112.50	15	100	7	116.67	1	100	32	91.43
2	Pulses	0	0	7	87.50	14	93.33	5	83.33	1	100	27	77.14
3	Oilseed	0	0	4	50	10	66.67	3	50	0	0	17	48.57
4	Vegetables	0	0	2	25	7	46.67	3	50	0	0	12	34.29
5	Fruits	0	0	2	25	3	20	0	0	0	0	5	14.29
6	Milk	0	0	2	25	3	20	0	0	0	0	5	14.29

Table 53. Response on Inadequacy of food items in Yadgir Rf-4 micro-watershed

Sl.No.	Particulars	LL (5)		MF (8)		SF (15)		SMF (6)		MDF (1)		LF (0)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	5	100	0	0	0	0	0	0	0	0	0	0	5	14.29
2	Pulses	5	100	1	12.50	0	0	1	16.67	0	0	0	0	7	20
3	Oilseed	5	100	5	62.50	6	40	3	50	1	100	0	0	20	57.14
4	Vegetables	5	100	6	75	8	53.33	4	66.67	1	100	0	0	24	68.57
5	Fruits	5	100	4	50	4	26.67	4	66.67	1	100	0	0	18	51.43
6	Milk	5	100	6	75	12	80	6	100	1	100	0	0	30	85.71
7	Egg	5	100	5	62.50	8	53.33	4	66.67	1	100	0	0	23	65.71
8	Meat	5	100	5	62.50	7	46.67	4	66.67	1	100	0	0	22	62.86

Response on Inadequacy of food items: The data regarding inadequacy of food items in Yadgir Rf-4 micro-watershed is presented in Table 53. The results indicated that, cereals were inadequate for 14.29 per cent of the households, pulses were inadequate for 20 per

cent, oilseed were inadequate for 57.14 per cent, vegetables were inadequate for 68.57 per cent, fruits were inadequate for 51.43 per cent, milk were inadequate for 85.71 per cent and egg were inadequate for 65.71 per cent of the households.

Farming constraints: The data regarding farming constraints experienced by households in Yadgir Rf-4 micro-watershed is presented in Table 54. The results indicated that, lower fertility status of the soil and wild animal menace on farm field in the area was the constraint experienced by 82.86 per cent of the households, frequent incidence of pest and diseases, high cost of fertilizer and plant protection chemicals and high rate of interest on credit (85.71%), Inadequacy of irrigation water (74.29%), low price for the agricultural commodities (51.43%), lack of marketing facilities in the area (40%), inadequate extension service (31.43%) and Lack of transport for safe transport of the Agril produce to the market (48.57%).

Table 54. Farming constraints Experienced in Yadgir Rf-4 micro-watershed

Sl. No.	Particulars	LL(5)		MF (8)		SF (15)		SMF(6)		MDF(1)		All (35)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	0	0	7	87.50	15	100	6	100	1	100	29	82.86
2	Wild animal menace on farm field	0	0	7	87.50	15	100	6	100	1	100	29	82.86
3	Frequent incidence of pest and diseases	0	0	8	100	15	100	6	100	1	100	30	85.71
4	Inadequacy of irrigation water	0	0	8	100	13	86.67	4	66.67	1	100	26	74.29
5	High cost of Fertilizers and plant protection chemicals	0	0	8	100	15	100	6	100	1	100	30	85.71
6	High rate of interest on credit	0	0	8	100	15	100	6	100	1	100	30	85.71
7	Low price for the agricultural commodities	0	0	6	75	7	46.67	4	66.67	1	100	18	51.43
8	Lack of marketing facilities in the area	0	0	4	50	6	40	3	50	1	100	14	40
9	Inadequate extension services	0	0	5	62.50	5	33.33	1	16.67	0	0	11	31.43
10	Lack of transport for safe transport of the Agril produce to the market.	0	0	5	62.50	7	46.67	4	66.67	1	100	17	48.57

Chapter 5

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 35 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 94 (55.62%) men and 75 (44.38%) women among the sampled households. The average family size of landless farmers' was 3.6, marginal farmers' was 4.8, small farmers' was 4.8, semi medium farmers' was 5.3 and medium farmers were 7. The data indicated that, 29 (17.16%) people were in 0-15 years of age, 83 (49.11%) were in 16-35 years of age, 43 (25.44%) were in 36-60 years of age and 14 (8.28%) were above 61 years of age.

The results indicated that Yadgir Rf-4 had 56.83 per cent illiterates, 14.79 per cent of them had primary school, 11.83 per cent of them had Middle school education, 11.83 per cent of them had high school, 4.73 per cent of them had PUC, 4.14 per cent of them had diploma, 1.18 per cent of them had ITI and 0.59 per cent of them had degree education.

The results indicate that, 68.57 per cent of household heads were practicing agriculture and 22.86 per cent of the household heads were agricultural labourers. The results indicate that agriculture was the major occupation for 44.97 per cent of the household members, 24.85 per cent were agricultural labourers, 0.59 per cent were government and private service, 18.34 per cent student, 4.73per cent were housewives and 5.92 per cent were children.

The results show that, 100 per cent of the population in the micro watershed has not participated in any local institutions. The results indicate that 8.57 per cent of the households possess thatched, 85.71 per cent of the households possess katcha house and 5.71 per cent of the households possess pucca/RCC house.

The results show that 68.57 per cent of the households possess TV, 8.57 per cent of the households possess mixer/grinder, 14.29 per cent of the households possess bicycle, 5.71 per cent of the households possess motor cycle and 91.43 per cent of the households possess mobile phones. The results show that the average value of television was Rs. 3,812, mixer/grinder was Rs. 1,000, bicycle was Rs. 1,240, motor cycle was Rs. 47,500 and mobile phone was Rs. 2,682.

About 37.14 per cent each of the households possess plough, 8.57 per cent each of the households possess seed/fertilizer drill and sprayer, 2.86 per cent of the households

possess sprinkler and 28.57 per cent of the households possess weeder. The results show that the average value of plough was Rs.2,750, seed/fertilizer drill was Rs. 7,500, sprayer was Rs. 2,866, sprinkler was Rs. 5,000 and the average value of weeder was Rs. 89.

The results indicate that, 37.14 per cent of the households possess bullocks, 14.29 per cent of the households possess local cow, 2.86 per cent of the households possess buffalo and sheep, 11.43 per cent of the households possess goat.

The results indicate that, average own labour men available in the micro watershed was 1.6, average own labour (women) available was 1.4, average hired labour (men) available was 9.1 and average hired labour (women) available was 6.67. The results indicate that, 82.86 per cent of the households opined that the hired labour was adequate and 2.86 per cent of the households opined that the hired labour was inadequate.

The results show that, 2.96 per cent of the population in the micro watershed has migrated. The results show that, average distance of migration was 1950 kms and average duration of migration was 12 months. The results show that, 100 per cent of the population has migrated for the purpose of job/wage/work and business.

The results indicate that, households of the Yadgir Rf-4 micro-watershed possess 34.42 ha (81.17%) of dry land and 7.98 ha (18.83%) of irrigated land. Marginal farmers possess 5.43 ha (100%) of dry land. Small farmers possess 21.08 ha (96.3%) of dry land and 0.81 ha (3.7%) of irrigated land. Semi medium farmers possess 7.91 ha (60.55%) of dry land and 5.15 ha (39.45%) of irrigated land. Medium farmers possess 2.02 ha (100%) of irrigated land.

The results indicate that, the average value of dry land was Rs. 364,516.70 and the average value of irrigated land was Rs. 400,608.21. In case of marginal famers, the average land value was Rs. 736,214.61 for dry land. In case of small famers, the average land value was Rs. 322,503.85 for dry land and the average land value was Rs. 988,000 for irrigated land. In case of semi medium famers, the average land value was Rs. 221,212.90 for dry land and the average land value was Rs. 349,253.73 for irrigated. In case of medium famers, the average land value was Rs. 296,400 for irrigated land.

The results indicate that, there were 4 functioning and de-functioning bore wells in the micro watershed. The results indicate that, there were 1 functioning and de-functioning bore wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 11.43 per cent and open well was the source in the micro watershed for 2.86 per cent of the farmers. The results indicate that, the depth of bore well was found to be 8.80 meters and depth of open well was found to be 2.35 meters.

The results indicate that, small, semi medium and medium farmers had an irrigated area of 0.81 ha, 3.38 ha and 2.02 ha respectively. The results indicate that, farmers have grown cotton (6.27%), green gram (0.81 ha), groundnut (5.96 ha) and red

gram (21.08 ha). Marginal farmers have grown cotton and red gram. Small farmers have grown cotton, green gram, groundnut and red gram. Semi medium farmers have grown groundnut and red gram. The results indicate that, the cropping intensity in Yadgir Rf-4 micro-watershed was found to be 95.76 per cent.

The results indicate that, 88.57 per cent of the households have bank account and 17.14 per cent have savings. The results indicate that, 97.14 per cent of the households have availed credit from different sources.

The results indicate that, the total cost of cultivation for Cotton was Rs. 30741.14. The gross income realized by the farmers was Rs. 49327.74. The net income from Cotton cultivation was Rs. 18586.60. Thus the benefit cost ratio was found to be 1:1.6. The total cost of cultivation for green gram was Rs. 21020.94. The gross income realized by the farmers was Rs. 20254. The net income from green gram cultivation was Rs. -766.94. Thus the benefit cost ratio was found to be 1:0.96. The total cost of cultivation for Red gram was Rs. 45728.81. The gross income realized by the farmers was Rs. 35678.40. The net income from Red gram cultivation was Rs. -10050.41. Thus the benefit cost ratio was found to be 1:0.78. The total cost of cultivation for groundnut was Rs. 47989.68. The gross income realized by the farmers was Rs. 104205.14. The net income from groundnut cultivation was Rs. 56215.46. Thus the benefit cost ratio was found to be 1:2.17.

The results indicate that, 25.71 per cent of the households opined that dry fodder was adequate and 11.43 per cent of the households opined that dry fodder was inadequate.

The results indicate that the annual gross income was Rs. 153,000 for landless farmers, for marginal farmers it was Rs. 69,662.50, for small farmers it was Rs. 109,186.67, semi medium farmers it was Rs. 201,000 and for medium farmers it was Rs. 332,000. The results indicate that the average annual expenditure is Rs. 14,292.50. For landless farmers it was Rs. 31,000, marginal farmers it was Rs. 3,678.57, for small farmers it was Rs. 3,998.38, for semi medium farmers it was Rs. 17,138.89 and for medium farmers it was Rs. 153,000.

The results indicate that, households have planted 4 coconut and 3 lemon trees in their field. The results indicate that, households have planted 4 teak and 49 neem trees in their field and also 6 neem trees in their backyard.

The results indicated that, households have an average investment capacity of Rs. 13,314.29 for land development, Rs.285.71 for irrigation facility, Rs.1,914.29 for improved crop production and Rs.200 for improved livestock management. The results indicated that loan from bank was the source of additional investment for 8.57 per cent for land development and 2.86 per cent for irrigation facility. Own funds was the source of additional investment for 45.71 per cent for land development, 37.14 per cent for improved crop production and 8.57 per cent for improved livestock management.

The results indicated that, cotton, groundnut and maize was sold to the extent of 100 per cent, green gram was sold to the extent of 87.5 per cent, paddy was sold to extent of 61.4 per cent and red gram was sold to the extent of 91.29 per cent.

The results indicated that, about 94.29 per cent of the farmers sold their produce to local/village merchant. The results indicated that, 94.29 per cent of the households have used tractor as a mode of transportation.

The results indicated that, 62.86 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 85.71 per cent have shown interest in soil test.

The results indicated that, 51.43 per cent of the households used fire wood, 2.86 per cent of the households used kerosene and 48.57 per cent of the households used LPG as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 71.43 per cent, 22.86 per cent of the households used bore well, 5.71 per cent of the households used lake/tank in the micro watershed.

Electricity was the major source of light for 100 per cent of the households in micro watershed. The results indicated that, 97.14 per cent of the sampled households possessed BPL cards and 2.86 per cent of the households does not possessed PDS cards. The results indicated that, 88.57 per cent of the households participated in NREGA

The results indicated that, cereals were adequate for 91.43 per cent of the households, pulses were adequate for 77.14 per cent, oilseed were adequate for 48.57 per cent, vegetables were adequate for 34.29 per cent, fruits and milk were adequate for 14.29 per cent. programme.

The results indicated that, cereals were inadequate for 14.29 per cent of the households, pulses were inadequate for 20 per cent, oilseed were inadequate for 57.14 per cent, vegetables were inadequate for 68.57 per cent, fruits were inadequate for 51.43 per cent, milk were inadequate for 85.71 per cent and egg were inadequate for 65.71 per cent of the households.

The results indicated that, lower fertility status of the soil and wild animal menace on farm field in the area was the constraint experienced by 82.86 per cent of the households, frequent incidence of pest and diseases, high cost of fertilizer and plant protection chemicals and high rate of interest on credit (85.71%), Inadequacy of irrigation water (74.29%), low price for the agricultural commodities (51.43%), lack of marketing facilities in the area (40%), inadequate extension service (31.43%) and Lack of transport for safe transport of the Agril produce to the market (48.57%).